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Agricultural Trade and Poverty

MAKING POLICY ANALYSIS COUNT



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FOREWORD

When looking at this volume, which contains the papers presented in May 2002 at the OECD Global Forum on "Agricultural Trade Reform, Adjustment and Poverty", two questions may be asked. Why does agricultural trade reform matter in the fight against poverty? What is the role of OECD in this context?

One in five of the world's population live in abject poverty, with a per capita income of less than a dollar a day. At least two-thirds of these people live in rural areas. In the poorest countries, the share is as high as 90%. For all of these people, what happens to agriculture is vitally important. Moreover, for poor urban and non-farm households agricultural policies matter too, as a high proportion of their household expenditures is spent on food. In order to address the blight of global poverty, the agricultural situation in developing and least-developed countries needs to be improved. Growth in agricultural production has proven effective in lifting people out of poverty, and exports can contribute significantly to growth.

Yet, access to OECD markets for agricultural products is limited, and international competition distorted by subsidies. Many OECD countries impose high tariffs on developing country agricultural exports. Overall, OECD countries provide USD 311 billion a year (in 2001) of support to their farm sectors, equivalent to twice the value of developing country agricultural exports and six times the value of Official Development Assistance. Developing countries cannot, and should not, match these levels of support. They wonder about policy coherence in OECD countries, and question the seriousness of OECD governments that speak about the benefits of an open trading system, but do not liberalise their own agricultural markets. However, the benefits of trade reform are not just about easier access to overseas markets. The removal of protection to uncompetitive sectors in developing countries, and the elimination of policies that discriminate against agriculture, can allow a more productive use of internal resources and foster growth.

However, we need to be realistic about what agricultural trade reform can and cannot do. Although the development dimension of trade negotiations is important, trade reform alone cannot deliver development. In many countries, there is a vicious circle between poverty and factors such as war and conflict, weak governance and HIV/Aids that also needs to be broken. We also need to acknowledge that trade reform creates both winners and losers, and that the concerns of the immediate losers cannot be shrugged off on the promise of higher average incomes. Moreover, the pattern of gains and losses will vary considerably from one country to the next, depending on the underlying economic structure. For example, countries that are dependent on exports of one or two key cash crops are likely to have a very different set of concerns to countries with a diversified export base. Similarly, exporting countries may place a priority on market access, whereas net importers may be more concerned with the size of their food import bill.

The papers presented at the Global Forum and collected in this volume explore these issues from various angles, and make important contributions to the analysis of the underlying factors. The OECD is extremely grateful to the authors for having made such high quality contributions to the Global Forum, and for making their papers available for wider circulation in this volume.

Discussion during this Global Forum contributed to improved mutual understanding on these difficult issues. It also showed that there is need for further analysis, and clarified how the OECD can contribute, by exploiting its specific competence in policy analysis, policy design, and policy dialogue. We will make a determined effort, in the years to come, to improve our understanding of agriculture-trade-poverty linkages, in order to help both OECD and developing country governments adopt more successful policies.

The OECD Global Forum on Agriculture is one of eight "Global Forums" managed by the OECD's Centre for Co-operation with Non-Members. Their objective is to deepen and extend relations with non-OECD economies in fields where the OECD has particular expertise and where global dialogue is important. This book is published under the responsibility of the Secretary-General of the OECD.

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AGRICULTURAL TRADE REFORM, ADJUSTMENT AND POVERTY: MAPPING THE LINKAGES

Jonathan Brooks[*]

Abstract

This paper examines the nature of the linkages between agricultural trade reform and the incidence of absolute poverty in developing and transition economies. Its purpose is the shed light on how an improved understanding of these linkages can lead to improved policy advice. The paper proposes a distinction between strategic policies that focus on reaping the long-term benefits of reform, and tactical policies that aim to mitigate any adverse impacts on the poor over the short to medium term. Such policies need to be based on an empirical understanding of the disaggregated impacts of reform. Accordingly, the paper seeks to demonstrate the wider relevance of the specific contributions in this volume, and to establish some priorities for future work.

1. Introduction

This paper discusses the nature of the linkages between multilateral agricultural trade reform and the incidence of absolute poverty in developing and transition countries. Its point of departure is the recognition that agricultural trade reforms will have a complex range of distributional effects, and that these effects are of crucial importance in countries where food and agriculture figures prominently in peoples' lives, either as a source of income or a major component of expenditure. The main premise is that policymakers need specific quantitative information on who is likely to be affected by agricultural trade reform and by how much. Armed with such information, it should be possible for them to design policies to ensure that the aggregate benefits of open international trade do not occur at the expense of people who are living in poverty, or are threatened by poverty.

The basic case for multilateral trade reform rests on the principle of comparative advantage. This principle holds that a country can gain from specialising in those goods (or services) in which its *relative* costs of production are lower than in other countries, and exporting them in return for products in which it has a comparative disadvantage. Such a pattern of specialisation and trade is only likely to emerge if countries avoid trade protection and other measures that affect the allocation of resources in tradable sectors. Many developing countries have a comparative advantage in some form of agricultural activity, and a reduction in agricultural protection by potential trading partners should enhance their export opportunities in these activities. To the extent that the resulting efficiency gains translate into faster economic growth, agricultural trade reform should, in principle, help lift people out of poverty.

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Yet although trade reform promises substantial aggregate gains in economic welfare, it is nevertheless important to acknowledge that it requires adjustment, and puts pressure on those sectors that formerly benefited from protection. Many developing countries have much to gain from improved market access, notably to OECD country markets. Yet there are concerns that even if a country gains in overall terms, producers in less productive import-competing sectors may lose from an opening up of domestic markets, and that consumers may end up paying more for their food. There are also some countries for which agricultural trade reforms may impose more costs than benefits. For example, some net-importing countries may lose from less subsidised production in OECD countries, while some exporters with preferential market access may lose if they are forced to compete with other potential suppliers. Naturally, these net costs may be outweighed by the benefits of reform in other sectors, and by the more efficient use of national resources over time. But the immediate impacts cannot be ignored, particularly if there is a chance that those impacts could hurt the poor. In the case of the poorest countries, there are fears that the opening up of import markets will have a harmful effect on the poor, while the absence of domestic export capacity may limit any potential benefits.

A major dilemma for policy-makers stems from the need to mitigate any potentially adverse effects of trade reform on the poor (or potentially poor), while at the same time steering the economy towards a more productive pattern of specialisation and trade based on the country's comparative advantage. In attempting to balance these two concerns, it is important to note that qualitative information, and the results of theoretical models, are of limited practical value. Rather, there is a need for specific quantitative information on how the various impacts of trade reform filter down to the household level, and how households adapt over time.

The linkages between agricultural trade reform and poverty are multiple, complex and difficult to measure. Many important information gaps need to be plugged. But policy-makers need to know which gaps need to be filled most urgently in order to improve the quality of policy advice. They also need a clearer idea of the kind of detail that is necessary. How can the short-term and long-term effects of reform be understood and measured with sufficient detail to inform policy advice, and yet without so much data collection and analysis that timely and cost-effective policy responses are not possible?

It would be impossible for a short paper such as this to provide a comprehensive review of the efforts that have been made to measure the links between agricultural trade reform and poverty. Accordingly, the task of this paper is more modest. It sets out a simplified schema for examining the linkages between trade reform and poverty, discusses some of the methodologies that are being used to shed light on these linkages, and assesses our ability to measure them. As such, it seeks to provide a route map for the specific applications presented in subsequent sessions.

The implications of the analysis are important for OECD countries as well as developing countries with a high incidence of poverty. In the first place, OECD countries have a responsibility to consider the effects that their own policies have on other countries, particularly when those policies have a negative overall effect on the poor. This responsibility coincides with self-interest, since impeding developing countries' ability to export products in which they have a comparative advantage imposes net economic costs on importers as well as exporters. It is also worth noting that three OECD countries have developing country status at the WTO and significant poverty, notably in their agricultural and rural populations, so the OECD and non-OECD distinction is not a neat contrast of rich and poor.[1]

Finally, it is important to acknowledge the social and political urgency of these issues. Trade reform in general, and agricultural trade reform in particular, has a role to play in lifting people out of absolute

1. Korea, Mexico and Turkey.

poverty. With multilateral trade negotiations under the auspices of the WTO underway, and countries committed to responding to the Doha Development Agenda, it is important that any prospective agreement takes full account of the concerns of developing countries. Uppermost among these concerns is that any prospective agreement should, at a minimum, not end up hurting the poor.

The paper is organised as follows. Section 2 presents a simplified schema for examining the links between agricultural trade reform and poverty. This schema has three key elements: first, the effects of agricultural trade reforms on world markets; second, the effects of world market changes and own-country reforms on the prices paid by consumers and received by producers; and third, the effects of domestic price changes on different types of household. These three elements are considered in sections 3, 4 and 5 respectively. Section 6 places these elements in the context of agriculture's broader role in the process of growth and development. Section 7 concludes with a general consideration of how quantitative information can be used to determine the scope and jurisdiction of trade policy and domestic policy.

2. A simplified schema

An examination of the links between agricultural trade reform and poverty needs to be clear about the terms being used. In this paper agricultural trade reform is taken to mean a reduction in explicit trade intervention (*e.g.* a lowering of tariffs or a reduction in export subsidies) and a reorientation in domestic policies away from measures that influence production and consumption decisions and, by extension, international trade. In other words, agricultural trade reform is synonymous with a reduction in the use of policies that distort agricultural trade, either directly or indirectly. For each country, there are two dimensions to agricultural trade reform: first, the reforms to a country's own policies; second the effects of reforms in other countries. The latter include both composite effects, such as the overall effect of multilateral reform on world prices, and more direct impacts via bilateral trading relations.

There is no universally accepted definition of poverty. The term is often used generally to refer to some form of deprivation; but that deprivation may be in the form of low relative or absolute incomes, a lack of access to social services, or, more broadly, an inability to participate in society (be that economically, culturally, socially, or politically). The OECD's *DAC Guidelines on Poverty Reduction* recognise the multi-dimensional nature of poverty, defining it as "the ability of people to meet economic, social and other standards of well-being".[2] UNDP defines poverty more broadly as "the denial of opportunities and choices…to lead a long, healthy, creative life and to enjoy a decent standard of living, freedom, dignity, self-esteem and the respect of others".[3]

To make the analysis of the links between agricultural trade reform and poverty tractable, this paper focuses on poverty at the *household* level and adopts an absolute money metric (such as a threshold level of per capita income or expenditure). This approach has a number of shortcomings. For example, it ignores intra-household deprivation (notably of women and children) and non-monetary needs (such as autonomy or participation). Nevertheless, it is an approach that enables the links between agricultural trade reform and poverty to be delineated in a measurable way that overcomes vague conjectures about who will be affected by trade reform and in what ways. One way of viewing this measure is as a useful albeit imperfect indicator. If the income or expenditure of a particular household, or group of households, falls below a given threshold, then that is also likely to be

2. OECD Development Assistance Committee (2001).

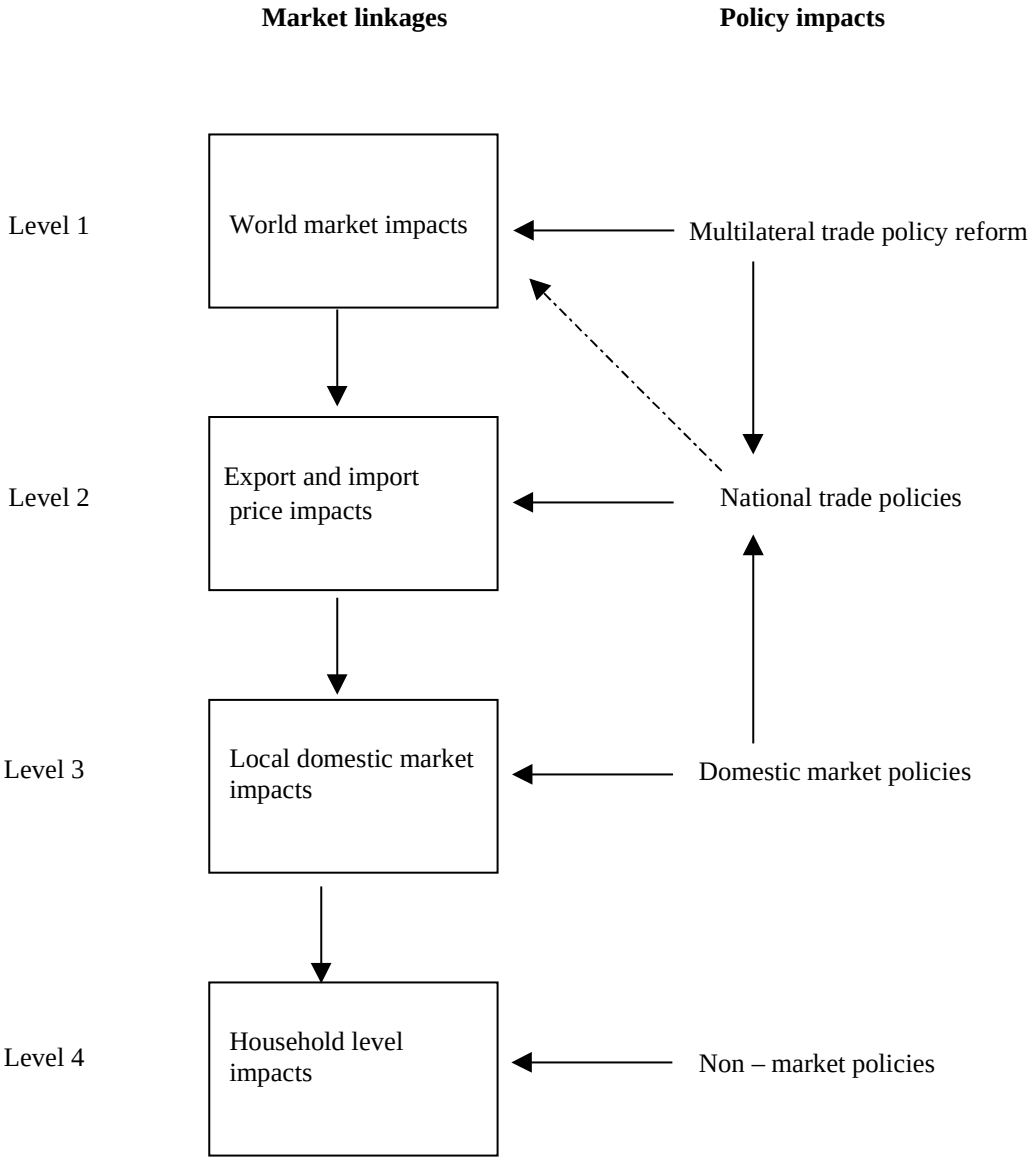
3. UNDP (1997).

associated with non-monetary forms of deprivation requiring policy action. The World Bank has adopted as its yardstick of poverty a per capita income of less than one US dollar per day. This measure is recognised in the Millennium Development Goals, which include a commitment to halve, between 1990 and 2015, the proportion of people whose income is less than this amount.

It is important to note that the emphasis here is on poverty, as distinct from inequality, although the two are often related. The implications of this distinction are discussed in Section 6, which considers the linkages between trade, aggregate growth and the disaggregated structure of economic growth.

With these definitions in mind, it is possible to present a simplified schema through which the effects of agricultural trade reform can be tracked down to the household level. The proposed schema is presented in Figure 1.

Figure 1. **A simplified schema of market and policy linkages**



It is possible to identify four stages of transmission through which agricultural trade reform affects households' incomes and expenditures. First, multilateral trade reform has a global effect on international markets, as resources are reallocated in response to the existing pattern of comparative advantage (level 1). Second, these changes on world markets, together with own-country policy changes, are associated with changes in the prices paid by importers and received by exporters in individual countries (level 2). Third, changes in prices paid and received at the border lead to changes on local domestic markets (level 3). Fourth, changes in these prices affect the incomes and expenditures of households, with consequent effects on the incidence of poverty (level 4). As the right hand column illustrates, policies can have a direct impact at each stage. Not all policies are independent. For example, both multilateral rules and domestic policies can affect national trade policies. In the case of a large country, national trade policies may have a measurable effect on world markets (dotted arrow).

A key point to note is that between each stage there is a transmission mechanism, and that the degree of transmission (alternatively, the extent of market integration) is likely to be less than perfect in all cases. The two sources of imperfect transmission are: (a) government policies; and (b) non-policy factors that limit the arbitrage of price differences between markets. Thus, between levels 1 and 2, changes in world market prices may not equal changes in the prices paid by importers because of continuing trade barriers such as tariffs, or excessive transport costs that make it unprofitable for middlemen to exploit price differences. Similarly, between levels 2 and 3, domestic producers may receive more or less than the traded price for a given quantity and quality of output, depending on domestic price policies and non-policy factors such as transport costs and the availability of information.

At the household level, the effects can be complex. Fully subsistence farmers may not be affected directly by reform, since they neither buy nor sell on markets. However, their incomes and expenditures may be affected indirectly via other market interactions. Farm households with a marketable surplus will see their incomes rise if trade reform causes the prices they receive to go up. But whether or not this happens will depend on whether they are taxed or subsidised, and whether multilateral reforms will cause world prices to go up (which is likely to happen when there is widespread global support) or down. The opposite applies for households that are net buyers of food. The incomes of agricultural wage earners are likely to depend on the profits of the companies they work for, but the effects of trade reform on prices of cash crops may be very different from the effects on food crop prices. This diversity of potential impacts underscores the importance of a disaggregated understanding of the incidence of reform.

Such a representation of trade reform impacts is an oversimplification for several reasons. In the first place, the causality can run both ways. For example, structural changes at the household level can affect local markets, while changes in local markets can affect the relative prices of tradables and non-tradables, which, in the case of a large country, can alter the conditions on world markets. Second, there are general equilibrium impacts at each stage. For example, households may receive incomes from agricultural production in the form of wages or profit, which they then spend on a variety of agricultural and non-agricultural goods according to the structure of their demands. The overall pattern of demand will in turn have a bearing on the structure of production. Similarly, tariffs may affect government revenues, which can be spent in a variety of ways. Finally, there is a range of dynamic impacts, including the complex linkages between trade, economic growth and poverty. These dynamic effects are extremely important, not least because they may counteract the static impacts, and possibly overwhelm them in the long-run. Some approaches to measuring the importance of dynamic factors are discussed in Section 6. In the meantime, a simple tracking of the immediate impact of agricultural trade reform on individual households provides a valuable starting point.

3. Agricultural trade reform and world market impacts

A multilateral trade agreement obliges countries participating in that agreement to reform policies which are deemed to distort international trade. In the case of the Uruguay Round Agreement on Agriculture (URAA), for example, countries were required to limit their use of import tariffs, export subsidies and trade-distorting domestic policies. In each participating country, and for each sector subject to reform, the liberalisation of national policies in these areas has an influence on the prices received by exporters and paid by importers, and hence on the levels of supply, demand and trade (the difference between the two). At the same time, the reform of national policies, by changing each country's system of price incentives, has a *cumulative* effect on world markets. For a country participating in a multilateral trade agreement, two types of effect therefore apply: the *direct* effect of national reforms and the *indirect* effect as world markets adjust to a new equilibrium. With a composite multilateral package, these effects may counteract each other. For example, national reductions in trade protection may reduce prices paid by importers, while global reforms may cause world prices to rise. In the case of a country that does not participate in an agreement (*e.g.* non-WTO members), only the effect of other countries' reforms is felt.

The direct effects of national reforms can be captured with a national model. But to understand the effects of multilateral reforms on world markets as well, a multi-country (and multi-sector model) is generally needed. The question is what sort of model is appropriate? There is no short answer to this question. All models have their strengths and weaknesses, and more than one type of model is capable of shedding light on how world markets and national markets are linked (levels 1 and 2). The first decision is whether a partial equilibrium (PE) or general equilibrium (GE) model should be used.

A PE model is essentially a collection of supply and demand curves, with a limited sectoral focus, which means that some interactions are ignored. For example, the OECD's *AGLINK* model, presented in this meeting by **Thompson**, is a global PE model for which the sectoral focus is limited to the output markets for major agricultural commodities.[4] The OECD's Policy Evaluation Matrix (*PEM*) crop model is also a PE model, with more limited country and commodity coverage, but an explicit modelling of the linkages between output and factor markets. *AGLINK* has proven adept at examining commodity market effects, while *PEM* has been a useful tool for looking at the effects of alternative policies on output and input markets (and for shedding light on the issue of decoupling).

A GE model is more "complete" in that it takes account of inter-sectoral interactions. The Global Trade Analysis Project (*GTAP*) model is a global computable general equilibrium (CGE) model that incorporates all countries and all sectors, albeit at a fairly high level of aggregation in some cases. **Beghin *et al.*** apply *GTAP* to examine the impact that agricultural trade reforms in OECD countries will have on the trading relationships of developing countries. *GTAP* provides information on inter-sectoral effects that clarify the importance of agriculture vis-à-vis other sectors. It also captures shifts in bilateral trading patterns.

Most multi-market partial equilibrium models, including *AGLINK* and the FAO's *World Food Model*, solve for a single world price for each commodity that clears global supply and demand. The response of domestic markets to world prices depends on the modelling of national policies, on other factors determining the extent to which world price changes are felt on domestic markets, and on the price responsiveness of domestic supply and demand. The modelling of world prices in *GTAP* is more indirect. *GTAP* contains different price wedges for each bilateral trade flow, with the size of these wedges dependent on the border measures employed by each country. As the size of these wedges

4. The commodity coverage of *AGLINK* corresponds to those crops and livestock products for which the OECD calculates support.

changes, trade shifts between countries according to the responsiveness of traders to relative price changes. As a consequence, *GTAP* offers more information on bilateral trading patterns and does not rely on the assumption of a unifying world price. Against this, the modelling of policy detail has tended to be more rudimentary. These particular differences are specific to the modelling approaches used, rather than fundamental differences between PE and GE models, as a partial equilibrium model with a breakdown of bilateral trade could also be constructed.

In general terms, which type of model is most appropriate? The answer depends on the question at hand. GE models require exhaustive data sets, with the consequence that there is typically a greater level of aggregation both to keep the modelling task manageable and to focus on the effects that GE models are best placed to illuminate. In essence, the choice comes down to whether the interest is in disaggregated and specific information on particular markets or sectors, or in inter-sectoral and, in the case of *GTAP*, inter-country allocations. Both PE and GE models provide useful information on level 1, namely the effects that trade reform will have on world markets, although PE models typically provide more detail. GE models can be particularly informative on the links between levels 1 and 2, *i.e.* in explaining how national economies are linked into global markets.

Poorer households are likely to be as concerned about the *variability* of agricultural prices as they are about their levels. Multi-market PE models are well placed to explore the complex effects of trade reform on world price volatility. For most agricultural commodities, trade has been restricted by border protection, so multilateral reform should broaden world markets and reduce international price variability. However, own-country reforms could either offset or reinforce this tendency. For example, a removal of border protection may, by making domestic price guarantees untenable, increase domestic exposure to international price variability (even if those prices are less volatile than before). On the other hand, further integration with world markets could reduce the impacts of local shocks (such as the weather) on domestic prices.

Finally, when different models are used, it is often valuable to compare the results. If a common model is used to analyse different trade reform scenarios, a comparison of the results can serve as a useful sensitivity analysis. If the model's underlying assumptions are changed, then this can shed light on the robustness of the results. And when the models are of a different character (*e.g.* the results of a PE model are compared with those of a GE model), differences in the results can clarify the insights that come from each modelling structure (*e.g.* the importance or otherwise of general equilibrium effects).

4. Price distortions and price transmission

It is instructive to break down the impact that changes in world market prices have on domestic prices into two components. First, the transmission of world price changes across international borders – in the case of an importer, the internal price at the border once tariffs and other duties have been paid (*i.e.* the link between levels 1 and 2).[5] Second, the internal transmission of prices change to and from the border (between levels 2 and 3). Both effects need to be understood in order to gauge the impacts that trade reforms will have on the prices received by farmers and paid by consumers and hence on the welfare of different types of household.

International price transmission will be affected by both *policy* and *non-policy* factors. For example, import tariffs and high transport costs can both insulate national markets from world markets. The same is true of domestic price transmission, where internal taxes can limit the degree of market

5. In the case of an exporter, the price received once border taxes and subsidies in both the home and destination countries are accounted for.

integration, but so can transport, marketing and other costs. As a general rule, non-policy factors ("transactions costs") are likely to be more important the less developed the economy, meaning that price transmission will typically be lower for a given degree of trade protection. Strictly speaking, the term "non-policy" may be a misnomer, as the government may be able to pursue development policies that bring transactions costs down. However, the term is used here to distinguish these factors from specific measures designed to insulate domestic markets.

In order to gauge the effect that trade reform will have on domestic markets it is necessary to separate the policy and non-policy sources of price distortions.[6] The OECD's Producer Support Estimate (PSE) attempts to do just that. It provides an annual estimate of support accorded to producers as a result of government policies.[7] A key element of the PSE is the market price support component, which is based on a comparison of farmgate prices and international (traded) prices. As the paper by **Melyukhina** points out, the calculation of market price support involves compiling information on price policies and making estimates of the non-policy sources of price differences. This is a challenging task because of a number of practical difficulties, notably the need to ensure that domestic and internationally traded products are of a comparable quality; that prices are compared at the same stage of marketing (ideally at the farmgate); that the appropriate exchange rate conversion is used; and that transport costs are measured accurately.

Since the PSE is an estimate of support attributable to policy, *changes* in the PSE should also reflect changes in policies rather than the effects of non-policy sources of price distortions. However, there are two reasons why caution needs to be applied when interpreting changes in PSEs and market price support.

First, the PSE (and its market price support component) is a static measure, whereas responses to price changes take place dynamically over time. Even with no policies in place, changes in world prices do not lead to equivalent changes in domestic prices once transport and other transactions costs are factored in. The most obvious reason for incomplete and delayed adjustment is imperfect information. As a consequence, external shocks, such as an exchange rate change or a shift in market fundamentals, can open up persistent gaps between internal prices and traded prices, even after all measurable transactions costs have been factored in. The speed and completeness of arbitrage is an empirical issue that will vary by market and by country. Some commodity markets are more developed than others (for example, wheat is more tradable than potatoes), while traders are more geared to exploit price differences in some countries than others (for example, price differences in small markets may not be worth arbitraging away).

Second, if transport costs between two markets exceed the price difference between those markets, then arbitrage will not occur. This means that the gap between world and domestic prices can move within the bounds of transport costs irrespective of policy. This implies that a narrowing of the price gap (implying lower market price support) cannot always be associated with a reduction in explicit support policies, and likewise an increase in the gap (implying higher market price support) cannot always be associated with an increase in explicit support.

6. For a discussion of the mechanisms, see Colman (1995).

7. In most OECD countries, this support is significant, but in many developing countries it is likely to be negative, as farmers are often implicitly taxed by government policies. The OECD currently calculates PSEs for its 30 Member countries, plus Bulgaria, Estonia, Latvia, Lithuania, Romania, Russia and Slovenia.

For this reason, other tools can usefully complement the PSE. Notably, the dynamic issue of price transmission can be illuminated with more frequent price data. For example, co-integration and other econometric techniques have been used to measure the extent to which price changes on one market pass through to another. The papers by **Valdés and Foster, Larson** and **Sharma** each apply different methodologies to consider how the removal of agricultural price distortions will affect domestic prices in developing and transition economies.

5. Household level impacts

Having estimated how world market price changes are felt at the local level, and the accompanying effects of own-country reforms, the next phase is to gauge how these effects are felt at the household level (level 4). A key reason for focusing on poverty impacts at the household level is that, to a large extent, the household is the unit which pools incomes and makes integrated decisions on how to spend them. Poverty, as defined in this paper, thus becomes apparent if households do not have enough money to provide for their collective well-being.

The recognition of the household as the basic institution governing decisions regarding production, consumption and labour supply also has important implications for the kinds of analysis that need to be undertaken. In particular, households can be *categorised* according to economic, structural and other characteristics, and the effects of reform estimated in each case.

In economic theory, production, consumption and labour supply decisions are often modelled separately. The common element is optimisation subject to economic constraints. Thus, production decisions are made by firms, which maximise profits subject to constraints determined by market prices, fixed factors and technology. Consumers maximise their utility subject to a budget constraint determined by market prices and disposable incomes. Workers maximise their utility with respect to work time and home time, subject to constraints determined by the market wage and total time available.

Each of these approaches is valuable for agricultural policy analysis, since agricultural policy changes (specifically exogenous price changes) will have different effects on the incomes of commercial producers of food, consumers of food, and those who work for agricultural enterprises. However, this breakdown only covers those households that are affected in one of these three ways. Yet about a quarter of the world's population belongs to farm (peasant) households, where all three effects may be felt at once. Hence there is a need to add a fourth class of agent to the analysis: the farm household that both produces and consumes food, and possibly sells its own labour or hires outside labour.

Analytically, the recognition of the specific characteristics of farm households might not be important. If all markets work and there are no transactions costs, then production, consumption and labour supply decisions can be solved separately. This is because if market prices correspond to true opportunity costs, then it does not matter whether the household consumes its own food or sells it and then buys food on the market. Similarly, it is immaterial whether the household provides its own labour to the farm, or works off-farm and hires labour.

In reality, however, there are several sources of market failure which are important in developing countries, and, because they induce a wedge between market prices and opportunity costs, call for a simultaneous (as opposed to separable) modelling of household decisions. These include:

- Transactions costs. These include poor infrastructure, which may raise the opportunity cost of obtaining off-farm inputs and supplying goods to the market; the costs of

obtaining information on output and input prices; and squeezes on margins by merchants with local market power. Other transactions costs include the costs of monitoring hired labour, whose objectives differ from those of household members.

- Shallow local markets. This may imply a high negative correlation between a household's output and the effective price it receives, thus affecting the decision on whether or not to produce a surplus.

- Price risks and risk aversion. Households discount sale prices and mark up purchase prices according to the degree of risk in the market and the extent of their risk aversion. The greater the risk and the degree of risk aversion, the larger the difference between the market price and the opportunity cost to the household.

- Limited availability of credit. Credit deficiencies restrict production and consumption choices and introduce a similar wedge between market prices and the households' decision prices. For example, the decision prices of goods that relax the credit constraint (such as daily milk sales) are marked up, so increasing their production and sale.

The beauty of household models is that, given suitable survey data, they can be built with considerable detail. For example, the producer side can account for output responses to changes in the relative prices of different crops. Similarly, off-farm income can be accommodated in order to demonstrate the relative effects of changes in the relative prices of crops (via production and consumption decisions) and in off-farm wages (via the on-farm versus off-farm labour decision). The importance of specific sources of market failure can also be gauged empirically. All this information may be valuable for policy-makers.

The chief limitation of such models derives from impracticality of extending such a disaggregated level of detail to the national level, in order to obtain an economy-wide representation of the effect of policies. Although the household approach can be retained at the national level, with the breakdown of households into different structural categories, there will necessarily be a loss of detail in the way that policy effects and behavioural responses are captured.

General equilibrium applications constitute a set of tools which can provide important, albeit more aggregated, insights into how different types of household fit into a country's overall structure of economic activity, and hence how they will be affected by policy changes. Two types of general economy-wide structure have proven particularly useful: Social Accounting Matrices (SAMs) and national Computable General Equilibrium (CGE) models. CGE models are calibrated on the basis of an underlying SAM.

A SAM breaks down an economy's structure into a system of accounting identities with total expenditure on each account equal to total income. These identities describe the circular flow of income in the economy. For example, production generates value added, which is paid as wages, rent and profit to factors of production. These incomes are then payable to institutions, including households and the government. The incomes of institutions are either saved or spent on domestic production or imports.

The greatest contribution of a SAM is that it *describes* in a fully consistent way the structure of a country's economy. It can thus be used to investigate the importance of specific structural characteristics, such as the links between the agricultural sector, factor incomes (wages, profit and rent), and patterns of incomes and expenditures. A SAM consolidates three important data sets: an input-output survey, a household income survey and a household expenditure survey. As such it

allows for some disaggregated detail, but not as much as household surveys constructed specifically for modelling purposes. That said, economy-wide national surveys provide an important link from the micro to the macro level.

The accounts of a SAM can be disaggregated so as to emphasise those aspects of the economy of greatest interest. A common approach is to partition all households into distinct categories according to occupation (*e.g.* agricultural versus non-agricultural), income (*e.g.* by quintile), and location (*e.g.* urban versus rural). SAMs with varying degrees of disaggregation are available for many developing and least developed countries (several are available on the International Food Policy Research Institute's website).

A SAM can also be used as a *model* in order to simulate the effects of policy changes. The key insights come from multiplier analysis, which shows how an exogenous change (say in transfers to households) affects all accounts once the circular flow is engaged. The critical assumption, as with input-output analysis, is that the relationships between accounts are purely demand driven. The limitations of ignoring price effects mean that SAMs tend to be more useful as guides to potentially induced linkage effects than as predictive models (for example they can illustrate the extent to which agriculture drives the rural economy).

In order to simulate more accurately the effects of policy reform it is necessary to parameterise the supply and demand interactions in the economy. There are a number of ways of doing this, but the most comprehensive is to develop a CGE model based on the SAM's underlying data. **Bussolo** does this in order to examine the effects of alternative redistributive policies on poverty in Ghana. CGE models are particularly useful if the focus of policy interest is on macroeconomic factors, price effects or the role that a country's socio-economic structure plays in determining policy impacts.[8] They typically offer medium-term insights, *i.e.* before major dynamic effects take hold. In addition, they are well placed to highlight the importance of intersectoral effects, such as upstream and downstream linkages from the farm-gate. The scope for measuring intersectoral effects was a noted advantage of *GTAP*, which is a global CGE model, albeit one that contains national level information by integrating national SAMs.

More generally, Bussolo makes a useful distinction between "micro" applications, which use the household approach, "macro" applications, which dispense with it, and "meso" applications, which fall somewhere between the two. SAMs and CGE models often fall into this third category: they partition all households into distinct categories, on the basis of either economic characteristics (such as level of income or principal economic activity) or other criteria relevant to policy design (such as location). They typically draw on nationally conducted surveys or census data, which allows for some disaggregated detail but not as much as specially conducted household surveys.

A key question is how the "micro" insights of household models can be combined with the "meso" insights of SAMs and CGE models in a practical way that provides the necessary level of detail for effective policy design. The appropriate answer will depend on the rationale for government policy and the type of intervention that is envisaged. Obviously, the more disaggregated household information available, the better our understanding of how individual households will be affected by policy reform. However, the gathering of such detail may not be cost-effective. If the chief concern is with the level of household incomes, then the need for reliable national household income data is paramount. Beyond that, information on households' sources of income and patterns of expenditures may be valuable in explaining their connections to the wider economy (for example in a SAM). The

8. Sadoulet and de Janvry (1995).

additional benefit of calibrating detailed household models is likely to come from the ability of these models to identify instances of market failure and quantify their empirical importance. Here, appropriate national policies may not require exhaustive economy-wide information.

Often the biggest challenge lies not with data collection and analysis, but rather with choosing the right tools and producing policy analysis that is relevant to the needs of policy-makers. Some guidelines for how data and analysis can be harnessed for maximum effect are suggested in the conclusions.

6. Trade, growth and poverty

The main rationale for trade reform comes from the idea that if countries allocate their resources more efficiently, then that should raise incomes. Both dimensions of multilateral reform matter. First, liberalisation abroad should increase a country's potential to export goods and services in which it has a comparative advantage. Second, reform at home should increase that country's scope for importing goods and services in which it has a comparative disadvantage. The shift of a country's resources away from sectors in which it has a comparative disadvantage and into sectors in which it has a comparative advantage should allow exports to increase, and imports to be paid for at a lower cost in terms of domestic resources. In countries where average incomes are low, trade reform should, by raising aggregate income, benefit the poor.

A major question for policy-makers is how they should balance concerns about the immediate *incidence* of reform (where there will be both winners and losers) with a longer-term perspective on the potential of trade-induced growth to lift people out of poverty. To answer this question, it would be helpful to know how large the dynamic gains are likely to be, how they are likely to be distributed, and how long it will take before they are felt. Unfortunately, policy-makers are unlikely to have such precise information at their disposal. Nevertheless, an improved understanding of the links between trade, growth and poverty - and agriculture's role in that process – should enable some balance to be struck between the long-term benefits of trade for the poor and the more immediate (and diverse) needs of poor households.

There are two main strands of literature on these links: one on the relationship between international trade and economic growth, the other on the links between growth, the structure of growth, and poverty.[9] The latter forms the basic core of development economics. It is not possible to review this vast literature here, but it is possible to highlight some of the most salient points from a policy standpoint, and to provide some specific consideration of agriculture's role in the development process and how this role may be shaped by trade reform.

Does openness to trade increase economic growth? So far, the research literature has not managed to produce simple unequivocal results that are convenient for policy-makers. In the first place, the insights from stylised (2 good, 2 factor, 2 country) models are less clear-cut in a world with several goods, factors and countries, or when other simplifying assumptions (such as competitive markets) are relaxed. Moreover, these static models suggest a one-off increase in the level of income, which is not

9. For a review of how trade and growth theories apply to agriculture, see van Berkum and van Meijl (2000).

the same as a faster rate of growth. Second, cross-country empirical analysis has not managed to establish unambiguously a clear link between openness to trade and growth.[10]

This being the case, why has so much faith been placed on the prescription of trade liberalisation, and shouldn't policy recommendations be more circumspect? The answer would seem to be that, despite the caveats above, there are still compelling reasons for believing that there *is* an important link between trade and growth, and hence for specialising and trading according to comparative advantage.

In terms of the theory, the insights of traditional trade models are still important. These models show how differences between countries – for example, in factor endowments and technology – may lead countries to trade in order to take advantage of these differences. The difference now is that there are additional insights. The main point would appear to be that there is no longer a single body of trade theory, but rather a range of theories that offer collectively important insights. These insights are important in view of the changing nature of trade in agricultural and food products, notably the increasing share of trade in higher value processed agricultural and manufactured food products, and the rise of intra-industry trade. These elements point to the importance of elements of the new trade and growth theories, notably dynamic models which take account of market imperfections, product differentiation, economies of scale and innovation.

It is important to underline that none of these arguments refute the basic case for trade being determined by the principle of comparative advantage. However, they do call for a more subtle interpretation of the known facts. There are some circumstances under which a country can gain from protection, under the assumption that the broader trading environment remains open; but these are exceptions based on the presumption of market power and when the benefit comes at the expense of another country do not produce recommendations that generalise across counties. More important is the insight that countries can influence the underlying pattern of comparative advantage, and that if comparative advantage shifts into sectors with more promising growth potential then that can accelerate the process of growth. The practicalities of this are taken up later, but the principle recommendation appears to be that this is best accomplished by investing in *factors* (such as skills and education) rather than *sectors*.

The failure of cross-country empirical studies to establish a clear link between openness to trade and growth is of less concern. Aside from well-documented empirical difficulties (*e.g.* concerning how to measure openness), it is not surprising that trade alone cannot be separated from a wide range of other determinants of growth which are difficult to measure and in many cases are complementary with trade. Indeed, there is a wide accumulation of case study evidence that open trade policies form an important element of a broad mix of sound policies that can foster faster economic growth. Certainly no country has prospered by turning its back on trade. That said, it is important not to view trade reform as a panacea: in a number of Asian and sub-Saharan African countries issues such as conflict, HIV/Aids and weak governance are more important, and trade reform would be of little benefit in the absence of complementary capacity building.

In terms of the links between growth and poverty reduction, it is important to note that in the poorest economies it is impossible to have the latter without the former. If per capita incomes average less than USD 1 or USD 2 per day, then redistribution alone will not lift people out of poverty. Yet the structure of growth matters too. Concentrated growth will clearly not pull people out of poverty as

10. Several studies do find evidence of a positive link between openness to trade and growth, including those by Sachs and Warner (1995), Edwards (1998), Frankel and Romer (1999) and Dollar and Kraay (2000). However, these studies have received strong criticism, notably from Rodriguez and Rodrik (2000).

quickly as a more broad-based structure of growth. The question of whether there is an inevitable link between the dynamics of growth and inequality has long been a source of controversy.[11] From a policy standpoint, the nature of the linkages may or may not be an issue. If everyone is poor, then the process of wealth creation (which involves some getting richer) will naturally tend to raise inequality. On the other hand, it is not clear from cross-country evidence whether more egalitarian countries experience faster or slower growth.

It can be argued that the econometric search for evidence is a fruitless exercise. Some countries, for example in South America, have enjoyed periods of strong but unequal growth, whereas other countries, notably in Asia, have grown more rapidly in the wake of land reforms that have had an equalising effect on incomes. The key point appears to be that there is more than one path to economic development. In poor countries, where the majority of the population is either employed in agriculture, or indirectly dependent on it, it is clear that the sooner the productivity of the agricultural and rural population can be improved - either in agriculture or out of it – the more broad-based economic growth can be. If that productivity can match the levels in the sectors which are driving economic growth, then overall growth should be faster too. Investments in human capital (for example through expenditures on education, training, and health) and in technologies and infrastructure can improve the productivity of agriculture, thereby releasing resources for other activities. This will not create unemployment to the extent that the generation of agricultural surpluses will create a demand for new goods and services, which a healthier and better educated and trained workforce should be able to provide. In other words, investment in poverty reduction should be able to lead to a pattern of growth that is both faster and more egalitarian.

Wiggins identifies three levels at which growth in the agricultural sector may have a particularly important role to play in poverty alleviation. First, there is the *direct* impact of agricultural growth on farm incomes, which account for a large share of national income in most poor economies, and its tendency to generate more on-farm employment and rising real farm wages. Second, there are numerous *rural economy* linkages. These include more jobs in agriculture related industries, and more jobs in the non-farm economy as farm labourers spend their additional incomes. More jobs and higher incomes in the rural economy may in turn lead to better nutrition, better health and increased investment in education. These improve welfare directly and also increase productivity. Agricultural growth may also generate more local tax revenues, thereby facilitating investment in infrastructure. The benefits of improved agricultural productivity should also be passed on in the form of reduced food prices for net buyers of food. Finally, there are impacts at the *national level*. Reduced prices for food and raw materials may raise the real wages of the urban poor. Agricultural growth may also generate savings that permit greater investment in non-farm activities and generate the foreign exchange necessary to pay for imported inputs.

It is striking that whereas econometric studies have been unable to establish a clear link between openness to trade and economic growth (or between equality and growth), there is overwhelming cross-country evidence that agricultural growth is important in reducing poverty. Indeed, Irz *et. al* (2001) find that a modest 10% increase in agricultural yields may reduce the one-fifth of the world living on less than USD 1 per day by up to 9%, that is by 100 million persons.[12]

A variety of approaches can be used to quantify each of the specific impacts identified above. In particular, SAMs and CGE models can be used to trace out many of the linkages described above, and explain some of the underlying microeconomics of how macroeconomic growth gets going. **Taylor**

11. For an historical review, see Kanbur (1999).

12. Irz, Lin, Thirtle and Wiggins (2001).

illustrates the potential of these models for China and Mexico, while **Bussolo** describes the micro to macro linkages for Ghana. In each case, the applications shed light into *how* the agricultural sector fits into the overall process of economic growth and poverty reduction.

This type of analysis takes underlying economic structures as given. But comparative advantage is not static and governments can speed up growth by investing in areas with relatively high returns. In most developing countries agricultural growth matters, so if governments can invest in ways that speed up agricultural growth or the development of related industries, then that should have a beneficial effect on poverty.

Kydd develops the notion that formal and informal institutions are the basic source of comparative advantage and will affect these dynamics. For example, countries with a higher degree of central co-ordination will tend to attract more specialised (asset-specific) investments (*e.g.* in capital, skills and education) because of longer-term planning horizons. From the standpoint of agricultural reform, some countries may find it relatively easy to switch into new activities where existing inputs are relatively transferable. On the other hand, they may struggle to compete in sectors that require continuous (asset-specific) investment. This is not an argument for pigeon-holing countries, but more a case for looking at strengths and weaknesses, and recognising that generic policy prescriptions are of limited usefulness.

The practicalities of these issues are illustrated by Foster and Valdés (2001), who observe that import-competing sectors will be affected immediately by reform, while potential exporters will take time to respond. The authors provide specific examples of where countries have been more or less successful in switching resources from import-competing activities to export-oriented production. He suggests that the relative success of Chile compared with other South American countries (observable in sectors such as salmon farming and tomato paste) is primarily attributable to a stable macroeconomic policy and institutional environment.

7. Conclusions

The preceding discussion has illustrated the sheer complexity of the links between agricultural trade reform and poverty. This complexity makes life difficult for policy-makers, who need concrete advice on how they can harness the insights of research in order to design policy more effectively. Providing such advice is no easy task, given the diversity of theories, the range of empirical information, and the numerous information gaps.

As a first step, it is instructive to make a distinction between *strategic* policies that focus on reaping the long-term benefits of trade reform and *tactical* policies that aim to mitigate any adverse impact on poor households over the short to medium term. In both cases, there is enough information to suggest some generic policy principles, but specific policies will in each case need to be based on more detailed information reflecting each country's unique circumstances.

At the strategic level, there is compelling evidence to suggest that liberal trade policies constitute an important element of a sound policy mix that can foster faster economic growth. Yet trade liberalisation is not enough, and governments need to examine carefully which domestic policies will enable them to benefit from the opportunities created by openness to international trade. Translating generic prescriptions (such as institution building, or investment in infrastructure and human capital) into practical policy recommendations can only take place on the basis of appropriate information. Thus there is a need for information on general equilibrium (inter-sectoral) effects, the dynamics of the

growth process, and the role of agriculture in development. Much of the development literature is concerned with filling information gaps in these areas.

At a more tactical level, governments pursue a range of sector-specific policies, either in the form of trade policy interventions or domestic policies. The basic target of these programmes is seldom the sector per se, but rather the welfare of those households that are affected by changes in the sector, either as producers, consumers or wage earners. As a general principle, the welfare of these households is likely to be addressed more effectively by domestic policies than by trade policies. For example, the needs of producers in import-competing sectors may be best addressed by investment in areas that would improve their productivity, or, if their future lies in other sectors, through targeted adjustment assistance. However, such precisely targeted policies may not be an immediate option in developing countries. Investments take time to pay off, and household-specific policies take time and information to develop.

Accordingly, governments need to know which mix of policies can best smooth the process of transition towards a structure under which open markets enable resources to be engaged in the most profitable activities. If poor households have the potential to switch to more productive activities, then it clearly makes sense to help them do so. If they do not (say because of age), then there is similarly a strong case for policies that protect their incomes. Targeted household-specific policies are the ideal way of addressing these concerns, but it is no simple task to obtain a detailed economy-wide understanding of the extent to which different households are vulnerable to the shocks generated by trade reform. Nor is it easy to design and implement programmes at the household level. Partially targeted domestic and trade policies may therefore be necessary if there is inadequate household information, or if the costs of setting up and administering household policies is too high.

Governments face the difficult task of guiding their economies to long-term patterns of specialisation and trade that build on their comparative advantage, while simultaneously ensuring that any adverse impacts on poor, or potentially poor, households are mitigated. This task is likely to be best accomplished through a judicious mix of household based policies, and sector-based policies that require progressively less border protection, but nevertheless protect households from shocks and facilitate the process of adjustment. Such a pragmatic approach to policy-making argues for a similarly a pragmatic approach to information gathering and analysis.

As researchers and policy-makers seek to refine their understanding of the links between agricultural trade reform and poverty, there is a strong case for institutions and individuals specialising according to their expertise. The World Bank, FAO and other development-focused organisations have long recognised the importance of disaggregated analysis, and have a wealth of experience in household level data collection and analysis. This has been complemented by a wide array of research in the academic community. Yet there remain information gaps, and the results of research have not always been communicated in the most effective way to policy-makers. In many cases there is still a need for more information on what policies exist in the first place. The OECD has a traditional expertise in documenting and measuring agricultural policies. There is a strong case for extending this work to a broader range on non-member economies and harnessing its value as an input into further analysis. Finding a practical way of gathering the relevant bits of information - and putting them together in a coherent whole for policy-makers – is an urgent priority.

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PART 1: AGRICULTURAL TRADE REFORM & WORLD MARKET IMPACTS

APPLICATIONS OF THE AGLINK MODEL IN POLICY ANALYSIS

Wyatt Thompson[*]

Abstract

Aglink is a partial equilibrium model that focuses on the medium-term dynamics of temperate zone agricultural commodity output markets, with special emphasis on how government policies affect the evolution of prices and quantities. Researchers working in the OECD Secretariat and in certain OECD Member countries and Non-Member Economies have developed the model over years of work and, in fact, continue to update the model according to new market events and policy decisions. Thus, the model remains a useful analytical tool to quantify the effects of certain policies or market conditions, as is evident from the annual Outlook publication and from recently completed analysis relating to market access and certain export competition policies. Like any empirical tool for economic analysis, Aglink has both strengths and limits. The following text introduces the model briefly and provides some examples of analyses conducted using Aglink, so as to highlight these strengths and weaknesses.

Model design

General points

The OECD Secretariat and co-operators in Member countries and certain Non-Member Economies (NMEs) have steadily developed Aglink over time. The model is a recent manifestation of on-going research at the OECD to quantify the links between agricultural policies and market evolution. As a consequence of this process, the model focuses on a certain range of issues and measures. These are described later in this document and examples are provided.

Another outcome of this development process is a strong network of Aglink co-operators. The model is not - indeed, cannot be - maintained by a single individual. Instead, a team of researchers within the Secretariat and co-operators external to the Secretariat all interact at various stages of model development and application, with participation of each individual ranging from active contributor to evaluator. This network is critical to the model's usefulness for practical reasons of quality-control, but is also of importance in the OECD environment of consensus-based decision-making.

Like any empirical model, certain assumptions underlie the commodity market representation of Aglink. Some of the more important assumptions follow. First, commodity aggregates (to be defined below) are assumed to be homogeneous. Although there are exceptions where quality adjustments are appropriate, it is assumed that agricultural commodities, such as wheat, coarse grains, butter or pork, are sufficiently similar across countries to be usefully represented as homogeneous. Second, markets are represented as perfectly competitive, with no agents possessing sufficient market power to sustain

* OECD.

a non-competitive solution (on an annual basis). Third, price expectations are considered to be "naïve", in that current decisions that determine future production are based on current or recent prices, rather than on explicit forecasts of prices. Fourth, various assumptions are sometimes necessary in order to incorporate policy variables in the model. One common assumption is that producers who receive government support in addition to market returns will not generally view these alternative sources differently, apart from the fact that government support may be based on different criteria than simply quantity of output. This assumption may be questioned if one expects that risk has a very strong effect on producer decision-making and, moreover, that government support tends to incur far less risk than market returns.

Figure 1. **Approximate country and commodity scope of Aglink**

	Commodity scope							
Countries scope	Wheat	Coarse Grains	Rice	Oilseeds and products	Beef	Pork	Poultry & eggs	Milk and dairy products
Australia	X	X	X	X	X	X	X	X
Argentina	X	X	X	X	X	X	X	X
Brazil					X			
Canada	X	X	X	X	X	X	X	X
Chile					X			
China	X	X	X	X	X	X	X	X
Chinese Taipei					X	X		
European Union	X	X	X	X	X	X	X	X
Hungary	X	X		X	X	X	X	X
India					X			
Indonesia					X			
Japan	X	X	X	X	X	X	X	X
Korea	X	X	X	X	X	X	X	X
Mexico	X	X	X	X	X	X	X	X
New Zealand	X	X			X	X	X	X
Poland	X	X		X	X	X	X	X
Paraguay					X			
Russia	X	X	X	X	X	X	X	X
Singapore					X			
Thailand			X					
Uruguay					X			
USA	X	X	X	X	X	X	X	X
Others aggregate	X	X	X	X	X	X		X

***Notes**:* "X" indicates that the market is endogenously determined in the model. An absence of an "X" typically indicates that the market is identified, but exogenous, or is incorporated in the "Other aggregate". The list does not include cases where a country is identified, but never endogenously determined (e.g. Czech Republic, Norway, Slovakia and Turkey).
Certain commodities that are not widely represented in the model are not listed here (e.g. potato and sheepmeat components.
Source: OECD Secretariat.

Scope

Aglink currently spans the commodities and countries or regions listed in Figure 1, but this list is not intended to be complete. The sectors shown are wheat, coarse grains, rice, oilseeds and oilseed products, beef, pork, poultry, eggs and dairy. The coarse grain and oilseed aggregates are partially decomposed: there are typically separate representations of the production of individual crops within these aggregates. Oilseed products in the model are oilseed meal and vegetable oil, with the latter comprising the sum of oilseed oil plus palm oil. The dairy products in the model are butter, casein, cheese, skim milk powder, whole milk powder and whey powder, although not all country markets are

represented for each product. The list does not provide information on the scope of certain commodities that are represented in only a few countries.

The list omits certain countries which are identified in the data, but not represented endogenously. The "others aggregate" represents the sum of all quantities not listed in the table as endogenous or quantities identified but held exogenous. For almost all markets, quantities of supply and demand for each commodity in this aggregate are endogenously determined based on prices, income, trends and other factors where appropriate. Policy representation in this case is reduced to implicit inclusion in parameters as no individual country's policies are directly relevant to all countries that are not specifically modelled. The decision on whether or not to select a country for independent representation depends not only on the importance of the country to the particular market, but also on the continued existence of co-operators who can help to develop, maintain and operate a model of that country. Yet, in Aglink, all countries should be represented in some form, even though many are included indirectly through the final "others aggregate".

In the context of the model scope, it is important to note that the model is in a constant state of development. For example, the representation of Russia is a recent development that was enabled through the assistance with officials of the Russian Ministry of Agriculture and through contributions by co-operators at Agriculture and Agra-food Canada and the Economic Research Service of the USA. Through a similar process of model development, Brazil may also be more thoroughly modelled in Aglink in the near future. Of course, the need for future expansion in terms of country representation in order to identify key players in world markets must be balanced against the threat of exceeding the resource limits available for managing the database and the constant maintenance required for any such empirical modelling exercise.

Structure

The model structure is one of net trade and world price transmission (or lack of transmission) to domestic prices, with dynamic elements to account for adjustment processes. The price of world (or, in some cases, regional) trade is determined by matching the supply and demand of the world (or regional) market. The traded price will generally be transmitted back to agents within each country, so production, consumption, stocks and trade (typically a residual) will adjust to changing world prices. The world to domestic price transmission may be direct in the absence of barriers due to policy intervention or undeveloped infrastructure, but in many cases price transmission is limited, or even completely severed, by import barriers and/or export competition measures. Many OECD Members, for example, choose to use market price support as a primary mechanism for supporting their farmers, in which case trade measures are necessary to increase internal prices to support price levels without regard to lower world prices.

The responsiveness of any particular agent to changing incentives is governed by the relevant elasticities. For each supply and demand decision that is represented in the model, a parameter is estimated, assumed or drawn from other work in order to calculate the degree to which that particular quantity shifts in response to a change in prices or other determining factors. Other parameters govern technical coefficients that relate to transformation or transportation of goods. In each case, policy may intervene in the market to change the incentives to agents relative to the market prices signals, as in the case of direct payments to producers which provide additional incentives to expand production independent of market prices.

The dynamic elements of Aglink are lags in production processes, adjusting price expectations and stocks. In other words, the market conditions of each year affect market conditions in the subsequent

year through these mechanisms. Lagged effects in agricultural commodities production processes are fairly common in the annual intervals of Aglink, with crop and livestock production possibilities in any year determined, in part, by producers' decisions in previous years regarding area planted or breeding animal stocks. For example, a falling market crop price will typically lead to lower yields and less area planted after some delay, thereby reducing future production, while encouraging greater stock accumulation which will increase supply in the subsequent year. Of course, government intervention may prevent any or all of the steps in this chain of events.

Aglink applications

The Outlook

The OECD Agricultural Outlook (or, more simply, the Outlook) is an annual publication which contains projections regarding the evolution of certain commodity markets for the next five years and discussions of key factors. The 'projections' are distinct from 'forecasts' in that there is no effort to predict future prices or quantities. Instead, the exercise is intended to calculate what would occur under a certain set of assumptions. Altogether, the assumptions about future events may be implausible, but are neutral in a certain sense. The Outlook calculations rest on these general assumptions: (1) fairly stable macroeconomic growth in the period (subject to some initial adjustments); (2) normal weather; (3) trend productivity growth; and (4) a continuation of current or announced policy. The process also favours neutrality of the results in that the projections are consensus-based following input from various co-operators and also from OECD delegates who review the results. By applying these assumptions and expert advice from co-operators and delegates, the annual Outlook projections tend to be neutral and consistent with past trends, rather than varying towards extremes that might follow from an arbitrary weather or macroeconomic shock or from assumptions regarding future policy reforms which may or may not occur.

The Outlook projections are useful to readers in two ways. First, although not forecasts, the projections can be taken as indications of future price evolution under *status quo* assumptions described above (steady economic expansion, normal weather, trend productivity growth and announced policy). In this capacity, the Outlook text focuses on the main factors of supply or demand changes during the projection period, which may help the reader to understand what forces are more important for markets in the medium-term future.

A second use of the Outlook projections is to provide a basis for scenario analysis, several examples of which are provided in each Outlook publication in order to highlight further critical assumptions or factors. Where an assumption regarding the macroeconomic setting, the weather or a policy regime is important and uncertain, the interested reader is provided with "what if?" scenarios that vary the assumptions. The implications for market prices and quantities of alternative levels of exchange rates or income growth, yields and policy parameters are measured against the neutral projections of the Outlook.

Several scenarios are being undertaken in the context of the current Outlook publication. These include macroeconomic scenarios to highlight how changing expectations about the macroeconomic environment affect commodity markets. For example, the following question is asked: "What if the slowdown in growth of 2001, which is expected to end in 2002, had not occurred at all?" Results of this scenario are expressed in terms of the increase in selected world prices which follow from the alternative macroeconomic assumptions relative to the Outlook projections. Other scenarios explore the effects of new or changed policies, such as initiatives to expand biofuel production, dairy price support elimination in Japan and planned in the United States, or policy implementation, such as the

future levels of US marketing loan rates and EU set-aside rates. In each case, prices (domestic and world) and quantities (of production, consumption and trade) of the scenario can be compared to the original values of the Outlook in order to identify the effects of the changes in assumptions about macroeconomic growth or about policies and policy implementation during the projection period.

Special reports

Aglink use is not restricted to the annual Outlook exercise. In addition, the model is applied to provide quantitative analysis in support of special reports under various items of the programme of work of the OECD's Directorate for Food, Agriculture and Fisheries. Of course, caution must be exercised when determining which projects might be usefully supplemented by Aglink analysis and how such analysis might be undertaken. Below, two examples are drawn from an OECD publication recently released.[1] The publication compiles OECD analysis that investigates certain aspects of market access and export competition, two of the pillars of the Uruguay Round Agreement on Agriculture (URAA). An additional example is briefly explored that describes recent analysis on the medium-term effects of trade reform on aggregate food security.[2] In fact, this analysis is conducted using two models, with a general equilibrium model supplementing Aglink results. However, discussion here is restricted to the role and results of Aglink in the report.

Market access

The URAA culminated with an agreement to open markets by converting non-tariff barriers into tariffs and setting a schedule for gradual reduction in these and other tariff rates. Where a non-tariff barrier had previously been present, participants further agreed to establish minimum access levels, with import opportunities provided by means of tariff-rate quotas (TRQs). Thus, two-tier tariffs were imposed on the imports of many products, with a lower rate (the in-quota rate) applied on imports up to the quota amount (in-quota imports) and a higher rate (the out-of-quota rate) applied to imports exceeding the quota (out-of-quota imports). In addition to TRQ regimes, tariffs unrelated to TRQs (non-quota tariffs) continue to impede other trade flows as well. Over the implementation period, participating countries increased their TRQ quota quantities and reduced tariff rates. As multilateral negotiations continue, the OECD analysed the effects of further liberalisation of markets in the form of lower tariffs (TRQ or otherwise) and greater quotas governing the imports of certain commodities into certain countries.

Aglink was chosen as the instrument to quantify the effects of greater market access. In order to undertake this analysis, model development was necessary to incorporate TRQ regimes with greater detail and with greater attention to a newly developed database, the Agricultural Market Access Database (AMAD), which served as the primary source of information about tariff rates and quota levels. The model structure was changed to explicitly recognise the three potential structures of domestic price and import determination in the presence of a TRQ. These three structures are: (1) the TRQ quantity limit may be binding, so that the imports are at the quota level and the domestic price may be anywhere within a range from a low point of the world price plus in-quota tariff to a high of world price plus out-of-quota tariff; (2) the domestic market conditions and world price may favour out-of-quota imports, so the domestic price equals the world price plus the higher out-of-quota tariff

1. OECD (2002), "Agriculture and Trade Liberalisation: Extending the Uruguay Round Agreement."

2. OECD (2002), "Medium-term Impacts of Trade Liberalisation in OECD Countries on the Food Security Situation in Non-Member Economies."

and the imports exceed the quota; or (3) market conditions may be such that the quota is not filled, so imports are less than the quota with price equal to the world price plus the lower, in-quota tariff. Where previously the model frequently assumed that one or the other circumstance was relevant during the Outlook process, this analysis required that the model would switch among these three possibilities in an endogenous manner. Thus, falling world price, higher domestic demand or lower domestic supply may result in imports that start below the quota level (with price equal to world price plus in-quota tariff) to rise to the quota level or, alternatively, imports currently at the quota level to exceed the quota level (and price to rise to be equal to world price plus out-of-quota tariff).

As stated before, any empirical analysis must impose limits or boundaries in order to define a tractable problem. In this case, tariffs had to be aggregated to a level useful for Aglink starting from sometimes incomplete data. For example, preferential tariff rate information is not always available. Moreover, there is no way to know if some part of any under-fill of the quota (imports less than the quota level) results from some inefficiency in the allocation mechanism, so this aspect is ignored and under-fill is assumed to be a result of market conditions. Despite the limitations of the analysis, however, the work supports certain conclusions by estimating the effects of greater market access and/or lower tariffs on world commodity markets.

If tariffs were reduced by 36% and quotas expanded by 50%, imports would expand, particularly in the case of dairy products, and world prices increase. Domestic prices are reduced in those countries where internal prices are insulated by such import barriers whereas domestic prices are increased in other countries. Quantitative results indicate that reductions in out-of-quota tariff rates and non-quota tariff rates are the more important component of the policy change in terms of the effects on markets. Of course, in those cases where the tariffs are prohibitive, as is sometimes the case for out-of-quota tariffs, these will remain insurmountable following any modest liberalisation of trade. These results highlight the sometimes overlooked fact that only one aspect of a TRQ regime (in-quota tariff, quota quantity or out-of-quota tariff) can be binding at one time. This implies that changes in a single aspect of a TRQ regime may have no effect at all. But as changes in one instrument may lead to a regime switch so that another instrument becomes the binding one, simultaneous liberalisation of all TRQ instruments would yield the largest effects.

Export subsidies and export credits

Export subsidies (as defined under Article 9 of the URAA and as notified to the WTO) and officially supported export credits are two export competition policies that may be used to expand exports of those countries that rely on such schemes relative to what would otherwise be the case. Recent OECD analysis uses Aglink to estimate how elimination of these two mechanisms would impact on world agricultural commodity markets. In the case of officially supported export credits, the study focuses on wheat markets, but the general conclusions can be extrapolated.

Some adjustments to the base model or data had to be undertaken in order to conduct these analyses, although most of the significant subsidised exports are represented in the model. In the case of officially supported export credits, the analysis by the OECD estimates a subsidy element of such programs during the 1994-1998 period for which survey data are available and also notes evidence that supports a treatment in the model that is the same as the treatment of export subsidies - namely, the relatively large share of officially supported export credits provided to countries that are likely to import from competitive markets. Thus, the analysis of this report provides estimates of the impact of an elimination of either of these two export competition policies on world commodity markets.

Using Aglink, the effects of an elimination of export subsidies are estimated to be relatively small changes in world prices, with the exception of dairy products. The generally small results are largely driven by the relatively limited application of export subsidies during the Outlook projection period relative to the quantities exchanged in world markets which, in turn, depends upon two key assumptions. First, the Outlook assumes that those countries that have unilaterally reduced their export subsidies relative to their URAA commitments - or even suspended their programme altogether - maintain their current policy regime rather than revert to applying these trade-distorting policies. Second, the general assumptions of the Outlook have supported steadily rising nominal world prices relative to recent low levels, which decreases the pressure on countries with support price policies to subsidise exports. This effect is pronounced for the European Union when world prices are denominated in terms of the relatively weak Euro assumed during the projection period. Of the commodity markets represented in Aglink, world dairy markets are most significantly affected by the elimination of export subsidies because these markets are subject to a large amount of distortion in the form of export subsidies relative to the small share of world production which is traded. Of course, if the assumption that countries do not expand use of export subsidies within their URAA limits in the future proves false, whether caused by changing export prices or by domestic policies, then an elimination of such programs would have even greater effect on world commodity markets.

As regards officially supported export credits, while the report estimates that individual transactions are distorted by some countries' officially supported export credits, the aggregate effects on world markets are likely to be small due to the small average effect on importers' costs and the small share of exports facilitated by officially supported export credits. On the other hand, the estimated effects are based on the assumption that the use of these programs would not expand in the future, even though the use of officially supported export credits is not disciplined at this time.

The interface of domestic and trade policies in Aglink

Aglink is designed with special attention to representing policy intervention in markets. Thus, in the case that a policy regime provides market price support, the favoured modelling approach is to identify those instruments that are used to maintain market prices at or near support price levels. Policy levers that can be used to maintain a domestic price higher than the world price generally include public stocks, import barriers and export subsidies. Where endogenously represented in the model, these policy levers will change automatically during the projection period as market conditions evolve, so that export subsidies may increase or decrease, for example, to help maintain a domestic price near a support price level.

When the OECD analysed the effects of a hypothetical elimination of export subsidies, these policies had to be considered within the context of a broader array of policy levers. In most cases, export subsidies which shift quantities from the internal market into the world market in order to raise internal prices operate alongside public stocks. Thus, in the absence of export subsidies but in the presence of support prices, the automatic response to falling internal prices relative to support prices would be growing public stocks. However, as stocks would have to increase in each year of the analysis approximately by the amount of export subsidies which were projected in the Outlook, the public stocks grow quite large. In fact, if the analysis is undertaken with the assumption that all current policy except export subsidies are maintained in the elimination scenario, then public stocks tend to rise implausibly as compared to domestic production.

Any analysis must recognise the interface of trade and domestic policies where these links are represented in Aglink. In the study of the implications of an export subsidy elimination, policy-makers are assumed to accommodate the elimination of export subsidies by allowing internal prices to fall below support price levels. Such price reductions encourage consumption and discourage production, thus leading to a better balance in internal markets even though prices may still remain high relative to world prices due to import barriers.

The limitations of the export subsidy work are quite similar to those of the market access scenarios. The input data does not precisely match the commodity aggregation of Aglink, allowing for some potential errors in aligning information found in export subsidy notifications to the WTO with the quantities trade in Aglink. Indeed, an insurmountable inconsistency of basic data prevented the extension of the hypothetical elimination of officially supported export credits to more commodities than wheat alone. There is no representation of bilateral trade flows in Aglink, in part due to the assumptions of homogeneous good and perfect competition as well as absence of reliable data on bilateral trade flows and bilateral policy parameters (*e.g.* export subsidies by destination). However, in either case, these assumptions are plausible: export subsidies provide cost reductions that expand exports into competitive markets that are purchasing goods at some price and officially supported export credits seem to target competitive markets where a modest price reduction can capture trade. Where such policies capture a larger share of transactions than an exporter's price would support, competitors must lower their price to compete with the supported trade or else must seek markets elsewhere or defer sales and thereby incur some additional costs.

Food security

Among the concerns that have been expressed regarding the effects of trade liberalisation is the impact on food security. In response to this concern, the recent OECD report extends some of the analysis described above in order to identify how further trade liberalisation, such as an increase in market access or a reduction in export subsidies on the part of OECD Members, might affect food security. In order to conduct such an analysis, the limitations of Aglink must be acknowledged or overcome and the results of the model are interpreted with a view to providing indications for the evolution of food security following OECD policy reform.

Certain characteristics of Aglink cause limits in this work which could not be changed. First, obviously, the focus on the work was only on the links between trade and food security, even though this is certainly not the only source of food insecurity problems nor the only cure available. Second, the nature of the model restricted the focus to the aggregate level. Thus, the results tend to be national averages and the food security of selected individuals or groups will be improved or damaged to a greater degree than the average results would indicate. Third, of course, the general assumptions underlying the representation of markets remain relevant in this work as well. (In the report, certain of these limits are overcome by applying a second, general equilibrium model in parallel to Aglink in this analysis.)

The scope of Aglink was temporarily expanded through co-operation with the FAO in order to conduct this analysis. For some 115 countries (currently included in the "others aggregate" of Figure 1), parameters governing price transmission and the responses of supply and demand to determining factors, such as prices, were derived from the FAO's World Food Model. Thus, consumption and production, at least of those commodities represented in Aglink, could be represented on a country-by-country basis for the purposes of this analysis.

Aglink results are measured using national-level indicators of food security. Three dimensions of food security, food availability, food access and food stability, are identified using a FAO definition and indicators are developed to represent how trade policy changes impact on food security along each of these three dimensions. Thus, the impacts of increased market access or an export subsidy elimination by OECD countries on world, OECD and selected NME markets effects (as described above) can be extended in order to understand the effects on aggregate food security in NME.

The results from that part of the analysis relating to Aglink vary, depending on the characteristics of a NME, but the ranges of change in their food security situation due to an increase in market access or a reduction in export subsidies on the part of OECD Members are typically very slight. The analysis results follow from three factors. First, as shown above, the OECD trade reform discussed has only modest impact on world prices, particularly world crop product prices that are most relevant in the context of food security. Second, the parameters derived from the World Food Model indicate that there are weak links between world prices and local prices in NMEs and, moreover, that there are weak responses of domestic agents to those prices (*e.g.* low supply and demand response). Third, the Aglink commodities represent two-thirds of the calorie consumption in these countries and the remaining third is assumed not to change following the modest changes seen in these scenarios. While this work does highlight the potential for investment to further market integration, the form of higher price transmission or greater supply response, these results must be understood within context of the model framework and within the narrow focus of the study.

Limitations

Limitations specific to the assumptions underlying the Aglink framework are given above. In addition, when considering the general model structure applied to each market, imperfect data regarding a country's market or policy parameters may hinder development. Price data relevant to decision-making can be particularly difficult to find. More generally, maintaining elasticities that are relevant in the context of evolving markets and changing policies, yet preserving the simplest theoretical constraints, poses challenges as well.

Aglink is built and maintained to study certain policies and certain policy effects, but not all policies and not all effects. For example, Aglink does not include any explicit representation of measures that relate to externalities of agriculture, such as environmental benefit or harm, rural economic well-being or other concerns apart from commodity prices and quantities. There is usually no representation of input markets in Aglink apart from area (which is combined with yield to give crop production) and key cattle breeding inventories, as these comprise important elements in the dynamics of commodity markets.[3] Moreover, Aglink is constructed and operated with a view to providing analysis in a forward-looking context, with policies measured relative to a neutral baseline, rather than providing *ex post* analysis of the consequences of past policy changes for markets and trade. In this regard, it is important to note that current or announced policies are represented in Aglink, whereas defunct policies are only used to generate parameter values from historic data, if at all. Aglink results are, at present, deterministic in that the outcome is contingent upon point values for assumptions that may be subject to great uncertainty. Of course, as a partial rather than general equilibrium model, there are limits to the sectoral scope of the model. The model emphasises detailed policy and market representation rather than offer a more simplified, but broader perspective. Finally, the model remains somewhat exclusive in nature, limiting its use, but also input in maintenance and development to OECD Members and co-operators.

3. The OECD maintains an equilibrium displacement model, PEM, which is derived directly from Producer Support Estimate (PSE) data. By using the decomposition of support provided in these data, policy intervention can be represented as wedges between market and agents' prices, including prices for a variety of inputs. Applying ranges of key elasticities drawn from literature and a set of starting values (again, typically drawn from PSE data), the PEM model is used to conduct policy analysis which focuses on input markets as well as output markets. Output in terms of prices and quantities of these markets is supplemented with budget and welfare calculations. At present this model covers a similar set of crops as compared to Aglink, but expansion to include dairy markets as well is under way.

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HOW WILL AGRICULTURAL TRADE REFORMS IN HIGH-INCOME COUNTRIES AFFECT THE TRADING RELATIONSHIPS OF DEVELOPING COUNTRIES?

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Abstract

The current WTO round has been set in motion by recent negotiations in Doha, Qatar. Among the most contentious issues in that meeting, and probably over the course of the next round, is direct and indirect producer support for agricultural exporters in the North and forgone production, employment, and trading opportunities for farmers in the South. Our results indicate that real commitments to reduce agricultural support in high-income countries will induce substantial changes in world food prices, domestic agricultural rates of return and output, and dramatic shifts in agricultural trade patterns. Total trade expands and real output, wages, and incomes in developing countries, especially among the rural poor, increase substantially. In particular, rural incomes in low and middle income countries increase by over USD 60 billion, a figure that comfortably exceeds even the most ambitious goals for increased development assistance and a substantial savings to OECD taxpayers. At the same time, EU and Japanese agricultural exports fall sharply and their imports rise. Other OECD countries see more balanced aggregate trade growth, but a number of strategic sectors are still adversely affected. These factors are likely to complicate negotiations in the Doha Round significantly.

Introduction

Following the Uruguay Round of the World Trade Organisation (WTO) many developing countries have voiced their concerns and frustration during the agricultural agenda debate preceding the Doha Declaration of the WTO (Kennedy *et al*., 2001; WTO, 2001). These concerns have shaped the Doha Ministerial declaration. This frustration has at least two components. First, there is the lack of market access in high-income countries. Tariff rate quotas (TRQ) and other trade barriers block access to markets in which developing economies are competitive (Anderson *et al.*, 2001; Martin and Winters, 1996). The lack of market access constrains trading opportunities for exporting developing members. Second, large agricultural subsidies in high-income countries via domestic farm and trade policies of high-income countries lead to depressed world market prices. Exports from some of the high-income countries are subsidised explicitly or implicitly through production subsidies.

The Doha declaration states that the agricultural negotiations should try to achieve "substantial improvements in market access; reductions of, with a view to phasing out, all forms of export subsidies; and substantial reductions in trade-distorting domestic support." (WTO 2001, para. 13).

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Despite the progress achieved with the Uruguay Round Agreement on Agriculture, a heterogeneous structure of market interventions in high-income countries distorts resource allocation and trade in agriculture. European countries still rely heavily on export subsidies and domestic support, while the United States has been increasing domestic production subsidies to implicitly subsidise crop exports. Both the European Union and the United States have kept a few protectionist bastions with high-tariffs (*e.g.* sugar and dairy). High-income Asian countries which tend to be net importing countries rely on high tariffs and/or TRQs with prohibitive out-of-quotas tariffs in many agricultural and food sectors, *e.g.* Korea and Japan.

In this paper, we assess these claims and elucidate the empirical evidence contested between the developing members and high-income members of the WTO. Using a dynamic global CGE model (van der Mensbrugghe, 2001), we quantify the impact of trade and domestic agricultural distortions of high-income countries on the terms of trade, welfare and trade flows of developing economies and their partners. We consider the removal of all export subsidies, tariffs and TRQ schemes, and output and input subsidies affecting production decisions in high-income countries. We look at eleven agricultural activities and six food sectors (including two meat sectors, vegetable oils, dairy products, sugar, and other food). Our country coverage includes high-income economies: Western Europe (EU-15 and EFTA countries), The United States, Canada, Australia and New Zealand, and High-Income Asia (Japan, South Korea, Taiwan, Singapore, and Hong Kong). Among developing and transition economies, we have Argentina, Brazil, China, India, Rest of East Asia, Rest of Latin America and the Caribbean, Eastern Europe and Central Asia, Sub Saharan Africa and SACU (South Africa, Botswana, Lesotho and Swaziland), and Rest of the World.

Our paper is part of the new literature analysing agricultural negotiations issues in the Doha Round of the WTO (Burfisher, 2001; Diao, Roe and Somwaru, 2002; Francois, 2000; Hoekman and Anderson, 2000; and World Bank, 2001). The contribution of our paper resides in its focus on policies in high-income countries and the quantification of their effects on the relative competitiveness of North and South, for a large set of commodities and food industries. These policies affect the developing world's terms of trade in agricultural markets, its trade patterns, and welfare for a large set of products and food industries. In light of the policy asymmetries among countries noted above, how can agricultural trade patterns, as well as induced income and employment effects, be expected to evolve in the course of further globalisation? In particular, will WTO action against export subsidies confer an international competitive advantage on US agriculture, and what would be the consequences for the United States and its trading partners? We evaluate two major scenarios, elucidating the detailed adjustments that would take place in trade, world prices, national welfare and rural income, and domestic economic structure.

We find that the world welfare cost of agricultural distortions in high-income countries amounts to about USD 82 billion annually at 1997 prices, while the developing world would gain about USD 26 billion per year at 1997 prices from the removal of the same distortions. OECD agricultural policies are a huge tax on developing country agriculture. Rural value added could increase by more than USD 60 billion (per annum, not cumulatively) in low and middle-income countries. This figure, incidentally, exceeds the most ambitious target for increased aggregate development assistance by over 20%. Ironically, realising poverty alleviation in this way would occasion substantial savings for OECD taxpayers. Reduced OECD support would raise world food prices, causing real wages in developing countries to rise across the board and increase more than capital returns. In other words, removal of OECD agricultural protection is pro-poor on average, with the possible caveat that wage gains among urban poor would be offset by rising food prices.

Though world food prices rise, the changes in terms of trade are positive for all developing regions on aggregate. Terms of trade effects induced by domestic programs are substantial, especially for meat products. Further, there will be a significant re-orientation of agricultural trade because the current

structure of production and trade is highly distorted. Trade in agriculture would increase by 17% at the global level, with agricultural and food exports increasing by 24% for low and middle-income countries. This gives the latter an opportunity to purchase needed manufactured imports and capital goods.

In the next section, we provide a brief overview of global agricultural support patterns. This is followed by the results section of the paper, including policy scenarios, estimates, and interpretation, and finally some concluding remarks. The model documentation is available in van der Mensbrugghe (2001) and therefore not reproduced here.

Agricultural and trade policies in high income countries

This section provides stylised facts on current domestic and border distortions in key high-income countries as they relate to our aggregation in the model, namely, Australia and New Zealand, Canada, the European Union and EFTA countries, High-Income Asia (Japan, South Korea, Taiwan, Singapore, and Hong Kong), and the United States. We focus on distortions relevant to agriculture and food industries. Although the GTAP database used in the model refers to 1998, we provide a characterisation of current policies based on the most recent data published by the OECD (OECD, 2001) and the most recent country notifications to the WTO.

Australia and New Zealand

Australia and New Zealand have few distorting policies. Agricultural producers in these two countries are the least supported among OECD countries. The total producer subsidy equivalent (PSE) for Australian agriculture was 6% in 2000. The corresponding PSE for New Zealand was 0% in 2000 (OECD, 2001).

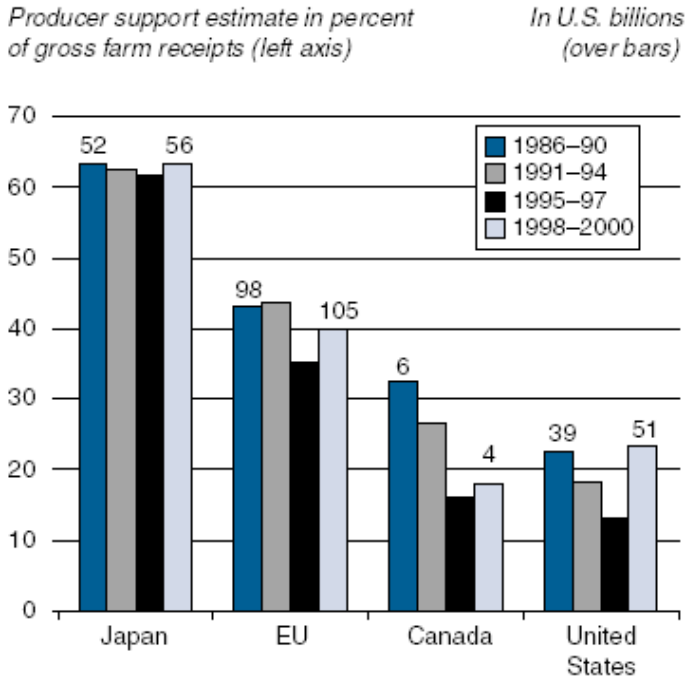
Until recently the Australian dairy industry used to be heavily distorted. The dairy programme, which set milk prices and a system of production quotas, was the last sector price support scheme in Australian agriculture. It was eliminated in 2000. An adjustment programme replaces it and is financed by a levy on consumers for eight years. Australia still has state-trading entities in charge of exports for wheat, barley, rice, and sugar. State trading does not seem to distort price signals for consumers or producers (OECD, 2001).

Canada

As shown in Figure 1, Canadian agriculture is moderately protected in aggregate with a PSE of 19% in 2000. A few sectors are heavily protected however, such as dairy, which constitutes about 40% of the support received by Canadian agriculture in 2000 as measured by the OECD PSE (OECD, 2001). The Canadian dairy program combines price supports with production quotas to increase domestic prices. In recent years the production quotas have been binding and the price supports have been redundant. TRQ schemes at the border limit dairy imports with prohibitive out-of-quota tariffs, which allow raising prices internally. The other sectors being supported are oilseeds and meat production but at a much lower level than dairy.

Canada has been moving away from commodity-specific policy toward an income-safety net approach to farm subsidies. With the exception of dairy, producer prices for most commodities are slightly above the corresponding world prices.

Figure 1. **Producer Support Estimates in Some OECD Countries**



Source: OECD.

The European Union

As suggested in Figure 1, European agriculture is heavily subsidised using various combinations of import restrictions, price support, area payments, and export subsidies. The most protected industries are sugar, dairy, and beef. Sugar and dairy receive price supports constrained by production quotas, while import restrictions and export subsidies complement domestic support and facilitate exports of excess production. Cattle and beef producers enjoy price supports, headage premia based a fixed number of animals, TRQs on imports and export subsidies, and aid for private storage. Pigmeat production benefits from the same kind of assistance and protection, although the European Union does export substantial quantities of high-quality pork without subsidies. Grain production benefits from export subsidies, receives price support and area payments, but faces a set-aside requirement associated with the latter. Oilseeds receive area payments associated with a set-a-side, but do not have an intervention price.

Although the European Union remains a major distorting force in world agricultural markets, the Common Agricultural Policy (CAP) has evolved dramatically since 1992 with a series of reforms culminating with the Berlin Accord on Agenda 2000. The reforms have modified the sources of income support using lower price support which was offset by compensatory payments that are linked to historical production and impose set-aside requirements (crops), and headage payments combined with fixed production quotas (livestock, dairy). Area payments to oilseed producers are being progressively reduced to the level for cereals by the 2002/03 marketing year. The base rate for compulsory set-aside is 10% through the 2006/07 marketing year.

These CAP reforms and the devaluation of the Euro vis-à-vis the US dollar have helped decrease the support level of European farmers as measured by the PSE (about 38% of aggregate farm income in 2000). Agricultural and food export subsidies amounted to USD 2.6 billion (ECU 2.76 billion) in

2000-01 according to official notifications (WTO, various), a sharp decline from the 1999-2000 level of ECU 5.6 billion. The total direct payments amounted to about ECU 20 billion in 1998-99, and the AMS for Europe was in excess of ECU 46 billion for 1998-99, the most recent notification to the WTO (WTO, various).

EFTA countries subsidise and protect their agriculture even more than the EU-15 countries do. They rely on trade restrictions, domestic subsidies, and export subsidies to get rid of production surpluses (Norway). Their aggregate PSE was 63% for Iceland, 66% for Norway, and 71% for Switzerland in 2000.

High Income Asia

The High Income Asia aggregate is made of net-importing countries, which are characterised by restrictive trade policies, which are used to support domestic agriculture. WTO commitments achieved under the Uruguay round have opened some of these markets, such as feed markets (corn, and soybean). Nevertheless, food grain markets and in particular rice, dairy and meat markets remain virtually closed. Minimum imports for these products under TRQs are anemic because of prohibitive tariff on out-of-quota imports. The Korean government uses price supports, which are sustained by trade restrictions and limited government purchases (less than 5% of production for rice, soybeans and corn) and direct payments. The trade restrictions include a quota on rice (a WTO exemption until 2004, and TRQs on most other commodities). State trading in beef has been abolished in 2001. Korea is virtually self-sufficient in rice. The Korean government also provides a few direct payments for environmental practices, and some input subsidies (fertilisers and interest subsidies). Self-sufficiency remains a policy objective, particularly in the rice sector, because of the cultural content of this good (Beghin, Bureau, and Parks, 2001). The PSE for Korean agriculture was 73% in 2000, the highest among OECD countries.

The objectives of Japan's agricultural policies have much in common with those of Korea. Food self-sufficiency is an official policy with a target of 45% for total calorie intake. This policy target has been affecting most commodities including rice, dairy, and meat production. Support to agriculture is done through administrative prices and state purchases, trade protection and production limits. The government buys about 10% of rice production for "strategic" reserves. TRQs are in place for meat and all major grains including rice. The import quota on rice was abolished in 1999. Under minimum access requirements dictated by the URAA, a state trading agency controls rice imports, about half of which is re-exported as food aid. Another State trading agency control dairy imports and administer dairy prices. There are supply controls for dairy via production quotas, and for rice via compulsory diversion to other crops. Rice farmers receive direct compensation when market prices fall below some historical average level. Production subsidies are also received for calves and dairy manufacturing (OECD, 2001). Special safeguard duties are frequently used to increase the border protection of various food industries. As shown in Figure 1, the overall PSE of Japanese agriculture was 63% for the 1998-2000 period. Producer prices were about three times world prices in 2000 (OECD, 2001).

Taiwan has large livestock and meat production industries, mostly geared to export pork to Japan. This trade has collapsed because of several foot-and-mouth disease breakouts since 1997. Taiwan has had high trade barriers on pork and beef, which became TRQs schemes with WTO membership in January 2002. Feed grains and protein crops enter the country with low duties since Taiwan does not produce enough feed domestically. No PSE information is available for Taiwan. Hong Kong and Singapore have no agriculture production.

The United States

The United States has a myriad of policies affecting agriculture. We focus on the main key policy instruments relevant to our trade liberalisation analysis. Since 1997, the United States has been following an opposite route to the European Union, increasing farm support levels to most commodities including exportable crops through three major instruments. First, decoupled payments, the "production flexibility contracts" of the 1996 farm bill, subsidise farming activities although they have no production requirements, but inflate land prices. These payments are linked to historical production and land use for contract crops (corn, wheat, rice, cotton, sorghum, barley, and oats). Second, program crops (contract crops, oilseeds, sugar, and tobacco) benefit from producer price subsidies known as marketing assistance loans and/or loan deficiency payments, essentially the difference between the market price and the loan rate which acts as a price floor. Finally, "counter-cyclical" emergency payments under the "market loss assistance" program have been taking place since 1998 for contract crops, dairy and soybeans. Loan deficiency payments are contentious because they are directly linked to output and are trade distorting. They depress world prices. Like the European Union, the United States has a few well-established bastions of protectionism relying on restrictive TRQs (sugar, dairy, and peanuts) and countervailing duties (lamb). In 2000, dairy had a PSE of 50%, which was the highest PSE among all US commodities in 2000. TRQs are in place for virtually all dairy products, raw and refined sugar, peanut-based products, and some meat products.

The United States resorts to small explicit exports subsidies for dairy products (USD 78 million in 1999) and for poultry although the latter is marginal according to WTO notifications (WTO, various). The United States also subsidises exports via export credit guarantees, which help foreign countries to buy US products. This subsidy covers shipments of about USD 3 billion per year. US farmers also enjoy heavily subsidised crop and revenue insurance. The net subsidy of this insurance program was in excess of USD 1 billion in 2000.

The aggregate PSE for US agriculture was 22% in 2000, right at the OECD average. The aggregate PSE has been rising, reaching USD 51 billion annually for 1998-2000 (see Figure 1). The Aggregate Measure of Support (AMS), which is used by the WTO to monitor commitments to reduce distorting assistance to agriculture, has been increasing dramatically compared to 1996-97 levels. Abstracting from de minimis and counting the marketing loss assistance as Amber Box payments, the total U.S. AMS for 2000 was above USD 21 billion, exceeding the US WTO commitment of 19.1 USD billion for 2000 (Hart and Babcock).

Policy coverage in GTAP and scenarios

The GTAP database (release 5.3) provides a realistic description and parameterisation of actual agricultural and trade policies, which rely to a large extent on the agricultural policy information collected by the OECD (OECD, 2001). The database maps domestic policies into four categories (output subsidies, input subsidies, payments to land, and payments to capital). The GTAP database also accounts for agricultural trade distortions (import tariffs, export subsidies). TRQ schemes are not explicitly accounted for, although tariff estimates reflect trade-weighed averages over in-quota and out-of-quota tariffs.

Some shortcomings constrain the accuracy of our analysis. The database refers to 1998 and hence lags on important developments that have taken place since, such as the entry of China and Taiwan into the WTO. As a result the GTAP database significantly overstates China's tariffs on oilseeds and grains, which do not reflect the current situation. A similar problem arises with the European Union because new policies have been put in place in 2000 with the Berlin Accord on Agenda 2000. The latter

increases direct payments and reduces crop intervention prices. Finally, in the case of US policy, the GTAP database maps production flexibility contract payments received by a subset of crops into subsidies to land devoted to these crops. The general view is that these subsidies benefit all crops because farms grow a mix of crops and these payments do not require any specific crop to be grown. These payments are also coupled because of expectations of future programs, and insurance and wealth effects under risk (Adams *et al.*, 2001; Hennessy, 1998).

The GTAP data do not distinguish raw and refined sugar uniformly across countries, leading to much raw sugar being accounted for as refined sugar, especially in trade data. Hence, the refined sugar sector provides information for the aggregate sugar industry (raw and refined) whereas the results for the raw sugar sector should be discounted.

These shortcomings are significant but not radical enough to invalidate our policy analysis exercise. Production and trade flows would be different under a more accurate policy description but the key messages emerging from our analysis remain unaltered. To assess the global consequences of liberalising agricultural markets, we developed a variety of scenarios with the dynamic CGE model (van der Mensbrugghe, 2001).

Initial simulation results with the model were based on a calibrated, Business as Usual baseline and two counterfactual policy scenarios. The latter scenarios were designed to reflect liberalisation of the various forms of agricultural support with respect to both domestic and external markets. For the first scenario we consider the removal of all domestic agricultural distortions (output subsidies, input subsidies, payments to land, and payments to capital) and trade distortions (import tariffs, and export subsidies). In the second scenario we only consider the removal of border distortions. These two capture the effects of domestic and external liberalisation, individually and collectively, and should indicate the efficiency losses associated with both kinds of market bias. Results for the other scenarios are available from the authors.

The simulations assume that liberalisations are phased in stepwise between 2005 and 2010. In each of these years, one sixth of the relevant benchmark policy is eliminated, while the simulations provide identical results between 1997 and 2004. The model is allowed to settle down for five years after the final year of phase-in. Policy reductions are only implemented in the high-income regions defined as Australia and New Zealand, Canada, the European Union and EFTA countries, High-Income Asia, and the United States. In the case of tariffs, only positive tariffs are reduced. In the case of all other instruments, they are only reduced when they are negative, *i.e.* are acting as subsidies.

Simulation Results

Table 1 presents the aggregate effects of the two scenarios. In the first column, aggregate income changes are given in 1997 USD billion. More precisely, this is measured as the change in the expenditure function at baseline and post-shock prices, *i.e.* it is a measure of Hicksian equivalent variation (EU). The second column provides the levels of EV income change as a percent of baseline expenditures. As is usual with neo-classical growth models, aggregate shifts in production possibilities are limited by resource constraints, but it is noteworthy that, under both domestic and international agricultural liberalisation, EV income increases for every country except China. On current trends, by 2015 the latter country will be facing some constraints on agricultural supply and slightly higher levels of imported food dependence, which remain modest however. Higher world prices negatively affect imports of food items such as dairy and grains.

Table 1. **Real income impacts from agricultural reform in high-income regions**

Impact in 2015 compared to baseline

	($1997 bn)		(percent)	
	Removal of all protection	*Removal of border protection*	*Removal of all protection*	*Removal of border protection*
United States	5.0	4.3	.05	.04
Western Europe	17.0	21.4	.17	.21
High income Asia	22.1	25.8	.34	.40
Canada	4.2	3.0	.55	.39
Australia and New Zealand	7.7	6.2	1.23	.98
Argentina	3.6	2.0	.79	.44
Brazil	3.2	1.8	.32	.17
China	-0.7	1.5	-.04	.07
India	1.6	1.1	.23	.16
Rest of East Asia	0.6	0.5	.07	.06
Rest of Latin America and the Caribbean	9.2	8.2	.72	.65
Eastern Europe and Central Asia	3.2	2.2	.22	.15
Sub Saharan Africa x SACU	1.8	1.6	.57	.52
Rest of the World	3.6	3.4	.22	.20
Low- and middle-income countries	26.0	22.3	.27	.23
High-income countries	56.1	60.6	.20	.21
World total	82.1	82.9	.21	.22
Cairns group	28.5	21.6	.57	.43

Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

Clearly, removing price distortions confers efficiency on most of the economies under consideration, and the result is output expansion in nearly every country. Small aggregate changes, dictated by resource constraints in the basic model, are not the most important message of this analysis, however. Whether the aggregates move up a little or more substantially, there are very dramatic adjustments taking place under the smooth veneer of the aggregate production possibilities frontier.

In particular, as relative prices shift in response to removal of preferential agricultural price distortions, factor returns in these sectors adjust dramatically and resources are pulled toward other activities. At the same time, removal of support takes a subsidy burden off the international price system, as OECD agricultural prices must rise to offset the loss of government support. This in turn will raise rates of return for farmers with support below the prior levels, especially those with no support in developing countries, and the lowest rural incomes can rise sharply.

To get a more precise impression of these agricultural linkages effects, consider the sectoral output adjustments presented in Table 2. Here we express sectoral output changes in 2015 as a percent of their corresponding baseline levels, the counterfactual being the first scenario (removal of all agricultural support). For the economies with relatively high prior protection, the adjustments can be relatively dramatic. While the rice sector is relatively small in the United States and ANZ, removal of rice support in Japan and other high-income Asia triggers significant competitive responses from these countries. As one might reasonably expect, heavily subsidised (raw and refined) sugar output contracts sharply in the United States and the European Union. The main beneficiaries are Latin American farmers.

Table 2. **Change in output from full removal of agricultural protection in high-income regions**

(percent change from baseline in 2015)

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Argentina*	*Brazil*	*China*	*India*	*Rest of East Asia*	*Rest of Latin America and the Caribbean*	*Eastern Europe and Central Asia*	*Sub Saharan Africa x SACU*	*Rest of the World*	*Low- and middle-income countries*	*High-income countries*	*World total*	*Cairns group*
Paddy rice	473.5	-71.4	-63.7	..	1285.7	-1.4	0.6	0.9	8.6	-1.4	6.1	0.6	-0.6	0.2	1.9	-32.3	-3.5	6.0
Wheat	4.2	-44.0	-77.1	43.3	12.0	3.8	5.2	3.8	0.4	28.7	22.0	12.7	7.0	8.5	7.0	-15.1	0.5	17.9
Other cereal grains	-0.1	-51.2	-60.8	-0.9	-6.4	30.9	2.7	5.9	0.0	1.8	10.6	19.7	6.4	8.7	8.5	-13.2	0.4	9.0
Vegetable and fruits	4.6	-11.3	-5.0	-2.4	-5.2	-0.9	0.1	-0.2	0.6	0.3	3.1	2.7	1.9	3.1	1.1	-4.3	0.0	0.9
Oil seeds	-9.9	-31.2	-44.3	17.9	10.2	-2.7	13.2	3.4	0.3	5.0	11.2	8.6	25.8	2.4	5.1	-11.5	1.0	9.1
Raw sugar	-45.4	-43.3	-58.6	23.5	-2.2	0.4	3.8	0.6	-0.1	2.3	18.8	7.7	36.7	3.8	6.1	-42.1	-1.5	6.7
Plant based fibers	1.9	19.1	104.0	..	-18.6	-3.3	0.0	0.4	0.1	0.7	-1.6	0.8	-2.4	0.1	-0.2	-1.9	-0.4	-3.4
Other crops	-10.7	1.6	-12.0	-3.3	10.0	-6.9	2.4	0.3	0.6	2.4	4.7	5.6	-0.7	1.3	1.7	-5.1	-0.7	3.6
Bovine cattle etc	5.3	-39.8	-27.2	12.7	30.9	38.5	11.3	0.1	0.4	2.6	9.3	34.6	3.5	9.7	9.5	-11.0	-1.4	13.7
Other livestock	1.3	-15.6	-2.4	-14.8	-7.6	-4.6	4.2	-0.2	-0.2	0.7	31.2	5.7	-1.7	2.7	2.9	-8.9	-0.4	9.3
Raw milk	1.0	-15.7	-40.9	-12.1	73.3	14.7	0.2	0.0	0.3	4.5	9.3	12.0	2.5	4.7	5.7	-8.6	-0.7	13.5
Fossil fuels	0.6	3.2	2.4	0.8	-6.1	-5.9	-1.3	0.2	-0.3	1.2	-3.2	-0.9	-3.3	-0.4	-0.9	0.7	-0.5	-1.8
Other natural resources	0.3	1.8	1.7	-0.3	-5.5	-2.1	-1.2	0.1	0.1	0.5	-1.3	-0.9	-0.4	-0.4	-0.3	0.4	0.0	-1.3
Bovine meat products	3.1	-36.4	-8.8	9.8	57.2	40.0	12.3	0.2	11.3	2.2	9.2	10.2	39.5	11.1	12.8	-10.1	-1.4	20.1
Other meat products	2.4	-18.5	-20.5	-10.5	3.7	-0.1	3.5	2.0	..	8.7	49.8	8.6	1.2	11.3	14.3	-11.4	-1.1	19.6
Vegetable oils and fats	-3.2	-7.0	45.5	-1.7	-5.6	-3.5	2.4	-2.2	-0.5	4.1	0.7	3.8	1.1	2.6	0.6	-1.2	-0.1	0.7
Dairy products	1.1	-16.1	-50.5	-16.6	82.0	0.6	0.4	2.2	-0.3	9.7	9.7	41.7	16.4	15.8	15.2	-9.4	-2.4	15.7
Refined sugar	-45.6	-65.4	-59.0	32.0	-2.2	0.4	5.3	2.3	4.7	2.6	26.0	8.5	73.2	9.3	13.2	-54.2	-4.5	11.8
Oth ProcFood, Bev, Tob	-0.4	-0.7	3.5	-1.9	-4.0	-1.0	-0.2	-0.7	-3.2	-1.7	-0.8	-0.5	-1.2	-0.7	-0.9	0.4	-0.1	-1.2
Text, Leath, and Apparel	0.3	2.7	1.6	-0.4	-7.2	-1.2	-0.4	-0.3	-1.0	0.3	-2.1	-2.0	-2.0	-1.6	-0.8	1.4	0.0	-1.1
Chem, Plastic, Rubber	-0.1	1.3	0.4	-0.6	-4.1	-2.0	-0.6	-0.3	-0.5	-0.7	-1.7	-1.7	-0.3	-1.1	-0.8	0.5	0.0	-1.3
Other manufacturing	-0.1	1.4	0.6	-0.6	-4.2	-2.1	-1.1	-0.1	-0.5	-0.2	-2.9	-1.7	-2.1	-1.2	-0.8	0.5	0.1	-1.5
Electricity and gas	0.2	0.4	0.3	-0.1	-0.6	0.4	-0.3	0.1	0.3	0.1	-0.8	-0.2	-0.2	0.1	0.0	0.3	0.1	-0.3
Construction	0.0	0.1	0.0	0.3	1.0	0.2	-0.1	0.1	0.2	0.1	0.4	-0.1	-0.1	0.1	0.1	0.1	0.1	0.3
Other services	0.0	0.5	0.2	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.2	-0.2	0.2	0.1	-0.1
Agriculture	2.7	-22.3	-24.4	6.4	26.2	8.0	3.8	0.6	1.5	0.4	10.0	8.9	3.1	4.5	3.6	-10.3	-0.6	6.8
Processed foods	-0.2	-10.1	-0.9	-3.4	24.8	3.9	2.1	-0.5	0.1	0.1	8.4	6.2	5.5	3.3	3.2	-3.8	-0.7	5.1
Manufacturing	-0.1	1.2	0.5	-0.3	-3.2	-1.6	-0.8	-0.1	-0.3	0.0	-2.0	-1.3	-1.5	-0.8	-0.6	0.5	0.1	-1.1
Services	0.0	0.5	0.2	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.2	-0.2	0.2	0.1	-0.1
Total	0.0	0.0	0.1	-0.1	0.6	0.3	0.0	-0.1	0.1	0.0	0.6	0.0	0.5	0.1	0.1	0.0	0.0	0.2
Agriculture and food	0.7	-13.4	-6.7	0.2	25.4	5.5	2.9	0.2	1.3	0.3	9.1	7.4	4.0	3.9	3.4	-5.7	-0.6	5.8

Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

Important disparities emerge between the United States and Western Europe, however, especially in cereals and meat. Wheat has significantly higher prior protection in Europe, and the result of liberalisation is a significant contraction of Western European output, offset largely by expansion in the United States and elsewhere. The same thing happens with Bovine, other Meat, and Dairy products, with Western European output declining sharply against more competitive sources.

It is also worth noting that similar, but more dramatic effects occur in high income Asia. Rice output falls by about two thirds, while wheat drops more than three quarters and meats fall by about half. The main beneficiaries of this market diversion are Low and Middle Income Countries and the Cairns Group.

Overall (see last row) Agriculture and Food contract sharply in Western Europe and High Income Asia, and this is offset by expansion in the United States, ANZ, and a wide variety of low income countries in Latin America, Africa, and Asia. Indeed, one of the most salient features of these results is redistribution between OECD farmers in the prior group and farmers in poor countries. Our results appear to support the inference that wealthy taxpayers are undermining incomes of the rural poor across the developing world. While Western European protection appears to be sustaining artificially high aggregate agricultural protection, US support actually represses agriculture by comparison to open multilateralism. If all support were removed multilaterally, aggregate US agricultural output would be 0.7% higher annually from 2015. Given the large fiscal burden of this protection, this indicates that US protection is justifiable only on a defensive basis, and that (apart from relatively narrow sectoral interests like sugar), the United States should rationally take the developing countries side in the Doha Round.

Finally, note the aggregate agriculture output effect for the regional aggregates in the latter columns of Table 2. Here again the progressive nature of the implied income distribution is immediately apparent. According to our results, the prevailing regime of global agricultural support is repressing output and incomes in most low-income continents, including Africa, Latin America, and low income Eastern Europe and Asia. This trend is particularly ironic since the support budgets in question comfortably exceed development assistance budgets exerted in the opposite direction.

The results in Table 3 enable us to better understand the microeconomics of the adjustment process for the high-income countries and the regional aggregates. As one would expect from a producer support program, abolition leads to direct and indirect increases in the cost of capital, and this is particularly evident in Western Europe where direct producer support is quite high. Even on an average basis, High Income capital costs rise quite significantly when support is removed multilaterally. Returns to capital fall uniformly within countries because the current model specification assumed perfect domestic capital mobility.

In the case of land, we see the expected result that factors' rate of return falls sharply, while its price declines to partially offset this as output is reduced. Land prices fall dramatically in the United States under the first scenario. Our model treats land as being imperfectly substitutable among agricultural activities. Land devoted to grains production experiences the steepest decrease, with a 45%, 74%, and 63% reduction for land devoted to rice, wheat, and other coarse grains, respectively. Generally speaking, the interactions between expanding and contracting sectors and land intensity are relatively complex but, at the regional aggregate level, the net burden of protection determines the direction of the adjustment in rate of return, land values, and rural incomes. Again richer farmers are the losers and poorer ones the winners.

Table 3. **Factor returns in agriculture**

Percent change from baseline in 2015

(

Cost of capital inclusive of subsidies

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Low- and middle-income countries*	*High-income countries*	*World total*	*Cairns group*
Paddy rice	2.5	-1.1	10.3	0.0	3.4	0.9	17.7	7.5	1.5
Wheat	2.7	121.2	10.0	3.1	3.4	1.9	48.8	20.6	1.2
Other cereal grains	3.1	145.3	14.2	5.8	3.4	1.8	30.6	16.1	2.6
Vegetable and fruits	0.6	-0.6	0.3	0.5	3.4	2.0	-0.8	1.3	2.4
Oil seeds	2.8	136.7	21.9	3.5	3.4	3.2	26.5	10.8	3.3
Raw sugar	2.0	-0.6	8.6	0.5	3.4	2.4	1.6	3.3	2.1
Plant based fibers	0.6	-0.7	0.3	0.0	3.4	1.2	1.0	1.1	2.2
Other crops	0.6	-0.6	0.3	0.5	3.4	1.8	0.9	1.8	2.3
Bovine cattle etc	4.1	442.5	42.9	4.4	4.7	2.2	200.6	85.5	2.5
Other livestock	3.4	19.3	21.5	11.0	3.4	2.1	13.3	4.4	2.7
Raw milk	18.9	13.2	13.0	13.7	3.4	1.9	13.0	6.9	2.6

Returns to capital exclusive of subsidies

Paddy rice	0.6	-1.1	0.3	0.0	3.4	0.9	7.7	4.8	1.5
Wheat	0.6	-0.6	0.3	0.5	3.4	2.0	-5.6	0.5	0.7
Other cereal grains	0.6	-0.6	0.3	0.5	3.4	1.8	-3.7	0.4	2.1
Vegetable and fruits	0.6	-0.6	0.3	0.5	3.4	2.0	-0.8	1.3	2.4
Oil seeds	0.6	-0.6	0.3	0.5	3.4	3.2	-2.5	2.1	3.0
Raw sugar	0.6	-0.6	0.3	0.5	3.4	2.5	0.5	3.1	2.2
Plant based fibers	0.6	-0.7	0.3	0.0	3.4	1.2	1.0	1.1	2.2
Other crops	0.6	-0.6	0.3	0.5	3.4	1.8	0.9	1.8	2.3
Bovine cattle etc	0.6	-0.6	0.3	0.5	3.4	2.3	-4.2	-0.4	1.9
Other livestock	0.6	-0.6	0.3	0.5	3.4	2.2	-1.0	1.1	2.4
Raw milk	0.6	-0.6	0.3	0.5	3.4	1.9	-0.5	1.0	1.9

Cost of land inclusive of subsidies

Paddy rice	80.8	-59.9	-65.5	0.0	180.1	2.0	-19.4	2.3	4.1
Wheat	4.6	-53.2	-70.2	22.2	27.3	5.1	42.4	36.3	12.5
Other cereal grains	3.1	-55.5	-63.7	7.9	19.6	5.0	23.5	23.2	9.4
Vegetable and fruits	4.6	-42.1	-51.6	7.6	20.2	2.9	-31.6	-2.1	5.0
Oil seeds	-0.5	-49.6	-60.0	14.5	26.6	4.4	22.5	16.5	7.8
Raw sugar	-15.8	-49.9	-63.9	0.0	21.5	3.8	-25.2	5.0	5.7
Plant based fibers	3.7	-35.5	-36.0	0.0	14.2	2.4	3.3	2.5	3.3
Other crops	-0.9	-39.1	-53.2	7.0	26.3	4.3	-22.7	-2.7	6.8
Bovine cattle etc	5.9	-45.6	-55.6	12.2	33.7	4.3	-2.9	3.9	9.8
Other livestock	4.2	-38.5	-52.6	3.0	19.4	2.0	-24.6	-0.1	6.6
Raw milk	4.6	-39.9	-58.7	4.0	46.7	5.7	-20.1	0.1	14.9

Returns to land exclusive of subsidies

Paddy rice	0.2	-77.8	-68.4	0.0	180.1	2.0	-27.8	0.8	4.1
Wheat	-73.2	-95.8	-79.3	-31.6	15.2	5.4	-72.8	-27.0	1.0
Other cereal grains	-62.3	-95.7	-68.0	-36.3	6.1	5.8	-62.5	-19.8	7.4
Vegetable and fruits	4.6	-42.1	-51.6	7.6	20.2	2.9	-31.6	-2.1	5.0
Oil seeds	-23.4	-96.5	-61.6	-19.7	26.6	4.4	-46.1	-3.7	4.9
Raw sugar	-29.5	-66.3	-63.9	0.0	12.7	3.8	-40.2	2.9	5.5
Plant based fibers	3.7	-35.5	-36.0	0.0	14.2	2.4	3.3	2.5	3.3
Other crops	-0.9	-39.1	-53.2	7.0	26.3	4.3	-22.7	-2.7	6.8
Bovine cattle etc	-3.6	-50.6	-56.3	-8.4	20.0	4.3	-11.8	1.2	7.5
Other livestock	-3.7	-47.9	-53.3	-14.0	4.8	2.1	-31.6	-1.0	5.8
Raw milk	-5.0	-47.7	-58.7	0.6	38.6	5.7	-28.1	-2.4	14.3

Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

Most agricultural economists believe that the rental rate paid by producers (rents to landlords) would fall by the amount corresponding to the rate of return. The rental rate paid should fall because it was inflated by the farm programs formerly received by producers/renters. This may be a limitation of the GTAP database - all subsidies go to the factor owner not the user of the factor.

Now we examine the most dynamic adjustments, exports and imports by sector and country. Tables 4 and 5 present these. There are many interesting individual adjustments. Note for example that world rice exports expand by 800%. Trade of cattle meat products expands substantially (70% for cattle, 69% for beef, 48% for other meats). Global grain trade expands by 20 to 25% despite an expansion of livestock output in major grain producing countries (Argentina, United States, and Australia). The European Union experiences a major surge in meat and grain imports (130% for wheat and coarse grains, 129% and 176% for cattle and beef), and a collapse of its exports of the same products (-87 and 94% for coarse grains and wheat, -77% for cattle; –82% for beef). Dairy and sugar trade expands significantly. The GTAP database does not track raw sugar trade separately and it is difficult to disentangle changes in trade patterns in refined and raw sugar. Nevertheless it is clear that Brazil, India, China, and Sub-Saharan Africa benefit from sugar trade liberalisation as their exports increase substantially.

While the tables reward this kind of close inspection, however, we now direct the reader's attention to the last row of aggregate agricultural exports and imports by exporter and importer, respectively. On the export side, the story of course mirrors sectoral output adjustments in Table 2. For example, the United States expands agricultural exports by 16% more per year by 2015 under multilateral liberalisation, while the Cairns Group manages a 26% increase. Even more dramatic are the Rest of Latin America (31%), Eastern Europe and Central Asia (45%), and the Rest of the World (36%), and ANZ with a sensational 58%. Some of this trade growth is displacing Western European exporters, whose shipments decline by 14.2%, but the vast majority is driven by economic growth in a less distorted market environment. Again, the burden and opportunity cost of agricultural protection is far greater than simple market defence could justify.

On the import side, we see rising world food prices inducing greater food self-sufficiency in some poor countries, including Brazil, China, India, Rest of (low income) East Asia, and Rest of the (non-OECD) World. For richer countries, income effects and lower relative prices for foreign agricultural products drive significant increases in imports. Generally speaking, a Doha-style approach to more balanced abolition of agricultural price distortions would greatly increase global agricultural trade, improving the livelihoods of a significant and underprivileged majority of the world's farmers.

A final insight from these scenarios concerns world food prices. Table 6 presents these by sector under the two scenarios (removal of all domestic and trade support, removal of trade support only). These results clearly indicate that most of the burden of agricultural support on international food trade is indirect. When only tariff and export subsidies are removed, world food prices for these product categories never change by ten percent or more. If domestic and external supports are abolished together, however, percentage increases in global food prices can be up to two orders of magnitude greater by 2015. Cattle prices, for example, would drop half a percent if only external distortions were removed, indicating that the existing pattern of external policy toward this sector is withholding supply from world markets. If domestic support were removed, however, an 18% world price increase would be necessary to offset this and restore equilibrium in world beef markets. Clearly, it is not conventional protectionism or export promotion that is most responsible for the dysfunction of today's agricultural markets, but direct producer support. It should also be noted that, upon inspection of trade weighted world prices for all product categories, we find that, although world food prices rise significantly, overall terms of trade improve for developing countries.

Table 4. **Change in exports from full removal of agricultural protection in high-income regions**

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Argentina*	*Brazil*	*China*	*India*	*Rest of East Asia*	*Rest of Latin America and the Caribbean*	*Eastern Europe and Central Asia*	*Sub Saharan Africa x SACU*	*Rest of the World*	*Low- and middle-income countries*	*High-income countries*
Paddy rice	2543.5	-94.3	..	..	8268.5	-5.1	..	5776.8	398.0	31.9	38.0	..	..	53.0	282.6	2919.4
Wheat	13.4	-40.5	..	55.5	12.4	6.1	45.6	678.1	24.5	33.4	240.5	67.4	..	125.9	60.1	13.4
Other cereal grains	-12.5	-86.7	..	2.0	-19.4	46.3	28.3	238.1	..	-16.4	102.4	136.1	146.5	121.5	89.1	-24.9
Vegetable and fruits	31.9	-10.1	133.9	8.1	-15.6	-4.3	12.8	34.7	12.4	8.9	6.3	20.9	10.5	20.9	11.3	7.2
Oil seeds	-15.6	-51.3	-77.0	54.5	23.2	-1.5	35.1	60.5	12.9	-2.5	19.9	18.3	115.1	5.2	30.3	-8.4
Raw sugar	..	-43.3	..	..	..	..	..	..	..	..	..	..	..	..	..	-43.3
Plant based fibers	4.7	20.0	148.3	..	-23.2	-11.1	-1.0	..	1.2	3.1	-6.1	2.0	-3.0	0.5	-1.1	-1.0
Other crops	15.1	20.0	73.5	-3.5	-21.7	-14.3	5.0	9.9	4.1	7.0	6.3	13.1	-1.2	2.1	3.7	17.3
Bovine cattle etc	212.4	-77.2	1069.5	20.8	-12.6	-6.2	..	212.0	..	..	16.8	295.0	18.7	295.4	180.8	2.6
Other livestock	-1.3	-4.6	57.0	-16.5	-25.2	-25.4	33.5	-5.1	-27.1	-21.2	-7.3	4.3	-24.0	7.2	-1.5	-5.7
Raw milk	..	-22.1	..	..	..	..	..	..	-11.3	..	..	-17.1	..	-16.2	-15.6	-22.1
Fossil fuels	1.6	3.9	3.6	1.6	-8.2	-10.8	-5.8	3.1	-1.6	2.0	-3.7	-0.8	-3.5	-0.3	-1.1	1.3
Other natural resources	1.4	4.9	5.0	0.8	-10.8	-13.8	-5.2	1.7	-0.2	2.5	-5.0	-1.5	-4.2	-1.1	-1.5	-1.4
Bovine meat products	47.8	-82.5	196.4	77.0	106.6	231.7	387.9	-3.6	11.3	57.3	168.0	118.1	639.1	500.3	209.9	21.4
Other meat products	27.6	-33.4	188.0	50.2	30.6	2.8	17.2	69.3	..	65.3	1247.2	45.7	48.6	275.7	166.5	-7.5
Vegetable oils and fats	-4.8	-10.3	247.2	1.8	-34.6	-6.5	4.7	-29.0	-2.4	7.5	1.7	10.1	33.9	28.9	2.9	7.8
Dairy products	150.0	-36.8	399.8	311.8	146.2	13.4	..	-43.6	-41.7	24.1	180.0	553.1	36.9	310.6	315.1	13.6
Refined sugar	213.7	-93.6	82.3	152.7	-10.4	60.3	19.5	20.2	97.2	13.6	91.7	44.4	200.8	165.9	81.5	-56.4
Other processed foods incl beverages and tobacco	-7.8	2.7	40.8	-4.3	-23.4	-19.1	-10.0	-12.8	-7.8	-9.0	-12.1	-7.8	-14.5	-9.3	-10.4	1.5
Textiles clothing and leather	1.1	4.0	2.9	-0.8	-15.1	-15.9	-6.6	-0.2	-3.4	0.5	-6.7	-3.6	-7.1	-3.4	-1.8	3.0
Chemicals plastics and rubber	-0.4	2.5	1.9	-1.5	-13.5	-14.7	-6.0	-1.1	-3.6	-1.2	-6.4	-4.0	-6.0	-3.4	-2.9	1.5
Other manufacturing	-0.5	2.3	1.2	-1.0	-11.2	-11.8	-5.5	-0.4	-2.8	-0.2	-5.6	-3.4	-5.9	-2.7	-2.2	1.1
Electricity and gas	-0.4	1.4	0.9	-0.2	-6.4	-9.4	..	0.0	..	0.1	-2.4	-0.8	-1.8	-1.0	-1.1	1.1
Construction	-1.1	1.1	0.0	-1.4	-7.9	-8.5	-4.3	-1.1	-1.9	-0.7	-4.4	-2.5	-3.5	-1.7	-2.2	0.6
Other services	-0.6	3.3	2.3	-1.4	-13.0	-13.9	-6.7	-0.6	-2.5	-0.3	-7.3	-2.5	-5.8	-2.6	-2.7	1.6
Agriculture	24.3	-21.5	97.4	31.0	23.9	14.9	19.0	92.8	41.0	2.7	11.0	41.4	5.2	30.3	19.2	12.6
Processed foods	8.2	-13.0	80.5	27.7	76.9	27.2	18.5	-5.6	0.5	0.2	62.7	48.2	62.6	44.8	28.5	3.5
Manufacturing	-0.4	2.4	1.4	-0.8	-11.1	-12.4	-5.6	-0.4	-3.0	0.0	-5.4	-3.1	-4.5	-1.9	-2.0	1.3
Services	-0.6	3.3	2.3	-1.4	-13.0	-13.9	-6.7	-0.6	-2.5	-0.3	-7.3	-2.5	-5.8	-2.6	-2.7	1.6
Total	0.5	1.9	2.1	0.8	0.6	4.3	2.4	-0.2	0.8	0.0	1.1	0.2	1.9	0.4	0.5	1.5
Agriculture and food	16.0	-14.2	82.3	29.5	57.9	21.8	18.8	12.7	15.3	0.6	31.0	45.2	16.1	36.1	23.8	6.1

Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

Table 5. **Change in imports from full removal of agricultural protection in high-income regions**

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Argentina*	*Brazil*	*China*	*India*	*Rest of East Asia*	*Rest of Latin America and the Caribbean*	*Eastern Europe and Central Asia*	*Sub Saharan Africa x SACU*	*Rest of the World*	*Low- and middle-income countries*	*High-income countries*
Paddy rice	101.5	55.7	6568.0	0.0	..	..	-6.1	..	..	-1.5	-10.5	-2.5	-41.1	-1.3	-6.2	1241.1
Wheat	33.1	130.6	14.0	459.8	..	..	-8.2	-17.9	-21.6	-0.5	-8.3	-0.5	-18.6	-14.1	-10.0	89.1
Other cereal grains	16.8	133.5	-13.9	18.5	..	17.1	-11.1	-18.1	..	-19.4	-3.8	1.2	-0.1	-14.1	-11.6	44.7
Vegetable and fruits	2.7	12.1	39.3	2.5	10.2	3.9	-5.5	-4.1	-2.0	-3.4	3.1	0.2	4.3	-0.2	-1.2	13.7
Oil seeds	64.4	17.1	40.5	-5.5	-4.5	-1.7	-3.4	-7.9	..	-4.2	-0.1	3.7	3.6	-3.3	-4.3	25.3
Raw sugar	..	-43.3	..	..	..	..	..	..	..	..	..	..	..	..	..	-43.3
Plant based fibers	-3.0	1.8	0.8	-0.6	..	..	-0.3	-2.8	-2.8	-3.1	3.7	-0.4	-0.8	-0.9	-1.7	1.3
Other crops	27.1	-1.7	9.0	1.9	27.8	3.8	-0.4	-0.4	3.0	-0.9	6.5	4.1	1.3	1.0	2.1	6.2
Bovine cattle etc	11.4	129.0	305.1	6.4	33.9	55.1	5.8	..	..	-15.6	1.0	-3.6	5.0	-4.8	-5.7	92.0
Other livestock	-0.6	-0.2	-19.9	52.2	13.1	5.0	-0.2	-5.3	-1.3	-3.0	36.9	4.7	3.4	2.3	0.6	-5.5
Raw milk	18.9	-12.9	-51.8	..	..	..	..	..	..	..	..	..	..	..	..	-16.0
Fossil fuels	-1.3	0.0	-0.2	-0.5	1.1	3.2	-0.4	-1.6	-0.6	-1.0	-2.7	-0.9	-0.3	-1.2	-1.1	-0.4
Other natural resources	-1.5	-1.7	-1.5	-0.8	3.2	3.1	1.0	-2.9	-0.5	-1.3	1.2	-0.8	2.7	-0.6	-1.3	-1.6
Bovine meat products	16.5	176.1	21.9	32.8	8.7	9.2	-4.2	-3.9	..	-3.2	-4.2	-13.4	-11.7	-13.4	-8.6	102.0
Other meat products	6.5	73.6	59.6	172.4	13.9	7.7	6.7	-4.2	..	-3.7	4.0	-0.1	-3.9	0.2	-1.0	67.4
Vegetable oils and fats	15.2	14.7	-24.9	12.7	13.2	4.3	-1.3	2.3	0.9	1.1	-1.4	1.5	17.6	3.1	2.1	8.4
Dairy products	92.4	39.3	245.7	797.6	16.0	4.0	-6.7	-14.4	-10.6	-8.3	-13.0	-15.8	-21.9	-11.7	-12.5	74.6
Refined sugar	133.0	163.7	114.1	-0.4	0.4	7.9	..	-2.1	-3.9	-2.3	1.5	-1.1	-2.8	-7.0	-3.6	139.7
Other processed foods incl beverages and tobacco	0.5	-3.3	-16.4	-0.8	9.5	8.1	1.4	1.8	2.6	2.4	3.9	3.3	5.1	2.3	2.9	-5.8
Textiles clothing and leather	-0.2	-0.1	-0.6	0.4	3.0	8.1	3.3	0.7	1.0	0.1	2.7	0.9	2.2	0.8	1.2	-0.1
Chemicals plastics and rubber	0.4	-0.3	-0.9	0.6	5.3	7.1	3.9	0.6	1.4	0.2	2.6	1.3	3.5	1.6	1.6	-0.1
Other manufacturing	0.1	0.1	-0.2	0.2	3.6	5.3	2.5	0.5	1.4	0.1	1.3	1.0	1.8	0.9	0.9	0.1
Electricity and gas	0.2	-0.2	-0.1	0.2	..	3.1	1.3	..	1.1	0.9	1.3	0.1	0.7	0.8	0.5	-0.1
Construction	0.4	-0.5	0.0	1.2	5.2	4.9	2.1	0.7	1.2	0.6	2.8	1.3	1.7	0.8	1.0	-0.3
Other services	0.5	-1.4	-0.9	1.2	8.2	8.6	4.0	0.4	1.7	0.3	4.3	1.7	3.6	1.5	1.9	-0.6
Agriculture	15.9	21.0	51.5	7.3	20.8	3.9	-4.1	-6.8	-3.9	-4.3	1.1	1.7	-6.8	-6.9	-3.8	26.2
Processed foods	13.2	28.5	9.5	29.7	10.3	7.6	-0.8	0.4	0.8	-0.1	0.3	0.2	1.8	-0.9	0.0	21.6
Manufacturing	0.0	0.0	-0.4	0.2	3.7	5.7	2.6	0.4	1.1	0.1	1.5	0.8	2.0	0.9	0.9	0.0
Services	0.5	-1.4	-0.9	1.2	8.2	8.6	4.0	0.4	1.7	0.3	4.3	1.7	3.6	1.5	1.9	-0.6
Total	0.6	1.5	1.3	1.2	4.9	6.2	2.5	0.1	1.1	0.0	1.8	0.9	2.4	0.7	0.9	1.3
Agriculture and food	14.4	25.4	24.9	22.0	12.7	6.1	-2.7	-3.2	-1.7	-2.1	0.6	0.7	0.0	-2.8	-1.4	23.4

Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

Table 6. **Changes in world prices**

(percent change from baseline in 2015)

	Removal of all protection	*Removal of border protection*
Paddy rice	5.5	4.1
Wheat	12.0	1.9
Other cereal grains	14.5	2.7
Vegetable and fruits	0.3	0.1
Oil seeds	8.1	1.0
Raw sugar	-1.7	-2.2
Plant based fibers	1.8	1.4
Other crops	0.9	0.6
Bovine cattle etc	18.2	-0.5
Other livestock	2.2	-0.9
Raw milk	2.4	0.1
Bovine meat products	10.4	1.9
Other meat products	1.7	-0.9
Vegetable oils and fats	2.2	-0.2
Dairy products	8.3	5.9
Refined sugar	9.0	8.4
Other processed foods incl beverages and tobacco	-0.2	-1.0
Agriculture (weighted average)	4.3	0.7
Processed foods (w.a.)	2.1	0.3

Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

What would be the global distributional consequences of abolishing OECD agricultural protection? This can be inferred by the market linkages in question, *i.e.* rising global food prices improve incomes among farmers without prior support, but more detailed estimates are available directly from the simulation model and presented in Table 7. These changes in national rural value added indicate that the big losers would be farmers in Western Europe and High Income Asia (mainly Japan), while low and middle income farmers would benefit more in absolute (but less in relative) terms. Indeed, OECD agricultural policies represent a huge tax on developing country agriculture. Removing all OECD subsidies would increase rural value added by more than USD 60 billion (per annum, not cumulatively) in low and middle-income countries.

This figure, incidentally, exceeds the most ambitious target for increased aggregate development assistance by over 20%. Unlike development assistance by conventional means, realising poverty alleviation in this way would also occasion substantial savings for OECD taxpayers. Perhaps most significant, these USD 63.4 billion real net dollars would be delivered directly to the doorstep of poor households in the developing world by the marketplace, bypassing local, regional, national governments and a variety of other mediating institutions. At the heart of these policies lies a potent catalyst for global poverty alleviation. For those, like the present authors, who believe globalisation has been beneficial to the poor, it would thus be ironic if, as the new US farm bill threatens to do, OECD agricultural protection were to break the Doha Round.

Table 7. **Impact on nominal rural value[1] added from agricultural reform in high-income regions**

(impact in 2015 compared to baseline)

	Removal of all protection	*Removal of border protection*	*Removal of all protection*	*Removal of border protection*
Western Europe	-28.8	-34.4	-15.5	-18.6
United States	5.5	7.6	4.8	6.6
High income Asia	-34.4	-35.0	-36.6	-37.2
Canada	2.1	1.5	15.4	11.1
Australia and New Zealand	7.8	6.6	41.5	34.9
Argentina	6.6	3.8	15.5	8.9
Brazil	5.7	3.3	7.0	4.0
China	7.9	4.6	2.0	1.1
India	4.9	3.6	3.3	2.4
Rest of East Asia	1.5	0.4	1.4	0.4
Rest of Latin America and the Caribbean	15.3	12.3	15.2	12.2
Eastern Europe and Central Asia	7.7	4.4	10.8	6.2
Sub Saharan Africa x SACU	3.4	2.6	6.3	4.8
Rest of the World	10.3	6.2	6.8	4.1
Low- and middle-income countries	63.4	41.2	5.5	3.6
High-income countries	-47.7	-53.7	-11.2	-12.6
World total	15.7	-12.5	1.0	-0.8
Cairns group	39.1	27.9	10.8	7.7

1. Loss in value net of agricultural subsidies.
Source: Authors: Beghin, Roland-Holst, van der Mensbrugghe.

Conclusions and extensions

Global agricultural trade is a centrepiece of the Doha Round of multilateral trade relations. This focus is eminently sensible since agriculture is one of the largest and most stubborn areas of government market intervention remaining after thirty years of determined progress toward open multilateralism. Agricultural protection is also seen as an important source market bias between rich and poor nations, and reconciling this has special significance in the context of recent multilateral commitments to more aggressively attack the causes of global (largely rural) poverty.

In this paper, we use a new dynamic simulation model and global database to assess the efficiency and welfare burdens of today's agricultural support programs. Our results indicate that these burdens are quite substantial, that their abolition would lead to dramatic shifts in domestic and international resource allocation, and that the result would be a more progressive distribution of farm income. In particular, our results give strong empirical support to the idea that current agricultural support in high-income countries is depressing output and incomes in low-income farm households across the developing world. Thus, for example, taxpayers in OECD countries are paying twice for development assistance, once to reduce the incomes of poor farmers and once to alleviate the same poverty.

Abolition of OECD agricultural support would be a potent catalyst for global poverty alleviation, at the same time realising substantial savings for OECD taxpayers. Today, these policies reduce rural value added by more than USD 60 billion (per annum, not cumulatively) in low and middle-income countries, a figure 20% higher than the most ambitious goals for increased development assistance. If

they were also to undermine the Doha Round, as the new US farm bill portends, it would be a doubly regressive blow to North-South economic relations.

Among our more specific conclusions are the following:

a) Though world food prices would rise with the abolition of agricultural support program, the overall terms of trade would appreciate for developing regions as a group.

b) There would be significant growth and re-orientation of global agricultural trade, *i.e.* the current structure of production and trade is highly distorted. Trade in agriculture would increase by 17% at the global level, with agricultural and food exports increasing by 24% for low and middle-income countries. This would give the latter an essential opportunity to purchase more manufactured imports and capital goods.

c) Real wages in developing countries would rise across the board, and increase more than capital returns, *i.e.* removal of agricultural protection in OECD countries is pro-poor on average, and more than likely equitable.[1]

d) The Cairns group would be a clear beneficiary of this liberalisation.[2]

The results reported here are preliminary in the sense that we would like to calibrate existing support patterns in greater detail, and also because this support may change significantly in the near future. The new Farm Bill in the United States has, in light of our results, momentous implications for the Doha Round. Not only does the Bill threaten escalation to unprecedented support levels, but in its present form it repudiates one of the important tenets of Doha: decoupling support from output levels. To reduce the distortionary impact of agricultural support, it has been argued that it should be converted from output-based assistance to lump sum income transfers. The new Farm Bill thus represents two steps backward from more liberal global trade, higher absolute subsidy burdens and more direct distortion of market incentives. In subsequent work, we hope to evaluate this policy and the potential for retaliation, including a breakdown of the Doha Round.

1. One caveat to this is rising food prices faced by the urban poor.

2. Cairns group includes ANZ, ARG, BRA, Rest of East Asia, and Rest of LAC.

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TRADE, FOOD SECURITY AND WTO NEGOTIATIONS: SOME REFLECTIONS ON BOXES AND THEIR CONTENTS

Eugenio Díaz-Bonilla, Marcelle Thomas, and Sherman Robinson.[*]

Abstract

An important component of the current debate about agriculture trade negotiations is whether further liberalisation of trade and agricultural policies may help or hinder food security in WTO member countries. To contribute to the debate, this paper surveys and discusses in detail three main aspects of trade liberalisation and food security within the WTO: the adequacy of the current WTO classification of countries, the policy perspectives in industrialised countries and in developing countries, and the legal issues faced by developing countries, with particular consideration of different special and differential treatment proposals.

The authors make a case first for a better classification of WTO members based on objective food-security indicators to target food insecure countries. Second, they argue that the main imbalances in world agriculture is that industrialised countries have enough legal room under the WTO to subsidise their own agriculture and the resources to do it, while many developing countries although not legally constrained to invest in food security, lack the financial, human, and institutional resources to do it. The pay off to developing countries would be greater if they limit the ample legal room industrialised countries now have to protect and subsidise their agriculture rather than try to expand further their own SDT. Yet, food insecure developing countries may need streamlined instruments to protect poor farmers from unfair trade practices and import surges, and require adequately long transition times linked to a program of investment in rural development and poverty alleviation. This should be recognised by ensuring that agricultural trade negotiations proceed in parallel with increased funding by international and bilateral organisations for agricultural and rural development, food security, and rural poverty alleviation.

Introduction

The Agreement on Agriculture (AoA) negotiated during the Uruguay Round of international trade negotiations stipulated in Article 20 the need to continue agricultural negotiations within the World Trade Organisation (WTO), beginning in the year 2000. At Doha, in November 2001, WTO members launched multisectoral trade negotiations, including agriculture as part of a single undertaking. An important component of the current debate about those negotiations is whether further liberalisation of trade and agricultural policies may help or hinder food security in WTO member countries. Although Article 20 only indicates that those negotiations should take into consideration, among other things, "non trade concerns", the preamble to the Agreement mentions as examples of those concerns, "food

* IFPRI.

security and the need to protect the environment".[1] The Doha Declaration, after reaffirming that "the long-term objective" is "to establish a fair and market-oriented trading system through a program of fundamental reform", confirmed that special and differential treatment will be granted to developing countries "to effectively take account of their development needs, including food security and rural development" (Doha Declaration, paragraph 13).

While usually the preoccupation with economic liberalisation and food security has centred on developing countries (Pinstrup-Anderson, 1990; Commander 1989; and Sahn *et al.*; 1997), some industrialised countries have also included food security concerns as part of the idea of "multifunctionality" of agriculture, a concept that some WTO members have argued should be considered during the negotiations.[2]

In consequence, the issue of food security and agricultural negotiations within the WTO has been raised both by industrialised and developing countries. For richer countries that are net food importers, the discussion centres, in part, on whether there exists some "adequate" proportion between total domestic food production and the level of trade needed to satisfy food requirements at the national level, and whether the continuation of the negotiating process may place undue constraints on attaining the desired ratio of imports over domestic production (Japan and the Republic of Korea, 2000). Those ratios may be linked to some notion of insurance in an uncertain world, or national autonomy to be able to confront outside pressures, or both. It is much less clear what would be the basis for claiming food security concerns in the case of industrialised countries that are net food exporters.

In the case of developing countries, the discussion is broader, including whether important policy objectives such as elimination of poverty and hunger (as cause and consequence of food insecurity) may have been helped or hindered by the current AoA, and whether further negotiations may improve upon the existing text or will further compromise the attainment of those objectives in poor countries. Several developing countries have presented their concerns about food security issues, including the possibility of special and differential treatment embedded in a "Development Box" or a "Food Security Box" (WTO b and c).

To properly address those concerns there are at least two questions to consider. First, what is the relevance of the current classification of countries in the WTO with respect to their food security

1. The text of Article 20 indicates that negotiations would take into account: "(a) the experience to that date from implementing the reduction commitments; (b) the effects of the reduction commitments on world trade in agriculture; (c) non-trade concerns, special and differential treatment to developing country Members, and the objective to establish a fair and market-oriented agricultural trading system, and the other objectives and concerns mentioned in the preamble to this Agreement; and (d) what further commitments are necessary to achieve the above mentioned long-term objectives" (GATT, 1994, p. 55).

2. The basic idea of multifunctionality is that agriculture, in addition to supplying the obvious direct products, also generates positive externalities including food security, environmental conservation, rural landscape, employment, and vital rural communities. A policy conclusion from this line of analysis is that the government could justifiably intervene with subsidies and protection to agriculture to ensure an adequate supply of the postulated externalities. The notion of multifunctionality has led to some controversy, including the fact that other productive sectors may also have multifunctional properties and the nature of the policies that may help generate the postulated externalities without affecting other countries (for a general discussion, see FAO, 1999b; OECD, 2001; and Díaz-Bonilla and Tin, 2002; for country perspectives see Abare, 1999; European Union, 2000; Norway, 1998; and USDA, 1999).

status? Second, do the current legal texts, which define WTO commitments on the basis of those categories of countries, adequately consider food security concerns through the AoA's provisions on special and differential treatment. Both questions are related: if the categories are badly defined to capture food security concerns, then it is unlikely that the different treatment under WTO rules will deal with those concerns in a meaningful way. But even if those categories capture the variety in the situations of food (in)security, current WTO rules and commitments may still need adjustments to take into account the problems of food insecure countries.

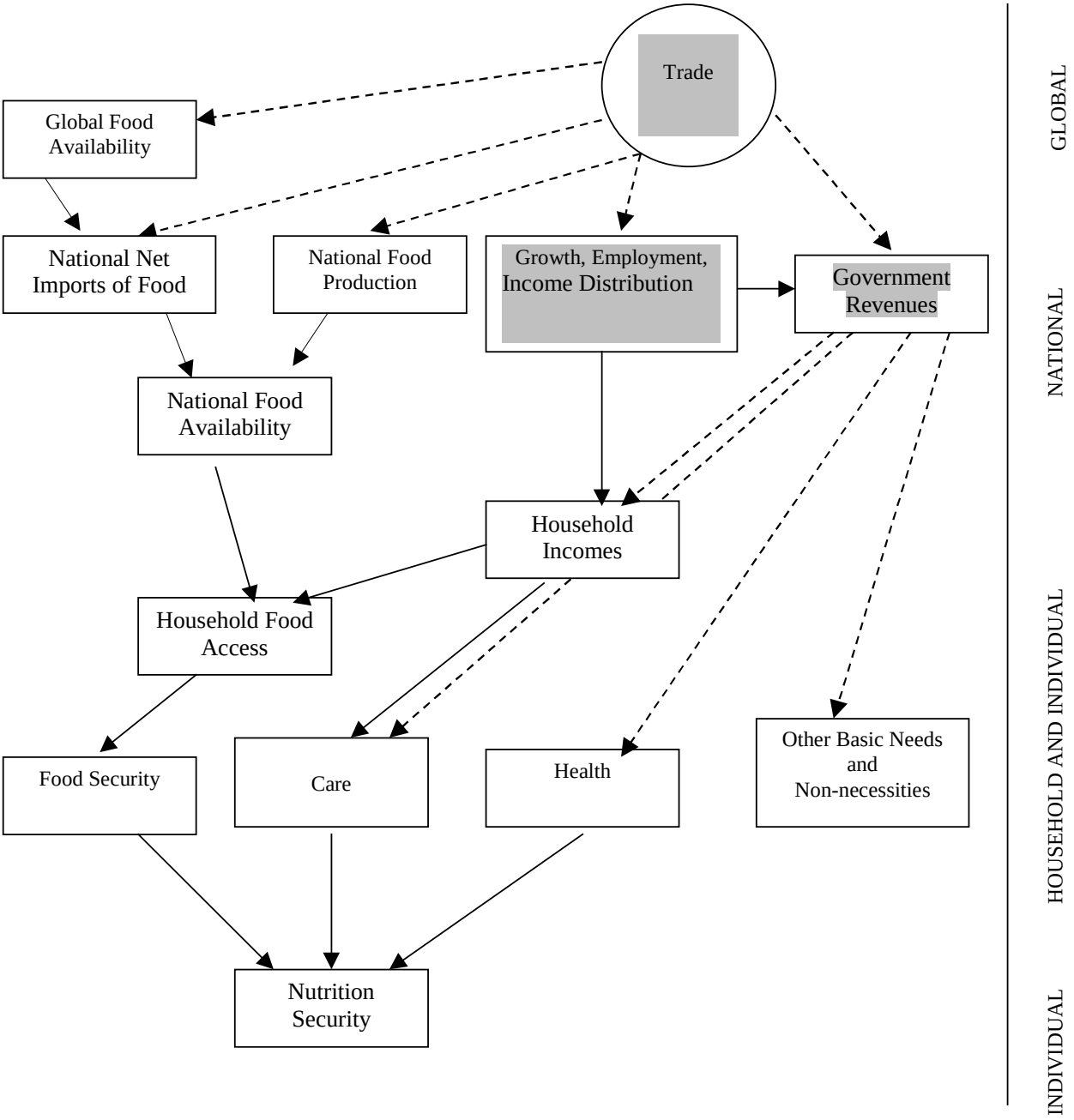
The paper is organised as follows. The next section briefly discusses the notion of food security and analyses different channels through which changes in agricultural trade may affect food security. A short background on food security trends follows. The rest of the paper discusses in greater detail three main issues related to WTO negotiations: country classification according to their food security situation; protectionism and subsidies in industrialised countries; and domestic policies for food security in developing countries. The paper closes with some concluding remarks.

Food security and nutrition security

Food security can be analysed at the global, national, regional, household, and individual levels (Figure 1). Since the World Food Conference of 1974, the focus has been moving from the initial concerns about food availability at the global and national levels to those aspects that affect food access and utilisation at the household and individual levels, where issues of food security emerge in a more concrete way (Maxwell, 1996). The importance of poverty and lack of income opportunities in food insecurity was highlighted early (Sen, 1981). In addition to the trend level of food availability, its variability around that trend for both food supply and access, and its sustainability over time were increasingly emphasised (Maxwell, 1990). It was further argued that food intakes should provide for more than mere survival: they have to support also an active and healthy life (Maxwell and Frankenberger, 1992). The 1996 World Food Summit included several of those components of the notion of food security when it accepted the definition that "food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

But availability and access are only preconditions for adequate utilisation of food. They do not determine unequivocally malnutrition (or nutrition insecurity) at the individual level (Smith, 1998; Smith and Haddad, 2000). For instance the measure of malnutrition utilised by the Food and Agriculture Organisation (FAO, 1999a) (which is based on calories availability at the national level, doubly corrected by the gender and age structure of the population, and by the consumption or income distribution profile of the country), shows a highly significant correlation with national food availability measured by national consumption of calories per capita, but is more weakly correlated with "deeper" measures of malnutrition, such as the percentage of child malnutrition based on anthropometrical measures (Smith, 1998). Analysing nutrition insecurity at the individual level (utilising child malnutrition as the indicator) requires the consideration of other determinants (Smith and Haddad, 2000). Figure 1, shows some of the links between trade and trade policies, on one hand, and food security and nutrition security, on the other.

Figure 1. **Conceptual framework for food security**



Source: Adapted from Smith (1998)

Trade influences both world food availability, as well as production and food imports (including food aid) at the national level (the latter two aspects defining national food availability).[3] Food availability is a component of the more specific notion of food security, and it has been shown to have a positive correlation with declines in malnutrition (Smith and Haddad, 2000). But trade and trade policies may also have an impact on the rate and variability of growth, as well as its "quality" (*i.e.* the employment, income distribution, and poverty effects). Income opportunities, along with food availability, define food security at the household level. Another important channel of influence of trade and trade policies is through government revenues, directly as collection of trade taxes and indirectly through the impact of the rate and quality of growth on general tax collection (Winters, 2000a and b). The level of government revenues affects the possibility of implementing transfer policies (like food subsidies or other poverty-oriented programs) and to finance public services and investments in health, education, and related areas. Looking at the individual level, malnutrition depends on food security (*i.e.* household and individual food access), as well as other determinants such as the quality and quantity of care (which is mostly related to women's education and women's relative status in the society) and the health environment (including health services and infrastructure) (Figure 1; for a more detailed discussion see Smith and Haddad, 2000).

Certainly food and nutrition security take a more concrete form at the household and individual levels, where they are heavily influenced by such determinants as income distribution and women's status in society. Yet trade negotiations within WTO are conducted at the national level, and special and differential treatment is granted to categories of countries.[4] Therefore, part of the discussion that follows, which focuses on the implications of food security as a non-trade concern for possible changes in the WTO legal framework, particularly the Agreement on Agriculture, takes in several instances a national perspective. This is particularly the case for the cluster analysis of countries based on food (in) security indicators, which utilises national averages of consumption, production, and trade measures.

Trends in food security

Food security appears to have improved, on average, over the past four decades. Total food availability in developing countries, measured in daily calories and grams of proteins per capita, was about 30% higher at the end of the 1990s than in the 1960s, even though the world population almost doubled during that time (Table 1 and 2). The number of malnourished children under five (a better indicator of food problems than average food availability) declined between the 1970s and the mid-1990s by about 37 million (Table 3), and the incidence of malnutrition dropped from 47% to 31% (Smith and Haddad 2000).

3. It should be noticed that the Agreement on Agriculture of the WTO, covers not only agricultural trade policies but also domestic agricultural policies. Therefore, the "Trade" circle in Figure 1 can be understood as including in addition to trade and trade policies, the legal framework for domestic agricultural policies, as embedded in the WTO obligations.

4. Although skewed income distributions and bias against women would certainly modify results based on national averages, it seems doubtful that a country can claim special and differential treatment on trade negotiations because it is discriminating against women and the poor through other policies and institutions.

Other points to be noticed are:

- Food availability in developing countries comes mostly from domestic production: imports were about 15% of total food production in the 1990s (up from 10% in the 1960s and 1970s) (Figure 2).

- Food trade, along with food stocks, contributed to reduce the variability of food consumption in developing countries to about 1/3 to 1/5 of that of food production (Tables 4, 5 and 6).

- The burden of the total food bill (measured by food imports as a percentage of total exports) declined on average for developing countries from almost 20% in the 1960s to about 6% in the 1990s (Figure 3). This was caused by the expansion of total trade, which has grown faster than food imports, along with a decline in real food prices.

- Volatility of real agricultural prices in world markets in the last half of the 1990s - since the implementation of the World Trade Organization (WTO) agricultural agreements - does not seem to be higher than for the whole period since the 1960s (Table 7). It is less clear what has happened to the volatility of agricultural prices within developing countries, which also depends on domestic policies.

Table 1. **Calories per capita per day**

	1960s	1970s	1980s	1990s	1995-99	Last/60	Last/70	Last/80
World	2 347	2 453	2 636	2 750	2 790	1.189	1.058	1.137
Industrialised countries	2 956	3 079	3 201	3 337	3 359	1.136	1.049	1.091
Developing countries	2 036	2 173	2 424	2 607	2 667	1.310	1.100	1.227
Least developed countries	2 016	2 018	2 078	2 067	2 073	1.029	0.998	1.028
Africa South of Sahara	2 070	2 077	2 075	2 160	2 189	1.058	1.055	1.054
Transition markets	3 236	3 366	3 383	2 992	2 906	0.898	0.859	0.864

Source: Díaz-Bonilla *et al*., 2002.

Table 2. **Proteins per capita per day (grams)**

	1960s	1970s	1980s	1990s	1995-1999	Last/60	Last/70	Last/80
World	64	65	70	73	75	1.170	1.143	1.074
Industrialised countries	90	94	99	103	104	1.155	1.103	1.050
Developing countries	51	53	59	66	68	1.326	1.278	1.148
Least developed countries	50	51	51	51	51	1.008	1.006	0.990
Africa South of Sahara	53	52	51	52	53	1.000	1.009	1.024
Transition markets	97	102	103	90	86	0.887	0.842	0.834

Source: Díaz-Bonilla *et al*., 2002.

Table 3. **Number of malnourished children since 1970**

Regions	1970	1975	1980	1985	1990	1995	1997
	(millions of children under age 5)						
Latin America and the Caribbean	9.5	8.2	6.2	5.7	6.2	5.2	5.1
Sub-Saharan Africa	18.5	18.5	19.9	24.1	25.7	31.4	32.7
West Asia/North Africa	5.9	5.2	5.0	5.0	n.a.	6.3	5.9
South Asia	92.2	90.6	89.9	100.1	95.4	86.0	85.0
East Asia	77.6	45.1	43.3	42.8	42.5	38.2	37.6
All regions	203.8	167.6	164.3	177.7	176.7	167.1	166.3

Source: Smith and Haddad (2000) from 1970 through 1995; 1997 data are the IMPACT base-year values extrapolated from 1995 values using the IMPACT model (Rosegrant *et al.*, 2001).

Note*:* n.a. is not available.

Table 4. **Volatility of food production**

	1961-2000	1991-2000	1995-2000
Asia	0.150	0.100	0.050
Africa	0.110	0.080	0.060
LAC	0.110	0.080	0.050
EU	0.060	0.040	0.030
Japan	0.050	0.040	0.030
US	0.050	0.040	0.020

Source: Díaz-Bonilla *et al*., 2002.

Table 5. **Volatility of calorie consumption**

	1961-2000	1991-2000	1995-2000
Asia	0.051	0.030	0.012
Africa	0.056	0.031	0.014
LAC	0.041	0.022	0.010
EU	0.023	0.016	0.007
Japan	0.012	0.004	0.001
US	0.014	0.006	0.005

Source: Díaz-Bonilla *et al*., 2002.

Figure 2. **Ratio of food imports to food production in real terms**

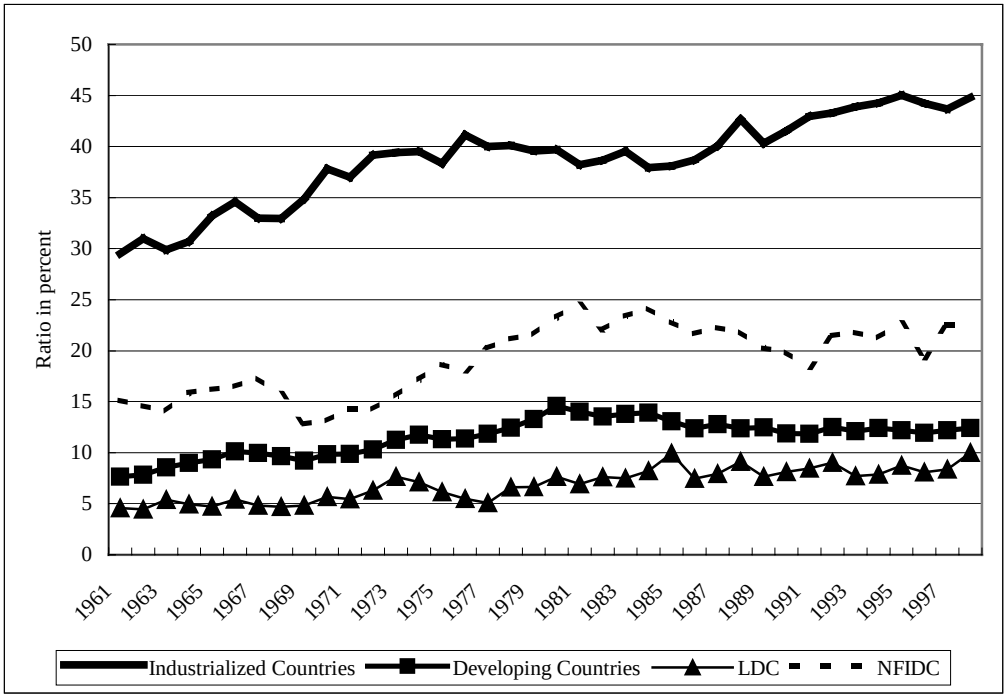


Table 6. **Volatility of protein consumption**

	1961-2000	1991-2000	1995-2000
Asia	0.057	0.034	0.019
Africa	0.063	0.038	0.020
LAC	0.055	0.037	0.017
EU	0.024	0.017	0.008
Japan	0.020	0.007	0.008
US	0.022	0.006	0.002

Source: Díaz-Bonilla *et al*., 2002.

Figure 3. **Ratio of food imports over total exports**

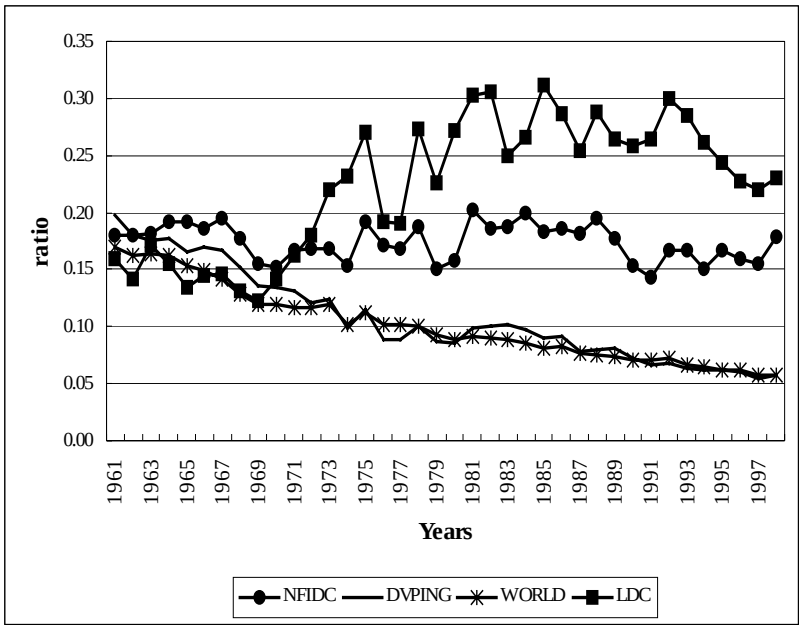


Table 7. **Coefficient of variability for price: constant value**

	1960-1999	1990s	1995-1999
Cocoa (cents/kg)	0.54	0.14	0.13
Coffee Mild (cents/kg)	0.40	0.29	0.21
Coffee Robusta (cents/kg)	0.55	0.26	0.14
Tea (cents/kg)	0.20	0.19	0.21
Sugar (cents/kg)	0.81	0.16	0.17
Orange ($/mt)	0.11	0.08	0.01
Banana ($/mt)	0.11	0.12	0.11
Beef (cents/kg)	0.21	0.13	0.06
Wheat ($/mt)	0.22	0.14	0.16
Rice ($/mt)	0.34	0.13	0.07
Maize ($/mt)	0.21	0.16	0.17
Sorghum ($/mt)	0.21	0.13	0.15
Coconut Oil ($/mt)	0.36	0.29	0.15
Soybean Oil ($/mt)	0.30	0.18	0.13
Groundnut Oil ($/mt)	0.28	0.15	0.08
Palm Oil ($/mt)	0.30	0.29	0.19
Soybean ($/mt)	0.22	0.11	0.12
Soybean Meal ($/mt)	0.27	0.16	0.21
Cotton (cents/kg)	0.19	0.14	0.12

Source: Díaz-Bonilla et al., 2002

However, although food security has improved in general, there are regions and countries at risk, and some have become more food insecure:

- Average food availability is still low for regions such as sub-Saharan Africa (SSA). And for more than one-fourth of all developing countries, per capita indicators have decreased since the 1960s (Table 8). In most cases those declines appear to be associated with war.

- The number of malnourished children under the age of five has actually increased in SSA, and the incidence of malnutrition is still very high there and in South Asia (Table 3).

- For the least-developed countries (LDCs), the total food bill has remained high at 20% (Figure 3), and several developing countries with large external debts face additional constraints in financing their food imports.

In summary, while aggregate trends of food security indicators for developing countries seem positive, the situation is deteriorating in several cases. There appears to be a variety of food (in)security situations across countries, which require a more disaggregated analysis. This issue is discussed next.

Table 8. **Developing countries with worsening indicators for calories and proteins**

	Countries with lower indicators in 1990s than in 1960s and than the group average in 1990s	Countries with lower indicators in 1990s than in 1980s and than the group average in 1990s
Level Calories	26 (20%)	37 (28%)
Level Proteins	33 (25%)	42 (32%)
	Countries with higher indicators in 1990s than in 1960s, and than the group average in 1990s	**Countries with higher indicators in 1990s than in 1980s, and than the group average in 1990s**
Volatility Calories	23 (17%)	16 (12%)
Volatility Proteins	23 (17%)	21 (16%)

Note: Based on data for 132 developing countries.
Source: Díaz-Bonilla *et al*., 2002.

Table 9. **Classification of countries in 12 clusters: Mean values of the food security variables**

	Calories per capita CALCAP (calories)	Proteins per capita PROTCAP (grams)	Food production per capita PRODCAP (US$)	Export to food import ratio EXPTOIMP ratio	Share of food import to total export 1/EXPTOIMP (%)	Share of non-agricultural pop. NAGRPOP ratio
Cluster-1	1 982.9	48.6	81.8	4.9	20.4	0.23
Cluster-2	2 229.2	58.8	117.6	5.3	19.0	0.71
Cluster-3	2 244.6	52.6	120.3	14.1	7.1	0.41
Cluster-4	2 581.5	70.8	157.2	4.8	20.8	0.39
Cluster-5	2 602.3	66.5	210.4	11.3	8.8	0.75
Cluster-6	2 672.9	72.8	124.1	19.8	5.0	0.41
Cluster-7	2 976.1	82.7	135.1	9.1	11.0	0.82
Cluster-8	2 827.7	78.4	233.3	25.6	3.9	0.83
Cluster-9	3 231.3	100.1	254.2	18.6	5.4	0.88
Cluster-10	3 271.8	97.7	304.2	35.9	2.8	0.93
Cluster-11	3 303.7	103.3	520.6	17.7	5.7	0.93
Cluster-12	3 374.1	107.5	923.9	32.7	3.1	0.93

Source: Díaz-Bonilla *et al*., 2000.

Variety of food security situations and implications for WTO negotiations

The heterogeneity of country cases for food security analysis raises the question of the adequacy of the WTO country categories to address that non-trade concern. There are four main categories with some bearing on the issue. In addition to the basic distinction between developed and developing countries, the WTO recognises two other groups within developing countries: LDC, a United Nation (UN) classification; and Net Food Importing Developing Countries (NFIDC), which are selected through the Committee on Agriculture of the WTO. The category of LDC has several legal implications under the WTO framework, and both types of countries were considered in a special Ministerial Decision on agricultural issues (the "Decision on Measures Concerning the Possible Negative Effects of the Reform Program on Least-developed and Net Food-Importing Developing Countries") approved at the end of the Uruguay Round.[5]

The question is how well those four categories capture the heterogeneity of developing countries for food security concerns. Díaz-Bonilla *et al*., (2000) try to answer that question using various methods of cluster analysis (including an approach based on fuzzy sets) and data for 167 countries to identify groups of countries categorised according to five measures of food security: food production per capita, the ratio of total exports to food imports, calories per capita, protein per capita, and the share of the non-agricultural population.[6] To avoid giving more weight to any one variable because of its unit of measure, variables were converted to z-scores (subtracting the mean and dividing by the standard deviation). The results identify 12 clusters of countries according to their similarities in their food security profiles (measured by the variables listed above) from very food insecure, cluster 1, to very food secure, cluster 12 (Table 9).

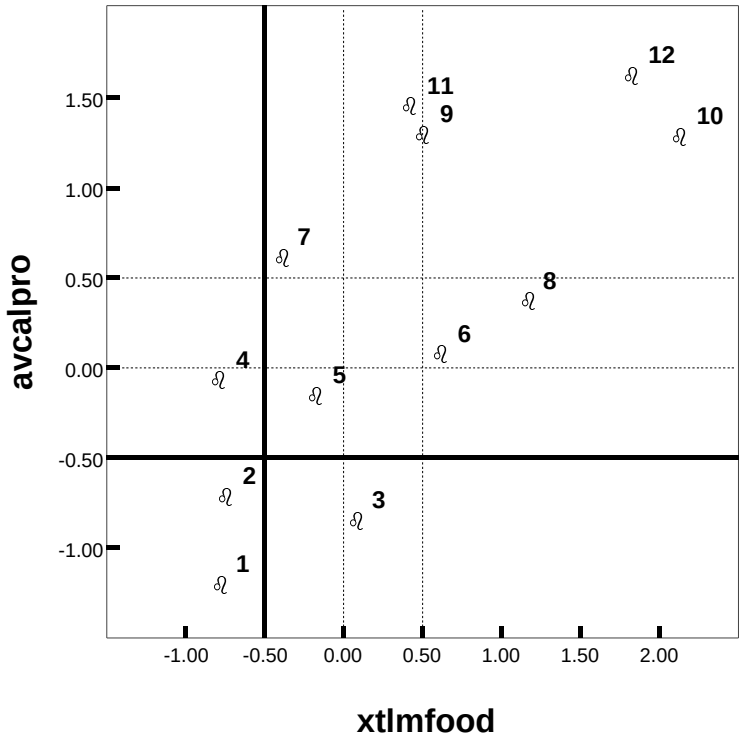
5. See Díaz-Bonilla, Piñeiro, and Thomas (1999) for a more detailed discussion of these groups. Other categories with legal implications for the WTO are not related to agricultural issues. The Food and Agriculture Organization (FAO) also defines Low Income Food Deficit Countries (LIFDCs), but they are not subject to any special treatment or legal consideration under the WTO.

6. The indicators utilized in the study are considered proxies for three elements of food security at the national level: food availability, access, and utilization.

Clusters with centres (in z-score values) falling below -0.5 (minus half a standard deviation from zero) are defined as “food insecure”. Clusters 1, 2, 3, and 4 fall in that category. Clusters 5,6,7, and 8 have most of their variables in the –0.5 to +0.5 range (plus or minus half a standard deviation around zero). They are considered to be in the “food neutral” category. Finally, clusters 9, 10, 11, and 12, with most of the variables above +0.5, are considered “food secure”.

Figure 4 illustrates the relative position of the 12 clusters in a diagram where the average value of the z-score variables for the combined consumption of calories and proteins (avcalpro), is plotted against the trade indicator showing the burden of the food bill (exptoimp, which indicates total exports per dollar of import, also in z-score values). The solid lines at the values of –0.5 across both axis of the chart divide the space into four main quadrants separating the food insecure clusters from the rest (the dotted lines at the +0.5 values add other quadrants differentiating among clusters that are food neutral or food secure): clusters 1 and 2 appear in the quadrant that is consumption vulnerable and trade stressed (Southwest quadrant), with values below –0.5 on both dimensions; cluster 3 is in the Southeast quadrant, which shows consumption vulnerability but not trade stress; cluster 4 is in the trade stressed quadrant but is above the level of –0.5 for consumption (Northwest quadrant). The rest of the clusters appear in the intermediate or high levels of consumption and trade security (Northeast quadrant), with both dimensions above the –0.5 value.

Figure 4. **Scatter plot of consumption per capita (average of calories and proteins indicators) versus trade indicator.**



Cluster 1 includes the most food insecure countries. They show the lowest levels of availability of calories and proteins per capita, and of food production per capita. Their food imports use more than 20% of their total export earnings, compared to the world weighted- average of 6%, and they are predominantly rural (only about 23% of the population is urban, Table 9). This group includes 30 countries, all of them LDCs, except Kenya, a country classified as NFIDC by the WTO. They are mostly from Africa (23 out of the total 30). They include 21 WTO members and 4 WTO observers (Table 10).

Cluster 2 includes food insecure countries with an urban profile. Those countries show somewhat higher levels of consumption and production than cluster 1, but they are still "consumption vulnerable" and also trade stressed. The main difference is that these countries are far less rural than those in other food vulnerable clusters: in fact, on average, more than 70% of the population is classified as urban (Table 9).[7] This raises the issue of urban food insecurity, which has its own special characteristics (see Garret and Ruel 2000). While countries in the previous cluster, being mostly rural, may be more concerned about food insecurity in the countryside and the impact of agricultural imports on poor agricultural producers, in countries with larger urban populations (like those in cluster 2), and where conceivably an important percentage of poor and food insecure groups may be urban dwellers, there is a clear trade-off for policies aimed at agricultural trade protection: they may maintain higher incomes for poor producers, but they may also act as a tax on poor consumers (both effects depending on other policies and the interaction of markets and institutions).[8] Among the 14 members of this cluster, two are LDCs from Africa and five are NFIDCs (mostly from Latin America). The other seven members are basically former republics of the ex-Soviet Union and Latin American countries. Except for Tajikistan, all of the countries are either WTO members (11) or observers (2) (Table 10).

Cluster 3 includes food insecure countries with consumption vulnerability. This cluster has availability of proteins and calories below cluster 2, but is better off than cluster 1. It is also slightly below cluster 2 in production (but above cluster 1), and it is as rural as cluster 4. The main characteristic is that the burden of the food bill over total exports is at an intermediate level. This cluster can be characterised as consumption vulnerable but trade neutral, the mirror image of cluster 4, discussed below (Figure 4).

Cluster 3 includes 17 countries, four of which are LDCs and two are NFIDCs. All belong to the WTO as members or observers, and are developing countries in Africa, Asia, and Latin America (Table 10). Three countries from the Cairns Group appear in this group (Bolivia, Guatemala, and the Philippines).[9] India, Namibia, the Philippines, and Vietnam are also in Cluster 3. These countries have a low incidence of the food bill on total exports (*i.e.* they are not "trade stressed"): about 5% for India and Vietnam, and about 6% for Namibia and the Philippines. Except for the Philippines, these countries are all net food exporters. Some of them may also exemplify a possible policy dilemma: because those countries have a low food import bill they could expand food imports to improve their low levels of consumption; but at the same time, because they have large poor agricultural populations, there is concern regarding the impact of additional food imports on those rural groups.

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7. The variable for urban/rural population is not shown in Figure 4.

8. The case of vulnerable rural groups that are net consumers of food must also be considered, even in Cluster 1.

9. The Cairns Group is a negotiating block of agricultural exporting countries that has argued for greater liberalisation in world agricultural markets. The current 18 members are Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Fiji, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, the Philippines, South Africa, Thailand, and Uruguay.

Table 10. **Country membership in Cluster 1 to 12**

			LDC	NFIDC	Others
Food Insecure Groups	1. (30)	WTO members	Angola, Bangladesh, Burkina Faso, Burundi, Central African Republic, Chad, Dem Republic of Congo, Gambia, Guinea, Guinea-Bissau, Haiti, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, United Rep of Tanzania, Uganda	Kenya	
		WTO observers	Cambodia[1], Ethiopia, Nepal [1], Yemen		
		Others	Afghanistan, Comoros, Eritrea, Liberia, Somalia		
	2. (14)	WTO members	Djibouti, Lesotho	Botswana, Cuba, Dominican Republic, Honduras, Peru	El Salvador, Georgia, Mongolia, Nicaragua
		WTO observers			Armenia, Azerbaijan
		Others			Tajikistan
	3. (17)	WTO members	Solomon Islands, Togo, Zambia	Côte d'Ivoire, Sri Lanka	Bolivia, Cameroon, Republic of Congo, Ghana, Guatemala, India, Namibia, Papua New Guinea, Philippines, Zimbabwe
		WTO observers	Laos[1]		Vietnam
		Others			
	4 . (13)	WTO members	Benin, Mauritania, Senegal	Pakistan, Saint Lucia	Albania, Grenada, Saint Kitts and Nevis, Saint Vincent/Grenadines
		WTO observers	Sudan[1], Vanuatu[1]		Seychelles
		Others	Kiribati		
Food Neutral Groups	5. (18)	WTO members		Jamaica, Trinidad and Tobago, Venezuela	Belize, Brazil, Colombia, Costa Rica, Croatia,, Ecuador, Fiji Islands, Guyana, Kyrgyzstan, Nigeria, Paraguay, Suriname, Swaziland
		WTO observers			Macedonia (The Former. Yug. Rep.), Uzbekistan
		Others			
	6. (5)	WTO members	Myanmar		Antigua and Barbuda, China, Gabon, Indonesia
		WTO observers			
		Others			
	7 (14).	WTO members	Maldives	Barbados, Egypt, Mauritius, Morocco, Tunisia	Brunei Darussalam, Dominica, Estonia, Jordan, Kuwait, Macau, Mexico
		WTO observers	Cape Verde		Algeria, Bahamas, Lebanon, Russian Federation, Saudi Arabia
		Others			Islamic Rep of Iran, Libyan Arab Jamahiriya, Syrian Arab Republic
	8. (9)	WTO members			Bulgaria, Chile, Republic of Korea, Latvia, Malaysia, Republic of Moldova, Panama, Slovakia, South Africa
		WTO observers			
		Others			

Table 10. **Country membership in Cluster 1 to 12** *(continued)*

			LDC	NFIDC	Others
Food Secure Groups	9 . (16)	WTO members			Czech Republic, Germany, Iceland, Israel, Japan, Lithuania, Malta, Poland, Portugal, Romania, Slovenia, Turkey, United Arab Emirates, United Kingdom
		WTO observers			Belarus, Kazakhstan
		Others			
	10. (9)	WTO members			Austria, China--Hong Kong SAR, Finland, Hungary, Norway, Sweden, Switzerland, United States of America
		WTO observers			Ukraine
		Others			
	11. (9)	WTO members			Argentina, Belgium-Luxembourg, Canada, France, Greece, Italy, Netherlands, Spain, Uruguay
		WTO observers			
		Others			
	12. (3)	WTO members			Australia, Denmark, Ireland
		WTO observers			
		Others			
	Outliers (2)	WTO members			New Zealand, Thailand

Notes: WTO members not included because of data unavailability: Bahrain, Cyprus, Liechtenstein, Qatar and Singapore.
LDC: Least Developing Countries. LDC not included because of data unavailability: Bhutan, Equatorial Guinea, Samoa, Sao Tome Principe, and Tuvalu.
NFIDC: Net Food Importing Developing Countries.
Number of countries in a cluster is in parenthesis.
[1] Countries in the process of accession to the WTO.
Source: Díaz-Bonilla et al., 2000.

Cluster 4 is composed of food insecure countries with trade vulnerability. While the previous cluster had low consumption but intermediate levels of trade burden, cluster 4 shows the opposite profile: it has intermediate levels of consumption but it is very trade stressed; in fact, this group has the heaviest trade burden with a food bill of almost 21% of total exports. Figure 4 shows cluster 4 in the trade stressed quadrant but with an average consumption of calories and proteins above not only Clusters 1, 2, and 3, the other food insecure groups, but also the food neutral Cluster 5. Cluster 4 has 13 members, including five LDCs and three NFIDCs. All of them except one are WTO members or observers. Although the inclusion of some bigger countries in this group (such as Pakistan, Sudan, and Senegal) conform to the notion of having intermediate consumption but being trade stressed, the classification of some small islands from the Caribbean and the Pacific in this group is less clear. This may simply reflect lack of data regarding exports of services (like tourism) and/or the fact that the urban/rural distinction does not have the same meaning in small islands as in bigger countries.

The rest of the countries are classified as food neutral or food secure.[10] The conclusion is that some of the categories utilised by the WTO appear inadequate to capture food security concerns. This seems to be the case of the category of "developing countries": they appear scattered across all levels of food (in) security, except cluster 12, the highest ranked among the food secure groups (Table 10). This fact has implications for the definition of a "Development Box" as different from a "Food Security Box" (see below)

In the category of NFIDCs, 10 (or 11 counting Egypt as food insecure) out of the 18 countries are in food insecure groups (clusters 1 to 4); the remaining 8 (or 7 without Egypt) are in food neutral groups (clusters 5 and 7), which have intermediate levels of food security. Being a net food importer appears to be only a weak indicator of food vulnerability. Some countries may be net food exporters but still have a larger percentage of their total exports allocated to buy food, and vice-versa (for example, Mali, an LDC, is a net food exporter but its food bill is about 15% of total exports, while Venezuela, a NFIDC, spends about 5% of total exports on imported food). Additionally, some countries may be net food importers just because of a dominant tourist industry (like Barbados, which also has the highest income per capita of the NFIDCs, about US$7,000). Other NFIDCs have important levels of oil exports (such as the case of Venezuela, and Trinidad and Tobago) and therefore imports of food only reflect the comparative advantages of their production structure. With the exception of Egypt, food imports of the NFIDCs in the food neutral group represent about nine percent of total exports; for the food insecure NFIDCs (including Egypt), the average is about 16%.

The category of LDCs, on the other hand, does correspond broadly to countries suffering from food insecurity, even though food security criteria were not explicit in their definition. Only three out of the 43 LDCs covered in this study are not among the first four clusters of most vulnerable countries.[11] At the same time, some countries, like Kenya, have a food security profile similar to the more vulnerable LDCs but are not included in this category, although it is a NFIDC. Others, such as El Salvador, Georgia, Mongolia, and Nicaragua (all WTO members), which have somewhat better profiles but are still in the food insecure categories, are neither LDCs nor NFIDCs.

In terms of the WTO negotiations, this analysis suggests that using the category of LDCs to define specific rights and obligations in the WTO for food security reasons appears an appropriate starting point. Yet, some countries classified as food insecure by the cluster analysis are neither LDC nor NFIDC and are therefore now excluded from WTO special treatment. A category of food insecure countries based on quantitative indicators (which would include all LDCs plus those NFIDCs that are food insecure, plus other food insecure countries according to the selected indicators), would correct that exclusion. There is still the issue of NFIDCs that are not food insecure. The current category of NFIDCs, a classification negotiated during the Uruguay Round, has some implications as defined in the Ministerial Decision, and constitutes an acquired right. Even if a special category of food insecure countries is defined, all the NFIDCs would still have the general rights under that Decision, but only those that are food insecure would receive special and differential treatment for food security reasons.

10. In Díaz-Bonilla *et al.*, 2000, the case of some countries classified in food neutral clusters, but with a high burden of food imports over total exports is also discussed. A special situation is Egypt, a NFIDC that because of the level of trade stress may be counted among the food insecure.

11. Cape Verde, Maldives, and Myanmar are in clusters 6 and 7. However, as in the case of Egypt, the first two countries show high levels of the food import bill compared to total exports. Therefore, they could also be considered among the food insecure countries (see the full discussion in Díaz-Bonilla *et al.*, 2000). That would leave Myanmar as the only non-food insecure among the LDCs included in the cluster analysis.

It is also relevant to address the issue of food security raised by some developed countries as part of the notion of "multifunctionality" of agriculture, or, more generally, non-trade concerns. The cluster analysis classification, however, shows, unsurprisingly, that developed countries are all concentrated in the food secure groups (clusters 9 to 12). Therefore, the term "food security" seems to be utilised with different meanings in developed and developing countries. In terms of policy implications and the agricultural negotiations, maintaining the same label for two altogether different situations only obscures the issues being negotiated. The discussion of food security should be limited to the vulnerability of developing countries, using a different terminology for developed countries' concerns.

In summary, the implication of this analysis is that there is a need for a better definition of food insecure countries, based on objective quantitative indicators. Those food insecure countries should be granted special and differential treatment limited to food security considerations, but those concessions should not change the balance of other rights and obligations for LDCs and NFIDCs that have been agreed for reasons other than food security.

But even if an adequate category of food insecure countries is defined, there is still the question of what are the changes in the legal texts of the WTO that can address those food security concerns. In discussing those possible changes, it is important to keep in mind a distinction between what is legal under the WTO and what the economic implications are of those legally available measures. In this regard, an obvious point (which is sometimes overlooked) must be stressed: the fact that a country has legal room under WTO rules to follow a specific policy does not mean that such policy is advisable in terms of general welfare and equity (for that country and/or for others). The next sections cover both legal and economic aspects, trying to distinguish, when necessary, those aspects related to achieving what may be seen as a fair and balanced outcome in legal terms, and the efficiency, welfare, or equity merits of those commitments.

Trade, trade liberalisation, and food security: Policy perspectives

The discussion about trade liberalisation and food security can be divided into those aspects that relate to the agricultural policies of industrialised countries and those that apply to developing countries. This distinction corresponds to two broadly different approaches for the negotiations that developing countries may follow (and in fact have been following in different degrees): one is to play "offence" and try to open up markets in industrialised countries and limit their ability to use funds from their Treasuries to compete against farmers in non-subsidising countries; the second is to use a "defensive" strategy, such as asking for high levels of protection for themselves and the possibility of utilising the same (or even higher, in relative terms) levels of subsidies as the industrialised countries (Konandreas, 2000). In this section some of the economic policy issues are discussed, while the legal implications are taken up later.

Trade liberalisation in industrialised countries

It seems undeniable that the combination of domestic support, market protection, and export subsidies in industrialised countries has displaced agricultural production and exports from developing countries. Different studies before the beginning of the Uruguay Round in the mid 1980s tried to quantify the impact on developing countries of agricultural protectionism in industrialised countries. They usually showed substantial positive effects on developing countries' incomes, production, and exports of agricultural and agroindustrial products from an eventual reduction of tariffs and other forms of agricultural protection in industrialised countries (Valdés and Zietz, 1980; Goldin and Knudsen, 1990). Simulation models for the Uruguay Round, as well as preliminary projections of

possible scenarios for the current negotiations, show that agricultural and agroindustrial production in developing countries, as well as their net welfare, would increase if agricultural protectionism in industrialised countries was reduced (Sharma, Konandreas, and Greenfield, 1996; Goldin and van-der-Mensbrugghe, 1995, for the Uruguay Round; Hertel, *et al.*, 2000; USDA/ERS, 2001; ABARE, 1999; for the current negotiations).[12] While those studies mainly project the future impact of possible scenarios of liberalisation, other work supports similar conclusions from a historical perspective: they suggest important negative effects in several developing countries for production and employment linked to agroindustrial products such as meat, sugar, and canned tomatoes, as a result of industrialised countries' agricultural policies (OXFAM, 1987; Eurostep, 1999).

Increased access to international trade opportunities is usually associated with higher growth rates for the economy in general, and for the agricultural sector in particular. Scandizzo (1998) shows, in a sample of 71 developing countries, covering the period 1969-1991, that agricultural exports are strongly and positively correlated with overall economic growth. But if agricultural growth is hampered by protectionism, this may have important implications for developing countries to the extent that agricultural-led growth strategies appear to have larger dynamic multipliers for the rest of the economy than other alternatives in poor developing countries (Delgado *et al*., 1998). Even in the success stories of the newly industrialised countries of East Asia, a common characteristic is that they invested strongly, and very early, in rural and agricultural development (McCalla, 2000). In turn, high and stable growth rates have been commonly associated with reductions in poverty rates, and agricultural growth tends to have greater impacts in the reduction of poverty (Lipton and Ravallion, 1995, and the recent reviews in Eastwood and Lipton, 2001, and Osmani, 2001). In particular, if countries follow their comparative advantages, international trade by labour-abundant poor developing countries, should help increase employment and wages, further alleviating poverty. To the extent that poverty is the main cause of food insecurity, international trade opportunities should also help with food security concerns.

Other points to be noticed are that the expansion of trade in goods and services over the last decades, along with the decline in food prices resulting from technological advance, has led to sharp reductions of the incidence of the total food bill of developing countries as percentage of total exports (Figure 3). Also the fact that food consumption variability in individual countries is far smaller than food production variability shows the contribution of trade to food security (Tables 4, 5 and 6).

Therefore, a key objective for developing countries to increase economic growth, reduce poverty and enhance food security seems to be the elimination or the substantial reduction of subsidies and protectionism in industrialised countries during the current WTO negotiations. This may be an especially important issue for the poorer countries, where two-thirds of the population lives in rural

12. Some of those studies also raise the possibility of negative welfare effects for developing countries that are net importers of agricultural products, due to adverse changes in the terms of trade (Sharma *et al*., 1996). Usually, if dynamic effects are considered the negative impacts disappear (USDA/ERS, 2001). Also the results of the simulations change when trade liberalization in other sectors (such as industry) is also considered (Hertel *et al.*, 2000), and if unemployment is assumed, rather than the usual full employment closure. Finally, some of the simulations of developing countries' gains resulting from agricultural trade liberalization have usually lumped fruit and vegetables together with other subsectors, which may have led to underestimation of the benefits, considering the growing importance of this group of products in LDC exports. For instance, Islam (1990) found significant gains for LDCs of liberalization of world trade in fruit and vegetables. Yet, even after the Uruguay Round negotiations, production of fruit and vegetables remains highly protected in several developing countries, mainly on a seasonal basis, allowing entry with lower levels of tariffs only when there is no domestic production (Swinbank and Ritson, 1995). These issues need further analysis.

areas, agriculture generates over one-third of the gross domestic product (GDP), and a substantial percentage of exports depends on agriculture (World Bank Development Indicators, 2001).

However, against this general proposition three main reservations have been raised, some linked to food security concerns. First, there is a worry that liberalisation of agricultural policies in industrialised countries may increase the food bill of poor developing countries that are net food importers (see footnote 12). A second concern is that trade liberalisation in industrialised countries could erode the trade preferences of poor developing countries that have preferential access to those protected markets. Third, some, mostly in the NGO community, have argued that export expansion may have harmful effects on poverty and food security (see for instance Francisco, 2000).

The first point is related to the fact that the combination of domestic support, market protection and export subsidies by industrialised countries depressed world prices, hurting developing countries that were net exporters, but, it has been argued, probably helping the balance of payments position of developing countries that were net importers of those products (Koester and Bale, 1990; Sarris, 1991). This view, however, does not address the distributional impact within developing countries between consumers and producers, and across types of households. Equally importantly, it does not consider the employment effects from expanded production, if developing countries did not have to contend with subsidised and protected agriculture in industrialised countries. Even though agricultural trade policies in industrialised countries may have reduced the import bill of net importing countries, studies show that those same policies have had a stifling effect on agricultural and agroindustrial production in developing countries, regardless of their net trade position (Hertel, *et al.*, 2000; USDA/ERS, 2001; ABARE, 1999). Considering that those sectors are the main economic activities in many developing countries, particularly poor ones, and that they usually have significant growth multipliers for the whole economy (Delgado *et al.*, 1998), the level of non-realised dynamic benefits for those countries may have been substantial.

Rather than maintaining protection in the industrialised countries, a welfare-enhancing approach would be to offer cash grants or other financial schemes to compensate net importing poor developing countries for higher prices linked to agricultural liberalisation in developed countries.

The second point focuses on the possible erosion of preferences for a number of developing countries that have special market access arrangements with industrialised countries. For low-income developing countries, preferential access usually represents a large percentage of agricultural exports and sectoral value added, and has important implications for rural employment and balance of payments.[13] There are several options to compensate poor countries for the erosion in preferences that are better that maintaining current levels of protection. In some cases, changing the way TRQs operate could compensate for the erosion of preferences in the short run. One possibility would be to grant import licenses to the exporting countries (which would then receive the quota rent) instead of giving the licenses (and the rent) to domestic importers, and to reduce to zero the "in quota" tariff for those exporting countries. Another possibility is to transform into foreign aid the equivalent value of the trade preferences. This would mean extending to the affected poor developing countries the same logic

13. The continuation of those preferences is already under threat for products such as sugar, both in the US and the EU, irrespective of what happens in the WTO negotiations. For instance, in the US market, Mexico has expanded access under NAFTA, and will reach total liberalization by 2007/8, while in the EU market, future access under the agreement with Least Developed Countries ("Everything But Arms") and the inclusion of Eastern European countries, will reduce the margin of preferences (ABARE, 1999). Both the European Union and the USA have embarked on a series of regional trade negotiations that will create some rents, but erode others preexistent, such as those generated by the Generalized System of Preferences.

applied when industrialised countries compensate domestic producers for the reduction in direct support. Considering that a policy of liberalisation acts as a tax cut for consumers in the liberalising countries, using part of those funds may help to finance the compensations to poor developing countries for the lost access, and still leave net benefits for consumers.

The third caveat refers to some possible scenarios under which trade expansion may have less benign effects on poverty and food security. Much depends on the level, inclusiveness, and stability of the growth rate generated by that expanded trade. While poverty in the developing world declines rapidly with distribution-neutral growth, deviations from neutrality may wipe out those gains for the vulnerable groups (Lipton and Ravallion, 1995). Furthermore, even with neutral growth at higher rates, if its variability increases generating a greater likelihood of crises, then the poor may face significant additional downside risks, with the prospect of long-lasting damage to their low levels of human and physical capital (*i.e.* crises may force poor families to sell productive assets, increase the possibility of illness, or have their children drop out of school) (see for instance, Addison and Demery, 1989; Lipton and Ravallion, 1995).

Within the agricultural sector, criticisms to different developments such as the Green Revolution, the increase in commercialisation, and now the expansion of international trade, and more generally the process of globalisation, centred on the possibility of negative effects on the welfare of poor producers and poor consumers, through diverse channels. A moderately negative scenario would point out to the constraints the poor face because of lack of resources and access to technology, which excludes them from participating profitably in expanding domestic or international markets. This exclusion may lead to the possibility of worsening income distribution, but not necessarily to increases in absolute poverty. A more worrisome scenario would be if the poor became absolutely worse off, and not only in relative terms. Usually, arguments in support of the likelihood of this undesirable outcome suggest that the process of technological innovation or expansion of market opportunities may shift relative prices against the poor and/or reinforce the power of already dominant actors (large landowners, big commercial enterprises) allowing them to extract further incomes from the poor or to expropriate their assets. In terms of food security, the claims of negative effects usually revolve around the possibility of cash or export production displacing staple crops, and/or that women, usually the anchor for households' food security, may end up with less decision-making power and less resources due to the technological or commercial changes.

Different studies of the Green Revolution, and domestic and international commercialisation, have addressed those concerns. They tend to paint a more positive view of the process, usually showing advances for the poor, due to production, employment and food price effects, although recognising that uniform attainment of benign outcomes is by no means guaranteed (Hazell and Ramaswamy, 1991; Von Braun and Kennedy, 1994; IFAD, 2001, among others). Also studies for several countries in Africa have shown that poverty fell more among export crop producers, than among food producers (Christiaensen, Demery, and Paternostro, 2002; see also Kherala *et al*., 2001). With regard to gender, trade expansion that creates income opportunities for women may also give them greater control over expenditures, with positive impact on child nutrition and development, as well as greater incentives to invest in girls (Paolisso *et al*., 2001). But the impact may depend on the type of crops (for example, Fontana, 2002, shows that in Zambia, expansion of non-traditional exports, such as horticulture, may favour women more than other traditional products like coffee, cotton and tobacco), and there may be a trade-offs between income-generating activities and leisure time, and perhaps it may also affect some of the time allocated for childcare (Paolisso *et al*., 2001, Fontana and Wood, 2000). Generally, complementary policies and investments are needed to increase the physical and human capital owned by the poor and by women, to build general infrastructures and services, to ensure that markets operate competitively, and to eliminate institutional, political, and social biases that discriminate against vulnerable groups (IFAD, 2001).

Trade liberalisation and food security in developing countries

During the current WTO negotiations, while in general asking that industrialised countries reduce their levels of protection and subsidisation, several developing countries have also indicated concerns that liberalising their own agricultural trade may affect negatively those countries' large agricultural populations, where poverty is still concentrated (WTO, 2000b, 2000c, and 2000d). Developing countries have argued for a slower pace in reducing their tariffs (or maintaining and even increasing current levels) on the premise that industrialised countries should first eliminate their higher levels of protection and subsidies. The World Bank report on agriculture (1986) advised developing countries to live with those subsidies, taking advantage of lower prices for their consumers. As argued before, the problem with this advice is that even though export and domestic subsidies in industrialised countries may reduce the import bill of net importing countries, those same policies would hamper the full dynamic benefits that a sustainable agricultural sector and agro-industrialisation process can have on the whole economy, given a proper framework of domestic economic policies in developing countries.

A separate concern is how to avoid sudden negative impacts on poor producers emanating from external trade conditions, whose vulnerable livelihoods may be irreparably damaged by drastic shocks (Lipton and Ravallion, 1995).

Another argument utilised for holding the line on current levels of protection in poor countries is related to fiscal matters: the importance of trade taxes as an important source of government revenues may imply that trade liberalisation weakens public revenues. Yet, trade reforms such as moving from quotas or tariff-rate quotas to non-prohibitive tariffs, or in general the fact that trade liberalisation may increase international trade, could lead to larger government revenues. The final impact of trade liberalisation on government revenues is an empirical issue, and there are good economic reasons why countries, when the institutional framework allows it, should move towards more efficient and equitable forms of taxation.

Behind those concerns there is a permanent tension in agricultural policies between the desire of maintaining high prices for producers and keeping prices low for consumers. Generally speaking, industrialised and developing countries have tried to solve this old policy dilemma rather differently. Rich countries have used transfers from consumers (through border protection) and taxpayers (through budgetary outlays) to maintain high prices for producers (OECD, several issues). For OECD countries as a whole, equivalent domestic prices exceeded world prices by about 60%, with the largest difference corresponding to Norway (229% above world prices). In the case of Japan, more than 90% of the transfer was paid by consumers through border protection and the rest by taxpayers as budgetary outlays, while in the case of the European Union and the United States, the shares were about equal for consumer and taxpayer transfers (OECD, several issues).

Developing countries, on the other hand, have historically followed policies of low agricultural prices to help urban populations and further the process of industrialisation. The role of agriculture in development was seen as supporting the needs of industrialisation through four types of transfers: labour, food (or "wage goods") and raw materials, savings, and foreign currency (Johnston and Mellor, 1961). But by the mid-1960s, several concerns arose about the adequacy of a development strategy that discriminated against the agricultural sector. Schultz (1964) argued influentially that farmers in developing countries were "poor but efficient", reacting with economic rationality to changes in prices and incentives. If agricultural resources were efficiently utilised, no gains could be made by transferring labour and savings to other sectors. A better strategy would be to support the agricultural sector through investments in technology and physical and human capital formation in rural areas. The idea of a technological solution to the rural problem was behind the Green Revolution of the 1970s.

Other studies in the 1970s evaluated critically the development strategies and trade regimes based on import substitution industrialisation (ISI) in a number of developing countries (Little, Scitovsky and Scott, 1970; Balassa, 1971; and Krueger, 1978). They argued that ISI had a negative impact on economic efficiency and growth. Also, arguments about inelastic international demand ("elasticity pessimism") and deteriorating terms of trade began to be challenged (for an overview of those debates see Balassa, 1986). It was also clear that poverty alleviation in developing countries was impaired by policies that protected capital-intensive industrialisation and discriminated against agriculture, negatively affecting employment and income distribution. The obvious realisation that the poor in developing countries were concentrated mainly in rural areas led to the conclusion that if poverty alleviation was to be an important objective of economic policy, then greater attention should be given to agricultural and rural development. Chenery *et al.* (1974) presented the case for an investment program centred on the poor, especially in rural areas.

During the 1980s the emphasis shifted to the need for changes in the framework of development and macroeconomic policies. In particular, the combination of overvalued exchange rates, protection of domestic industry, and (often) explicit taxation of agricultural exports, were criticised for severely hindering agricultural growth, especially in poor countries. Under these assumptions, faster and more equitable growth would not happen until the general policy framework was revised. The policy recommendation was to eliminate inefficient industrial protectionism, to avoid the overvaluation of the exchange rate, to phase out export taxes on agriculture, and to reduce government's involvement in agricultural markets through inefficient and many times contradictory interventions (World Bank, 1986). At the macroeconomic level, policies underscored the need of having domestic absorption in line with production (eventually expanded by sustainable external financing). These policies, when implemented, have usually been part of IMF stabilisation programs and World Bank structural adjustment programs.

The results in terms of growth and equity of those programs continue to be debated (Dorosh and Sahn, 2000; and Kherala *et al*., 2001), but the relevant point here is that recent research indicates that the effects of such policy reforms have been to greatly reduce or, in some cases, eliminate the past policy bias against agriculture (Bautista, Robinson, Tarp, and Wobst, 1998). Although further improvements in domestic policies are still needed in different developing countries, now the focus in those countries could turn again to investment policies and projects in the agricultural sector, focusing on human capital, land, water, property rights, management, technology, infrastructure, strengthening organisations of small farmers, and other forms of expansion of social capital and political participation for the poor. Such an agricultural focus was largely abandoned during the period when improvements in the overall development strategy emphasising economy-wide trade and macroeconomic policies appeared paramount (Díaz-Bonilla and Robinson, 1999).

The question, in the context of the current negotiations, is whether after having first discriminated against the agricultural sector, and then changed to a more neutral stance, developing countries should, out of concern for small farmers, move even further towards protection of the agricultural sector, adopting policies that are the opposite of the previous low-price agricultural policies. In fact, some proposals, implicitly or explicitly suggest taxing consumers in developing countries to support producers, basically through higher levels of border protection (Madeley, 2000). However, considering that poor households may spend as much as 50% of their income on food (FAO, 1993), these recommendations could have a negative impact on the poverty and food security of not only the increasing number of poor urban households and landless rural workers, but also poor small farmers, which, in different development countries, include a non trivial number of net buyers of food. There has been a steady shift in the locus of poverty, food insecurity, and malnutrition from rural to urban areas in many developing countries (Ruel *et al*., 1998; Ruel *et al*., 1999; Haddad *et al*., 1999; and Garrett and Ruel, 2000). Urbanisation in developing countries is posing new questions regarding

economic and social policies in general, and also in relation to the impact of trade and trade policies on poverty and food security. A similar profile of trade protection (or trade liberalisation) will have different implications for developing countries with important contingents of urban poor affected by food insecurity, than for other poor countries where a majority of the population affected by poverty and food insecurity lives in rural areas and works in agricultural production. Of course there are also vulnerable rural groups which are net consumers of food, and for which taxes on food imports may have impacts more comparable to food-insecure urban groups, depending on the balance between possibly higher incomes and larger food costs. The impact of prices on vulnerable rural groups then depends on the structure of farming systems and markets, and the nature of poverty and food insecurity (IFAD, 2001).

In general, an import tax has a bigger incidence on poor consumers (who spend a greater percentage of their incomes on food), and is received mostly by bigger agricultural producers, which have larger quantities of products to sell. Also, trade protection for any sector usually implies negative employment and production effects in other sectors, and the general effect of widespread trade protection is a reduction in exports. There are also dynamic considerations, such as rural-urban migration. A policy completely tilted towards low prices for the consumer would damage the rural sector and exacerbate migration to the cities. Therefore, a balanced rural-urban policy, which includes but goes beyond food prices, should consider the short and long-term implications of those policies.

In summary, the policy dilemma between high prices for producers (which would help poor, small farmers, but also big ones, and the latter proportionally more) and low prices for consumers (which would benefit poor consumers, but not only them) cannot be wished away. The problems faced by poor farmers and poor consumers are more adequately addressed through policies and investments targeted to them directly, rather than using indirect methods such as trying to influence food prices, which inevitably lead to leakages (*i.e.* non-target groups receiving part, in some cases a substantial one, of the benefits) and additional distortions. The focus should be mostly on social groups rather than crops and their prices.[14] Also, given the important growth multiplier effects of agriculture especially in poor developing countries, policies that ignore or, even worse, discriminate against agriculture must be avoided. The best approach for developing countries to support agriculture is to eliminate biases against that sector in the general policy framework, and to increase investments in human capital, land tenure, water access, technology, infrastructure, non-agricultural rural enterprises, organisations of small farmers, and other forms of expansion of social capital and political participation for the poor and vulnerable. At the same time, developing countries may legitimately insist that industrialised countries reduce their higher levels of subsidisation and protection, and ask for policy instruments to protect the livelihoods of the rural poor from unfair trade practices and import shocks that could cause irreparable damage. The question in the context of the WTO negotiations is whether the current AoA and its possible future modifications would allow or limit the range of policies needed to make sure that increased trade opportunities lead to adequate rates of inclusive, sustainable and stable growth, contributing to reductions of poverty and improvements in food security. Some of the legal issues involved are discussed immediately.

14. See among others, Pinstrup-Andersen (1988) on consumers, and Díaz-Bonilla (1982 and 1990) on survival strategies and rural actors. The issue of defining the interventions in terms of people has been lately emphasized again by the approach based sustainable livelihoods; see for instance Adato and Meinzen-Dick (2002).

Playing offence or playing defence? Development and Food Security Boxes[15]

The AoA has been subject to several criticisms. A valid one is that there are imbalances in the legal texts because industrialised countries have been able to secure exemptions for some of their policies (like the Blue Box) and were allowed to continue using significant amounts of expenditures for domestic support and export subsidies. Rich countries have the legal room and the resources to implement the variety of policies allowed under that legal text. In this case, the negotiating strategy by developing countries should try to limit that ample legal room ("play offence").

Turning to developing countries' own policies ("defence"), the question is whether the AoA tightly constrains developing countries in legal terms, not allowing them to implement policies needed for their economic development. It is in this context that during the negotiations, and also in academic and civil-society debates, the notions of a Development Box (WTO 2000a) and a Food Security Box (WTO 2001a, by India) have been discussed. Usually the proposals ask for special and differential treatment (SDT) under the Agreement on Agriculture so developing countries (or a subset of them) can grant more domestic support, impose higher tariffs for food security reasons, and use quicker forms of safeguards and trade remedies against foreign subsidies and dumping. Some of those proposals also include more proactive measures such as better market access to developed countries' markets, binding commitments on food aid and technical assistance, and the possibility of international funds and food stocks to help vulnerable countries. The focus however, is mostly on "defensive" measures, mainly in the form of higher levels of protection.

An argument utilized to support this line of reasoning is that that the legal exemptions allowed for developing countries under the AoA are of no use to them, mainly because the policies permitted are very difficult to implement due to the financial, technical, and human resource requirements (Solagral, 1999; Murphy, 1999; and UNCTAD, 2000). Usually, the conclusion is that developing countries need additional flexibility mainly in terms of increasing the levels of protection allowed. Some of those arguments appear to suggest that trade protection measures are simpler to implement institutionally and have no costs to the economy, compared to the budgetary expenditures required to implement Green Box and other policies allowed under the AoA.

However, the argument that legal exemptions allowed for developing countries under the WTO are not very helpful because they "cost money" focuses only on the impact on citizens as taxpayers and ignores that tariff and non-tariff barriers to trade are equivalent of taxes paid by the citizens as consumers.[16] As argued above, protectionist policies have real costs to the economy, with potentially

15. For a more detailed discussion of the Development and Food Security Boxes see Díaz-Bonilla, Diao, and Robinson, 2002; Ruffer, Jones, and Akroyd, 2002; and Braun, Wobst, and Grote, 2002

16. A common mistake is to view import taxes as revenues paid by foreigners and collected only by governments. In fact, simple economic analysis shows that consumers usually pay the larger percentage of the sum of government revenues and associated transfers, and producers and traders generally collect the larger percentage of those payments. As discussed before, only a small fraction of total consumption of food products is imported in developing countries, but border restrictions increase prices for the total amount of the consumed product, which includes the larger percentage of domestically produced food resulting in a direct transfer from consumers to producers. This same fact limits also the suggestion of using the receipts from import taxes to subsidize food consumption of the poor (FAO, 2000; paper 6; footnote 4). To the extent that the volume of taxed commodities is only a fraction of total domestic consumption, and that the poor population may represent, as a whole, even though not necessarily per capita, a sizable percentage of that domestic consumption, government

important negative effects on the poor. Also, it is not clear that the institutional requirements to run efficient and honest customs administrations that can adequately manage the border measures are less exacting than organising, for example, an efficient system of agricultural research and extension. Whatever the institutional requirements, it is obvious that the interventions allowed under the AoA without restrictions, such as research, extension, infrastructure, and irrigation, to name a few, are the real foundations for increases in production, productivity, and competitiveness. Trade protection measures, on the other hand, are mostly internal transfers (and largely regressive in the case of food), with no clear link to the real sources of agricultural productivity growth. Díaz-Bonilla, Diao, and Robinson (2002) compare, for a set of developing countries that have supported the notion of a Development/Food Security Box, the strategies of utilizing protection, with its implicit (and mostly privately appropriated) tax, versus defining an equivalent and explicit, government-collected tax, whose revenues are applied to R&D in agricultural technology. The results of the latter strategy are far superior in terms of welfare, production, employment, and consumption.

A related issue is the argument for increased flexibility. In trade, and other, negotiations the parties usually try to limit other peoples' options while attempting to retain flexibility for oneself. But it seems dubious that industrialised countries would agree to grant developing countries ample flexibility, while renouncing their own. Of course, in any balanced negotiation, all parties would become committed to some mutually agreed common rules. Developing countries, as weaker players in the global arena, need an international legal system that limits the ability of larger countries to act unilaterally. The argument that the WTO is completely dominated by industrialised countries and by transnational corporations, fails to recognise the fact that the latter would have even more power without an international legal framework. Moreover, there are arguments why some lack of flexibility may be beneficial to developing countries (Oyejide, 2000). First, the implementation of internationally negotiated rules may limit the power of special interests and arbitrary government measures within developing countries, helping to strengthen domestic legal and institutional frameworks (Díaz-Bonilla, 2000). Second, it has been shown that investment is in part related to the stability and certainty of the policy framework (Campos, Lien, and Pradhan, 1999; Solimano, 1989). A legal framework, internationally sanctioned, that places some limits on discretionary policies (thus reducing a source of uncertainty), should help investment.

Going to the negotiating strategies, there are several points that developing countries need to ponder. First is the issue of who will be the users of the SDT embedded in the Development or the Food Security Boxes. In principle, a Development Box would come under the "enabling clause", officially known as the "Decision on Differential and More Favourable Treatment, Reciprocity and Fuller Participation of Developing Countries", adopted under GATT in 1979.[17] This clause, which allows developed WTO members to give differential and more favourable treatment to developing countries, has been usually interpreted as applying equally to all developing countries (although some additional flexibility is allowed for least developed countries). During the current negotiations some of the debate centred on whether the "enabling clause" should be reopened or not, and whether the SDT should or should not be equally available to all developing countries (WTO, 2002). A Food Security Box, if

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revenues from taxing imported commodities would typically not be enough to compensate poor consumers. The case of developed countries, where the incidence of poverty is smaller and which have additional fiscal resources, is different. They can tax consumers in general with border protection for food, but then, at the same time, are able to subsidize poor consumers through different targeted policies financed by general revenues.

17. The Enabling Clause is the WTO legal basis for the Generalized System of Preferences (GSP) (through which developed countries offer, unilaterally, non-reciprocal preferential treatment to products originating in developing countries), and for regional arrangements and trade concessions among developing countries.

defined for food insecure countries according to some quantitative indicators, may face less controversy on this regard. Industrialized countries would probably be more willing to grant extra latitude in the SDT considered, if the type of countries is more tightly defined (as it happened with Least Developed Countries in the Uruguay Round). Also, considering that trade is growing among developing countries, and that for many agricultural products, those countries will be the more dynamic markets in the next decades (Rosegrant *et al.*, 2001) the developing countries themselves may be harmed by widespread protectionism under special boxes. Simulations by Díaz-Bonilla, Diao, and Robinson, 2002, suggest that exports by developing countries, including those of the countries applying the SDT under a version of a Development/Food Security Box, would decline.

A related policy issue is the discussion about the relevant level (global, national, household or individual) to address food and nutrition security. The special and differential treatment granted at the national level has to be translated into adequate policies that operate at the household and individual level to have an impact on food and nutrition security. Also, as indicated before, a focus at the level of staple crops considered to be relevant for food security may not necessarily be the more effective and equitable way to address problems of poverty and hunger. It is usually more equitable and effective to design policies considering vulnerable groups rather than crops or other more indirect forms of targeting.

Second, when negotiating those SDT clauses developing countries need to be realistic about the resources they have to carry out the policies requested. If they are asking for legal room to apply subsidies that they will not be able to use later for lack of money, their negotiating position may be very weak. Industrialised countries will be only too happy to grant developing countries concessions that will have no effective implications, while, in return, extracting a price for the "concessions" granted. For instance, proposals that suggest a *de minimis* of 20% of total agricultural production for developing countries should be compared with the total budget of the Ministries of Agriculture or similar agencies (after discounting salaries), to see if enough fiscal resources to implement the concessions requested exist. Third, in general simulations show that the larger benefits for developing countries come from reduction in protection and subsidies in industrialized countries. Following a defensive strategy based on SDT for themselves developing countries may be weakening their negotiating position on the issues that offer the greatest potential for welfare gains. Fourth, what really matters is not a title, such as "Development Box" or "Food Security Box", but the content, *i.e.* the possible changes in legal texts that developing countries consider could satisfy their need for special and differential treatment. In defining that content developing countries should start from the substantial legal room they already have under the AoA, and propose specific changes in language utilising current WTO texts. It would be most unfortunate if developing countries pay a price in the negotiations just because some changes in current language are repackaged into a new "Box" that is then presented as a substantial concession from industrialised countries.

With those caveats in mind, it still seems reasonable that developing countries take a more deliberate and slow approach to reduction of trade barriers while the glaring imbalances between industrial and developing countries in agricultural subsidies are substantially reduced. There is a compelling argument to be made that the AoA—with the legal possibilities allowed to industrialised countries to subsidise exports, to provide trade-distorting domestic support, and to otherwise engage in protectionist agricultural policies—still leaves developing countries at a disadvantage in world markets. Therefore, an important issue is whether the Green Box and other domestic support measures should be further tightened because industrialised countries, with their financial, human, and institutional capabilities, would abuse them. At the same time food insecure developing countries may justifiably ask for some streamlined instruments to implement safeguards and countervailing measures when affected by import surges and unfair trade practices.

All this, however, does not detract from the main issue that to achieve the objectives of agricultural development and poverty alleviation, developing countries must design adequate domestic policies and investment programs in human capital, infrastructure, technology, regularisation and expansion of land ownership by small producers and landless workers, and, in general, promote the adequate functioning of product, factor, input and financial markets. By and large, the AoA does not restrict those policies. It can be argued that the main problem for developing countries is not necessarily the lack of legal room for the implementation of efficient and equitable policies, but the need for funds (at the national and international levels) to be able to implement those policies.

Still, there are different offence and defence measures that developing countries may consider as possible changes in the AoA. They are discussed immediately.

Export subsidies

The use of export subsidies has been widely criticised as unfair and disruptive of international trade. In complete contrast with industrial goods, this practice has not yet been completely eliminated for agricultural products, many of which are processed products. Therefore, the differential treatment of export subsidies under the current agreements of the World Trade Organization (WTO) is not only between primary agriculture and industry, but also between those industries based on agricultural raw materials (for which export subsidies are allowed) and the rest of the manufacturing sector (for which those unfair trade practices have been banned) (Díaz-Bonilla and Reca, 2000). Industrialised countries have been the main source of subsidised agricultural exports over the years.[18] Agricultural export subsidies have proved very disruptive both for developing countries that are net agricultural exporters, but also for the agricultural producers in net importing developing countries, which are displaced by this unfair competition. An important percentage of those export subsidies do not go to the poorest countries (more than 50% in several products such as meat, coarse grains, and dairy items), and some of the products covered (olive oil, wines, specialty cheeses) are not necessarily those that may be more directly linked to the alleviation of food security problems. Therefore the special treatment of agricultural export subsidies should be eliminated in the current negotiations, placing them under the Agreement on Subsidies and Countervailing Measures. This implies, among other things, the lapse of Article 13 of the AoA, also known as the "Peace Clause," which places some restraints on the measures that countries can take against subsidies.[19]

18. From 1986-1997, those export subsidies amounted to about 135 billion US dollars (see Leetmaa and Ackerman, 1999, for European and US export subsidies). That is the equivalent of almost 13% of the value of all agricultural exports by the developing countries of Africa, LAC and Asia (minus China) combined, during the period (Díaz-Bonilla and Reca, 2000).

19. Article 13 (a) of the AoA excludes Green Box from countervailing duties and actions based on claims of injury, nullification and impairment of concessions, and serious prejudice; and, from actions based on non-violation nullification or impairment of the benefits of tariff concessions. Further, Article 13 (b) exempts domestic support measures under Article 6 of the AoA (which includes the Blue Box, used now mostly by the EU; the *de minimis* levels of support in developed and developing countries and the SDT treatment for low-income and resource-poor farmers and some other subsidies permitted for developing countries) from the imposition of countervailing duties unless there is injury; and from actions based on claims of injury, nullification and impairment of concessions, and serious prejudice, as well as actions based on non-violation nullification or impairment of the benefits of tariff concessions, if the subsidies on a commodity basis did not exceed those budgeted for the 1992 marketing year. Finally, Article 13 (c) refers to agricultural export subsidies. If they are within the limits considered in the schedules of the AoA, they can be subject to countervailing duties only "upon a determination of injury or threat thereof," and "due restraint shall be shown in initiating any countervailing duty investigations."

A related subject is the operation of state trading enterprises, which may require increasing disciplines and transparency on practices that may be equivalent to subsidies or dumping on the export side, or hidden trade barriers, on the import side. Finally, it is important to integrate in a unified framework the disciplines related to the continuum of transactions involving agricultural products, particularly the interface of export subsidies with food aid and export credits.

The developing countries' position is to maintain the special and differential treatment exempting them from lowering subsidies related to marketing costs and internal transport and freight charges (in Article 9 d, and e). At the same time, developing countries have an interest in stricter disciplines on export taxes and export controls that may exacerbate price fluctuations in world markets and limit access to food.

Market access

A second set of issues is the opportunities for expanded market access. They will depend on increasing the volume of imports allowed under the current regime of tariff-rate quotas (TRQs); on a more transparent and equitable administration of those TRQs; on simplification of some complex tariff structures that include combinations of normal and ad-valorem tariffs, complexity which is compounded by seasonal adjustments in some cases; on further reduction of tariffs, particularly those still very high in some key products, such as fruits and vegetables, sugar, meat and dairy products, among others; and on completing the process of tariffication in the cases where exemptions were granted.

Tariffs can be capped to a uniform maximum, probably not more than 50%. Developing countries should negotiate possible reductions from their bound tariffs rather than utilising applied tariffs, as some industrialised countries have suggested.

The elimination of tariff escalation is an important subject for developing countries: this practice undermines their possibilities of generating local employment and increasing the value added of their products. Tariff escalation has been discussed at least since the Kennedy Round (Yeats, 1974). Although this characteristic of the tariff structure has diminished somewhat after the Uruguay Round, significant levels of tariff escalation will still remain after the full implementation of the Uruguay Round (Lindland, 1997; OECD, 1997). In particular, the OECD (1997) documents important tariff escalation in coffee and cocoa products, which can in part explain the increasing share of industrialised countries in the international trade of processed goods using those raw materials (Díaz-Bonilla and Reca, 2000).

Another issue of market access is the continuation of the Special Safeguard (SSG) established in the AoA, which was allowed for products that underwent tariffication, but had to be specifically designated for the eligible products. A total of 39 countries have established SSG for more than 6100 tariff items; about 60% of tariff items belong to industrialised countries (WTO, 2000a). Developing countries, by and large, resorted to binding commitments as an alternative to the tariff equivalent of the existing border measures, and therefore could not invoke the SSG. While some developing countries want to eliminate the SSG, others are asking to be able to use it. In general, the SSG acts as a variable levy, is not transparent, and has the potential of being very disruptive of trade. Probably for developing countries it would be more adequate to ask for the termination of the SSG, while reserving the possibility of a streamlined safeguard for a very limited number of products for food security reasons only (see below).

Domestic support

A third set of issues relates to domestic support. The final agreement reached at the Uruguay Round was weakened when the measure of support was transformed from a product-based one to an aggregate value for the whole agricultural sector, and when the main domestic subsidies of the European Union and the United States (at that time) were kept outside the disciplines in what was called the "Blue Box". With the changes in the 1996 Farm Bill in the US, the most important user of Blue Box measures is the European Union. However, the current version of the US Farm Bill brings back domestic subsidies to American farmers without the constraints of previous set asides (Orden, 2002)

On the other hand, many developing countries have dismantled or significantly reduced their own domestic support for agricultural producers, mainly because of fiscal constraints and concerns about inefficient policies, usually as part of structural adjustment programs supported by financial international organisations and aid donors. But the possible benefits that these countries and the world may gain from following their comparative advantages are drastically thwarted by the subsidies of developed countries.

In an attempt to discipline further domestic supports, some countries have proposed to tighten the criteria for the Green Box, the reduction of the measure of support by product, and the elimination of the exemptions considered under the Blue Box.

Another suggestion has been to put a cap to all or a specially defined subset of domestic support measures as a percentage of the total value of agricultural production (WTO, 2000b and 2000c). The argument that a uniform limit defined in percentages would contribute to level the playing field that is now heavily tilted in favour of industrialised countries (which have the legal room under the WTO and the money to distort production and trade in their favour), seems compelling.

Sanitary and Phytosanitary Measures

A fourth set of issues relates to sanitary and phytosanitary measures (SPS), as well as other technical, quality, and environmental standards. These measures can be, and have been, used as barriers to trade. Concerns about the possibility that the liberalisation of agricultural trade achieved under the AoA could be negated by manipulation of those regulations led to the negotiation during the Uruguay Round of two separate documents. The first was the Agreement on SPS measures, directly related to human, plant and animal health issues linked to trade in agricultural products. The second was the Agreement on Technical Barriers to Trade (TBT), which covered technical regulations and standards, and conformity assessment procedures.

Developing countries have complained over the years that SPS measures and inspections tend to become stricter when there are agricultural surpluses in the domestic markets of industrialised countries. They have also criticised the long periods required by industrialised countries to complete the pest and disease studies needed to allow the import of new agricultural products from developing countries (see Matthews, 1994 for other SPS issues). Since the Uruguay Round Agreement, and in the preliminary discussions related to the continuation of the negotiations mandated in Article 20 of the AoA, some developing countries have argued for greater flexibility in the implementation of their obligations under the SPS Agreement. Finger and Schuler (2000) have calculated the relatively important budgetary costs that some of the operational requirements of different WTO commitments (and not only the SPS Agreement) may impose on low income developing countries. They argued that

WTO regulatory issues should be evaluated considering the real developmental needs of developing countries, and not to focus exclusively on formal compliance with WTO legal texts.

For instance, SPS issues related to human health should be approached as part of the improvements needed to protect the local population from food-borne diseases and not only as a way to comply with trade regulations. Similarly, tackling animal and plant health problems must be seen as part of SPS requirements to increase production and productivity in developing countries. As a general proposition, it seems imbalanced to ask low-income countries to devote to the administrative machinery required to implement WTO obligations resources that represent, as a percentage of the GDP, a larger share than what industrialised countries assign to similar functions.

On the other hand, a strong SPS framework may be important for developing countries, not only because a competitive export position requires establishing and maintaining the sanitary and quality requirements for their products, but also as a way of improving health conditions in the developing countries, to the extent that best practices and standards would then be more widely applied in those countries. Probably the most satisfactory approach for developing countries is to insist on receiving the technical and financial assistance considered in the SPS Agreement (Articles 29 and 30) to build and improve their own systems of quality control and health and safety standards. These systems should be centred on their own needs to improve health and sanitary domestic conditions, and the regulatory burdens of compliance should, in general, not represent shares of the GDP, or of the value of agricultural production, larger than what industrialised countries devote to similar functions.

Food security and poverty

The AoA includes different clauses that are directly or indirectly related to food security and poverty issues. The discussion that follows focuses mostly on legal aspects, but it does not analyse the economic advantages or disadvantages of the different alternatives.

Food security stock. The most obvious instrument available in the AoA is the use of stocks for food security reasons. The Green Box measures (Annex 2 of the AoA) include "all support policies provided through a publicly-funded government program not involving transfers from consumers" and which do "not have the effect of providing price support to producers". They are exempted from reductions provided they comply with other specific criteria established in that Annex (Annex 2, paragraph 1, of the AoA).

The list of those programs and the specific policy criteria and conditions include, among others public stockholding for food security purposes. The stocks must be an integral part of a food security program identified in national legislation. It may include government aid to private storage of products as part of such a program. They must correspond to predetermined targets related solely to food security, the process of stock accumulation and disposal must be financially transparent, and the products must be bought "at current market prices and sales from food security stocks shall be made at no less than the current domestic market price for the product and quality in question" (Annex 2, paragraph 3).

A footnote in the Annex indicates that "governmental stockholding programs for food security purposes in developing countries whose operation is transparent and conducted in accordance with officially published objective criteria or guidelines shall be considered to be in conformity with the provisions of this paragraph, including programs under which stocks of foodstuffs for food security purposes are acquired and released at administered prices, provided that the difference between the acquisition price and the external reference price is accounted for in the AMS."

Emergency food stocks may have an important role to play in food security arrangements. Carrying stocks as an insurance mechanism is different from using stocks to stabilise domestic grain prices, which has proved expensive and relatively ineffective (Hazell, 1993; Knudsen and Nash, 1990). The AoA establishes the conditions for those stocks, which must be built based on clearly defined targets, for instance as a percentage of total consumption. Also, it would help public finances to limit the number of key food items (no more than three to five) to be stocked. Hazell (1993) suggests that relatively small percentages of total consumption may suffice to act as an insurance mechanism. He uses McIntire (1981) who estimates that stocks of five percent of total consumption may be enough for SSA countries. Also the AoA requires transparent financial arrangements, a sensible requirement to avoid waste and corruption.

The key point for the WTO commitments, though, is that those stocks must be bought and sold at market prices. The language is clear on sales from the stock: those prices are "current domestic market prices" (including any level of tariff protection the country may have). But the text is less clear in the case of buying food products. As indicated, building stocks for food security reasons is different from using stocks to stabilise domestic grain prices, which may be very expensive. For poor countries it makes sense not to add to the costs of the food security program through the use of non-market-based administered prices, which tend to generate losses buying high to support farmers and selling low to subsidise consumers. In any case, if a government buys at harvest time say 10% of the production of a crop paying market prices to achieve the stock to consumption ratio defined for food security reasons, then that operation would give some price support with respect to the counter factual of no intervention (Islam and Thomas, 1996: p. 58-61). But all the operations will be conducted at market price, ideally using some sort of auction. Following those rules, the program should be part of the Green Box and not subject to restrictions on the AMS.

Some have interpreted the wording of the AoA to mean either that the purchase of food items must be done at world prices (because the Schedule of the countries references an external price, although this price is not the current world price); or that administered prices are not an alternative to market-based prices (i.e. government-determined prices which would fall under the requirements of the footnote to Annex 2 of the AoA referred above). Here a different interpretation is offered where buying at the domestic market price the intervention remains under the Green Box. The negotiations may add some language to make the text clearer, avoiding any doubts about the applicability of this Green Box measure: one possibility is that LDCs and countries that are food insecure as defined by some objective indicators are presumed to be in compliance with the AoA when they build food security stocks by buying at domestic market prices a small number of pre-specified products in volumes not exceeding some limited percentage of domestic consumption (for example, stocks for not more than 10% of domestic consumption for up to 3 products).

If a developing country decides to use administered prices instead of the prices prevailing in the domestic market, then, according to the footnote, the difference with the external reference price (which, again, is not the current world price, but the 1986-88 price established for the original calculations) must be counted as part of the AMS. Yet, if the food security stock does not exceed, say, 10% of consumption, it would take a relatively large price subsidy (along with a large percentage of imports in domestic consumption), for a developing country to exceed the 10% *de minimis* exemption per product. In that case, the program would have changed from food security to price support, and it would most likely become financially unsustainable, regardless of its status under the AoA.

Domestic food aid. A second instrument for food security, which is also part of Green Box measures (Annex 2), is domestic food aid. According to Annex 2, paragraph 4, food aid must target the population in need subject to clearly-defined criteria related to nutritional objectives; food purchases by the government must be made at market prices; the financing and administration of the aid shall be transparent; food aid can be in the form of direct provision of food or the provision of means to allow eligible recipients to buy food either at market or at subsidised prices. In the case of developing countries, a footnote indicates that "for the purposes of paragraphs 3 and 4 of this Annex, the provision of foodstuffs at subsidised prices with the objective of meeting food requirements of urban and rural poor in developing countries on a regular basis at reasonable prices shall be considered to be in conformity with the provisions of this paragraph". Again, the AoA allows food security interventions, but imposes some sensible requirements, such as that of a clear plan with well-defined nutritional criteria, focusing on "population in need". Moreover, in the case of developing countries, there may be subsidised interventions for urban and rural poor. As in other instances, the issue is not legal restraints under the AoA, but rather how to design and finance adequate interventions (see Coady and Skoufias, 2001 for a discussion of different interventions).

Support to poor producers and production for food security. Although the formation of stocks, as indicated, can also help producers if the buying is timed adequately (Islam and Thomas, 1996), the two measures discussed so far operate mostly from the consumption, or demand, side. But developing countries usually emphasise the production side of food security. Several of them have expressed concern that agricultural and trade policies may create problems for their large rural populations, where poverty is still concentrated and which are basically agricultural producers (WTO 2000a, 2000b, 2000c, and 2000d). These concerns are related to issues of domestic support (how to provide meaningful support to agricultural producers, especially small farmers), market access (particularly the impact of further liberalisation and how to manage import surges), and export subsidies (that may displace local producers).

Regarding domestic support, it has been already argued that for industrialised and developing countries, the AoA allows a great latitude in domestic support policies: Green Box measures (Annex 2), Blue box (Article 6, paragraph 5), the *de minimis* exemptions (Article 6, paragraph 4 b), and the fact that the Aggregate Measure of Support (AMS) was changed from being product specific to an aggregate for all products (Article 6 paragraph 1). Developing countries, in addition to a *de minimis* exemption of 10% (as already indicated), were allowed to reduce their levels of domestic support less than non-developing members of the WTO and to implement the commitments in a period of 10 years instead of 6 (article 15, paragraph 2). Least Developed Countries are completely exempt from any reduction in domestic support (Article 15, paragraph 2).

Additionally, Article 6 paragraph 2 exempts developing countries from reduction commitments in yet other categories of domestic support. They include "measures of assistance, whether direct or indirect, to encourage agricultural and rural development" which "are an integral part of the development programs of developing countries". The article mentions investment subsidies generally available to agriculture; agricultural input subsidies to low-income or resource-poor producers; and support to eradicate illicit narcotic crops through diversification. Article 6.2 concludes saying that "domestic support meeting the criteria of this paragraph shall not be required to be included in a Member's calculation of its Current Total AMS".

Therefore a developing country is legally entitled under WTO to provide additional investment support to their agricultural producers provided that the measures are "an integral part of development programs of developing countries", or, in the case of input subsidies (from credit to fertilisers or water) if they are given to "low-income or resource- poor producers". By extension of the criteria of the Green Box, it could be argued that these interventions would be more protected from challenges, if

they were part of clearly defined and publicly-funded government program (Annexes 2.1 and 2.5). Article 6, paragraph 2 has the advantage, from the point of view of equity, that it encourages developing countries to design specific programs for rural development or alleviation of rural poverty, instead of resorting to general and non-transparent subsidy schemes that may benefit richer farmers or be wasted in corruption. Article 6.2 would, for example, allow the use of input subsidies to poor farmers to promote production of a staple crop as part of a rural development program for such producers, without having to count those expenditures under the AMS, and therefore, without having to reduce them within the WTO commitments. The only restriction is that those subsidies may be actionable under Article 13b, particularly if they exceed the budgetary limit of subsidies decided (not necessarily granted) in 1992 by product (13b, ii and iii). Some have interpreted Article 13 as prohibiting domestic subsidies in excess of 1992 budgetary limits (Solagral, 1999). In fact, those subsidies are not prohibited, but may be "actionable", meaning that the complaining WTO member must support its claim proving either serious prejudice, on one hand, or nullification or impairment of benefits, on the other.[20]

The whole scenario for such complaints appears unlikely for most, if not all, poor developing countries, because it must combine a highly successful program that displaces imports (when in fact most of the production of such a product would go to expanded domestic consumption) or reduces prices significantly in the domestic market, and the existence of a significant export market prior to the program (to make it commercially worthwhile to initiate a WTO complaint). Also, there must be a WTO member (basically an industrialised country or a higher income developing country, considering the origin of most food exports), willing to incur the public relations costs to sue a poor country on a program aimed at poor farmers. Yet because the unlikely sometimes happens, current agricultural negotiations may be well advised to clarify in greater detail the interface between Article 6.2, *de minimis* exemption (Article 6.4), and Article 13, particularly for poor countries with problems of food insecurity. A possibility is to include language in the AoA specifying that LDCs and countries that are food insecure, as defined by some objectives indicators, are not bound by the 1992 limits of Article 13 (if the Peace Clause is maintained), or that they are exempted from challenges under the Agreement on Subsidies and Countervailing Measures (if Article 13 is allowed to lapse), not only in regard to Article 6.2, but also in the case of the *de minimis* exemption. Also, if as suggested above, Article 13 is not renewed, and therefore export and other subsidies are placed under the Agreement on Subsidies and Countervailing Measures, further distinctions may be needed within the Green Box measures to determine which ones will not be actionable, with particular consideration for measures taken by food insecure countries.

Another issue linked to Article 6.2 is the meaning of "low-income or resource poor producers" (LI/RP). A possible approach is to take the usual measure of one dollar (or two dollars) a day, as the poverty line used for international comparisons, or a relative measure within the country (for instance, producers with less than 40% of national income per capita). In general, if food insecure countries are defined according to objective criteria, some language can be included to the effect that they are

20. As an example, suppose that a low-income country decides to subsidise poor farmers in their use of fertilisers, and that those producers have their production concentrated on some specific crop. Suppose that the program is so highly successful that, as a result, poor farmers not only supply the additional domestic demand (beginning with their own requirements and including urban population) but also displace previous imports in that product. Suppose further that the expenditures of the program in that low-income country have exceeded those approved for that crop in 1992. Then those countries that were suppliers of that market and that now may have been displaced, may claim "serious prejudice" (as in Article XVI, paragraph 1, of GATT 1994 or Articles 5 and 6 of the Subsidies Agreement), or "non-violation nullification" or "impairment of the benefits of tariff concessions" (as in Article XXIII, paragraph 1(b) of GATT, 1994).

rebuttably presumed in compliance with the criteria of Article 6.2 for low income and resource poor producers (i.e. the burden of the proof falls on those challenging the practices). Other developing countries that are not food insecure, if challenged, will have to show that the small farmers supported fall under the quantity limits for incomes.

Special Safeguard (SSG) and other trade remedies for food security. As mentioned, the SSG is available only to countries, mostly developed ones, which underwent tariffication. Some developing countries have argued for extending the utilisation of the SSG also to them. Other developing countries, however, want the SSG eliminated and a new special safeguard created for food security reasons. Conceivably this can be done under the common safeguard of the Emergency Action on Imports of Particular Products (Article XIX of GATT 1994), but including some modifications such as (i) streamlined and faster procedures for a limited number of designated crops for food security reasons; and (ii) exemptions from the need to offer compensations, linked to the temporary use of the safeguard (see Sharma, 2000; also Ruffer and Vergano, 2002).

Similarly, streamlined procedures can be defined to counter export subsidies (and, conceivably, also dumping activities) that may affect the group of two or three designated crops with food security implications in food insecure countries. An important first step in that direction, which would benefit all developing countries, would be to apply the common WTO rules for export and other subsidies in the Agreement on Subsidies and Countervailing Measures (ASCM) (including the possibility of claiming serious prejudice because of domestic subsidies of industrialised countries), instead of using, as is now the case, the stricter requirements of Article 13 of the AoA to apply countervailing duties and seek other trade remedies. In the case of the designated food security crops for food insecure countries, the latter may be allowed to apply provisional measures (countervailing duties) under Article 17 of the ASCD with more streamlined procedures than those considered in article 17.1 (a), (b) and (c); those procedures can be initiated by the government; and the countervailing duties can be applied before the period indicated in 17.3 and last for longer periods than the four months indicated in 17.4 (see a proposal for streamlined countervailing measures in WTO, 2001b).

Food aid, access to food, foreign aid, and price volatility. Current negotiations should also consider carefully other issues of food availability and price volatility. A general concern is the provision of adequate levels of food aid, which have declined in recent years, and the avoidance of cycles that tend to reinforce, instead of counteract, situations of oversupply and shortages (*i.e.* the fact that there is excess of food aid when world supplies are abundant and lack of it when supply conditions are tight). Food aid should be made available in grant form; focused towards poor countries and social groups; and delivered in ways that do not displace domestic production in the receiving countries.

It is also necessary to provide technical assistance and financial support to develop agriculture in food insecure countries, and to maintain and expand financial facilities (both multilateral and bilateral) to help with short-term difficulties in financing food imports. A special aspect is to make sure that export controls and export bans on food items are tightly disciplined so as not to hamper access to food by importing countries. Improvements in early warning systems of food shortages, in weather forecast, and in transportation and storage, along with an adequate programming of food aid and financial facilities for emergencies, should help net food importers.

The issue of volatility in agricultural prices must also be monitored carefully. As shown in Table 7 volatility of real agricultural prices in world markets in the last half of the 1990s - since the implementation of the World Trade Organization (WTO) agricultural agreements - does not seem to be higher than it has been for the whole period since the 1960s, and is even lower for some products. Yet, it is less clear what has happened with the volatility of agricultural prices within developing countries, which also depends on domestic policies. For the lowest income brackets of the population

food constitutes 50% or higher of total expenditure (FAO, 1993). The poor are therefore the most vulnerable to large swings in food prices. At the same time, however, if domestic price stabilisation schemes maintain prices higher on average than what would have been the case without them, then there may be a trade off for the poor: trade liberalisation may lead to more volatile but lower prices on average, while with stabilisation schemes prices albeit more stable would be higher possibly making more people food insecure (Sumner, 2000). In any case, it is important to devise mechanisms, consistent with WTO commitments, to provide adequate safety nets for those more vulnerable. Further analysis is needed on the potential costs and benefits of price instability and mechanisms to stabilise prices, incomes and consumption.

Conclusion

Can the WTO legal framework protect the interests of the world's poor and hungry? Obviously, the WTO cannot make sure that everyone on the planet gets enough to eat. But it can help to prevent unfair competition that hurts the poor. In the negotiations developing countries are legitimately insisting that industrialised countries reduce their higher levels of subsidies and protection first. The possible negative effects on some developing countries of higher food prices and lost preferences caused by the liberalisation of markets in rich countries are better addressed through cash grants or other financial schemes to compensate those countries affected, rather than maintaining protection in the industrialised world. Also, WTO country members may need to set up a new category of "food-insecure" countries, and make sure that they have the policy instruments to protect the livelihoods of the rural poor. Some of the SDT discussed in the previous sections has been cast in terms of countries and crops. However, it is important to remember that policy interventions based on countries or crops may not necessarily address the problems of specific poor farmers and poor consumers, and may have larger leakages and secondary distorting effects. For instance, increasing protection for food crops acts as a regressive tax, with a larger incidence on poor consumers and whose benefits accrue mostly to larger farmers. If the concern is about vulnerable groups it is better to target them for investments and subsidies (an approach accepted under the AoA). Many of the food security concerns can be addressed with specific clarifications and changes in the current language of the AoA, whether they are called "development" or "food security" boxes or not. While seeking the changes suggested (or some others) in the negotiations, food insecure developing countries may want to ensure that they are not asking for legal room to implement policies that they will not be able to utilise later because they lack the financial resources. One of the main imbalances in world agriculture is that industrialised countries have enough legal room under the WTO to subsidise their own agriculture and the resources to do it, while many developing countries although may not be legally constrained to invest in food security, lack the financial, human, and institutional resources to do it. This should be recognised by ensuring that agricultural trade negotiations proceed in parallel with increased funding by international and bilateral organisations for agricultural and rural development, food security, and rural poverty alleviation.

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SECTORAL IMPLICATIONS OF AGRICULTURAL POLICY REFORM: HIGHLIGHTS FROM THE MILK SECTOR IN BRAZIL

Antônio Salazar P. Brandão[*]

Abstract

This paper examines the implications of policy reform and trade liberalisation in Brazil's milk sector. It considers how exposure to competitive forces serves to increase productivity, and identifies the nature of the costs associated with the adjustment process. The paper suggests that while Brazil is unlikely to become an exporter of dairy products in the near future, domestic production can nevertheless increase and compete effectively with foreign production.

Introduction

Several regional trade agreements have been implemented in Latin America since World War II, and Brazil was a member of some of them. These early attempts of trade reform were based on the view that the enlargement of regional market would facilitate import substitution. Protection within the block remained high and little attention was paid to increasing exports to countries outside the region. As a result, economic incentives for companies to raise productivity and achieve levels of efficiency compatible with world-wide competition were weak.

In the beginning of the 1980s a new generation of trade reform started in the region. They were based on the view that more trade improves efficiency and increases welfare. Brazil was late to start these reforms, even though early agreements with Argentina were signed in the mid 1980s. Nevertheless, trade negotiations have become an important part of the agricultural policy agenda in Brazil and their importance is increasing. This is influenced by developments at home and abroad.

On the domestic front the key element was the end of an era of macroeconomic instability fuelled by lax fiscal and monetary policies. A new policy regime has been implemented since 1994 and the fiscal budget process, from preparation by the administration to approval by Congress, is becoming an effective instrument for the establishment of policy priorities. Furthermore, there is great demand for social policies, such as education and health, underlying the fact that financial support for sector policies will be restricted and very selective.

On the external front, the Uruguay Round Agreements and rules negotiated with partners of regional agreements, such as Mercosul, are the key elements. But equally important is the fact that disputes

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with OECD countries are likely to increase in the future, since trade distorting support to agriculture is on the rise in some of these countries, particularly in products of interest to Brazil (Brandão 2002).

This paper will focus on the analysis of the implications of policy reform and trade liberalisation on agriculture, giving special attention to one segment of the agricultural sector, namely milk production in Brazil. Policy reform and trade liberalisation have significant adjustment costs, even for activities that are competitive. And these costs are ultimately borne by factors of production and households. This paper selected milk production as an illustration of how the competitive forces work to increase productivity and the nature of the adjustment costs associated with this process.

The organisation of the paper is as follows: section 2 briefly describes trade reforms in Brazil, section 3 provides an overview of Brazilian trade in agricultural products, section 4 contains the analysis of the dairy sector and section 5 presents a summary and some conclusions.

Trade reforms in Brazil

During the decade of the 1980s agreements with Argentina indicated the will of Brazilian policy makers to promote trade inside the region and with the rest of the world. The reform of Brazilian trade policy started in 1990 with a comprehensive reduction in tariffs. Suffices to say here that the average tariff went from 32 to 14%, with agricultural tariffs ranging from 0 to 10% (Brandão and Lopes, 1977). With the negotiations of Mercosul and the implementation of the common external tariff (CET), there were further revisions to the schedule. The implementation of the Uruguay Round commitments was not a burden to Brazil because the CET was established at levels below the bound tariffs for most commodities. Table 1 shows bound and applied tariffs for selected commodities in Brazil. Applied tariffs have increased 3% since 1998. This was a result of a request from Argentina for the revision of the CET.

Table 1. **Brazil - Bound and applied tariffs for selected products (percent)**

Year		1995	1996	1997	1998	1999
	Bound			Applied		
Wheat (durum)	55	10	10	10	13	13
Wheat (other)	55	10	10	10	13	13
Wheat flour	55	10	10	10	13	13
Maize	55	8	8	8	11	11
Rice	55	10	10	10	13	13
Barley	55	10	10	10	13	13
Cheese	55	16	16	16	19	19
Butter	55	16	16	16	19	19
Beef	55	10	10	10	13	13
Beef, boneless	55	12	12	12	15	15
Meat of sheep and goat	35	10	10	10	13	13
Meat of swine	55	10	10	10	13	13
Poultry meat	35	10	10	10	13	13
Soybeans	55	8	8	8	11	11
Soybean oil	35	10	10	10	13	13
Soybean meal	35	10	10	10	13	13
Sugar	35	16	16	16	19	19
Orange juice	35	14	14	14	17	17
Cotton	55	1	3	3	6	8
Cotton, carded	55	8	8	8	11	11

Source: AMAD.

For completeness, it should be noted that Brazil has a tariff rate quota for wheat (750 000 tonnes) and for apples and pears (10 000 tonnes). For wheat the in quota tariff is zero[1] and for apples and pears the rate is 15%. The in quota bound tariff for the latter is 13.5% and the over quota rate is 13.5% for apples and 28.8% for pears. The applied rates for the two products were 10% from 1996 to 1997 and 13% in 1998 and 1999.[2]

Table 1 shows that the level of protection for agricultural products is quite low in Brazil. Furthermore, the implementation of the Uruguay Round commitments did not bring additional burden to the country in view of the unilateral reforms that had already been implemented and the agreements signed with the other partners in Mercosul.[3]

Trade flows

The major factors underlying changes in agriculture and agricultural trade in Brazil were:

- agricultural policy reforms, domestic and external, have contributed to favourable changes in the agricultural sector of Brazil, increasing productivity and exports of selected products; and

- the combination of high interest rates and an overvalued currency during the period 1994/1999 that squeezed agriculture and delayed further investments.

As a consequence of these conflicting forces, exports growth is below the potential of the sector.

Figure 1, taken from Brandão (2002), shows export values (constant USD) of selected agricultural products. It can be seen that:

- exports of the soybean complex were irregular during this period, but after 1991 an upward trend was established;

- the picture for sugar is similar, with exports growing after 1990/1991;

- exports of orange juice remain approximately constant since the mid-1980s;

- coffee exports decrease steadily since the beginning of the decade of the 1980s; and

- meat exports are increasing since 1990, pushed by beef and poultry. Exports of swine meat, albeit small relative to the other meats, are also increasing.

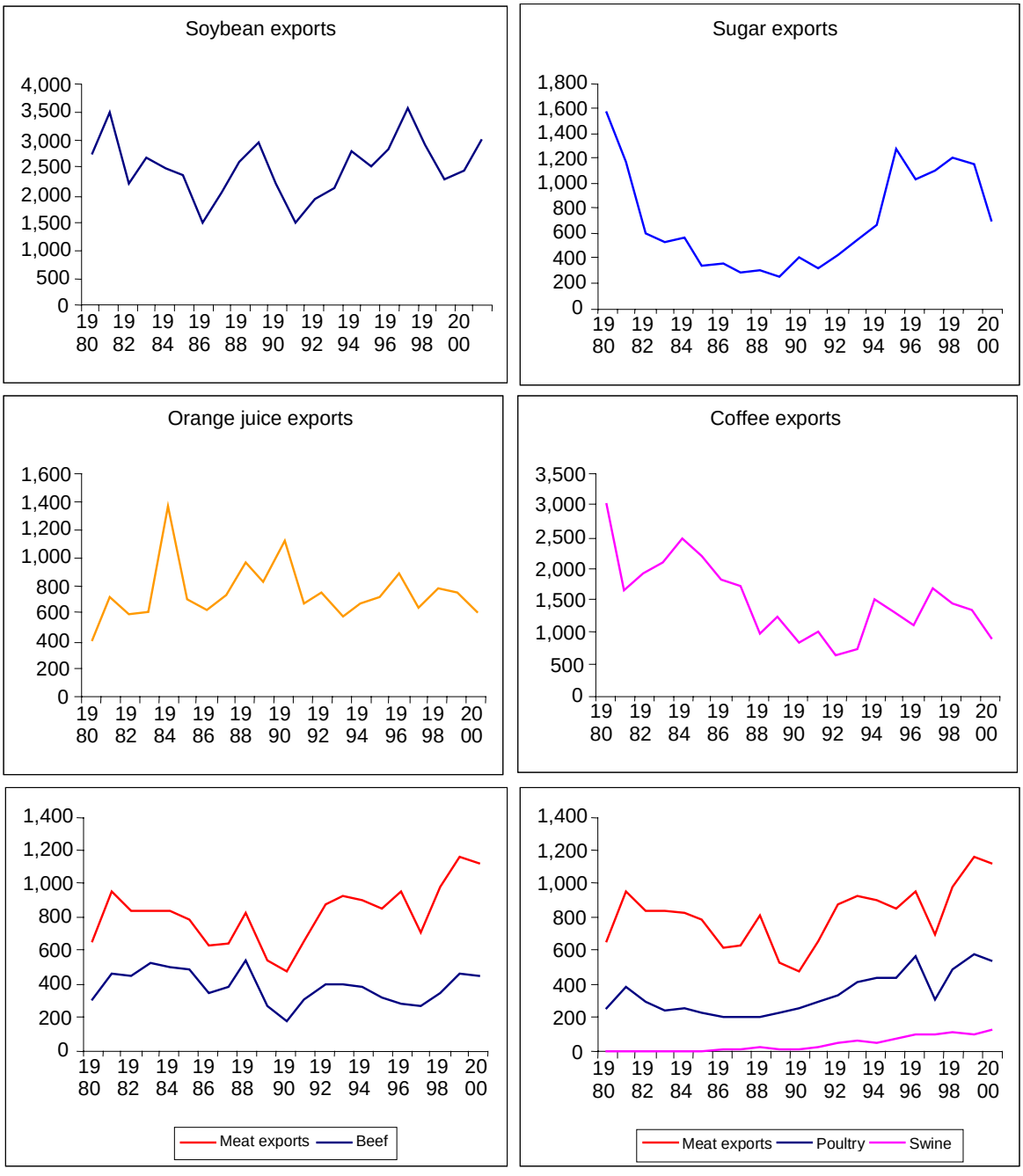
1. In practice the wheat quota has never been applied (annual imports of wheat are of the order of 6 to 7 million tonnes per year).

2. See FAO, 2000 and AMAD.

3. For more information, see Brandão, 2002.

Figure 1. **Exports of selected crops**

US$ millions



Source: FAO.

In summary, with the exception of coffee, exports are either growing or constant, despite the decline in world commodity prices.

The value of agricultural imports is relatively low and Brazil has a trade surplus of the order of USD 8 billion dollars in recent years. Imports of wheat, which amounted to USD 1 billion in 2000, accounted for 24% of the import bill. Another important product is milk that accounted for 9% of the total import bill in 2000.

In recent years the volume of imports has increased substantially. This can be seen in Figure 2 that shows import volumes for cereals, wheat, rice, maize and milk. This has raised concerns among domestic producers and created a demand for increased protection.

Sector implications

This section considers milk production, with an overview of the sector and an exploratory analysis of the effects of trade liberalisation[4]. The choice of dairy stems from the following considerations: the large number of producers engaged in the activity, the low productivity in the sector and the efficiency enhancement adjustments that are taking place as a consequence of foreign competition.

According to the agricultural census of 1995/1996 there are 1.8 million producers of milk in Brazil. Production takes place mostly in non-specialised farms:

- 9% in farms whose principal activity are temporary crops;
- 2.7% in farms whose principal activity are permanent crops;
- 66.5% in farms whose principal activity is livestock productions; and
- 21.3% in farms whose principal activity is a combination of livestock and crops.

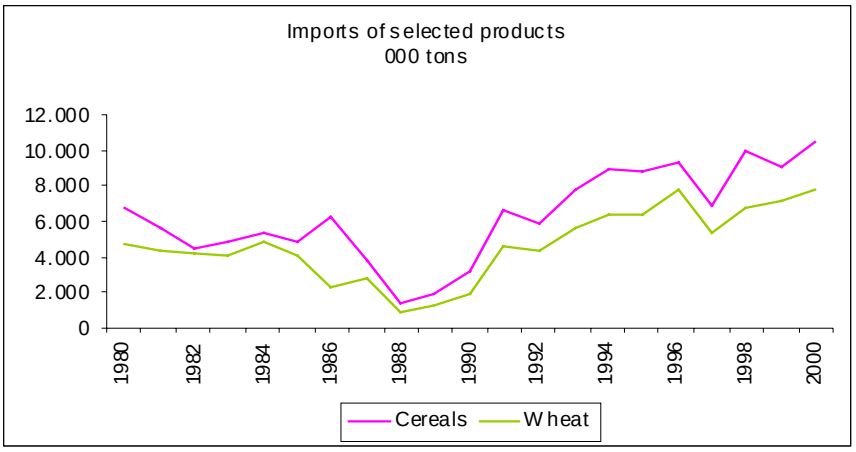
Another characteristic is that 75% of production comes from herds specialised in milk production and 25% comes from herds whose principal destination is not milk production.

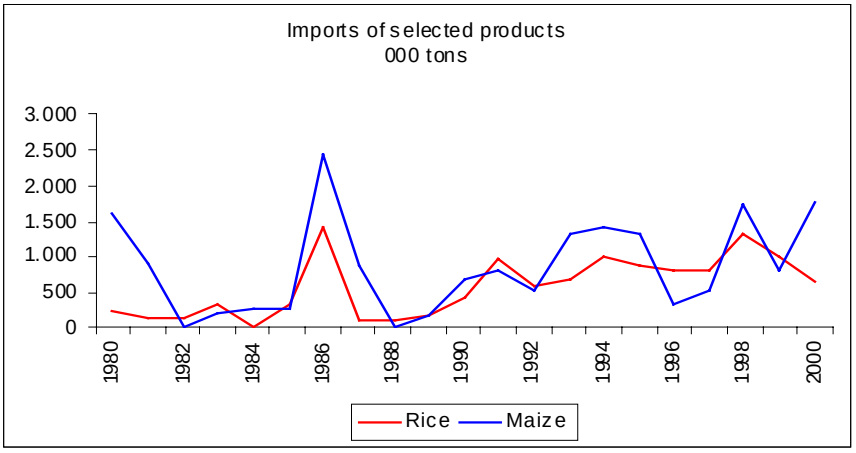
Productivity is low. The agricultural census shows that average production per milked cow per year is 1 307 litres, equivalent to about 3.5 litres per day.

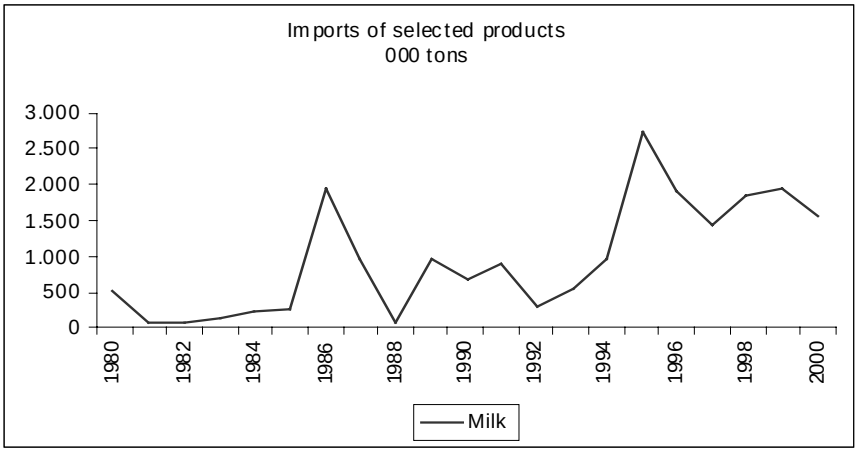
Farms that have areas between 10 and 500 hectares account for 80% of production and the highest productivities are observed in this area range. Farms with areas below 20 hectares (small farmers) comprise 20% of production and have the highest productivity, but they are only 6% above the national average.

4. For further details on the dairy sector see Vilela and others (2001) and Gomes and others (2001).

Figure 2. **Imports of selected crops**







Source: FAO.

From 1990 this situation started to change for the better. Brazilian production during 1990/2000 is growing at 3% per year and productivity at 4%.[5] But the process of change is not homogeneous and the aggregated data do not show the full extent of the changes yet. Competition with foreign producers, particularly from Argentina and Uruguay who have lower costs than Brazil, has induced farmers to modernise their operations, particularly in the states located in the South (Rio Grande do Sul, Paraná and Santa Catarina), which account for a significant portion of production. To face up to the competition farmers are investing in more productive animals, in increasing the scale of their business, in better management techniques, and in new technologies. These new technologies not only contribute to lower costs but also upgrade the quality of product delivered to industry.

Figure 3 provides some insights into the process of change in production and productivity in Brazil. The horizontal axis displays the rate of growth of production in the period 1990/2000 and the vertical axis the rate of growth of productivity over the same period. The points in the diagram represent state averages.

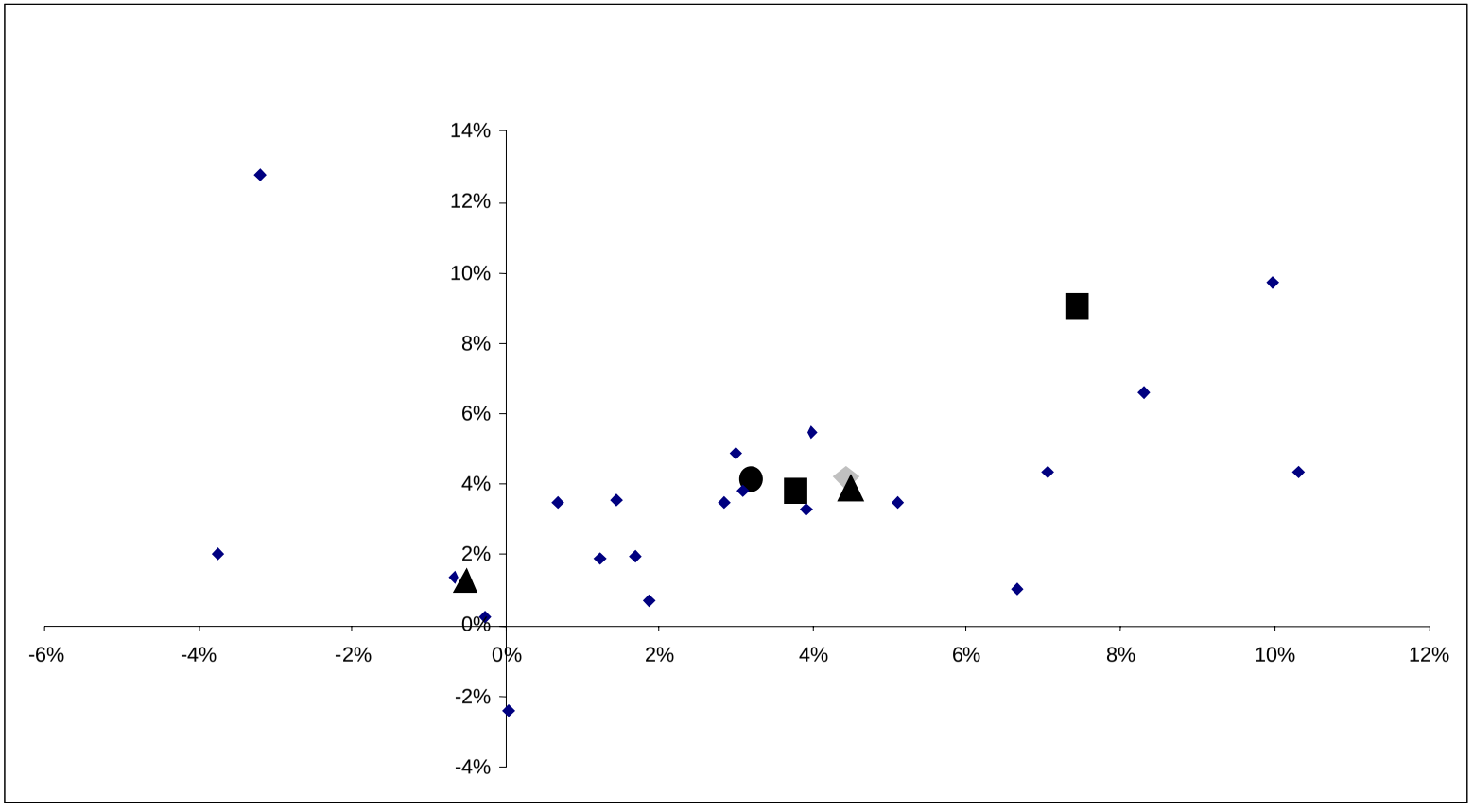
The largest producing state in Brazil is Minas Gerais, which accounts for 30% of production. The large dot in Figure 3 represents the state where production grew at 3% and productivity at 4% per year in the period 1990/2000. The states of Goiás and Rio Grande do Sul, the second largest producers (indicated by the large squares in Figure 3), with 11% each of national production have had an extremely good performance over the period: for the first, production grew 7% and productivity 9% per year; the corresponding figures for Rio Grande do Sul are 4% and 4%. São Paulo and Paraná are the next largest producers (large triangles in Figure 3), each accounting for 9% of production. While the performance of Paraná was similar to that of Rio Grande do Sul (4% growth rate of production and productivity) that of São Paulo was disappointing, with production declining at 1% per year and productivity growing 1% per year. The state of Santa Catarina (large grey diamond in Figure 3) is the next largest producer accounting for 5% of production. The performance of this state was similar to that of the other two southern states.

Not only trade liberalisation affected the sector, but also less government intervention in the domestic market. In 1990, a long-standing policy of fixing producer prices was abandoned. The decline trend in prices has been persistent since 1975 (see Figure 4), volatility (calculated as the 12 month moving average of the coefficient of variation of prices) declined sharply and has stayed at around 4% in the latest years. This apparently compensated the negative influence of lower prices and production kept increasing.

Another important component of this process has been the change in the industry structure induced by the failure of the traditional co-operative system and the liberalisation of domestic prices. Multinational corporations assumed a dominant market position and are putting additional pressure on producers to improve milk quality and reduce costs of production.

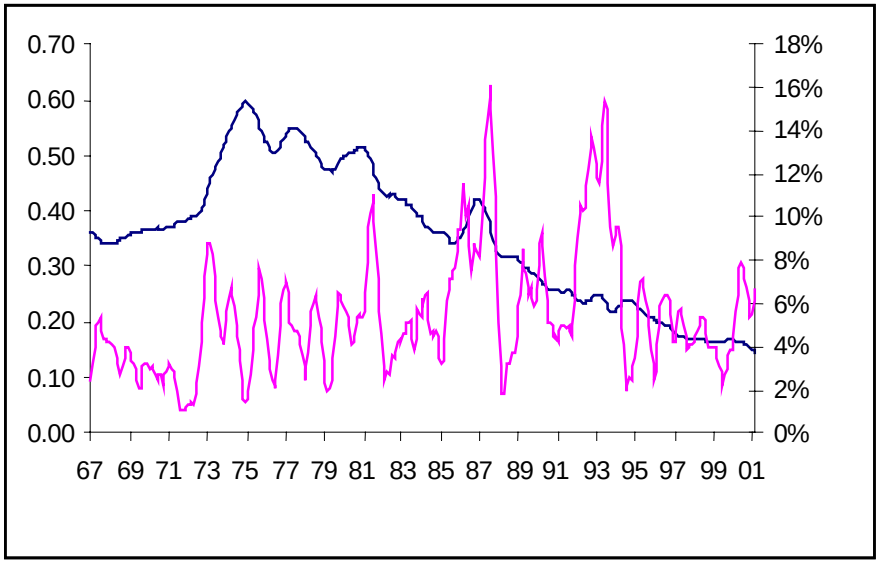
5. For more details see Yamaguchi *et al.*, 2001.

Figure 3. **Growth of Production and Productivity**



Source: IBGE.

Figure 4. **Farmer prices and price variability**



Source: Fundação Getulio Vargas.

The sharp decline in prices indicates that supply is growing more than demand for milk, and this, in turn, is forcing producers to further reduce costs. One of the steps taken to achieve this is the increase in the scale of production (not necessarily increase in area), which will, in turn, reinforce the process of producer price depression.[6] The lower limit is the world price which, in view of the high subsidies in OECD countries, are below production costs.

Based on simple assumptions[7] about supply and demand growth, Alves (2002) has estimated that the continuation of this process, in a 10-year period, will reduce the number of producers by 50%. In 20 years the reduction is of the order of 72%. These numbers illustrate the magnitude of the adjustment problem for the sector and indicate the importance of policies to reduce the costs of change for the displaced producers.[8]

The adjustment cost in the sector has been magnified by imports. After 1990 imports of milk skyrocketed, as can be seen in the last graph of Figure 2. This triggered reactions from producers and from the government. The most effective were the following: the tariff at the WTO was bound at a level higher than for most other products; the applied tariff is also higher than for most other products, (Table 2) and applied tariffs vary substantially among milk products, with the highest corresponding to milk powder and the lowest to UHT milk.

6. According to the agricultural census data, production per cow per year increases with the number of cows.

7. Key assumptions of Alves' simulation are that: demand grows at 4% in the first 5 years, and than 3% for the remaining of the 20 year period; production in each farm grows 10% per year and prices remain stable during the analysis.

8. The assumption of constant prices implies a fast adjustment of supply and demand. Under a different assumption, say that producers are slow to adjust and take time to leave the sector, the reduction in the number of producers per time period could be smaller.

Table 2. **Brazil - Bound and applied tariffs for milk and milk products (percent)**

Year		1995	1996	1997	1998	1999
	Bound			Applied		
Milk Products						
Maximum	55	32	30	27	27	30
Minimum	55	0	0	0	0	0
Average	55	16	16	15	17	19
Standard deviation	0	9	8	7	7	9
Mode	55	14	14	14	17	30
Median	55	14	14	14	17	17

Source: AMAD, author's calculations.

In January of 1999 the National Confederation of Agriculture (CNA) requested an anti-dumping investigation on exports of milk to Brazil. At the conclusion of the investigation, in February 2001, Brazil imposed anti-dumping duties on imports of milk powder and whole milk from New Zealand, the European Union and Uruguay. This initiative raised effective tariffs on imports to levels even higher than those indicated on Table 2, namely 41.8% on imports from the European Union and 30.9% on imports from New Zealand (Netto and Mustefaga, 2001; Bernardes and Netto 2002). The same process lead to price agreements with companies in the European Union and Argentina. The latter has also agreed to maintain the same tariff lines in the exception list for the Common External Tariff as Brazil, so as to avoid imports from other countries to enter through Argentina. This explains, in part, the decline in imports observed in 2000 and 2001.

The adjustment of this sector has not been concluded yet. Nevertheless, productivity is rising and in selected sub regions it is already at levels comparable to other countries, such Argentina and Uruguay. Many more producers will leave the activity and the sector and will face set up costs in other activities and sectors. And those that remain in the activity will need to upgrade technology and reduce costs. Both of these groups will need additional capital, which is still scarce and expensive in the country. The level of protection abroad makes the cost higher than in an undistorted situation. Lower protection in the OECD countries and lower interest rates in Brazil (comparable to those in OECD countries) will ease and increase the speed of adjustment of the sector.

Summary and conclusions

This paper focused on the sectoral impacts of trade liberalisation in Brazil. It started from an analysis of trade flows and of the trade reforms implemented by Brazil to provide a background for the analysis. The data presented here shows that protection of agriculture is low and exports are increasing in key export products. The growth of exports is mostly supported by high productivity, since Brazil has little domestic support for agriculture.

Milk production was selected to illustrate how policy and trade reforms can contribute to increased efficiency, but at the same time, the analysis illustrates the costs of the adjustment and points out the challenges for the sector. It is unlikely that Brazil will become a major exporter of dairy products in the near future, but certainly domestic production can increase and compete, hand in hand, with foreign produced dairy products.

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PART 2: PRICE DISTORTIONS AND PRICE TRANSMISSION

POLICY AND NON-POLICY SOURCES OF AGRICULTURAL PRICE DISTORTIONS: EVIDENCE FROM THE MEASUREMENT OF SUPPORT IN SELECTED TRANSITION ECONOMIES

Olga Melyukhina[*]

Abstract

The OECD started computing PSEs/CSEs for transition economies at the beginning of the 1990s. This paper presents the PSE/CSE estimates for seven monitored countries: Bulgaria, Estonia, Latvia, Lithuania, Romania, Russia, and Slovenia. It then looks at the empirical issues of estimating support in transition economies, focusing specifically on the measurement of domestic price distortions. Finally, some aspects concerning interpretation of support estimates for transition economies are discussed. PSEs/CSEs have proved to be useful tools for monitoring developments in the agricultural sectors of non-OECD transition economies. These measures help explain the scale of agricultural market distortions and the cost of these distortions to producers, consumers and taxpayers. PSEs/CSEs can indicate the need for reform and point to areas where it is critical. However, while quantifying monetary transfers to producers from consumers and taxpayers, the PSE does not measure what effect these transfers have on farmers' incomes. The PSE therefore needs to be complemented by other analytical instruments, in particular those estimating the various effects of policies applied.

Introduction

The OECD started applying its Producer Support Estimate/Consumer Support Estimate (PSE/CSE) analysis to transition economies at the beginning of the 1990s. Political developments in the central and eastern European countries (CEECs) and the Former Soviet Union opened the way to market transformation and closer integration of these countries into the world economy. This raised interest in the process of reforms in the region and their potential implications for OECD countries. In 1994 the OECD released its first comprehensive Agricultural Policy Review for Hungary. Similar studies followed on Poland (1995), the Czech Republic (1995), Estonia (1996), Latvia (1996), Lithuania (1996), the Slovak Republic (1997), Russia (1998), Romania (2000), Bulgaria (2000), and Slovenia (2001)[1]. PSE/CSE analysis was an important component of these studies.

Estimation of PSEs/CSEs is based on a comprehensive inventory of agricultural policies. The approach has three major strengths. First, the identification and classification exercise is itself a valuable contribution to policy analysis. Second, PSEs/CSEs provide a quantitative evaluation of policies based on a technique that is relatively simple and can be carried out on an annual basis. These estimates help provide an understanding of the scale of agricultural market distortions and the cost of

* OECD.

1. Four of these countries have become OECD members: the Czech Republic in 1995, Hungary in 1996, Poland in 1996, and the Slovak Republic in 2000.

these distortions to food consumers and taxpayers. Third, PSEs/CSEs, representing aggregate tariff-equivalent measures of diverse policies, are well suited to cross-country comparisons (Cahill and Legg 1989/1990). Undertaken initially as part of one-time Agricultural Policy Reviews, PSE/CSE estimates have been updated each year. As with OECD member countries, PSE/CSE analysis has become an important feature of the annual monitoring of agricultural policies in several non-OECD economies.

This paper discusses the OECD experience of measuring PSEs/CSEs for non-OECD transition economies. It begins with the presentation of the PSE/CSE results for seven monitored countries: Bulgaria, Estonia, Latvia, Lithuania, Romania, Russia, and Slovenia. It then deals with the practical aspects of estimating support, focusing specifically on the measurement of price distortions, which are the main source of producer support (taxation) in the analysed countries. Finally, some questions of interpretation of PSE/CSE estimates for transition economies are discussed.

One purpose of this paper is to demonstrate the potential of PSEs/CSEs for monitoring and analysing trade and domestic policy reform. Another is to highlight the key methodological features of the measurement of price distortions as part of the PSE/CSE analysis, as well as information required to carry it out. The paper also seeks to stimulate the feedback from the Forum participants on the usefulness of applying the PSE tool, or elements of the methodology, to developing economies.

Trends in agricultural support in non-OECD transition countries between 1986 and 2000

The OECD defines ***Producer Support Estimate (PSE)*** as an annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm-gate level, arising from policy measures which support agriculture, regardless of their nature, objectives or impacts on farm production or income[2]. The ***Consumer Support Estimate (CSE)***, a PSE-related indicator, measures the cost of producer support to consumers of agricultural products[3].

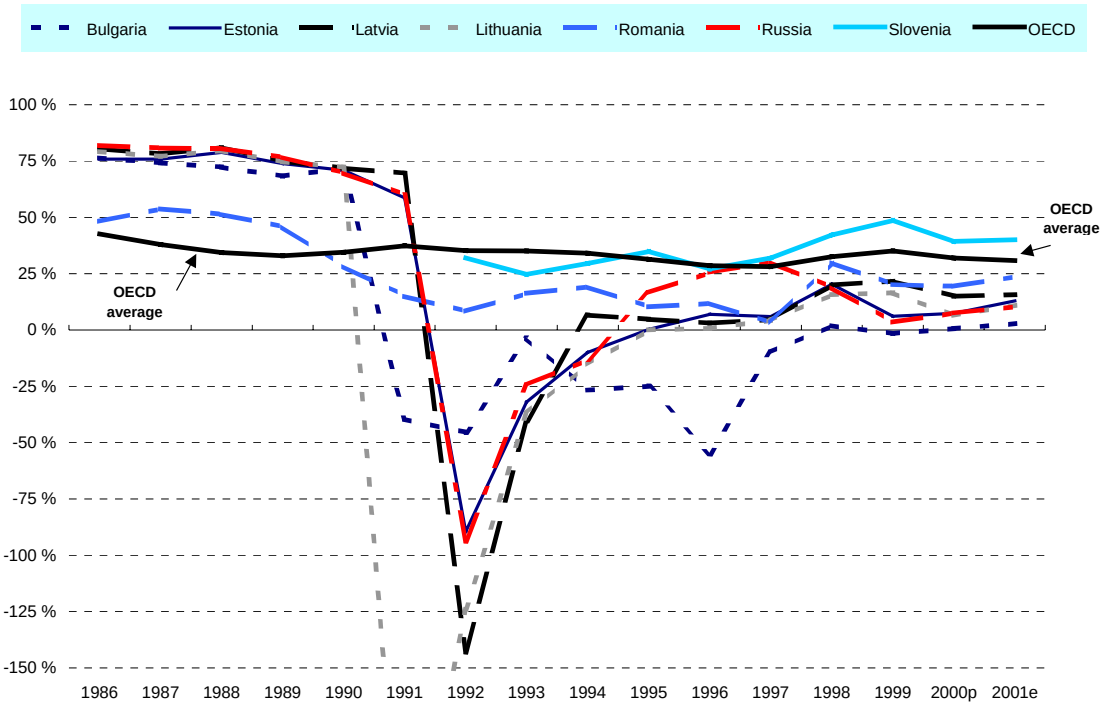
The PSE measures two types of transfers - market price support and budgetary payments to producers. *Market Price Support* (MPS) transfers emerge when there is a wedge between domestic prices for given agricultural products and the world prices for equivalent products. This price wedge occurs as a result of various government interventions, for example border measures, domestic price support (control), marketing regulations (restrictions), subsidised export, etc. In transition countries factors other than explicit government intervention may also have a strong impact on the price gap, as discussed later. The second component of the PSE, *budgetary payments to producers*, take either the form of actual payments to producers, or budgetary loss (i.e. forgiveness of debt on credit provided from the government resources) or budgetary income foregone (i.e. resulting from tax benefits granted to agricultural producers). The breakdown of the various categories of support is shown in Annex II.

The PSE/CSE estimates covering the period from the mid-1980s to 2001 demonstrate a general pattern of support in non-OECD transition countries: (i) a phase of very high support under the planned system (over 70% for the majority of analysed countries); (ii) a strong negative swing in support at the beginning of the transition period between 1991 and 1994; and (iii) modestly positive and moderately fluctuating PSEs between 1995 and 2001 (Figure 1).

2. For definitions and composition of OECD's PSE/CSE and related indicators, see Annex I and II. A comprehensive explanation of OECD methodology is contained in OECD (2001b).

3. In the OECD methodology the consumer is understood as the first stage buyer of agricultural products.

Figure 1. **Percentage PSEs by country and OECD average, 1986-2001**



Source: OECD PSE/CSE database.

In general, the estimates for the pre-transition period reflect the significant isolation of domestic producers from international markets under the planned economy. High administered producer prices, large budgetary transfers, and exchange rate controls, all contributed to the high pre-transition PSE estimates. Economic liberalisation at the beginning of the 1990s, brought about significant falls in relative agricultural prices and a drastic reduction in budgetary support. This period was also marked by strong macro-economic shifts, leading to substantial weakening of the exchange rates in the monitored countries. Altogether, this caused a sharp fall in PSEs. The negative macroeconomic and sectoral trends of the early transition were reversed in the mid-1990s, with the result that PSEs recovered to positive levels during the second half of the decade. Since the mid-1990s, the annual PSE variations have become relatively moderate reflecting partly a greater integration of the monitored countries with world markets, as well as their relatively more stable macro-economic environment. In the majority of non-OECD countries support remained well below its pre-transition level, and below the OECD average. The estimates for 2001 indicate that PSEs ranged from 3% in Bulgaria to 24% in Romania compared to the OECD average of 31% (see Annex III and OECD 2002a). In the four OECD-member transition economies support was within the same range[4]. Out of all monitored transition countries, both OECD members and non-members, Slovenia represents a special case, with

4. The PSE trends in the Czech Republic, Hungary, Poland and the Slovak Republic generally exhibit the same pattern as in the non-OECD transition countries: high support before the transition, a reduction in the late 1980s and the first half of the 1990s, followed by some pick-up in 1998-1999, and a slight decline in the most recent years. In 2001, PSEs were estimated at 17% for the Czech Republic, 12% for Hungary, 10% for Poland and 11% for Slovakia (see Annex III). Market price support comprised 71% of producer support in Poland in 1999-2000, 63% in the Czech Republic and 59% in Hungary. Only in the Slovak Republic was this share relatively low, at 28%.

a PSE at 40% exceeding the EU and OECD averages. It is worth noting, however, that the overall modest levels of producer support in the majority of monitored countries mask considerable differences across individual commodities. For example, in Bulgaria, the country with the lowest average %PSE in the monitored group at 3%, producer support ranged from 59% for sugar to minus 21% for barley.

The composition of PSEs indicates that Market Price Support and input subsidies dominate transfers to (from) producers in non-OECD economies. Thus, in 2001, Market Price Support (MPS) accounted for over one half of total PSE in Latvia, Lithuania, Russia and Slovenia, reaching as high as 87% in Romania and 89% in Bulgaria. Only in Estonia, with its liberal domestic market and border regime, does the MPS contribute a relatively small share to the total PSE (37%).

The budgetary component of the PSE in most countries was dominated by input payments. These are particularly important in Russia and Bulgaria, accounting for 66% and 73% of total direct budgetary payments respectively.[5] While input subsidies continue to be an important component of support in the majority of monitored countries, a substantial shift to area and headage payments can be observed in recent years. Six out of seven monitored countries are candidates for accession to the European Union. The increased emphasis on area and headage payments largely reflects the process of aligning domestic policies in these candidate countries with the Common Agricultural Policy of the European Union.

The Consumer Support Estimates (CSE) generally mirrored the PSEs in all monitored countries, with substantial producer support during the centrally planned period translating into an implicit tax on consumers.[6] The situation radically reversed itself in the early transition years, with positive CSEs indicating that consumers were implicitly subsidised during this period. Starting from the mid-1990s, the pre-transition situation has been restored, however, with consumer taxation much lower than during the central planning years.

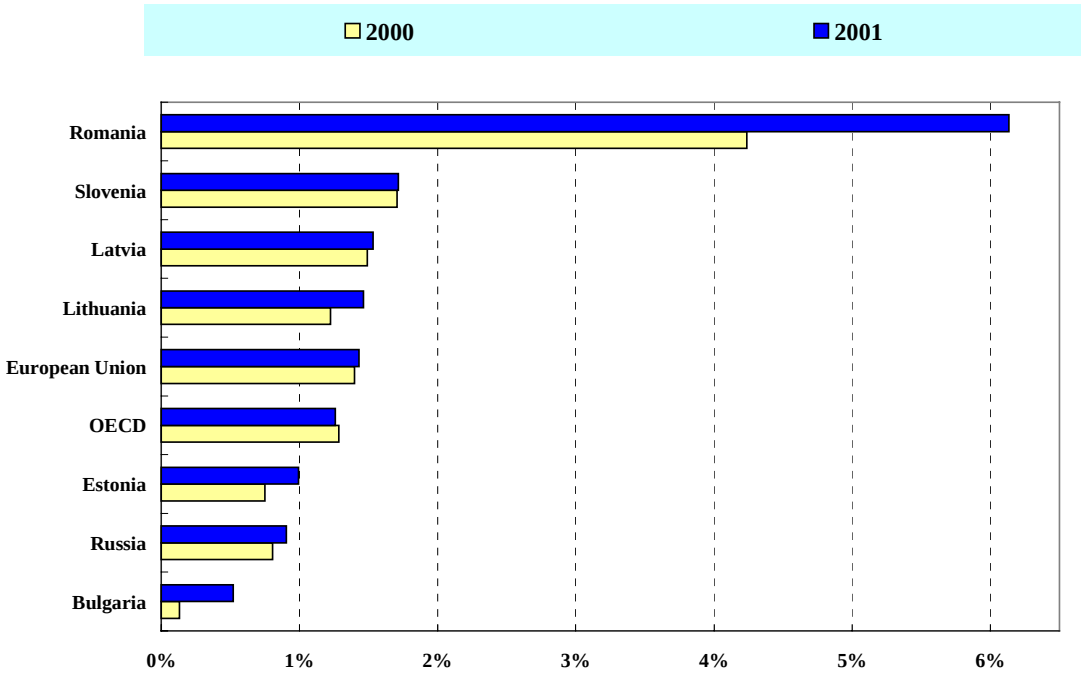
The Total Support Estimate (TSE), a broader indicator of support, complements the PSEs/CSEs. The TSE is the sum of transfers to agricultural producers (the PSE), expenditure for general services (GSSE), and budgetary transfers to consumers. Expressed as a percentage of GDP, the TSE indicates the burden that support to the agricultural sector places on the overall economy. In 2001, the percentage TSE in four of the monitored non-OECD countries remained above the OECD average of 1.3%, with Romania having the highest level of all monitored non-OECD countries (6.1% of its GDP). Among the seven monitored countries, only in Russia, Bulgaria and Estonia were TSEs below the OECD average (Figure 2).

5. In some cases, *e.g.* Russia and Romania, sizeable amounts of input assistance were provided in the form of debt forgiveness.

6. However, in many monitored countries governments provided budgetary transfers to consumers to reduce this implicit taxation. Thus, grain elevators/milling plants, and milk and meat processors received direct budgetary compensation, which served as the principal instrument of maintaining high agricultural producer prices and low food prices.

Figure 2. **Total Support Estimate (TSE) by country and OECD average in 2000-2001**

In per cent of GDP



Source: OECD PSE/CSE database.

A comparison of the PSE levels in transition countries with the OECD average suggests that less support to producers is provided in transition economies. But at the same time higher shares of total support in relation to GDP in many monitored countries mean that this support places a heavier burden on transition economies than in many OECD countries. This burden grows with the share of agriculture in GDP. Romania, a country with one of the largest shares of agriculture in GDP among the CEECs (11% in 2001), has the highest burden of all. Producer support (percentage PSE), roughly within the range of other CEECs, costs Romania more as a share of its national economy than any of these countries and more than twice what it costs OECD countries.

Estimating Market Price Support

Estimating MPS is the most challenging task when calculating PSE. One reason is the high weight of price transfers in the total measured support in the monitored countries. A second is the fact that the price gap captures the impacts of various implicit and non-transparent actions of the government, which affect agricultural prices. This point is essential for some transition countries, where the rapid evolution of macroeconomic and agricultural policy frameworks have often been associated with recourse to ad hoc interventions, various exemptions and special treatments within the formal regimes (*e.g.* trade tariff schedules), and non-transparent administrative controls of commodity flows. A final reason is that price gap estimation is data demanding. It requires external and domestic price data of reasonably good quality, as well as specific background information on individual commodities,

notably, the link between primary, domestic wholesale and international markets, handling, processing margins and transportation costs.

i) Choice of a reference price

The measurement of price transfers requires an understanding of the opportunity cost of the country's domestic production. In the case of a country that is a net exporter of a given product the opportunity cost would be the export price of the product; in the case of a net import, it would be the import price of the commodity in question. Therefore, as an initial step of domestic-to-international price comparison, an analysis of a country's position vis-à-vis international markets is needed. For transition economies, this task has sometimes been complicated by the instability of their trade patterns during the past decade. A broader analysis of a country's production and consumption conditions has often been needed to make a judgement on the most representative type of interaction with external markets and the underlying opportunity cost.

Once the question on whether to adopt an import or an export as a benchmark for comparison is answered, the appropriate import/export price has to be selected. The first approach at hand would be to use prices reported by national trade statistics (average import/export unit values[7] or specific prices for major trading partners). However, for transition countries, this can rarely be considered the first-best choice. National data usually suffer from inconsistencies. All monitored countries went through a profound transformation from state monopoly to private trade. Trade registration systems and statistical methodologies have been changing as well. Hence, the national trade data for the pre- and early transition periods and most recent years are often weakly comparable. Second, the reported trade values are sometimes distorted due to barter trade, inter-governmental debt settlement agreements, food aid, etc. Therefore, the OECD practice to date has been to use the trade data of developed market economies, representing the major partners of monitored non-OECD countries. An additional practical consideration in favour of this approach relates to substantial time lags in the release of the national trade statistics in non-OECD countries. With such delays the usual timeliness of annual OECD policy monitoring would have become problematic.

For all seven monitored non-OECD economies a common set of international reference prices is currently applied. For the majority of PSE products, EU export f.o.b. unit values in extra-EU trade are used. The same prices are applied for calculation of the European Union's own PSEs and those of some neighbouring countries. For milk, a New Zealand farm gate price is applied as an international reference, according to a procedure uniform for all OECD member countries. The choice of EU prices for almost all products is explained by a number of reasons. The monitored CEECs and Russia are net food importers of the majority of PSE products. The European Union is the main trader in the region, and the principal supplier-partner of the monitored countries. Hence, EU export prices can be assumed a reasonable indicator of the opportunity cost for these countries' domestic production. For the six monitored CEECs, which all are in the process of accession to the European Union, EU prices take on additional significance as a benchmark for their future competitive position within the Union.

7. Import unit value is calculated as the total c.i.f. import value of a given commodity divided by the total volume of imports of the respective commodity, export unit value is calculated similarly, based on total f.o.b. export value and the corresponding exported volume.

ii) Price adjustments for farm-gate comparison

According to the OECD methodology, the price gap is measured at the farm-gate level. To be an adequate estimate of the opportunity cost for domestically produced commodities at the farm-gate level, the external (import or export) reference price should be adjusted for the relevant transportation and handling, as well as processing costs. The reference price should also be comparable with the domestic price in terms of quality. Adjustment of prices for quality may not be a particularly serious problem for a net exporter, as the f.o.b. price generally reflects the characteristics of the commodity produced domestically. However, in the case of a net importer, quality differences between domestic and purchased products may be substantial (OECD, 2001b). A quality correction should then be carried out for the external price. This is particularly relevant for transition economies, where the quality of domestic products is generally lower compared to imported products belonging to similar commodity groups[8].

Measurement of the protection at the farm-gate level requires, therefore, a good understanding of domestic commodity markets and product-specific marketing systems. This calculation is also conditional on the availability of information on technical coefficients, marketing margins, transportation and handling costs. This partly explains why estimation of domestic-to-international price gaps is the most challenging component of PSE calculations. The challenge is particularly acute for transition economies, where consistent data series of this kind are rarely available and the quality of the existing information is sometimes limited. For this reason, some of the required adjustments are left out. An estimation error is certainly involved with this approach. However, this seems to be the most pragmatic solution given insufficient information for comprehensive adjustments and the fact that adjustments to some extent offset each other. At the same time, this is complemented by continuous efforts to improve the quality of the data and reduce estimation errors.

iii) Impediments to price transmission under the transition

Adjustments to the external reference price are needed to ensure that all differentials which are due to quality variations, marketing and transportation costs are eliminated from the measured gap between the two prices. Once these differentials are eliminated from the price gap, the remaining wedge is theoretically the result of government interventions preventing market forces from arbitraging away the price differences between domestic and external markets. "Theoretically" in particular means assuming a perfectly competitive market structure and that market agents can absorb information, make and implement new contractual arrangements in response to changed prices either immediately or within a short time. In real world these conditions rarely hold, as markets are usually characterised by various imperfections (asymmetric information, monopolistic structures, etc.), while market agents have to incur certain transaction costs. These factors, as well as the government policies impede the price arbitrage and contribute to the price gap between local and world markets. In transition countries, market imperfections and transactions costs can be a particularly important impediment to the transmission of world prices onto domestic markets. This to a large extent arises from the "immaturity" of markets during the transition phase. Economies which begin their transformation from a centrally planned to a market system suffer inherent market deficiencies, particularly at the onset of reforms. All post-socialist countries inherited an underdeveloped physical and institutional infrastructure. Even those countries that can be considered as the most advanced in the group are far behind the mature market economies in terms of the development of transportation, storage and

8. For a more detailed discussion on adjustment of external reference prices for measuring the price distortions at the farm gate, see Tsakok (1990), Colman (1995), and OECD (2001b); Tomek and Robinson (1981) provide an in-depth analysis of spatial, value-added and quality price differences.

communication networks. Market information systems and new financial infrastructure are in the process of being established; these services are as yet scarce and expensive. Additional costs and risks are linked with the imperfect regulatory framework and weak contract enforcement mechanisms.

Such infrastructural and institutional deficiencies are an inevitable feature of post-socialist economies, which is variously identified as a "systemic legacy" (Liefert *et al*., 1996), "shortage of arbitraging entrepreneurs and capital", "isolation" and "fragmentation" of markets. This "legacy" prevents economic agents from responding effectively to market signals and benefiting from price differences between domestic and international markets. In other words, exporting/importing potential and supporting institutions in transition countries are too weak to bring adequate price adjustments. The existence of a large subsistence sector in some transition economies is an additional cause limiting price adjustments. The loose linkage of a considerable part of domestic production and consumption with the markets curbs the responsiveness of market supply and demand.

These institutional and structural deficiencies therefore contribute to the gap between internal and external prices. There is an apparent policy aspect to this. At the beginning of the transition these effects could be interpreted as the inertia of the past economic system with its policies, and in more recent years as the failure of current policies to induce efficient market institutions as well as shifts to a more commercially oriented agriculture. This suggests that the "support" (or "taxation") measured for transition economies implies a wider "definition of 'policy' to embrace what might be described as 'policy failure' as far as its impacts on producers are concerned" (Harley, 1996).

iv) Exchange rate sensitivity

Where a price gap is used in estimating the market price support component of the PSE, the reference price (i.e. world market price) has to be converted into domestic currency before it can be compared with the domestic price, and the exchange rate is introduced into the calculations. In these cases, exchange rate movements can affect the PSE, and it is important to consider the interplay between exchange rate variations, agricultural policies and market factors. In the model of an ideally functioning market economy, where the law of one price holds (i.e. arbitrage eliminates price differences between locations except for transaction costs), and in the *absence of agricultural policies* that alter the prices farmers receive for their output or pay for their inputs, the domestic market price is identical with the world market price (except for transaction costs). Hence all changes in the world market price, expressed in domestic currency, are directly reflected in the domestic price, regardless of whether it is the world market price in foreign currency or the exchange rate that has changed. In this case, the gap between domestic and world price is zero and not affected by exchange rate variations. *With an agricultural policy* that insulates the domestic price against changes in the world market price, a non-zero price gap is measured, and its level changes with variations in both the world market price in foreign currency and the exchange rate[9]. In this situation it would not be correct to interpret a PSE change that is related to a movement in the exchange rate as being a result of currency developments. This is a result of an agricultural policy that has shielded the domestic market against influences originating in the world market, and hence the respective change in PSE can be interpreted as an effect of agricultural policy. In this situation even with no change in policies the effective support they are providing to producers changes.

In the real world, on many markets the law of one price does not hold perfectly, and hence there may be price gaps between domestic and world markets even in the absence of specific agricultural policies

9. Similarly, the support associated with other price-related policy measures, such as deficiency payments and certain types of input subsidies, will also be affected by exchange rate changes.

that create price wedges. As noted above, this has to be considered when interpreting the price-related component of PSEs. In the context of currency developments, it may be the case that the policy-independent element of the price gap varies with variations in the exchange rate. For example, lags in market response due to adjustment processes may mean that it takes time for domestic prices to respond to a change in the world market price (resulting from either a price change in foreign currency or a variation in the exchange rate). In some non-OECD economies, such lags in market response (and other factors with a similar effect) have been pronounced, particularly in the years of sharp exchange rate adjustments. In these cases, a variation in the exchange rate may result in a change in the price gap even where applied agricultural measures do not shield the domestic market from international price movements.[10] Ideally, this effect should be filtered out before the price-related component of the PSE is measured. In most cases, though, this may not be possible because of lack of relevant information. The PSE calculated will then be affected by exchange rate variations over and above the pure effects of agricultural measures applied, and the interpretation of the results should carefully keep this in mind.

The above discussion concerned the impacts of *variations* in exchange rate. A different, though related, issue arises when absolute *levels* of the exchange rate are considered. In particular, this concerns the case of a misaligned exchange rate, i.e. an exchange rate not representing an equilibrium regarding overall macro-economic conditions[11]. Again, this situation may be particularly relevant in some non-OECD economies. A disequilibrium in the exchange rate imposes a burden on, or provides a benefit to, domestic producers of tradable products. Sector-specific policies, such as market and trade policies in agriculture, may to some extent counteract (or amplify) that effect of macro-economic factors on the specific sector concerned. This explains why in a number of cases analysts have used adjusted (shadow) exchange rates when measuring nominal rates of protection or other policy indicators. In the past, the OECD Secretariat has in some cases computed PSEs on the basis of adjusted exchange rates for non-OECD countries. However, this exercise involved a high degree of discretion, with the results being highly sensitive to the chosen adjustment approach. It has thus been decided to use nominal (official) exchange rates in PSE calculations for non-OECD economies. This makes calculations more transparent and avoids the discretion linked with selection of the shadow rate and the adjustment technique. With this approach, the market price support component of the PSE has, then, to be interpreted as indicating the full effect of the relevant agricultural policies, irrespective of whether they were (explicitly or implicitly) designed to counteract or amplify any exchange rate misalignment.

Macro-economic instability and significant variations in the exchange rate, often including deviations from the longer-run equilibrium, have been typical for non-OECD countries, particularly during the pre-transition and early transition period. In some monitored countries considerable exchange rate distortions persisted until the late 1990s, leading to another wave of sharp adjustments. Thus, a substantial devaluation of the national currency took place in Bulgaria in 1996, in Romania in 1997, and in Russia in 1998. In cases like these, it is necessary to interpret with caution the annual changes in the market price support components of PSEs. In such periods the evolution of the measured market price support may be driven more by the impacts coming from the overall economic environment and lagged market adjustment than by agricultural policies as such. One way of gaining an impression of

10 A lag in market response may to a certain extent be a result of indirect government policies (or a lack of appropriate policies). For example, poor transport infrastructure may hamper the pass-through of international price signals. This may be particularly relevant in transition economies.

11. The extent to which exchange rate is misaligned can change over time, and pronounced exchange rate fluctuations can be interpreted as variable degrees of misalignment. From that perspective, misalignment can have a level component as well as a variable component.

the importance of exchange rate variations in such cases is provided by the PSE decomposition procedure. This allows measurement and presentation of the contribution of annual variations in different PSE components, including the exchange rate, to the overall annual PSE change (OECD 2001a, OECD 2001b).

Statutory and effective tariff

In order to understand the importance of non-tariff factors in creating price gaps, it is useful to compare statutory and effective tariffs. The *statutory tariff* is understood here as the applied import/export duty rate based on the country's formal tariff schedule. The *effective tariff* is calculated as the ratio between the measured price gap for a given product, derived from the PSE database, and the corresponding border price. The comparison of the two tariffs illustrates the importance of not only formal policies (in this case, tariff protection) but also various other policy factors affecting domestic agricultural prices. Examples of such factors include non-tariff barriers to trade; administrative controls of agricultural marketing (*e.g.* restrictions on interregional commodity flows); various exemptions from the general trade regime (*e.g.* import/export duty preferences granted to specific traders), etc. The impacts of some of these measures can only be captured through the gap between domestic and world prices. This gap also includes the tax (or subsidy) on producers created by infrastructural and institutional impediments to price arbitrage. Therefore, domestic-to-international price comparisons, expressed in the form of effective tariff, can reveal a picture of distortions which may contrast with what the statutory (formal) trade tariffs might suggest.

Figures 3 and 4 show the statutory and effective tariffs for selected agricultural commodities in Russia and Romania. For Russia, the statutory tariff corresponds to the weighted average of the MFN import duty rate[12] set for non-CIS countries and a zero rate applied to imports originating in the CIS[13]. For Romania, a WTO member subjected to the URAA market access discipline, the statutory tariff represents an average of the applied in- and over-quota *ad valorem* MFN import duty weighted by actual in- and over-quota trade values.

By way of general policy context, it is worth noting that by 1995 Russia had discontinued price administration at the federal level and since then border protection has been the only explicit federal policy providing market price support. In Romania, agricultural prices were fully liberalised in 1997. Before 1997 wheat, pigmeat and poultry were subjected to administered pricing. Between 1997 and 1998, no specific domestic price support measures were applied for these three products, but since 1999 they have benefited from export subsidies (the latter are also provided for exports of maize).

A comparison of the statutory and effective tariffs reveals considerable differences both in Russia and Romania. These differences concern not only the tariff scales, but in many cases, also their direction.

In Russia, despite some moderate formal import protection for grains (at about 3%) and beef (about 8%), producers are, nevertheless, effectively taxed (Figure 3: A, B, and D). This clearly indicates that there are other strong forces at work determining actual producer protection levels. Most obvious is the high transactions costs and infrastructural handicaps impeding the price arbitrage through exports and thus preventing producer prices from reaching higher levels. Another important impact originates from the actions of some regional authorities, which also contribute to dampening producer prices.

12. *Ad valorem* MFN rate, or, where applicable, specific MFN tariff converted into an *ad valorem* equivalent.

13. Russia is a member of the free-trade zone of the countries of the Commonwealth of Independent States (the CIS).

Until recently, there were many incidences of regional bans on commodity outflows and regional price interventions in Russia, especially in the grain sector. Regional authorities typically explained such measures by the concern for "regional food security". These actions have often taken non-transparent administrative forms and most likely served to depress producer prices. A similar profile of formal and effective protection can be observed in Romania. Thus, with quite high statutory import tariffs, the measured price wedges for sunflower, beef, and, between 1995 and 1997, for grains and pigmeat point to effective producer taxation (Figure 4: A, B, C, and E). Most likely, infrastructural and institutional weaknesses have the major role to play here as well. The impacts of various regional and bilateral import concessions (for example, Romania's trade with the European Union and CEFTA countries) are highly probable too (effectively, this amounts to an under-recording of the appropriate statutory tariff). Also, in the case of wheat and pigmeat, price regulations applied for these products up to 1997 evidently restrained producer prices. Following the 1997 price liberalisation, effective tariffs for wheat and maize became positive, however, tending to remain below the formal border protection levels.

There are also examples when effective protection is higher than the formal import tariff. One example is poultry in Russia, where there are no explicit domestic market price support policies. Possible causes of a higher effective tariff are monopolistic practices (for example among importers), and non-tariff import barriers. However, it would require a comprehensive market study in order to establish the exact cause. The benefit of the PSE is that it helps identify potential areas of attention for policy analysts and policymakers.

Conclusions

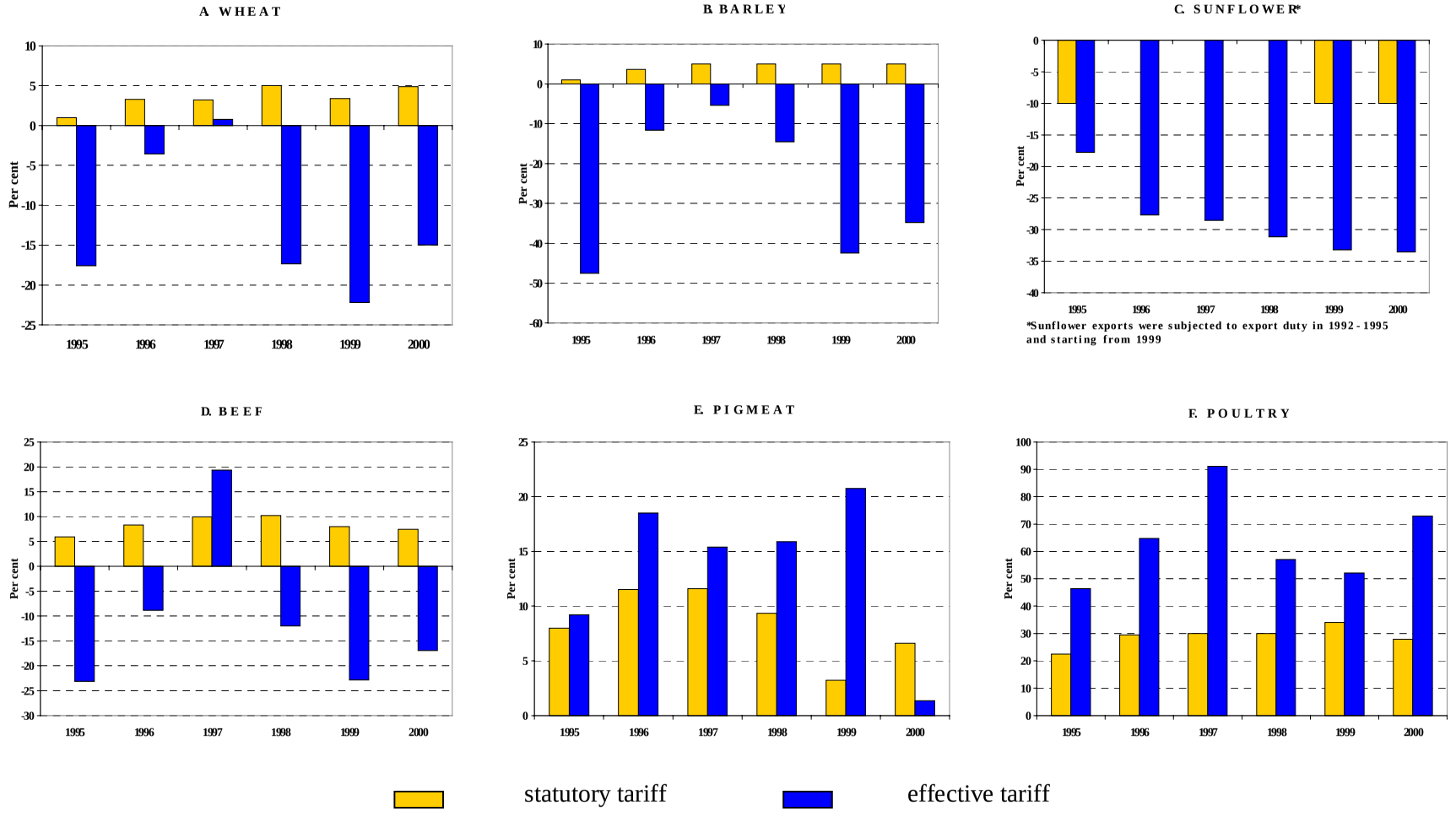
PSE and CSE analysis indicates that the first decade of transition brought about a notable overall reduction of distortions in the agricultural sectors of transition economies. Estimated market price and budgetary transfers, which in the majority of monitored economies constituted over two-thirds of producer gross receipts before the transition, fell to less than 20% towards the end of the 1990s. However, despite relatively low levels of support, this support is more burdensome to transition economies than the higher agricultural support in most OECD members. Moderate PSE levels on average mask strong variations of support across commodities. Distorted prices remain the principle source of overall transfers to or from producers and consumers.

Transition countries have undergone periods of sharp macroeconomic adjustments, and suffer from inherent structural and institutional deficiencies. This suggests that in many of these countries currently applied agricultural measures are clearly not the only important source of transfers to (from) producers. The latter are also due to substantial structural and institutional impediments to transmission between external and domestic markets. These impediments, however, have a strong policy component and are largely attributed to the legacy of the past command economy policies or, in a more recent period, to the failure of current policies to induce efficient market institutions. As transition countries progress towards a more stable macro-economic environment and developed market institutions, measured support would to a smaller degree incorporate the effects of imperfect price transmission associated with the handicaps of the transition phase. Although the markets and market institutions are not yet sufficiently developed, it is clear that during the past decade all transition countries have shifted fundamentally away from being planned economy and this process is expected to carry on. It is also evident that the speed of market reforms has been, and will continue to be, uneven between transition economies. These differences in the pace of market transformation should also be borne in mind when interpreting and comparing the agricultural support estimates across the transition countries and across their commodity sectors.

PSEs/CSEs being “flexible, reasonably comprehensive, easily explained measures” (Josling and Tangermann 1989), have proven to be useful tools for monitoring the overall developments in the agricultural sectors of non-OECD economies. These estimates help provide an understanding of the scale of agricultural market distortions and the cost of these distortions to food consumers and taxpayers. PSEs/CSEs are indicative of the need for reform and indicate critical areas in which reforms should focus. This is particularly relevant for transition countries, which are fundamentally reforming their agro-food sectors and continuously developing their reform agendas.

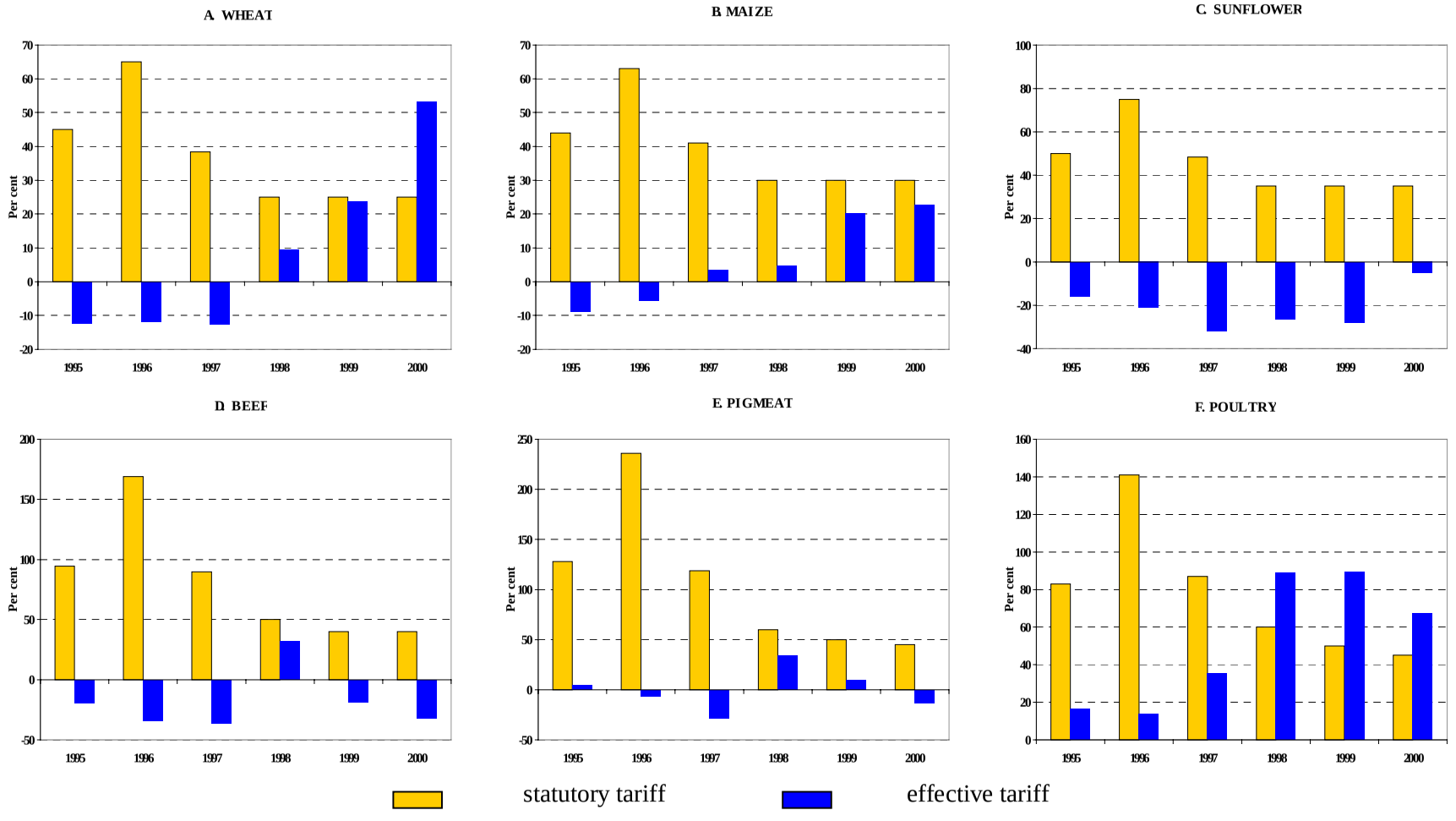
Like any indicator, the PSE cannot answer all questions. Most importantly, it cannot be regarded as a measure of producer incomes. While quantifying monetary transfers to producers from consumers and taxpayers, the PSE does not measure what effect these transfers have on farmers’ incomes. Some part of these transfers would be offset by the loss in producer income due to inefficiencies in resource use induced by the support; some part would be retained by other agents, *e.g.* input suppliers; some part would be lost as an administration cost. The linkages between the transfers to producers as measured by PSEs, and producer incomes, are therefore quite complex. The policy effects are especially difficult to estimate in transition and developing economies due to specific and evolving institutional and structural properties of their agro-food sectors. It is therefore important to complement PSEs by other analytical instruments, in particular, economic models that capture the diverse interactions in the economy and help explain the various effects of policies applied. The OECD applies such a combined approach, complementing its PSE/CSE analysis with studies of transfer efficiency and the decoupling of agricultural policies. This type of analysis has so far been done for member countries but could potentially be extended to transition and developing countries.

Figure 3. **Russia: Statutory and effective tariffs for selected agricultural commodities, 1995-2000**



Source: OECD Secretariat's calculations based on "Customs Tariff of the Russian Federation" and OECD PSE/CSE database.

Figure 4. **Romania: Statutory and effective tariffs for selected agricultural commodities, 1995-2000**



Source: OECD Secretariat's calculations based on Agricultural Market Access Database (AMAD) and OECD PSE/CSE database.

ANNEX I. DEFINITIONS OF THE OECD INDICATORS OF SUPPORT

Producer Support Estimate (PSE): an indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm-gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income. The overall PSE monetary value depends on the size and structure of a country's agricultural sector, as well as on the monetary unit used. Support (PSE) expressed in relation to the number of farmers or area of farmland is influenced by differences among countries in factor endowment and the number, type, and size of farm holdings. By contrast, support expressed as a percentage of gross farm receipts (%PSE) shows the amount of support to farmers, irrespective of the sectoral structure of a given country. For this reason, the %PSE is the most widely used indicator for comparisons of support across countries, commodities and time.

Producer Nominal Protection Coefficient (NPCp): an indicator of the nominal rate of protection for producers measuring the ratio between the average price received by producers (at farm gate), including payments per tonne of current output, and the border price (measured at farm gate level).

Producer Nominal Assistance Coefficient (NACp): an indicator of the nominal rate of assistance to producers measuring the ratio between the value of gross farm receipts including support and gross farm receipts valued at world market prices without support.

Consumer Support Estimate (CSE): an indicator of the annual monetary value of gross transfers to (from) consumers of agricultural commodities, measured at the farm-gate level, arising from policy instruments that support agriculture, regardless of their nature, objectives or impacts on consumption of farm products. If negative, the CSE measures the implicit burden placed on consumers by agricultural policies, from higher prices and consumer charges or subsidies that lower prices to consumers. The %CSE measures the implicit tax (or subsidy, if CSE is positive) on consumers due to agricultural policy as a share of expenditure at the farm gate.

Consumer Nominal Protection Coefficient (NPCc): an indicator of the nominal rate of protection for consumers measuring the ratio between the average price paid by consumers (at farm gate) and the border price (measured at farm gate level).

Consumer Nominal Assistance Coefficient (NACc): an indicator of the nominal rate of assistance to consumers measuring the ratio between the value of consumption expenditure on agricultural commodities domestically produced including support to producers and that valued at world market prices without support to consumers.

General Services Support Estimate (GSSE): an indicator of the annual monetary value of gross transfers to general services provided to agriculture collectively, arising from policy measures which support agriculture regardless of their nature, objectives and impacts on farm production, income, or consumption of farm products. When expressed as a percentage of TSE (the %GSSE), it gives an indication of the importance of support to general services provided to agriculture, such as research, marketing and promotion, and infrastructure, in the total support to agriculture (TSE).

Total Support Estimate (TSE): an indicator of the annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support agriculture, net of the associated budgetary receipts, regardless of their objectives and impacts on farm production and income, or consumption of farm products. When expressed as a percentage of GDP (the %TSE), it gives an indication of the burden this overall support represents for the economy.

ANNEX II. CLASSIFICATION OF POLICY MEASURES INCLUDED IN THE OECD INDICATORS OF SUPPORT

I. **Producer Support Estimate (PSE)** [**Sum of A to H**]

A. Market Price Support
1. Based on unlimited output
2. Based on limited output

B. Payments based on output
1. Based on unlimited output
2. Based on limited output

C. Payments based on area planted/animal numbers
1. Based on unlimited area or animal numbers
2. Based on limited area or animal numbers

D. Payments based on historical entitlements
1. Based on historical plantings/animal numbers or production
2. Based on historical support programmes

E. Payments based on input use
1. Based on use of variable inputs
2. Based on use of on-farm services
3. Based on use of fixed inputs

F. Payments based on input constraints
1. Based on constraints on variable inputs
2. Based on constraints on fixed inputs
3. Based on constraints on a set of inputs

G. Payments based on overall farming income
1. Based on farm income level
2. Based on established minimum income

H. Miscellaneous payments
1. National payments
2. Sub-national payments

II. General Services Support Estimate (GSSE) [**Sum of I to O**]

I. Research and development
J. Agricultural schools
K. Inspection services
L. Infrastructure
M. Marketing and promotion
N. Public stockholding
O. ***Miscellaneous***

III. Consumer Support Estimate (CSE) [**Sum of P to S**]

P. Transfers to producers from consumers
Q. Other transfers from consumers
R. Transfers to consumers from taxpayers
S. Excess Feed Cost

IV. Total Support Estimate (TSE) [**I + II + R**]

T. Transfers from consumers
U. Transfers from taxpayers
V. Budget revenues

ANNEX III. ESTIMATES OF SUPPORT TO AGRICULTURE BY COUNTRY, 1991-2001

	Units	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000e	2001p
Bulgaria												
PSE	mn BGL	-17	-23	-2	-26	-41	-188	-489	96	-68	23	141
	mn USD	-957	-997	-82	-482	-618	-1055	-291	54	-37	11	64
GSSE	mn USD	31	28	68	23	22	13	11	4	6	5	5
TSE	mn USD	-925	-961	-10	-457	-586	-1042	-280	58	-32	16	69
	% GDP	-11.8	-11.2	-0.1	-4.7	-4.5	-10.6	-2.7	0.5	-0.3	0.1	0.5
Percentage PSE	**%**	**-40**	**-45**	**-4**	**-27**	**-25**	**-55**	**-10**	**2**	**-2**	**1**	**3**
Producer NPC		**0.66**	**0.64**	**0.93**	**0.73**	**0.74**	**0.61**	**0.91**	**1.01**	**0.95**	**1.00**	**1.02**
Producer NAC		**0.72**	**0.69**	**0.96**	**0.79**	**0.80**	**0.65**	**0.91**	**1.02**	**0.98**	**1.01**	**1.03**
Estonia												
PSE	mn EEK[1]	2 977	-3 196	-1 504	-557	14	485	433	1 432	372	481	833
	mn USD	1 707	-265	-114	-43	1	40	31	102	25	28	48
GSSE	mn USD	34	6	10	10	18	13	11	13	13	9	6
TSE	mn USD	1 790	-254	-104	-32	19	54	42	115	38	37	54
	% GDP	n.c.	-23.3	-6.2	-1.4	0.5	1.2	0.9	2.2	0.7	0.7	1.0
Percentage PSE	**%**	**59**	**-89**	**-32**	**-10**	**0**	**7**	**6**	**20**	**6**	**7**	**13**
Producer NPC		**4.32**	**0.51**	**0.74**	**0.89**	**1.01**	**1.07**	**1.07**	**1.19**	**0.99**	**0.99**	**1.03**
Producer NAC		**2.42**	**0.53**	**0.76**	**0.91**	**1.00**	**1.07**	**1.06**	**1.25**	**1.07**	**1.08**	**1.15**
Latvia												
PSE	mn LVL[2]	6 487	-93 321	-153	24	19	12	19	72	64	46	54
	mn USD	11 184	-686	-226	43	37	22	32	121	109	76	86
GSSE	mn USD	1 666	7	6	11	17	13	10	19	32	31	29
TSE	mn USD	13 508	-679	-220	53	53	35	42	140	141	106	115
	% GDP	n.c.	n.c.	-10.2	1.5	1.2	0.7	0.7	2.3	2.1	1.5	1.5
Percentage PSE	**%**	**70**	**-143**	**-40**	**7**	**5**	**3**	**5**	**20**	**22**	**15**	**16**
Producer NPC		**12.71**	**0.39**	**0.69**	**1.04**	**1.01**	**1.01**	**1.04**	**1.18**	**1.21**	**1.13**	**1.11**
Producer NAC		**3.28**	**0.41**	**0.71**	**1.07**	**1.05**	**1.03**	**1.05**	**1.24**	**1.28**	**1.18**	**1.19**
Lithuania												
PSE	mn LTL[3]	-31 937	-120 631	-1 456	-607	1	45	288	1 007	885	314	547
	mn USD	-918	-733	-335	-153	0	11	72	252	221	79	137
GSSE	mn USD	10	13	18	40	43	52	60	51	52	54	37
TSE	mn USD	-907	-720	-317	-112	43	63	132	305	276	138	174
	% GDP	n.c.	-37.4	-11.9	-2.6	0.7	0.8	1.4	2.8	2.6	1.2	1.5
Percentage PSE	**%**	**-262**	**-124**	**-37**	**-15**	**0**	**1**	**4**	**16**	**16**	**6**	**11**
Producer NPC		**0.25**	**0.42**	**0.71**	**0.81**	**0.98**	**0.98**	**1.04**	**1.19**	**1.25**	**1.06**	**1.10**
Producer NAC		**0.28**	**0.45**	**0.73**	**0.87**	**1.00**	**1.01**	**1.04**	**1.19**	**1.20**	**1.07**	**1.12**
Romania												
PSE	bn ROL	114	184	1 234	3 427	2 557	4 499	2 626	31 050	26 235	31 103	65 999
	mn USD	1 490	598	1 624	2 070	1 258	1 459	366	3 498	1 711	1 433	2 270
GSSE	mn USD	212	105	148	157	245	138	147	194	126	122	73
TSE	mn USD	1 853	1 218	2 163	2 412	1 877	1 986	585	3 693	1 837	1 555	2 344
	% GDP	6.4	6.2	8.2	8.0	5.3	5.6	1.7	8.8	5.2	4.2	6.1
Percentage PSE	**%**	**15**	**8**	**16**	**19**	**10**	**12**	**3**	**30**	**20**	**19**	**24**
Producer NPC		**1.23**	**1.03**	**1.30**	**1.18**	**1.04**	**1.05**	**1.01**	**1.40**	**1.29**	**1.26**	**1.32**
Producer NAC		**1.18**	**1.09**	**1.19**	**1.24**	**1.11**	**1.13**	**1.03**	**1.43**	**1.25**	**1.24**	**1.31**
Russia												
PSE	mn RUR	153	-2 788	-5 248	-7 308	29 283	63 008	78 267	50 409	19 526	47 168	72 051
	mn USD	87 726	-14 486	-5 631	-3 316	6 430	12 297	13 529	5 192	793	1 677	2 468
GSSE	mn USD	4 802	380	620	1 003	788	762	3 979	469	442	411	334
TSE	mn USD	124 547	-13 721	-4 594	-2 114	7 218	13 058	17 508	5 662	1 235	2 087	2 801
	% GDP	n.c.	-13.9	-2.5	-0.8	2.1	3.0	3.9	2.0	0.6	0.8	0.9
Percentage PSE	**%**	**60**	**-94**	**-24**	**-13**	**17**	**26**	**30**	**19**	**4**	**8**	**10**
Producer NPC		**3.88**	**0.40**	**0.61**	**0.71**	**1.02**	**1.19**	**1.34**	**1.15**	**0.96**	**1.00**	**1.03**
Producer NAC		**2.50**	**0.52**	**0.80**	**0.88**	**1.20**	**1.34**	**1.43**	**1.23**	**1.04**	**1.08**	**1.11**
Slovenia												
PSE	mn SIT	n.c.	19 858	18 979	27 995	38 537	35 275	43 304	59 946	68 829	62 574	70 949
	mn USD	n.c.	189	143	184	252	208	240	322	355	305	327
GSSE	mn USD	n.c.	263	184	237	349	284	304	397	418	312	323
TSE	mn USD	n.c.	203	158	200	270	227	269	354	393	338	361
	% GDP	n.c.	2.1	1.5	1.6	1.9	1.5	1.7	2.0	2.2	1.7	1.7
Percentage PSE	**%**	**n.c.**	**32**	**25**	**29**	**35**	**27**	**32**	**42**	**49**	**39**	**40**
Producer NPC		**n.c.**	**1.47**	**1.37**	**1.45**	**1.51**	**1.34**	**1.40**	**1.68**	**1.86**	**1.52**	**1.47**
Producer NAC		**n.c.**	**1.47**	**1.33**	**1.42**	**1.53**	**1.37**	**1.47**	**1.73**	**1.94**	**1.65**	**1.67**

ANNEX III. ESTIMATES OF SUPPORT TO AGRICULTURE BY COUNTRY, 1991-2001
(continued)

	Units	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000e	2001p
Czech Republic												
PSE	mn CZK	69 946	38 986	36 637	25 093	24 656	26 221	7 937	31 890	29 348	20 567	22 248
	mn USD	2 373	1 379	1 257	872	929	966	250	988	849	532	585
GSSE	mn USD	36	35	35	116	119	124	110	106	104	105	101
TSE	mn USD	2 409	1 414	1 292	988	1 048	1 090	360	1 093	953	638	689
	% GDP	8.7	4.4	3.6	2.4	2.0	1.9	0.7	1.9	1.7	1.3	1.2
Percentage PSE	**%**	**53**	**32**	**29**	**21**	**20**	**19**	**6**	**23**	**24**	**16**	**17**
Producer NPC		**2.30**	**1.48**	**1.43**	**1.24**	**1.13**	**1.12**	**0.99**	**1.24**	**1.18**	**1.06**	**1.06**
Producer NAC		**2.12**	**1.48**	**1.41**	**1.27**	**1.26**	**1.24**	**1.06**	**1.30**	**1.31**	**1.19**	**1.20**
Hungary												
PSE	mn HUF	54 683	73 479	92 963	124 115	93 832	104 533	67 195	227 638	272 819	257 393	166 272
	mn USD	731	930	1 011	1 181	746	685	360	1 062	1 151	912	580
GSSE	mn USD	73	84	87	90	95	122	92	171	235	226	128
TSE	mn USD	851	1 014	1 099	1 270	842	807	452	1 234	1 390	1 143	708
	% GDP	2.5	2.7	2.8	3.0	1.9	1.8	1.0	2.6	2.9	2.5	1.4
Percentage PSE	**%**	**12**	**18**	**20**	**22**	**13**	**10**	**6**	**19**	**23**	**20**	**12**
Producer NPC		**1.06**	**1.11**	**1.24**	**1.20**	**1.03**	**1.01**	**0.95**	**1.11**	**1.17**	**1.12**	**1.01**
Producer NAC		**1.13**	**1.21**	**1.25**	**1.28**	**1.15**	**1.11**	**1.07**	**1.24**	**1.30**	**1.25**	**1.13**
Poland												
PSE	mn PLN	-59	117	2 819	5 097	4 736	7 088	6 566	12 404	10 245	4 335	5 928
	mn USD	-56	86	1 554	2 243	1 953	2 629	2 004	3 552	2 584	997	1 447
GSSE	mn USD	250	247	235	212	184	240	246	243	193	222	345
TSE	mn USD	198	335	1 791	2 457	2 140	2 874	2 253	3 799	2 782	1 224	1 797
	% GDP	0.3	0.4	2.1	2.5	1.7	2.0	1.6	2.4	1.8	0.8	1.0
Percentage PSE	**%**	**-1**	**1**	**11**	**17**	**11**	**13**	**12**	**22**	**19**	**7**	**10**
Producer NPC		**0.91**	**0.97**	**1.12**	**1.17**	**1.09**	**1.19**	**1.15**	**1.31**	**1.24**	**1.11**	**1.07**
Producer NAC		**0.99**	**1.01**	**1.13**	**1.20**	**1.12**	**1.16**	**1.14**	**1.28**	**1.24**	**1.08**	**1.11**
Slovakia												
PSE	mn SKK	24 755	15 884	17 918	16 782	8 585	1 428	7 610	20 980	16 078	15 492	7 319
	mn USD	840	562	623	524	289	47	226	595	389	335	151
GSSE	mn USD	89	71	54	62	67	59	55	56	48	39	34
TSE	mn USD	929	633	677	586	356	106	281	652	437	374	186
	% GDP	n.c.	n.c.	5.0	4.0	1.9	0.5	1.4	3.1	2.2	1.9	0.9
Percentage PSE	**%**	**41**	**30**	**34**	**29**	**14**	**2**	**11**	**31**	**25**	**23**	**11**
Producer NPC		**1.41**	**1.18**	**1.29**	**1.24**	**1.09**	**0.97**	**1.02**	**1.26**	**1.20**	**1.11**	**1.01**
Producer NAC		**1.70**	**1.42**	**1.53**	**1.40**	**1.16**	**1.02**	**1.12**	**1.45**	**1.34**	**1.31**	**1.12**
European Union												
PSE	mn Euro	113 165	95 487	95 190	94 761	96 123	91 727	92 664	102 330	108 241	97 244	103 937
	mn USD	139 873	123 578	111 497	112 400	125 659	116 435	105 016	114 447	115 330	89 617	93 083
GSSE	mn USD	18 232	18 780	11 362	11 417	9 349	13 596	14 307	10 569	10 346	9 193	9 017
TSE	mn USD	164 216	149 202	129 205	129 480	140 464	134 463	124 085	129 435	129 857	102 403	105 624
	% GDP	2.3	1.9	1.8	1.7	1.8	1.6	1.6	1.6	1.6	1.4	1.4
Percentage PSE	**%**	**44**	**38**	**37**	**35**	**35**	**32**	**32**	**36**	**39**	**34**	**35**
Producer NPC		**1.81**	**1.56**	**1.48**	**1.39**	**1.36**	**1.27**	**1.29**	**1.40**	**1.47**	**1.33**	**1.33**
Producer NAC		**1.78**	**1.62**	**1.59**	**1.54**	**1.53**	**1.46**	**1.47**	**1.57**	**1.63**	**1.51**	**1.54**
OECD												
PSE	mn USD	291 792	279 671	273 941	282 231	271 176	254 088	231 796	256 704	272 563	241 599	230 744
GSSE	mn USD	65 768	69 308	67 432	66 510	70 770	68 904	64 163	59 595	57 448	53 943	53 838
TSE	mn USD	383 018	377 638	370 920	378 260	371 098	351 940	325 041	343 826	356 629	321 104	310 959
	% GDP	2.0	1.8	1.8	1.7	1.6	1.5	1.4	1.5	1.4	1.3	1.3
Percentage PSE	**%**	**37**	**35**	**35**	**34**	**31**	**29**	**28**	**33**	**35**	**32**	**31**
Producer NPC		**1.55**	**1.48**	**1.45**	**1.41**	**1.34**	**1.28**	**1.28**	**1.36**	**1.41**	**1.34**	**1.31**
Producer NAC		**1.60**	**1.54**	**1.54**	**1.52**	**1.45**	**1.40**	**1.39**	**1.48**	**1.54**	**1.47**	**1.45**

p: provisional; e: estimate; n.c.: not calculated.

1. Rubles for 1991.

2. Rubles for 1991 and 1992.

3. Rubles for 1991.

Source: OECD, PSE/CSE database.

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THE TRANSMISSION OF WORLD PRICE SIGNALS: THE CONCEPT, ISSUES AND SOME EVIDENCE FROM ASIAN CEREAL MARKETS

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Abstract

Price transmission from the world to domestic markets is one of the key building blocks of global agricultural trade models designed to quantify the impact of trade liberalisation. It is in this context that this paper analyses price transmission mechanisms and draws some conclusions. First, there is some confusion on the usage of the term. Price transmission may be complete in an absolute sense but this is not equivalent to assuming a value of unity for the elasticity, which is, for full transmission, less than unity in the import case and greater than unity in the export case. Second, it is very unlikely that price transmission in real life even in an absolute sense is full or complete, for a number of reasons such as border and domestic policy interventions, non-competitive market structures and measurement errors. Third, the review of past studies as well as some fresh estimates for Asian cereal markets indicate that short-run transmission elasticities are more likely to be on the lower side, typically in the range of 0.2 to 0.4. Fourth, although the paper focuses on Asia, this conclusion applies to a majority of other developing countries too. Fifth, lack of sound analyses of the price transmission process for developing countries limits the ability of global trade models to quantify results on the impact of trade liberalisation on these economies. Finally, the paper discusses some trade policy issues, focussing on the role of the WTO bound tariff in price transmission. Until the time the developing countries are able to resort to other (and more efficient) instruments to safeguard the interest of producers and consumers, tariffs will continue to be used to respond to external price shocks and so price transmission will remain incomplete for some time.

1. Introduction

The economics of market integration and price transmission has been the basis for several useful applications. For example, many studies have been undertaken within this framework to test the hypothesis of the Law of One Price. The concept and the analytical technique has also been used to evaluate reform programmes, e.g. before-after comparisons of the degree of market integration in the context of the implementation of the structural adjustment programmes and more recently of the Uruguay Round Agreement. A rapidly growing area of application is the study of the integration of domestic markets, popularised by *inter alia* Ravallion (1986). The integration of vertical market segments, e.g. farm to wholesale to retail levels, is also analysed within this framework. And lastly, price transmission mechanism features prominently in all global agricultural trade models.

The focus of this paper is on world to domestic transmission of price changes in the context of the quantification of the impact of global agricultural trade liberalisation. Price transmission mechanisms or/and elasticity values are one of the key building blocks of these models, and play an important role

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in determining the magnitude of the impact. Given the increasing use of these models to address sensitive policy issues, e.g. trade liberalisation and the distribution of benefits and costs across countries and population groups, there is an urgency to review the parameters used in these models and fine-tune them for further applications.

The rest of the paper is divided into four sections. Section 2 introduces the conceptual framework for analysing price transmission, and illustrates how particular values of the transmission elasticity do matter for impact assessment. Section 3 makes a selective review of the literature on estimates of price transmission elasticities. The focus is on the size of the elasticities and issues raised by them. Section 4 presents fresh estimates of world to domestic price transmission elasticities for selected Asian cereal markets and discusses the policy environment in these markets. Section 5 concludes.

2. Conceptualising the mechanism of price transmission

A framework for determining farm-gate parity prices of tradables

Most agricultural products are tradables. For small countries, *i.e.* price takers in the world market, domestic prices are assumed to be determined by world market prices. The framework for the analysis of price transmission and the measurement of elasticity follows from the following expressions for import and export parity prices.

Import parity price at the farm level is defined as:

$$P^{M}_{farm} = (P_{world} + C_{freight}) * E * (Tax_{m}) + C_{transp} \qquad (1)$$

Similarly, export parity price is:

$$P^{X}_{farm} = (P_{world} - C_{freight}) * E * (Tax_{x}) - C_{transp} \qquad (2)$$

where, P^{M}_{farm} and P^{X}_{farm} are import and export parity prices at the farm level, P_{world} is f.o.b. world price, $C_{freight}$ is international freight cost, E is exchange rate, Tax_{m} and Tax_{x} are *ad valorem* import and export taxes, expressed in the form of (1+t) and (1-t), where t is the applied tariff so that if t=20%, Tax_{m} is 1.2 and Tax_{x} is 0.8. C_{transp} is domestic marketing cost (*e.g.* between the border and farm).[1]

Rearranging terms in equations (1) and (2), one obtains (3) and (4) where the terms that do not vary with world prices are separated:

$$P^{M}_{farm} = \{ C_{transp} + C_{freight} * E * Tax_{m} \} + \{E * Tax_{m} \}* P_{world} \qquad (3)$$

$$P^{X}_{farm} = \{ - C_{transp} - C_{freight} * E * Tax_{x} \} + \{E * Tax_{x} \}* P_{world} \qquad (4)$$

In these equations, domestic and world prices are related in a linear form, e.g. $P_{d} = a + b\ P_{w}$, where the term "a" is a constant, i.e. does not vary with the world price. If there are some other costs that do not vary with the world price, these can also be incorporated in "a".

1. Note that transaction costs are added in the case of import parity price and subtracted in the case of export parity price.

Transmission of world price changes in absolute and proportional terms

A great deal of confusion about the concept of price transmission results from not distinguishing clearly price transmission in *absolute* and *proportional* terms. To illustrate this point numerically, equations (5) and (6) were derived by assuming some values for the parameters in equations (3) and (4), as follows: $C_{freight}$ = USD 30, E = Rs10/USD, Tax_m = 1.2 (20% tariff), Tax_x = 0.80 (= 1-t, t = 20% export tax) and C_{transp} = Rs 200.

$$P^M_{farm} = 560 + 12\ P_{world} \quad (5)$$

$$P^X_{farm} = -440 + 8\ P_{world} \quad (6)$$

With assumed P_{world} of \$100 for some period, one obtains P^M_{farm} of Rs1 760 and P^X_{farm} of Rs360. Now, if the world price rises by 10% in the next period to USD 110, then the new P^M_{farm} is Rs1 880 and P^X_{farm} is Rs440. The change in the domestic price, in *absolute* term, is Rs120 (20% tariff on USD 10 rise in world price times the exchange rate) in the import case and Rs80 in the export case. The transmission is complete or perfect in an absolute sense because the full amount of the rise in the world price is passed on to the farm level (that in real life transmissions are unlikely to be complete even in an absolute sense is discussed below).

The *elasticity of price transmission*, on the other hand, refers to the price change in a proportional sense. This is defined like any other elasticity - percentage change in domestic price divided by percentage change in world price. In the above example, in the import case, the change in the domestic price following a 10% rise in world price was from Rs1 760 to Rs1 880, which is a 6.8% change. This, divided by 10%, gives an elasticity of 0.68, which is less than unity despite the complete pass-through of the price change in absolute terms. In the export case, the change in the domestic price (from Rs360 to Rs440) is 22%, which gives an elasticity of 2.2, greater than unity. The larger the constant term (*e.g.* high transport and marketing costs), the lower the elasticity from unity in the import case, and further higher from unity in the export case. The elasticity values are invariant to the size of the change in world price – a 20% rise in the world price, for example, gives the same elasticity – nor to the assumed exchange rate, as long as these remain constant. In some global trade models, and in common usage, the word price transmission is used in a rather loose sense without indicating if the assumption made (*e.g.* perfect transmission) is in an absolute or a proportional sense. A fairly common practice is to assume an elasticity value of unity to indicate complete price transmission. This would be incorrect because as noted above the true value of the elasticity, for complete transmission, is less than unity in the import case and greater than unity in the export case. The assumption (perfect transmission) would be correct only if the transmission expression in the model is such that changes in world market prices are fully transmitted in an absolute sense, but even then the implied elasticity can not be unity.[2]

On the question asked above, i.e. are world price changes in *real life* likely to be transmitted fully to the farm or consumer level even in an absolute sense, the answer is - very unlikely. Although in theory there is no reason why transmissions can not be perfect, there are good reasons why this is rarely the case in practice even when estimation is flawless. The main reasons can be categorised into three groups: trade and domestic policies; market structure; and measurement errors.[3] First, trade and domestic policies often weaken the relationship between domestic and world prices. A variable levy

2. An elasticity of unity would imply perfect transmission in a proportional sense only when the constant terms in equations (3) and (4) are zero, which is possible only if *both* C_{transp} and $C_{freight}$ are zero, which is unlikely to be the case in real life.

3. Colman (1985, 1992 and 1995) and Westlake (1987) provide many insights on this.

scheme is a classic example, but even where there is no such scheme in a formal sense (especially now with the Uruguay Round) the practice of varying tariffs in response to changes in world market prices seems to be a rule rather than exception (see section 3 on the Asian experience). Domestic market interventions, such as price support measures and open market operations to stabilise domestic prices, also weaken the link. Policy interventions are fairly common especially for staple foods. Second, on market structure, it is possible that marketing agents in the long chain from the export point to farm level do not pass the full change in the price to lower levels for strategic trade or marketing reasons. Where market structures are not competitive, price changes may not be transmitted fully. The third category of reasons is measurement errors. These include many things: poor quality of the data, differences in quality and variety of the products related, and econometric problems (*e.g.* whether or not factors such as seasonality, structural breaks, autocorrelation and asymmetry are appropriately taken into account). Thus, altogether, there are many reasons for price transmission to be incomplete, and ultimately it is the empirical estimate that provides the answer and not the theory.

A practical question here is what difference does it make in modelling works to assume a low or high elasticity? To answer this, Table 1 reports some results from a simple comparative static equilibrium exercise. Although somewhat simplified from a fully specified multi-market model, the difference can be striking. For example, with an elasticity of 0.1, there is virtually no impact on production and trade of an assumed 10% rise in the world price of wheat, say following global trade liberalisation. By contrast, an elasticity of unity results, for example for Pakistan, into a reduction of imports of wheat from over 2 million tonnes in the base case to virtually zero. The difference is still about 1 million tonnes of imports between the more commonly used elasticity values of 0.5 and 1. Thus, depending on what elasticity is used, one could conclude that trade liberalisation has a significant positive impact on developing country agriculture (*e.g.* reduced imports, increased production and self-sufficiency rate), or that there is little impact. Indeed, different assumptions about the elasticities were one of the reasons why models showed different impact of the Uruguay Round Agreement on Agriculture on world market prices, agriculture and incomes (see Sharma et al., 1996 for a review of such studies, and OECD 2001 for a recent application).

Table 1. **An example of the impact of a 10% rise in the world price of wheat for alternative values of price transmission elasticity**

		Unit	Tunisia	Pakistan	Ecuador
Production	Base level	'000 mt	3445	35226	487
	et = 0.1	% change from base	0.5	0.4	0.9
	et = 0.5	% change from base	2.5	2.0	4.3
	et = 1.0	% change from base	5.1	4.1	8.9
Consumption	Base level	'000 mt	4523	37587	942
	et = 0.1	% change from base	-0.2	-0.2	-0.3
	et = 0.5	% change from base	-0.9	-1.2	-1.4
	et = 1.0	% change from base	-1.9	-2.4	-2.8
Imports	Base level	'000 mt	1079	2361	456
	et = 0.1	% change from base	-2.5	-9.8	-1.7
	et = 0.5	% change from base	-12.1	-49.0	-7.8
	et = 1.0	% change from base	-24.2	-98.4	-15.5

Note: "et" is assumed elasticity of price transmission. The impacts were computed on the basis of the base year values and elasticities of demand and supply (respectively, -0.20 and 0.52 for Tunisia, -0.25 and 0.42 for Pakistan and -0.30 and 0.89 for Ecuador). These numbers are from the ATPSM model data base.

Source: Author's calculation.

To conclude the section on the definition of market integration, it is worthwhile to note a fundamental point made by Barrett and Li (2002) that *market integration* does not equate to *competitive spatial equilibrium* as understood in the Enke-Samuelson-Takayama-Judge tradition. Barret and Li define market integration as a phenomenon that reflects the tradability of products between spatially distinct markets, irrespective of the existence or absence of spatial market equilibrium. Competitive market equilibrium is defined as a state in which extraordinary profits are exhausted by competitive pressures to yield efficient allocations, regardless of whether this results in physical trade flows between markets. They find that traditional spatial market analysis methods confuse these two concepts. The problem lies, to a large extent, on analysts using only price data to study spatial market relationships while to properly identify integration and equilibrium one would need information on trade flow as well as transfer costs. They claim that their analytical method (distinguishing between integration and equilibrium) and application (integration of soybean meal markets in the Pacific Rim) is the first published work using data on all three variables, i.e. prices, trade volumes and transfer costs. Although highly desirable that one uses all three variables to study market integration, most analysts are left with little choice but to use only price series for estimation due to a lack of data.

3. Review of selected studies on price transmission

Despite the fact that the concepts of market integration and price transmission are relatively straightforward to understand, the estimation of the price transmission elasticity is fraught with difficulties. The numbers are like slippery fish, very hard to pin down accurately for reasons discussed above (para 7). Interpreting the numbers is also not simple, as this requires good information about the policy regime, natural protection and trade flows. One good way to visit some of these issues would be to review some selected studies and estimates. This is the purpose of this section.

In order to facilitate the review, Annex 1 presents an overview of the econometric technique for quantifying price transmission, in particular the Engle-Granger procedure.

The Mundlak-Larson and Quiroz-Soto studies

Mundlak and Larson (1992) and Quiroz and Soto (1996) are important works in this area in view of their comprehensive coverage of countries (58 and 78 countries, respectively) and interesting analytical and policy issues raised. Both measure price transmission from the world to producer levels using FAO's annual producer price data (for 1968-78 by M-L and 1966-91 by Q-S). For reasons of degrees of freedom, these studies used fixed-effects panel data technique and so elasticities were estimated for individual countries and not for individual commodities (both used between 5-10 agricultural commodity prices per country).

Using static regression technique (equation A1, Annex 1), the M-L study finds very high transmission elasticities for all countries, in the range of 0.74-1.24 with a median value of 0.95. In view of this, it concludes that the variations in world prices are almost fully transmitted to domestic prices. Their second major conclusion was that that a very high proportion of the variations in domestic prices was accounted for by the variations in world prices, which followed from the very high values of R^2 (in the range of 0.66 and 0.96).

The Q-S study starts by reviewing the M-L method and estimates and questions their conclusions. They ask how was it possible that the elasticity values averaged close to unity as this implied that government interventions in agricultural markets carried no consequence for international price transmission, which could not have been the case in real life? Q-S re-estimate elasticities using the

same method as M-L as well as the same FAO data (but updated). They find that the Durbin-Watson (DW) statistics were positive and very low in all cases, indicating widespread positive autocorrelation, and which they suspect to be the key econometric problem in the M-L estimates (the M-L paper does not report DW statistics).

The Q-S paper then goes on to estimate price transmission elasticities using a dynamic, error-correction model (similar to equation A4, Annex 1). They found that there was not even a long-term relationship (co-integration) between domestic and world prices for 30 of the 78 countries. This was the case for most EC countries, as was expected, but also for several others, including developing countries. They also find that for a majority of those countries that displayed long run integration, the speed of convergence was very slow. For example, not even 50% of the price shocks would ever adjust in nine cases, while for the other 22 it would take 5 years or more to transmit 50% of the shock.

To provide a flavour of these estimates, Table 2 shows results for Asian countries reported in those papers.[4] Column 3 shows that there is no long-term price relationship for Bangladesh and India (the coefficients are not statistically significant, shown in Italics). Column 2 shows relatively small values for error correction coefficients, which means that not much of the disequilibrium of the previous period is "corrected" in the current period. According to Q-S, convergence does not take place at all for Bangladesh and India, while many years are required for Malaysia, Sri Lanka, Pakistan and the Philippines. Column 1 shows that short-run elasticities are not statistically significant for Bangladesh, India, Indonesia and Pakistan, while for Thailand it is very low and negative in sign. Only for the other four countries are they of reasonable magnitude, in the range of 0.2 to 0.4.

Table 2. **Transmission estimates for Asian countries from Quiroz-Soto and Mundlak-Larson studies**

(coefficients not significant at 5 or 1% levels shown in *Italics*)

Country	Q-S, error-correction model (ECM)			Q-S, static, long-term		M-L, static, long-term Elasticity (6)
	Short-run Elasticity (1)	Error-corr. Coef. (2)	Long-run elasticity (3)	Elasticity (4)	D-W value (5)	
Bangladesh	0.00	-0.64	0.08	0.53	1.44	0.72
India	0.05	-0.16	-0.01	0.40	0.45	0.74
Indonesia	0.21	-0.32	0.59	1.13	1.06	n.a.
Korea, Rep.	0.27	-0.09	1.72	1.65	0.58	0.93
Malaysia	0.18	-0.17	0.36	0.71	0.52	0.86
Pakistan	0.03	-0.21	0.28	0.22	0.47	0.74
Philippines	0.24	-0.35	0.51	0.57	0.88	0.80
Sri Lanka	0.37	-0.25	0.42	0.38	0.59	0.81
Thailand	-0.02	-0.19	0.88	0.80	0.58	1.02

Source: Quiroz and Soto (1996) and Mundlak and Larson (1992). Both studies used FAO producer price data (1966-91 period by Q-S and 1968-78 by M-L).

4. Estimates are reported selectively for Asian countries only. This is mainly for reason of space, but also to facilitate comparison with some fresh estimates by the author for Asian countries (section 4).

Columns 3, 4 and 6 show long-run elasticities.[5] A comparison of the long-run elasticity from the ECM (Column 3) and static regressions (Columns 4 and 6) show that the ECM estimates are generally lower than from static regressions. Since the ECM technique is superior, these numbers would be more accurate. As it often happens, not all of the Q-S estimates (not in Table 2 but in the full range of the Q-S estimates) turned out to be as expected – there were several cases where signs were wrong and even long run elasticities smaller than short-run ones, but the reasons are not explained.

The Tyers-Anderson study

Tyers and Anderson (1992) is both a book with rich analyses of distortions in world food markets as well as a model of the world food economy. A reduced form of Nerlovian lagged adjustment model was used to estimate both short- and long-run elasticities for seven basic foods and 30 countries or country groups, 11 developed and 19 developing. Although the data used were for the period 1961-83, *i.e.* before structural adjustment programmes were implemented, the estimated values and the policy insights that are imbedded in these numbers are still relevant for the issues addressed in this paper.

The policy core of the T-A model is a price transmission equation that incorporates two key features of each country's food policies: (i) protection or anti-protection component, which alters the trend level of domestic prices around which price fluctuations occur; and (ii) stabilisation or insulation component, which limits price transmission. One significant implication is that the level of protection implied by the policy will drift through time. In particular, if the trend in the world market is towards lower international food prices, incomplete transmission in the long run implies growth in protection (or reduction in effective taxation) of the food sector.

Table 3 shows elasticity values for nine Asian countries from the T-A model. Note the difference in the values among the three cereals. The simple average of the short-run producer elasticity for rice, the staple food, is 0.28, which is 22% and 36% lower than for wheat and coarse grains, respectively. These numbers indicate heavy intervention in domestic rice markets, both in absolute terms and relative to other cereals, which is not surprising. More striking is the short-run consumer elasticity for rice, only 0.11 on average, indicating not only very low transmission but also that interventions are more intense here than on producer prices. This is consistent with the widespread practice in Asia, at least in those years, of price stabilisation through border measures, stocks operations and other policies including consumer subsidies in some countries (more on this in section 4).

5. Column 5 shows D-W statistics from Q-S static regression. This is to illustrate a criticism by Q-S that the M-L estimates suffered from high positive autocorrelation, which seems to be the case although the M-L paper does not report the D-W statistics.

Table 3. **Tyers-Anderson estimates of world to domestic elasticity of price transmission**

Commodit	Country	Short	Long	Short	Long
Rice	Banglades	0.71	0.74	0.13	0.19
	China	0.35	0.58	0.05	0.40
	India	0.17	0.26	0.17	0.26
	Indonesia	0.20	0.60	0.05	0.40
	Korea,	0.00	0.00	0.00	0.00
	Pakistan	0.31	0.58	0.11	0.13
	Philippine	0.07	0.15	0.06	0.08
	Thailand	0.49	0.74	0.31	0.58
	Other	0.20	0.80	0.15	0.50
	Simple	*0.28*	*0.49*	*0.11*	*0.28*
Wheat	Banglades	0.24	1.00	0.24	1.00
	China	0.44	0.60	0.05	0.60
	India	0.15	0.90	0.15	0.90
	Indonesia	1.00	1.00	0.09	1.00
	Korea,	0.17	0.35	0.50	0.10
	Pakistan	0.05	0.07	0.05	0.07
	Philippine	1.00	1.00	0.53	0.60
	Thailand	0.10	1.00	0.40	0.60
	Other	0.05	0.20	0.05	0.20
	Simple	*0.36*	*0.68*	*0.23*	*0.56*
Coarse	Banglades	0.60	0.85	0.60	0.85
	China	0.54	0.87	0.05	0.70
	India	0.14	0.80	0.14	0.80
	Indonesia	0.47	0.94	0.46	1.00
	Korea,	0.14	0.38	0.14	0.39
	Pakistan	0.52	0.70	0.40	0.60
	Philippine	0.33	0.69	0.37	0.50
	Thailand	0.85	1.00	0.75	0.84
	Other	0.40	0.80	0.30	0.50
	Simple	*0.44*	*0.78*	*0.36*	*0.69*
All	*Simple*	*0.36*	*0.65*	*0.23*	*0.51*

Source: Tyers and Anderson (1992), Annex Table A1.

Price transmission mechanism in the FAO World Food Model

In the version of the WFM prior to 1994, domestic and world prices were linked with constant elasticity specification (equation 7) for all countries modelled.

$$P^d_t = P^d_{t-1} \left(P^w_t / P^w_{t-1} \right)^{\eta} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

where, P^d_t and P^w_t are domestic and world prices and η is the elasticity of price transmission. Work was undertaken in 1994 to specify trade policies in preparation for the impact assessment of the Uruguay Round Agreement on Agriculture (FAO 1995). The result was the *linear* price linkage equation (8) with explicit trade policies. This specification was used for 57 countries that were assumed to undertake trade liberalisation (*e.g.* tariff reduction) while (7) applied to the rest of the 89 countries in the model.

$$P^d_t = P^d_{t-1} [\{\alpha + T^{spe}_t + (1+ T^{adv}_t) * (P^w_t +\delta)\}/\{\alpha + T^{spe}_{t-1} + (1+ T^{adv}_{t-1}) (P^w_{t-1} +\delta)\}] + \Delta EE \ldots\ldots (8)$$

where,

- T^{spe}_t and T^{adv}_t are specific and *ad valorem* tariffs for period t;
- α represents direct and indirect support not directly related to movements in world market prices (defined as structural or natural protection);
- δ is a price wedge that mainly reflects transportation costs (the values used are negative for exporters and positive for importers); and
- ΔEE represents price effects of export subsidies.

On the features of the specification (8), first of all note that this is an expression of the price transmission process and there is *no* explicit transmission elasticity – the elasticity is "implicit" in the expression. The price-wedge (the δ term) was meant mainly to reflect transportation costs – hence the values used were negative for exporters and positive for importers. This has the desirable effect of higher transmission on exports and lower on imports. In the current version, the price wedges apply to major importers and exporters only; for the vast majority of other countries these values are zero. The *ad valorem* and specific tariffs used are bound rates (bound base and bound final) from WTO country Schedules. The model uses reduction rates (*e.g.* 6% per year) to reduce these tariffs during the implementation period. Specific tariffs were used where it was clear that only this form of border measure is applied; otherwise, *ad valorem* rates were used. There were not many instances of specific tariffs on cereals.

The natural protection parameter, α, plays an important role in equation (8). Since the number of countries with specific tariffs is far fewer, it is this parameter that acts as a constant in the linear equation to dampen proportional price transmission. These numbers were derived in different ways. For WTO members for whom there were PSE estimates, the constant term was estimated by fitting linear equation and should capture direct payments and indirect transfers. For most other countries, these values were "calibrated" based on the constant elasticities used previously in the WFM so that the price transmission elasticity resulting from the linear equation was as close as possible to the constant elasticity value. The calibration process also involved a good deal of judgement of FAO commodity specialists.

The constant transmission elasticity values used in the WFM are mostly on the lower side. For cereals, they range between 0.2 and 0.5, with simple average of 0.27. The values are similar for producer and consumer prices, although different values that reflected domestic policy interventions would have been better, as was done in the T-A model.

In the case of the transmission elasticities resulting from the linear expression (8), these values are, on the whole, somewhat higher than the constant elasticity values used previously in the WFM. This was a deliberate decision in order to better reflect the fact that with the UR reforms in general and the tariff-only regime in particular, price transmissions should be stronger.

4. Price transmission to Asian cereal markets in the 1990s

The extent of the price transmission

This section reports from a work in progress (Sharma 2002b), obtaining some fresh estimates of short- and long-run price transmission elasticity for eight Asian cereal markets. These were estimated by using the Engle-Granger procedure described in Annex 1 with monthly wholesale or retail prices of cereals for capital or major cities for the period January 1990 to December 1999. The domestic and world price series were tested for non-stationarity using Augmented Dickey-Fuller (ADF) statistics; they were found to be non-stationary in level and stationary in first-differences.

Table 4 summarises the results. The first column ("co-integrated?") shows that rice prices were co-integrated in the long run in only 8 of the 16 cases.[6] There was no co-integration for both varieties of rice for Indonesia, Philippines and Sri Lanka, while prices were found to be co-integrated for both varieties for Korea Republic, Pakistan and Thailand. For other countries, prices were co-integrated for one variety but not the other. This is possible if the country in question mostly trades in that variety. In the case of wheat, long-term co-integration was found in only one case (Philippines). These results are surprising because Asian countries are known to intervene much less in wheat than in rice markets. The existence of the long-run relationship for maize is consistent with expectations for Asian markets, or for that matter for other countries where this is not a staple food and not subject to much intervention. On the whole, thus, there are far fewer cases of long-term co-integration than expected. It is indeed a challenge to explain why markets for such widely traded, and fairly homogenous, products like cereals do not co-integrate even in the long run. Unfortunately, there are no easy answers to explain this.

The coefficient of the error-correction term (second column) is a measure of the speed of convergence – the extent to which a disequilibrium in the two series in the previous period is corrected in the current period. Except for two cases for Thailand (with Thai100 rice variety and maize), all other coefficients are very small. The simple average of the significant terms is -0.053, which means that only 0.05% of the disequilibrium is corrected in one period (month), and it would take some four years to transmit 95% of the world price shocks to domestic markets. Similar findings were reported for many countries in the Q-S study.

As regards short-run elasticities, only five of the 16 estimates for rice were found to be statistically significant, and only for Thailand for both varieties. The significant values range between 0.17 and 0.54, with a simple average of 0.27. Although the results need much explaining, these values are not out of line, for example compared with the Q-S estimates but still higher than in the T-A estimates (where the simple average for these Asian countries was only 0.11). It is possible that transmissions have strengthened in the 1990s compared with the T-A estimates for which 1961-83 data were used.

A long-run elasticity makes sense only when there is a long-run relationship based on the co-integration test. That relationship was found in only 8 of the 16 cases for rice. The simple average value of the long-run elasticities for these 8 cases is 0.65, which is not out of line from other estimates. The elasticity for India is very low, only 0.12, but then the short-run elasticity is only 0.01. For wheat, only Philippines had significant long run relationship, with the elasticity of 0.62. The simple average of the four values for maize is 0.81.

6. Because of the lack of precise information on the variety of rice traded, domestic prices were regressed on two varieties of world prices, Thai100 (the more expensive variety) and ThaiA1.

Table 4. **Price transmission elasticities for selected Asian cereal markets in the 1990s**

Country	Cointegrated?	EC term 1/ Value	Sig.	Short-run elast.	Sig.	Long-run elast.
		(domestic rice and Thai 100 variety)				
Bangladesh	Yes	-0.066	5	0.15	5	0.79
India	Yes	-0.058	5	0.01	n.s.	0.12
Indonesia	No	-0.010	n.s.	-0.09	n.s.	0.65
Korea, Rep.	Yes	-0.083	1	0.10	n.s.	0.70
Pakistan	Yes	-0.057	1	0.06	n.s.	0.93
Philippines	No	-0.029	n.s.	0.13	n.s.	0.43
Sri Lanka	No	-0.068	n.s.	0.06	n.s.	-0.11
Thailand	Yes	-0.483	1	0.54	1	1.11
		(domestic rice and Thai A1 variety)				
Bangladesh	No	0.030	n.s.	0.16	n.s.	0.25
India	No	-0.031	n.s.	-0.06	n.s.	-0.09
Indonesia	No	-0.027	n.s.	0.08	n.s.	0.71
Korea, Rep.	Yes	-0.056	5	0.01	n.s.	0.41
Pakistan	Yes	-0.069	1	0.17	1	0.66
Philippines	Yes	-0.072	5	0.23	5	1.19
Sri Lanka	No	-0.073	n.s.	-0.18	n.s.	-0.02
Thailand	Yes	-0.065	5	0.27	5	0.51
		(domestic wheat and US No. 2 HRW wheat)				
Bangladesh	No	-0.020	n.s.	0.03	n.s.	0.24
India	No	-0.047	n.s.	-0.12	n.s.	-0.06
Indonesia	No	-0.010	n.s.	-0.02	n.s.	-0.22
Pakistan	No	-0.021	n.s.	-0.04	n.s.	0.29
Philippines	Yes	-0.048	5	0.06	n.s.	0.62
Sri Lanka	No	-0.064	n.s.	-0.20	n.s.	2.11
		(domestic maize and US No. 2 Yellow maize)				
Indonesia	Yes	-0.047	1	-0.02	n.s.	1.43
Pakistan	Yes	-0.053	5	0.11	n.s.	0.31
Philippines	Yes	-0.052	5	-0.01	n.s.	0.69
Thailand	Yes	-0.183	1	0.37	1	0.80

1. The coefficient of the error-correction term. "Sig." refers to the level of significance. The t-values for tests of significance are those used for ECM models.
Source: Sharma (2002b).

The policy environment and price transmission

Besides measurement errors and market structures, border and domestic policies are the major factors that cause domestic prices to move differently from world prices, and thus weaken price transmission. A variable levy policy is a classic example, but some other policies do also produce similar effects. Although these days, with the Uruguay Round Agreement on Agriculture, not many countries implement a variable levy scheme in a *formal* sense (there are still some exceptions), many countries do vary applied tariffs from time to time mainly in response to changes in world prices in order to stabilise domestic markets.

Such reactions are obviously more widespread when world prices fluctuate sharply. This was the case during the cereal price spike of the mid-1990s (rice in 1994 and wheat and maize in 1995-96). A FAO study conducted then (Sharma 1996) looked into the short-term transmission of cereal prices to 30 or so developing country markets as well as policy responses. The study found that many governments responded actively with measures aimed at offsetting the effect of the price rise, the most common measure being trade-related (lowering of tariffs and facilitating imports through additional import quotas and foreign exchange) as well as consumer relief measures in some cases. As one would expect, the response to falling prices of basic foods in the late 1990s has been the opposite (FAO 2001). This annual FAO review of food policies documents many instances when applied tariffs were raised (within the WTO bound level) to limit the transmission of depressed world prices. This period also saw increased cases of the WTO emergency safeguards initiated or implemented as world prices remained depressed. When this offsetting response is intense, estimated short-run elasticity is bound to be low, and even of the wrong sign at times.

Coming back to the Asian cereal markets, space limitation does not permit a detailed account of the policies in the 1990s. Such a review, highlighted below, shows that the stability of domestic cereal markets, especially rice and wheat, was an important objective of public policy and governments did intervene actively to attain that goal (FAO 2001; Sharma 2002b).

In Sri Lanka, the import of wheat as well as the domestic sales price was regulated throughout the 1990s. Prices were also influenced through consumer subsidies. In September 1994, the new government lowered the retail price of flour by as much as 50%, which not only de-linked domestic and world prices for a considerable period of time but also impacted on rice prices, the main substitute, as demand shifted to wheat flour. Rice imports were also regulated throughout the period. For many years in the 1990s, there was in place a minimum price below which imported rice (by the public and private sector) could not be sold in the market. Lately, the government has been varying tariffs on rice in the range of 0-35% (the WTO bound rate is 50%).

Pakistan implements an elaborate programme of wheat procurement and sales. Imports are considered to be subsidised because imported and domestically procured wheat is pooled and sold to flour mills at a price below the cost. The wheat import subsidy for 1995/96, for example, was estimated to be USD 200 million. Pakistan also frequently bans inter-provincial movements of wheat and flour by private operators in order to prevent the leakage of the subsidised product to neighbouring countries, yet another factor that weakens market integration.

In India, it was only in 1994 that the economic liberalisation programme that began in 1991 was extended to agriculture. Quantitative control was a prominent feature of trade policy for a long time. After 1994, cereal exports were allowed from time to time but exports were often regulated with quotas and minimum export prices. The domestic price situation was always a major factor in implementing these measures. The Indian government also initiated in 1993 open market operations, i.e. sales of public stocks aimed at stabilising domestic prices. Such interventions were carried out from time to time since then, which also weakened the relationship between the world and domestic prices.

Indonesia had a long tradition of market intervention aimed at stabilising domestic market prices, with the parastatal BULOG playing the lead role. BULOG operations continued until 1998 when these were scaled down. These included abolishing its import monopoly of rice and wheat, limiting its operations to procurement of paddy only (previously, all rice) and the end to domestic pricing and distribution of wheat and flour. Given the scale of operations of BULOG throughout most of the 1990s, the weak relationship between domestic and world prices should not come as a surprise.

5. Conclusions

First, on the concept of price transmission, there is some confusion in both common usage and specifications in global trade models. While price changes in world markets may be transmitted fully to the farm or consumer levels in an *absolute* sense, the *elasticity of price transmission* can not be unity as is often stated to indicate full transmission; rather, it will be less than unity in the import case and greater than unity in the export case. Moreover, price transmission even in an absolute sense is very unlikely to be complete in real life for a number of reasons, notably border and domestic market interventions, less than competitive market structures and measurement errors. Therefore, ultimately, the elasticity of price transmission for a particular commodity and country is an empirical matter.

Second, on the size of the transmission elasticity, the review of past estimates as well as fresh results from the Asian cereal markets, and considerations such as natural protection and policy interventions, all indicate that these values are likely to be on the lower side for most, if not all, developing countries. This is more so for basic foods than for other agricultural products. Elasticities in the range of 0.2 to 0.4 seem to be reasonable for the short run while long-run values will be higher but still less than unity in the import case. Current models that use higher elasticities may need to provide some explanation about the assumption, at the same time undertaking some sensitivity tests on the results with lower elasticities. Assuming complete price transmission as some models do (and using elasticity values of unity) does not appear to be correct even for developed countries. A recent paper by Thompson *et al.* (2000) finds transmission elasticity for the EU wheat market to be 0.113, which was also not found to have changed (increased) significantly in the post-1995 period, as normally expected with the implementation of the Uruguay Round reform process.

Third, although this paper focussed on price transmission estimates for Asian countries, it is unlikely that the situation is much different for other developing countries also. While Asian countries do intervene relatively more in domestic food markets, the practice of tariff variation to offset external price shocks is common to other countries also. Moreover, natural protection is much higher on average in Africa, while some countries in Latin America still implement variable levy policy to defend price band schemes for basic foods. Estimates of price transmission elasticities for other regions, *e.g.* in Tyers-Anderson and Quiroz-Soto studies, do also show similar values for other regions as for Asia. Therefore, the conclusion of relatively low transmission should apply, on the whole, to a majority of the developing countries. Transmission may have strengthened in the 1990s but so few studies are available that it is difficult to draw a conclusion with confidence.

Fourth, there is a dearth of good analysis on the *process* of price transmission, as well as *estimates* of the elasticity, for many developing countries, in particular those that are small players in the world trade and so do not feature prominently in global trade models and in background research to maintain the models. In these models, these countries are typically grouped as "rest of Asia", "rest of Africa", etc. and so not much analysis is undertaken for them. While this would not affect much the main model results, *e.g.* simulated world price changes because these countries are often small traders in the world market,[7] the models lack a basis for drawing sound conclusions on impacts on these countries. At the same time, the demand for precisely this type of information is growing, and will further increase as the new WTO trade talks gain momentum. This is also a very sensitive issue. The credibility of assessed impacts will depend on the soundness of the parameters used, some of which are critical, notably the level of distortions in the base period, transmission elasticity and supply response. It is not just enough to say that the elasticity values used were, say, 0.4 or 0.7, but it is

7. This is so in a relative sense, since model results are known to be sensitive to the level of aggregation (of countries and commodities) as country- and commodity-specific distortions tend to cancel out when grouped (Francois et al., 1995; Sharma et al., 1996).

important to justify them. Indeed, models are already blamed for being a "black box". In conclusion, there is much to be done in the area of analysis and explaining. This is a challenge facing all analysts/agencies involved in modelling and policy analysis.

Fifth, having said so, one would also need to note some constraints in this type of work. Analysts know well that a major limitation is lack of data on domestic prices.[8] FAO's producer price data have been used by some researchers, *e.g.* in the M-L and Q-S studies. The problem with these annual data is that the degrees of freedom required for robust econometric estimates are not adequate, even if one goes back to the past 20-30 years. But going back too far is also not helpful for reasons of the Lucas critique. The panel data technique used in the M-L and Q-S studies is also of limited use as these only provide results for either commodities or countries but not for both. So, analysts will need data with higher frequency, *e.g.* monthly data. Monthly price data for main market locations (typically wholesale and retail) are indeed collected in most developing countries but are not easily accessible without some effort and cost. Even where these data are assembled, analysing them will still remain a daunting task.

Finally, some trade policy issues. Stronger transmission of price signals is desirable as this contributes to reducing instability in world prices and to enhancing resource use efficiency within economies as economic agents take into account opportunity costs and values in their decisions. Where supply response is strong, greater transmission of higher prices following trade liberalisation should lead to increased domestic production.[9] This was a point stressed in several papers by among others Anderson and Tyers (*e.g.* Anderson and Tyers 1993). The simple simulation reported in Table 1 also shows this. While there is little disagreement that natural protection should be reduced by cutting the cost of doing trade, it is not as obvious whether policy makers in developing countries would like to see more of the external price shocks absorbed domestically than are transmitted currently until alternative means of coping with price shocks become accessible.

With quantitative control on trade no longer permitted by the WTO since 1995, tariff variation has been a prominent response to external price shocks, with the extent of price insulation depending on the intensity of the response. The limit to which applied tariffs can be raised for this purpose is set by the WTO bound tariffs. So, as long as the bound tariffs are relatively high, this practice is likely to be widespread. In this context, several WTO negotiating proposals by developing countries have called for the option to set "appropriate" levels of bound tariffs for them, especially for basic foods. A study that analysed this issue, using fluctuations in world market prices in the 1990s as the main external shock, finds that the bound tariffs have to be in the range of 50-60% for various basic foods for *complete* price stabilisation (Sharma 2002a); and lower bound rates for partial stabilisation. Although a tariff is not the first-best instrument for price stabilisation and safeguarding the interest of producers and consumers, these proposals argue that tariff is an instrument that is both effective and feasible for them. Moreover, they lack resources to resort to other measures for this purpose, unlike in rich countries where there are additional instruments, *e.g.* direct income payments, disaster payments when prices are depressed, subsidised insurance, access to risk management instruments etc. A recent FAO

8. As said by Barrett and Li (2002), a thorough analysis of all the issues on market integration and competitive equilibrium also requires data on transfer costs and trade flows, besides prices. But this is a long way to go, given the current state of the accessibility of price data for many developing countries.

9. While this is mathematically correct, many policy makers as well as development specialists disagree that supply response in developing countries is as high as is often assumed in global trade models. In particular, in a typical liberalisation scenario, world prices often increase for the entire range of commodities modelled and as a result domestic production too. But this amounts to assuming elastic "aggregate" supply response, which is often not the case.

study that analysed the experience of 14 developing countries with the implementation of the Agreement on Agriculture concluded that bound tariffs are indeed of a strategic significance for these countries (FAO, 2000).

In conclusion, stronger transmission of price signals has benefits for individual economies in terms of *inter alia* more efficient allocation of scarce economic resources, as well as indirectly through greater price stability in world markets as more countries share the burden of cushioning price and other shocks. The high level of natural protection in the developing countries is obviously an impediment that has to be tackled through increased investment in transport and communication and other measures that lower transaction costs. At the same time, efforts are required to strengthen human and institutional capability so that these countries are able to take advantage of other less-distorting, generally "first-best", instruments to safeguard the interests of farmers and consumers. Until then, policy makers in these countries would insist on retaining, or re-negotiating, the policy space they currently have, or think they should have, in the form of "appropriate" levels of the bound tariff that can be used for maintaining some degree of price stability. As a result, price transmission will continue to remain incomplete for some time.

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ANNEX 1: AN OVERVIEW OF THE ECONOMETRIC TECHNIQUE FOR QUANTIFYING PRICE TRANSMISSION

Bivariate correlation coefficients were the most common measures in the old days to assess market integration, with higher (and statistically significant) values indicating market integration. The weakness of this measure was that it did not capture dynamic relations among markets and could show spurious relationships when a third common factor – e.g. inflation or trend – influenced both variables similarly to produce positive, high correlations without one of them necessarily caused by the other.

Static regression analysis was the next most widely used econometric method to study price relationships. In its simplest form, the specification used was:

$$P^d_t = \varphi_1 + \varphi_2 \ P^w_t + \epsilon_t \ \ldots\ldots\ldots\ldots\ldots\ (A1)$$

where P^d_t is domestic price of a product in period t, P^w_t is world price, φ_1 and φ_2 are parameters to be estimated and ϵ_t is assumed to be an IID$(0,\sigma^2)$ term. When the data are expressed in natural logarithms, φ_2 directly gives transmission elasticity, with a value equal to unity often stated to indicated perfect transmission, while those closer to unity indicating high transmissions. This technique has now been found to suffer from some serious problems, including the non-stationarity of the data (below) and high degrees of positive autocorrelation.

Dynamic models based on co-integrating relationships has now become the mainstay of the econometric time-series analysis. A considerable advance was made in this area in the mid and late 1980s. Among other things, it has now been accepted that most economic time series are non-stationary in their level forms, which meant that they will tend to drift in a random way following a shock. The relationship obtained between two or more random series can only be spurious and so the results misleading. At the same time, it was realised that the traditional structural models were too static to represent relationships between economic variables that were more often out of equilibrium than in equilibrium. There was a need for models that not only captured these disequilibria but also how economic forces brought back the variables to equilibrium.

As a result, modern time-series econometrics is based on specifications that capture co-integrating relationships among variables and their dynamic relations. In applied works, the most common form of these dynamic models is the Error Correction Model (ECM), attributed largely to the work of Granger and Engle (Granger and Engle 1987 being the most quoted reference).

An ECM is closely related to the more commonly-known Auto-Regressive Distributed Lag (ADL) model. Equation (A2) is an ADL (1,1) model (one lag each of both variables).[10]

$$P^d_t = \alpha_0 + \beta_0 \ P^w_t + \beta_1 P^w_{t-1} + \gamma P^d_{t-1} + \epsilon_t \ \ldots\ldots\ldots\ldots\ (A2)$$

In this specification, the coefficient β_0 gives the same time relationship between the two variables, while the lagged terms introduce dynamic features to the relationship. It is useful to note that the static or long-run or equilibrium relationship between P^d and P^w described by (A1) is implicit in (A2) – the former corresponds to the solution resulting when there is no incentive to change, i.e. in that stage, P^d

10. The ECM and ADL models, and their correspondence, are described in many econometrics text books as well as in journal articles. The notations used here are based on Patterson (2000), an excellent text for its detailed exposition of the topics.

will not change from its equilibrium value unless there is a change in P^w. This implicit equilibrium can be solved from (A2) by setting the values of the two variables to their defining characteristics of equilibrium, i.e. $P^w_t = P^w_{t-1} = P^w_{t-2}$ .... and $P^d_t = P^d_{t-1} = P^d_{t-2}$ ..... The resulting expression is as follows.

$$P^d_t = [\alpha_0/(1-\gamma)] + [(\beta_0 + \beta_1)/(1-\gamma)]\, P^w_t + [\epsilon_t/(1-\gamma)] \quad \text{..... (A3)}$$

Since in defining equilibrium, it can be assumed that ϵ_t takes the value of 0, the expression becomes:

$$P^d_t = \varphi_1 + \varphi_2\, P^w_t \quad \text{..... } (\approx A1)$$

where $\varphi_1 = \alpha_0/(1-\gamma)$ and $\varphi_2 = (\beta_0 + \beta_1)/(1-\gamma)$.

One key achievement of the new time-series econometrics is dealing with the non-stationarity of the time-series data. Non-stationarity meant that it would not be appropriate to estimate (A1). The pioneering work of Engle, Granger and others in this area has been to demonstrate that where two non-stationary series are co-integrated, *i.e.* their linear combination is stationary, there is a mechanism (economic forces) that ensures that the stochastic trends in the two series move together in the long-run. In a dynamic sense, although the series could be in disequilibrium in the short-term, they have a long-term relationship between them. This insight led to the development of the ECMs, which make it possible to analyse three aspects of the relationship between the two variables within a single framework, namely long-term integration, short-term integration and error-correction mechanism that brings the series back to equilibrium.

The role of the equilibrating or error-correction mechanism is not explicit in the ADL model (A2) as it is in its error correction form. The ECM form of the ADL(1,1) is derived from equation (A2) after some algebraic manipulations (e.g. subtracting P^d_{t-1} from both sides of (A2), adding and subtracting β_0 P^w_{t-1} from the right side of (A2), and so on). The resulting ECM specification is shown as equation (A4).

$$\Delta P^d_t = \theta_0 + \theta_1\, \Delta P^w_t + \theta_2\, (P^d_{t-1} - \varphi_2\, P^w_{t-1}) + \epsilon_t \quad \text{..... (A4)}$$

where Δ is a difference operator, i.e. $\Delta P_t = (P_t - P_{t-1})$. The correspondence of the parameters in (A2) and (A4) is:

$\theta_0 = \alpha_0$
$\theta_1 = \beta_0$, short-run elasticity
$\theta_2 = -(1-\gamma)$, error-correction coefficient
$\varphi_2 = (\beta_0 + \beta_1)/(1-\gamma)$, long-run elasticity

In applications, the choice of an ADL model or an ECM to parameterise the information in the regression is a matter of convenience and interpretation – equations (A2) and (A4) are equivalent. The three parameters that are of most interest here are short-run effect (θ_1), long-run effect (φ_2) and the error correction term (θ_2). One advantage of working with (A2) rather than (A4) is that there is no need for knowing the value of the long-run impact (φ_2) in advance as it is the case with (A4). Although this parameter could come from equation (A1), there are some econometric implications for fitting (A1), this being not fully specified as is (A2). For this reason, it is more straightforward to fit an ADL model and then recover the parameters for the ECM, using the above correspondence.

REFLECTIONS ON THE POLICY IMPLICATIONS OF AGRICULTURAL PRICE DISTORTIONS AND PRICE TRANSMISSION FOR PRODUCERS IN DEVELOPING AND TRANSITION ECONOMIES

Alberto Valdés and William Foster[*]

Abstract

This paper considers the implications of agricultural trade reform for producers in developing and transition economies. It focuses on the impacts of reform on producers in import-competing sectors, which present a more difficult concern for policymakers than market access for exporters. The paper notes that there is a tendency for low prices to persist following downward shocks, and accordingly argues that there is a case for granting more flexibility to developing and transition economies with respect to well-defined import tariffs and surcharges.

1. Freer trade, greater price transmission, and the enhanced importance of world price distortions.

In the mid-1980s, several Latin American countries began a series of economic reforms, including trade liberalisation, privatisation and deregulation. Reforms progressed to other developing countries, eventually including the transition economies of Eastern and Central Europe during the 1990s. The degree and depth of these reforms, of course, varied significantly. Chile was an early and deep reformer, beginning with a radical change in its trade regime in approximately 1976. In contrast, Venezuela and Caribbean countries, for example, began reforms late in the mid-1990s, coinciding with the emergence elsewhere of the transition from command socialism.

Trade liberalisation meant (particularly in Latin America) the reduction in direct price interventions, the lowering of tariff levels, the convergence of previously disparate tariffs across commodities, and – perhaps most critically in terms of enhancing price transmission – the elimination of all but a few quantitative restrictions on imports and the removal of state trading in most countries. In the past these policies previously had the effect of insulating domestic consumers and producers from the vicissitudes of world markets and international trade. The decline of trade-restricting policies magnified the effects on domestic markets of changes in border prices; consequently arguments surrounding possible distortions in international prices have grown in importance in domestic policy debates.

In the former, more protectionist economic environment – especially with quantitative restrictions related to import licenses and quotas, variable levies, and state trading monopolies – distortions to world commodity prices associated with other countries' policies were of less importance to domestic policy formation. Although the question of the magnitude of price transmission is econometrically unresolved (a topic we address below), logically there should have been less transmission than under

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the present and evolving system, which emphasises the use of tariffs only. And even where no quantitative restrictions existed, high tariffs would have tended both to reduce the practical importance of the degree of distortion in world prices, and to cushion the effect of those distortions to whatever extent they were transmitted from international to domestic markets.

Today the set of policy instruments available to governments is largely restricted to tariffs and surcharges (including safeguards), and the level of those tariffs is limited. For many developing and transition economies, the present trade and policy environment has amplified political pressures in a situation of falling world prices to counteract the transmission to internal markets of the debilitating effects generated by perceived distortions in world prices caused by external interventions. Particularly worthy of attention, in our view, are the pressures arising in import-competing sectors.

Why the emphasis on importables?

The adverse effects of high levels of protection in developed, industrial countries is a widely recognised problem for developing countries as exporters of agricultural products. But what is likely an undervalued question (especially by economists in the "North"), and what generates the most complex domestic policy debates in many developing countries, surrounds the pricing of importables. In practical political terms, for less developed nations, the problem of access to markets of exportables is not a contentious issue in internal debates over domestic policies, although it is clearly an important issue in terms of foreign relations. While the question of access is certainly central to the international diplomatic debate over trade with OECD members, as we observe in the analysis of countries that have opened their markets significantly to trade, *the* dilemma today is dealing with the episodes of "excessively low" border prices affecting some import-competing activities. Moreover, the concerns over low price episodes are reinforced by the undeniable long-term declining historical trend in world prices.

Trade liberalisation did two things: first, it reduced border protection on importables, and second, it removed export taxes and restrictions on exportables. This had the combined effect of reducing the bias against export agriculture. So while the same characteristics of world prices of importables also applies to exportables, the beneficiaries of trade liberalisation tended to be producers in export-oriented sectors (and of course consumers). Furthermore, it appears to be a stylised fact that, with respect to policy issues, producers of importables usually are better-organised, more vocal and stronger lobbyists than producers of exportables. This political reality reinforces the prominence of importables in policy debates over that of exportables. Simply put, the political economies of the two types of products are different. On top of all of this, the present policy tools for protection of importables are straightforward and bureaucratically remunerative (e.g., increasing tariffs). For exportables there is not much fiscally-limited developing countries can realistically do, unlike the case of richer nations, such as the United States and the European Union, where export subsidies represent a relatively minor and often inconspicuous burden on taxpayers.

Also deserving of note is that from the perspective of farmers in import-competing sectors, the policy problem is not so much the volatility of domestic prices *per se*, as they are influenced by world price fluctuations. It is rather the difficulties associated with periods of exceptionally low price levels falling below the long-term trends. Aggravating the political pressures to "do something," producers and politicians in developing countries tend to attribute these episodes to the distortions in world prices brought about by the continued subsidies of developed countries. Moreover, it is understandable that the lack of confidence of many politicians in their domestic markets and institutions to manage the risks to farmers extended periods of low prices inhibits their commitment to further trade

liberalisation. It is in this context that the distortions in world prices and the issue of transmission become critical in the political commitment in developing countries to continue liberalisation.

In the next section we discuss first the evidence of the effects of government policies on world prices, followed by a discussion of the nature of world price instability and the persistence of price shocks below trend. Price transmission in general is then briefly discussed in the fourth section, and the fifth section presents a discussion of the practical relevance of enhanced price transmission due to trade liberalisation in the determination of real domestic prices. In this fifth section we present some evidence of the decomposition of price movements for some developing and transition economies. The sixth section asks, What evidence do we have that enhanced price transmission has exacerbated the vulnerability of producers? We conclude with a discussion of some policy implications, particularly in the context of WTO commitments and rules and future negotiations.

2. What do we know about price distortions in developed and developing countries?

Of central interest of this section is the manner in which government policies distort the levels of prices around their long-term trends. In the context of the policy debate in many developing countries, one often finds reference to the billions of dollars given to agriculture in developed nations. But it is an open question as to the degree to which current commodity price levels and the declining trend in prices are due to protection in developed countries, and to what degree are they the result of productivity levels, factor use, income growth and population.[1]

In many developing countries, implicitly at least but often explicitly, there is the assumption that international prices are so distorted by external subsidies that they do not represent a sound basis for the determination of the true competitiveness of domestically produced importables. Moreover, there is often the confusion that the producers in developing countries should be compensated for the absolute value of the export subsidies, without a clear distinction between measurable subsidy levels and their overall final effect on world prices. From an economist's perspective, of course, what should matter is the final effect of subsidies on world prices, not absolute subsidy levels. The focus on absolute levels of subsidies leaves the question of the appropriate compensating tariff or surcharges with an unrestricted upper limit.[2]

What we consider most relevant for the discussion, in terms of the familiar steady-state comparisons derived from modelling efforts, is that practically all quantitative analyses on agricultural protection conclude that such protectionist subsidy policies depress world prices relative to what would otherwise be the case with lower protection. This point is concisely made by McCulloch: "Agricultural markets are among the most distorted in the world, with both developed and developing countries maintaining high levels of intervention" (McCulloch *et al*., (2002), chapter 9, pp. 175-176).

But first one should keep in mind the importance of distinguishing the impacts of distortions from developing countries versus those of developed countries. The evidence indicates that the direction of the effects of intervention differs between developed and developing countries. Developed countries usually protect and developing countries usually tax their agricultural sectors. And certainly, the

1. Of course, productivity and factor use are endogenous and not independent of policy, but this issue is beyond the scope of the present discussion.

2. Recently in Chile farm lobbies proposed, with considerable political support from legislators, a surcharge on imported milk product prices that would compensate one-for-one the EU export subsidy on milk. If adopted this proposal would lead to internal Chilean prices approximately equal to the internal European price. This would grossly overestimate the true distortion in world prices.

historical evidence suggests that developed countries policies have depressed world prices, while developing countries policies have increased those prices.[3] In addition, complicating the issue in the case of developing countries, the effects of exchange rate misalignment and industrial protection have been shown to be influential in depressing the internal prices of agricultural tradables, unlike the situation in developed countries.

Regardless of past opinions, as it is well recognised today, domestic price and trade interventions among the major producing and trading countries continue to have a significant effect on world prices. The higher the level of protection on importables and the higher the export subsidies, the lower will be the world price facing exporting and importing developing and transition economies. From a welfare-analysis point of view, it is recognised that consumers of the country imposing these policies suffer the main costs of intervention. But for agriculture sectors, developed country policies can also impose high costs, particularly in developing economies where agriculture is a relatively more important and where rural poverty is of considerably greater social importance.

There have been several efforts to quantify the present effects of these interventions on world prices and trade flows. This is a literature discussed in several publications, including Goldin and Knudsen for the OECD, and various other sources. The modelling efforts presently undertaken by GTAP and the OECD are worth mentioning as the most significant in terms of recent work. In terms of methodology one can raise a number of questions regarding the particular estimates of the effects of trade liberalisation derived from these models. There are three notable themes:

1. Of specific interest to developing countries, there is a complex interaction between domestic distortions and the transmission of these distortions into domestic markets. What these models assume about price transmission is an important issue in and of itself (discussed by D. Colman, 1995; Taylor, 2001).[4] Notwithstanding the degree of significance of the validity of this point regarding the complexity of interactions, one can nevertheless draw on various parameters to estimate export demand and supply in order to predict the overall sector's response – even if there are various subsets of producers not well integrated in the markets for tradables. This question may have more to do with distributional welfare implications than with trade flows and prices, and we return briefly to this issue below.

2. Another question is how the analytical models deal with the transmission between domestic and world prices. Some earlier work (e.g., Valdés and Zietz, 1982) assumed perfect transmission, but more recent studies (such as Tyers and Anderson, 1992) have allowed for the possibility of lower transmission elasticities. This is an empirical question grounded in the nature of the data available and the econometric subtleties required to give flexibility to the analysis.

3. A question, seldom discussed satisfactorily in the literature, is that dealing with the interdependence across products, horizontally and vertically. It is a complex analytical problem, involving a proliferation of parameters that might adequately account for cross-product effects. Some authors consider a fix-proportion world, others are inclined to an Armington-style approach. In our opinion this has not been solved in a satisfactorily rigorous way.

3. See, for example, Zietz and Valdés (1989) for the OECD (in Goldin and Knudsen, eds.), and Tyers and Anderson for work on developed and developing countries.

4. For example, prices in remote areas tend to exhibit independence from prices in major trading centers. Colman (1995) has other examples.

Despite these basic caveats, however, there have been several studies that one can use as points of reference that offer a sense of the orders of magnitude involved in world price distortions. Certainly considerable progress has been made in terms of acquiring adequate data and the techniques of estimation. But we should underline that in the interpretation of the results one must consider several factors:

- It makes a considerable difference whether or not the analyst considers a removal of distortions by developed counties only, or a removal by both developed and developing countries.

- A second factor is whether or not the analysis is confined to a few products or if reform applies to all sectors. It could make a difference for some countries whether or not the analysis includes semi-processed agricultural products, where the effect of tariff escalation might be critical.

- A third factor is whether or not the analysis incorporates the so-called indirect affects, particularly exchange rate misalignment, and industrial protection, which applies to developing countries almost exclusively.

But finally, what can one conclude from the literature? Two comparable papers, Valdés and Zietz (1995) and Ingco (1996) summarise the findings of various published studies on predicting the world price effects of distortions. In Ingco, for rice and coarse grains, the world price effects on the order of 5% or less are a good approximation. For wheat, the estimates range from 1.2% to 10%, where three of the six estimates are – for all intents and purposes – approximately 6%. For tropical products the effects are lower. Notably, practically all studies conclude that the largest effects appear to be for sugar and dairy, approximately between 10 and 12%. (See also the OECD report on export subsidies (2001) and the ERS/USDA study on prospective agricultural policy reforms (2001)[5]).

3. Price instability and the persistence of low prices

The issue of the measurement of price instability in world agricultural markets is a relatively well-researched area. In recent years the work on measurement of Alexander Sarris, for example, has been comprehensive in the case of cereals. He arrives at several conclusions: With respect to the question of whether or not there has been an increase in inter-year and intra-year price variability for cereals, the evidence shows no trend toward greater world price instability. Harwood comes to the same conclusion for corn, using data from 1920 to 1996. To our knowledge, no other comparable studies have been applied to other commodities of interest to the developing world.

Table 1 presents the coefficients of variation of world prices for four selected commodities for 1960 through 1997 (reproduced from Quiroz, Foster and Valdés, 1999). The results show that sugar is considerably more unstable than the three cereals throughout the period. Also notable is that the sub-period 1973-1985 shows a much higher coefficient of variation than the preceding and following sub- periods. Evidently the coefficient of variation of these commodities changes with time, and moreover, for wheat and sugar, there has been a decline in price instability for the period 1986-1997 (consistent with the conclusions of Sarris, 1999).

5. See OECD (2001), *A Forward-Looking Analysis of Export Subsidies in Agriculture*, and the ERS/USDA study edited by Burfisher (2001).

Table 1. **Coefficients of Variation of World Prices of Selected Commodities**

Period	Corn	Rice	Sugar	Wheat
1960-1972	0.11	0.09	0.60	0.25
1973-1985	0.31	0.44	0.81	0.42
1986-1997	0.18	0.20	0.22	0.17
1960-1997	0.37	0.46	0.90	0.44

Source: Quiroz, Foster and Valdés, 1999

A related question: is instability due to the "system" of protection? (See for example Josling.) Certainly variable levies and quotas with a targeted domestic price on importables results in a shift of domestic instability to world markets. With the move toward removal of quantitative restrictions and variable levies, one would expect that the contribution of developed countries' distortions on world price instability would be less. A result of the Uruguay Round tariffication by developed and developing countries, one expects to see reduced instability but increased transmission of instability to domestic producers and consumers. Tyers and Anderson conclude from policy simulations of tarrification in industrial countries that "[t]he effect of tariffication is to reduce [world] price volatility substantially" during the 1990s for (p. 264). Tariffication in developed countries contributes to less instability in wheat, dairy products, and beef, among others. For some commodities, however, reduced instability would derive primarily from the tariffication policies of developing countries, such as is the case for rice and sugar.

Instability *per se* is one issue, but more important for our focus on the agricultural producers in developing and transition economies is the question of the persistence of low prices. In the context of an open economy, a central problem of the design of policy instruments to deal with instability is the understanding the nature and duration of price cycles in world markets. Do shocks to international prices dissipate rapidly, or are they phenomena that persist for several years? There is now a rich literature on the times-series properties of commodity prices. Early research, often framed within the context of unit-root analysis, led to the conclusion that prices exhibited a significant degree of shock persistence. The results presented by Gersowitz and Paxon (1990) show that the hypothesis of a unit root could not be rejected for a number of commodity prices of African exports. Later studies have been more cautious in coming to the strict conclusion of unit roots deduced from simple measures of persistence (Caner and Hansen, 1997; Perron, 1989; and Zivot and Andrew, 1992). Leon and Soto conclude real world prices do not exhibit unit roots, but rather they are trend stationary processes. Nevertheless, there remains the stylised fact that commodity prices exhibit considerable shock persistence (see also Deaton).

Especially pertinent – and in our opinion most convincing – is the 1999 study by Cashin, Liang and McDermott on the half-life of shocks to world commodity prices. In the case of wheat, for example, international price shocks have a *median* half-life of 44 month, with a 90% confidence interval that implies a range from an extreme low half-life of 14 months to an extreme high of "infinity." It is significant the there is a probability of 50% that prices prevail below the expected value (declining over time) for more than 44 months. The empirical evidence from Cashin, Liang and McDermott (see also Table 2) is that the distribution of prices is not symmetric – low prices endure for more months than high prices.

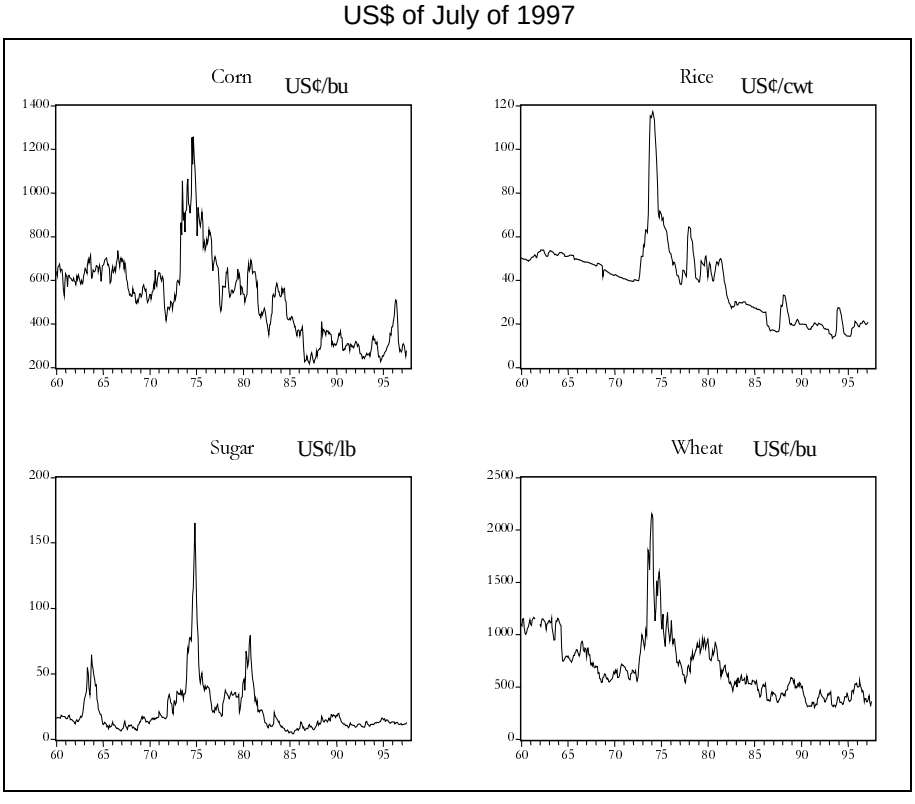
Table 2. **Statistics of Commodity Prices**

Period	Skewness	Corn Kurtosis	Jarque-Bera	Skewness	Rice Kurtosis	Jarque-Bera
1960-72	-0.34	2.34	5.87	-0.51	1.87	15.14
1973-85	1.01	3.58	28.50	1.59	5.53	107.30
1986-97	1.14	4.73	47.76	1.25	4.73	51.64
1960-97	0.65	3.77	42.60	1.21	6.30	310.64
Period	Skewness	Sugar Kurtosis	Jarque-Bera	Skewness	Wheat Kurtosis	Jarque-Bera
1960-72	1.88	6.47	170.7	0.35	1.65	14.39
1973-85	2.05	8.51	306.98	1.69	6.06	134.79
1986-97	0.62	3.12	8.85	0.43	2.22	7.86
1960-97	3.25	17.66	4835.00	1.41	6.10	325.08

Source: Quiroz, Foster and Valdés, 1999.

As Figure 1 amply demonstrates, the nature of price movements is such that low prices have the tendency to persist for many months, with occasional spikes of shorter duration. These characteristics of world price movements lead to notable difficulties in the design of policies. The use of futures markets would reduce the effect of short-term uncertainty but could not guard against the effects of consecutive years of low prices. In the past, minimum import price schemes were popular, and several developing countries still have in place systems of price bands. Safeguards are always an applicable contingency measure, but under WTO rules they are limited in duration, involve compensation, and are restricted in their frequency of application.

Figure 1. **Real price of selected commodities: 1960-97**



Source: Quiroz, Foster and Valdés, 1999.

4. What do we know about price transmission?

The degree of world price distortion and the nature and magnitude of price instability set the stage in which price transmission becomes a relevant question in the context of policy controversies in developing countries. There has been a lively debate in the literature regarding the degree of price transmission. For European producers, Tyers and Anderson demonstrate a transmission rate of world price variation less than 10% for the short run, and 20% for the long run. More generally, Sarris mentions transmission coefficients of 0.24 and 0.58 in the short and long run. In a controversial paper, Mundlak and Larson (1992) conclude, "the deviation from unitary elasticity is, on the whole, surprisingly small" (p. 419). In their judgement, while policies affect price levels, they appear ineffective at insulating to a great degree domestic prices from world price *changes*. The authors also note that variations in world prices are the major contributor to variations in domestic prices, a conclusion discordant with the evidence from the price decompositions presented below.

In contrast to Mundlak and Larson, Quiroz and Soto (1995) made use both of spot prices (in place of the Mundlak and Larson approach based on the FAO average unit export values), and of an error-correction specification of the relationship between world and domestic prices. Covering 78 countries, Quiroz and Soto conclude, "In an overwhelming majority of cases transmission of international price signals in agriculture is either non-existent or low, by any reasonable standard." But the degree of transmission, of course, ranges across countries. For Australia, Canada, New Zealand and Uruguay, 50% or more of any given shock from world prices is transmitted within a year. But these few countries are in contrast to 30 countries that exhibit price transmission characteristics such that it takes five years or longer to transmit half of any world price shocks. Surprisingly, another group of 30 countries appears "virtually isolated from international price signals."

One major caveat of these mentioned studies is that the data correspond to trade regimes that applied before the Uruguay Round. So with tariffication and the removal of QRs transmission could be higher today, and this offers a rich area of study.

5. But what is the practical relevance of enhanced price transmission to the determination of real domestic prices? - Price decomposition.

It is useful to return to the Mundlak and Larson study (or that of Quiroz and Soto) to aid in understanding the alternatives in how one can specify the question of the relevance of price transmission. The regression-oriented decomposition of Mundlak and Larson results in an isolated elasticity of world price transmission, controlling for the variability of other factors. That is to say, it is an elasticity derived from partial correlations underlying regression analysis, but in and of itself it says little about the magnitudes of the absolute effects of world price changes on domestic producer prices. A different approach consists of decomposing the total variation of domestic prices as a sum of changes in world prices, exchange rates and border protection. In a practical sense, the isolated, ceteris paribus effect of price transmission per se might not be the most important issue facing farmers in developing countries. The practical impacts of world prices on domestic prices are, at a minimum, filtered through fluctuations in exchange rates, which are, as is well known, much more volatile in developing economies. In addition, historically speaking, changes in border protection have also been of significant importance during the 1990s in many countries, influencing the ultimate effects of changes in world prices on domestic producers.

It is relevant to consider the extreme case of countries that have fixed exchange rates and dollar convertibility, such as Argentina until recently. In such a case, and where the rate of inflation would be close to zero, one would expect a price transmission elasticity of one. Moreover, any decomposition of

domestic price changes would show a near one-to-one total correlation between domestic prices and world prices (abstracting from marketing margin changes). In contrast, take the case of Chile, which in spite of a stable macroeconomic environment (with an inflation rate of less than 3%, a fiscal deficit less than 1% of GDP, and with ample foreign exchange reserves), the country's real exchange rate has fluctuated significantly. This has been due mainly to movements in capital accounts and also due to the inherent instability associated with emerging economies related to the "neighbourhood effect" – the Asian Crisis, the Tequila Effect, the Brazilian devaluation and most recently the Argentina crisis. Even if the price transmission elasticity were one for Chilean exported fruits and wine (which is likely the real case), the final effect of world price changes on real domestic prices might be overwhelmed by the accumulated influence of exchange variation.

Take the example of real price trends of wheat in the transition economies of Bulgaria, Romania, Russia and Ukraine (Valdés, 2000). These countries have experience large yearly real producer price variations. The decomposition of these fluctuations is presented in Table 3 for the period 1994 to 1997, permitting an examination of the contribution of price changes from changes in border prices, real exchange rates and policy interventions. What is notable from the data is the imperfect correlation (sometimes negative) between border price changes and domestic producer prices. For example in the case of wheat in Bulgaria during the period 1994-1997, domestic prices increased 25% while border prices fell 6%, the increase due primarily to a 34% increase in the real exchange rate.

Table 3. **Decomposition of real producer price for wheat in transition economies**

			Percent change in		
Country	Period	Domestic price	Border price	Real exchange rate	Residual – policies
	1994-97	-43	-10	-60	27
Ukraine	1994-95	-30	-5	-35	10
	1996-97	-13	-13	-3	3
	1996-97	-9	-24	3	12
	1995-96	-9	7	-20	4
Poland	1994-95	-8	-14	-8	14
Romania	1994-95	-8	-6	-1	-1
	1994-97	-8	-16	0	8
	1994-97	-7	14	4	-26
	1996-97	-6	-12	2	4
	1994-97	-4	-10	-7	13
	1996-97	-4	-12	-5	12
Germany	1994-95	-4	14	-5	-12
	1996-97	-4	-10	6	-1
	1996-97	-2	-18	22	-6
	1995-96	1	11	3	-12
Bulgaria	1994-95	2	6	-8	4
	1995-96	13	28	-2	-13
	1995-96	13	3	4	5
	1995-96	16	7	-2	11
Russia	1994-95	17	14	-4	7
	1995-96	25	6	20	-1
	1994-97	25	-6	34	-3
	1994-97	27	9	-4	22

Source: Valdés, A., "Agricultural support policies in transition economies," World Bank Technical Paper no. 470, 2000, p. 21.

The evidence for various agricultural commodities in Argentina, Chile and Colombia (Tables 4, 5 and 6) shows a similar pattern with respect to the alternating relative weight of border prices movements to the final determination of domestic real producer prices. In short, price transmission per se is not the whole story.

6. What evidence do we have that the elimination of distortions in developing countries – which enhances the degree of price transmission – has exacerbated the vulnerability of producers?

The 1992 study of the political economy of agricultural price policies in 18 LDCs by Schiff and Valdés shows that governments tend to insulate domestic sectors to a greater degree during periods of volatile world prices. If attaining price stability was the purpose for such interventions, then in overall terms governments succeeded in achieving the objective, primarily direct interventions. Relative to world prices, protective policies managed to reduce domestic price variability by an average of 25%, and even more so in products where world prices were highly volatile. Quiroz and Soto's 1993 cross-country analysis of the transmission of world agricultural price shocks reinforce these conclusions. In 67 of 76 countries examined, it took at least two years to transmit 50% of international price shocks to domestic markets.

The historical policy decisions of governments could be interpreted as evidence, in the sense of revealed preference, that government think that reductions in price transmission effectively reduce the vulnerability of producers. This is what one should expect from a welfare and public-choice perspective where commodity prices are politically sensitive. In terms of farmers, governments tend to be sensitive to price instability in developing countries, because farmers tend to be risk averse, there are fewer opportunities to hedge risk, credit markets are less developed, and governments do not have the fiscal resources to provide non-border support to farmers in years of low prices. In terms of consumer and labour markets, without the fiscal wherewithal to provide broad coverage of safety net programs, variation in food prices can have a significant effect on real wages and real household incomes.[6]

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6. Another aspect, which we do not consider here, is the effects of trade liberalization and price transmission on agricultural value added, and not simply on prices. The case of Brazil after the 1991 reforms is very interesting, where border protection on tradable inputs fell rapidly and significantly, benefiting the producers of exportables (whose export taxes were eliminated) and partially compensating producers of importables who confronted tariff reductions on their products. The data suggest that the reduction in price of purchased inputs and machinery tended to favor mid and larger scale farmers.

7. Another aspect, which we do not consider here, is the effects of trade liberalization and price transmission on agricultural value added, and not simply on prices. The case of Brazil after the 1991

Table 4. **Decomposition of producer price changes: Argentina**

		Cumulative Percentage Change in					
Product	Period	Real Domestic Prices	Real Border Prices	Real Exchange Rate	(1+Ti)	Others	(1+Ti) + Others
Exportables							
Beef	1960-69	-43.55	-30.97	-244			231.61
	1970-79	22.29	43.58	-67.67			46.38
	1980-84	-33.97	-104.29	87.20			-16.88
	1985-89	32.68	13.16	39.36	-19.62	-0.22	-19.84
	1990-93	-91.35	13.28	-132.01	27.75	-0.38	27.38
	1994-95	2.45	-3.31	-2.02			7.78
Maize	1960-69	2.57	-21.54	-14.42			38.52
	1970-79	-102.78	4.04	-83.34			-23.49
	1980-84	54.93	-33.69	89.39			-0.77
	1985-89	-38.40	-38.74	14.36	4.65	3.52	9.23
	1990-93	-68.28	-38.88	-61.98	28.61	3.97	32.58
	1994-95	25.97	13.08	-2.02			14.92
Sorghum	1960-69	-4.51	-24.07	-14.42			33.98
	1970-79	-38.49	4.86	-58.54			15.19
	1980-84	-4.69	-23.41	64.60			-45.88
	1985-89	-15.72	1.86	-35.62	2.65	15.39	18.04
	1990-92	-89.00	-47.73	-54.70	25.28	-11.85	13.43
Soybeans	1960-69	n.a.	n.a.	n.a	n.a	n.a	n.a
	1977-79	-112.07	-51.20	-55.40			-5.47
	1980-84	7.60	-60.75	80.42			-12.07
	1985-89	-41.02	10.87	-48.30	-3.52	-0.07	-3.59
	1990-93	-58.64	-39.38	-61.98	38.67	4.04	42.72
	1994-95	-41.36	-52.61	-2.33			13.58
Sunflowers	1960-69	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	1977-79	-89.08	-24.34	-55.40			-9.33
	1980-84	22.02	-59.88	80.42			1.48
	1985-89	-56.64	-17.50	-35.62	-2.01	-1.51	-3.52
	1990-92	-67.65	-46.14	-54.70	32.93	0.27	33.19
Wheat	1960-69	-3.77	-18.09	-14.42			19.51
	1970-79	-87.73	6.85	-92.60			-33.80
	1980-84	-64.03	-62.15	9.18			-11.06
	1985-88	-3.72	-19.11	-12.32	20.18	7.53	27.71
	1991-93	-24.76	-35.94	-26.64	31.64	1.42	37.82
	1994	-2.61	-5.93	-1.44			4.77

Source: Valdés, "Surveillance of Agricultural Price and Trade Policy in Latin America during Major Policy Reforms," 1996.

reforms is very interesting, where border protection on tradable inputs fell rapidly and significantly, benefiting the producers of exportables (whose export taxes were eliminated) and partially compensating producers of importables who confronted tariff reductions on their products. The data suggest that the reduction in price of purchased inputs and machinery tended to favor mid and larger scale farmers.

Table 5. **Decomposition of producer price changes: Chile**

Product	Period	Cumulative Percentage Change in Real Domestic Prices	Real Border Prices	Real Exchange Rate	(1+Ti)	Others
Exportables						
Apples, red	1960-70	133.77	41.02	30.94	17.14	44.67
	1971-74	-2.40	-21.22	44.77	-10.38	-15.58
	1975-83	6.40	-8.40	46.47	-6.77	-24.90
	1984-89	30.48	-4.10	36.11	0.00	-1.53
	1990-93	-429.10	-64.88	-14.79	0.00	-349.43
Grapes, Thompson	1960-70	99.29	21.53	30.94	17.14	29.67
	1971-74	54.35	4.37	44.77	-0.59	5.80
	1975-83	41.51	20.91	46.47	-16.55	-9.31
	1984-89	-4.70	-30.47	33.67	0.00	-7.91
	1990-94	22.24	21.37	-16.80	0.00	17.67
Importables						
Beef	1960-70	41.20	9.57	30.94	0.00	0.69
	1971-74	87.27	42.14	44.77	0.00	0.36
	1975-83	-51.72	-76.06	46.47	0.00	-22.12
	1984-89	136.69	64.93	33.67	13.98	24.12
	1990-95	-30.05	16.88	-26.84	-3.54	-16.54
Maize	1960-70	n.a.	n.a.	n.a.	n.a.	n.a.
	1971-74	n.a.	n.a.	n.a.	n.a.	n.a.
	1975-83	n.a.	n.a.	n.a.	n.a.	n.a.
	1984-89	-4.24	-45.12	25.27	-7.84	23.46
	1990-93	-22.18	-23.84	-16.25	-3.54	21.44
Milk	1960-70	3.29	-5.37	30.94	0.00	-22.28
	1971-74	77.44	14.27	44.77	0.00	18.40
	1975-83	-0.18	-2.39	46.47	0.00	-44.26
	1984-89	-6.25	9.46	33.67	13.98	-63.35
	1990-93	-16.51	-19.66	-16.25	-3.54	22.94
Sugarbeet	1960-70	n.a.	n.a.	n.a.	n.a.	n.a.
	1971-74	n.a.	n.a.	n.a.	n.a.	n.a.
	1975-83	n.a.	n.a.	n.a.	n.a.	n.a.
	1984-89	-1.35	39.16	25.27	-7.84	-57.93
	1990-93	-7.57	18.72	-16.25	-3.54	-6.50
Wheat	1960-70	6.33	-13.15	26.76	0.00	-7.28
	1971-74	53.81	80.13	9.89	0.00	-36.21
	1975-83	35.51	-88.39	81.35	0.00	42.55
	1984-89	-0.42	-32.83	37.84	-7.84	2.41
	1990-95	-27.80	-12.84	-26.84	7.84	4.04

Source: Valdés, “Surveillance of Agricultural Price and Trade Policy in Latin America during Major Policy Reforms,” 1996.

Table 6. **Decomposition of producer price changes: Colombia**

Product	Period	Cumulative Percentage Change in Real Domestic Prices	Real Border Prices	Real Exchange Rate	(1+Ti)	Others
Exportables						
Beef	1960-69	n.a.	n.a.	n.a.	n.a.	n.a.
	1970-79	n.a.	n.a.	n.a.	n.a.	n.a.
	1980-89	-6.45	-40.26	63.16	-29.22	-0.13
	1990-92	27.68	-35.73	4.94	75.43	-16.96
	1993-95	-24.77	15.87	-32.89	a	-7.74
Coffee	1960-69	-6.12	-27.89	20.90	-6.76	7.63
	1970-79	47.24	78.81	-21.43	-34.88	24.75
	1980-89	-33.07	-108.98	65.31	61.82	-51.22
	1990-92	-47.12	-61.91	4.94	28.45	-18.60
	1993-95	28.07	74.80	-32.89	a	-13.83
Cotton	1960-69	-7.30	-20.82	20.90	0.13	-7.52
	1970-79	13.46	40.04	-21.43	-0.09	-5.06
	1980-89	4.43	-52.62	65.31	0.11	-8.37
	1990-92	-25.87	-38.25	4.94	13.02	-5.58
Importables						
Rice	1960-69	-21.60	-16.70	20.90	0.00	-25.80
	1970-79	-29.05	2.89	-21.43	0.00	-10.51
	1980-89	10.62	-109.06	65.33	41.30	13.05
	1990-92	-30.75	-23.45	-12.18	6.86	-1.99
Maize	1960-69	n.a.	n.a.	n.a.	n.a.	n.a.
	1970-79	n.a.	n.a.	n.a.	n.a.	n.a.
	1980-89	-5.08	-46.55	63.37	-26.47	4.57
	1990-92	-36.69	-10.01	4.94	-20.01	-11.60
	1993-95	-33.53	-15.22	-32.89	a	14.58
Milk	1960-69	n.a.	n.a.	n.a.	n.a.	n.a.
	1970-79	n.a.	n.a.	n.a.	n.a.	n.a.
	1980-89	-15.58	-42.41	63.16	-44.87	8.54
	1990-92	-16.62	-29.41	4.94	25.61	-17.76
	1993-95	10.09	16.50	-32.89	a	26.48
Sorghum	1960-69	n.a.	n.a.	n.a.	n.a.	n.a.
	1970-79	n.a.	n.a.	n.a.	n.a.	n.a.
	1980-89	4.38	-54.42	63.03	-6.74	2.52
	1990-92	-21.28	-5.49	-12.02	-2.61	-1.16
Soybeans	1960-69	n.a.	n.a.	n.a.	n.a.	n.a.
	1970-79	n.a.	n.a.	n.a.	n.a.	n.a.
	1980-89	26.89	-45.34	63.03	10.55	-1.35
	1990-92	-43.95	-32.51	-12.02	-7.74	8.32
Wheat	1960-69	-11.40	-39.52	20.90	0.00	7.22
	1970-79	-25.40	17.64	-21.43	0.00	-21.61
	1980-89	31.22	-69.92	65.17	41.84	-5.87
	1990-92	-39.74	-31.59	-12.02	2.28	1.59

Source: Valdés, "Surveillance of Agricultural Price and Trade Policy in Latin America during Major Policy Reforms," 1996.

7. Policy implications – the context of WTO commitments

To summarise the concerns in developing countries, there are five points we have considered in this paper.

a) Perhaps the central concern in developing countries is the question of whether or not the level of prices are very distorted – and excessively low – due to the subsidies of OECD countries. This preoccupation is intensified in the context of falling prices in real terms.

b) There is a concern about world price instability and it is likely more of a concern in developing countries, but the real possibility of extended periods of "low prices" are the biggest political difficulty. And the persistence problem exacerbates any attempt to resolve that low price problem without resort to border measures.

c) What can be done to deal with the low price problem for developing countries? Special safe guards were conceived as an instrument, but most developing countries cannot use them, because they did not tariffy before the Uruguay Round. (We refer the reader to the Konandreas paper presented at the FAO/WTO workshop in Geneva, March 2001.)

d) From a perspective of developing and transition countries, as the result of their trade liberalisation (the reduction in price distortions and the removal of QRs) and thus enhanced price transmission, world price distortions are now more important. The reduction in protection and the change in the system of protection brought about by decisions in developing countries augmented the importance of world price distortions.

e) What we have emphasised is direct price transmission, but there are other effects of trade liberalisation on the welfare of the poor, which go uncaptured by simply looking at price effects. One must recognise that there are also questions surrounding what is the important definition of "transmission." Normally we speak of price transmission from border prices to domestic prices of tradables. But also importantly from the perspective of poorer farmer is the second-order transmission of world market changes through labour markets, capital markets and the influence of a missing staple market (Taylor, 2002). Imperfectly functioning capital markets and high transactions costs – including those associated with access to markets for new products – tend to isolate poorer farmers and rural areas. Rural households that would lose under trade liberalisation could conceivably move there resources – primarily labour – to other economic sectors where transactions costs are lower and where access to capital is less expensive. Many do, but for some the net benefits of migration are low, especially for older persons and those with human capital specific to farming and lower levels of education that might otherwise provide skills transferable to other sectors.

That world prices have been affected by government policies in both developed and developing countries appears to be a historical fact, although the degree to which such policies have distorted prices is subject to debate. Perhaps these distortions have changed with the recent overall movements toward liberalisation, but certainly not the direction of their negative effect on world prices. Liberalisation in developing and transition economies has certainly enhanced the transmission of prices, and thus the importance of the distortions that continue to exist.

Particularly in the context of ongoing WTO negotiations, what briefly can we say about the policy implications that one can draw from this environment of price distortion and price transmission? In this period of major policy reforms towards more open economies, there are valid political and economic arguments for governments and the farming community in developing countries to find

effective interventions to deal with enhanced price transmission especially in the context of the persistence of low world prices. The movement towards trade liberalisation, towards allowing market price signals to determine the use of resources, could be frustrated by the reluctance of governments to expose further their farming constituents, especially those in the import competing sectors, to the risks of price instability and periods of persistent low prices that would result from the enhanced price transmission associated with additional reforms. Obviously, those who believe in the benefits of freer world trade have an interest in facilitating policy adjustments in developing economies. But these adjustments must be designed in such a way as to overcome the potential political resistance likely to result from the exposure of large agricultural sectors, where there is a concentration of a large share of the poor, to the risks of sustained price decreases.

Although there is a variety of instruments presently in use, there is the question of how countries might deal with low prices under the current WTO legal framework and what could be the subject of negotiations of the Doha Round and the future. In a relevant technical note, Konandreas (2000) of the FAO discusses the current framework, classifying permissable policies into two broad categories: border measures through tariffs (within the tariff ceiling bounds) and domestic support measure (price and non-price programs within the limits of WTO commitments).

With respect to border measures, most countries have bound their tariffs at a relatively high rate, that is, 100%, and sometimes more. Several countries, such as the Philippines, Chile, Thailand, Argentina and Malaysia, have bound their tariffs around 30%. In many countries, the actual rates are lower than the bound tariff (the so-called "dirty tariffication"). In Konadreas's view, a high bound tariff might be insufficient to avoid the politically difficult situation of very low prices. But in addition, in our view, more significantly the lack of other instruments under the WTO has encouraged governments cynically to set an overly high bound tariff. This permits considerable discretion in the selection of tariff levels, and thus a greater degree of uncertainty with regard to the effective trade regime at any point in time.

And in practical political terms, very few countries have access to the special safeguard clause, an exemption to tariff ceiling levels. From earlier commitments eligibility is limited to the tariffication process, and because the majority of developing countries did not "tariffy," and instead offered ceiling bindings, very few can presently make use of the SSG clause.

With respect to domestic support policies, there are both bound supports under non-exempt policies subject to commitments of aggregate expenditure ceilings (the AMS established during the Uruguay Round), and non-bound supports, exempt from limits, operating within the "green box." In addition, developing countries have access to a special category of exempted under "Special and Differential Treatment" – investment subsidies, input subsidies to low-income farmers, *etc*. Most developing countries (61 of 71) reported zero AMS levels – of the remaining ten countries these levels are very small. In part thus was due to fiscal limitations (Konandreas). The implication is that most developing countries are limited in their support options to action under the *de minimis* clause and the definitions of the "green box," and are thus restricted in their use of non-border support policies. In contrast developed countries (and a few developing countries) reported high AMS.

Therefore, this is the situation: developing countries have fewer fiscal resources to aid their farmers through domestic supports, and have fewer alternative market instruments to compensate for the higher variability of domestic prices – and particularly lower prices – that might result from the trend toward trade liberalisation. This leaves many governments in developing countries with the temptation to seek protection of their import-competing sectors through border measures. From an economist's perspective of the welfare gains from trade, and from a practitioner's perspective of facilitating the liberalisation process, future WTO negotiations might well consider providing greater flexibility to

developing and transition economies with respect to well-defined and disciplined tariffs and surcharges. Such flexibility might come through price bands, floor price schemes, modification of the general WTO safeguards, and – a perhaps the most promising – the expansion of the special safeguard clause for countries with low bound tariffs.

There is a technical discussion ongoing in Geneva in other circles on these issues. The specificity of these measures, their legality, their operational implementation and their relative effectiveness are a set of questions which would be major research efforts in and of themselves, and which are certainly worthy of the professional attention of economists and others committed to improving the performance of the international trade system.

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ENDOGENOUS MARKETS, PRICES AND TRADE REFORMS: EVIDENCE FROM AFRICAN SECTOR AND COMMUNITY DATA

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Abstract

The benefits of trade reform depend on the efficiency of markets. Predictions of benefits rely on empirical measures of market efficiency. Using cross-country data on Africa and using community-survey data from Uganda, this paper finds evidence that markets in Africa effectively transmit price signals, but also finds significant heterogeneity in commodity market efficiencies. The paper identifies estimation challenges that make empirical measures difficult to obtain, which may lead to poor forecasts of trade benefits. The paper also concludes that spatial heterogeneity will affect the distribution of trade benefits. To the extent the poor live near markets that are less efficient, the positive and negative effects of trade reform on poverty will be muted.

Introduction

Exchange is a dominant feature of how economists view the world. Economists depend on exchange to value the activities of households and firms and use incomes, a summary of exchange-measured activities, as a first indicator of development. Economists also look at the characteristics of prevalent forms of exchange in a country as a diagnostic measure of development. Douglas North (1994), for one, argues that, historically, development entails moving from autarky and localised trade to far-reaching and specialised impersonal trade. This path relies on developing more efficient forms of economic organisation that are motivated and rewarded by the gains from trade. Sophisticated forms of economic organisation inevitably depend on collective institutions and usually governments. But tensions between specialised and general benefits from institutions lead to tensions in the process of rule making so that the same process that gives rise to more efficient trade can also place limits on the scope of trade. Government enforced restrictions on trade is an example.

Explaining and measuring the costs of such interventions is the mainstay of trade economics. However, trade reform is of special interest to development economists as well since expanded trade permits growth through the reallocation of scarce factors, rather than the slower process of factor accumulation. Trade reforms also put in place new incentives that influence a change in fixed factors with implications for longer-term growth. At the same time, experience from recent years indicates that the outcomes from trade reform have been uneven. Especially in the context of commodity market reforms, unexpected difficulties, often related to markets, have placed limits on the potential gains from reform (Akiyama, Baffes, Larson and Varangis, 2000.)

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In this paper, I present a simple model of spatial price discovery that depends on fixed factors. An implication from the model is that the benefits of trade will depend, in part, on how well markets function. Since markets of all types are heterogeneous in terms of efficiency, the pace and benefits of reform can be uneven. In short, the supply response expected from firms and households following reform may be limited not only by the productive capacity of households and firms, but also by limited stocks of market-related capital and fixed factors. This has implications for policymakers – since some market capital is provided by the public sector – and it also has implications for how market efficiency is measured.

The point of departure is the spatial equilibrium condition that the difference between two prices for the same good will differ by no more than the full cost of transacting an exchange between the markets. The condition is well known and well studied. Ekelund and Hérbert (1999) trace the foundations of spatial market theory to von Thünen (1826). Samuelson (1952) and Takayama and Judge (1971) credit advances in linear programming by Koopman (1949) to renewed interest in the formalisation of spatial equilibrium theory. In 1951, Enke gave a descriptive solution to the spatial market equilibrium that Samuelson formalised in 1952. Most modern models of spatial integration are derived from Samuelson's paper and subsequent extensions by Takayama and Judge (1964).

Applied models preceded Samuelson. In their recent review, the earliest study of spatial efficiency noted by Fackler and Goodwin (2001) was Mohendru's 1937 study of Punjab wheat markets. Although Samuelson (1957) was careful to distinguish between spatial and temporal market equilibria, most empirical studies rely on time-series data and general dynamic structure appended to spatial conditions. This literature is reviewed in Baulch (1997) and also in the already mentioned chapter by Fackler and Goodwin. Fixed effects in spatial data can be used to avoid the need for imposed-dynamics, but cross-sectional studies are less common. Some recent examples include Baffes (1991); Mundlak and Larson (1992); and Gardner and Brooks (1994).

The remainder of the paper is organised in the following way. In the next section I discuss the theoretical and statistical framework for the analysis. Following that discussion, empirical results are reported using sector data from FAO and then household and community data from Uganda. The last section draws implications for market reforms.

Framework

I draw on the framework developed in Mundlak and Larson (1993), which is a restatement of the spatial arbitrage condition under proportional transaction costs. The spatial arbitrage condition – or the law of one price – states that, when trade occurs, location-related differences in price are due to transaction costs. Otherwise arbitrage opportunities would induce actions to reinstate the condition. More explicitly, consider prices (P) for the same commodity (c) for two different markets ($l,*$) at time t, with transaction costs $R(p; s)$. For continuous trade, the arbitrage condition is given as:

$$P_{ct}^{l} = P_{ct}^{*} E_{t}^{l} R_{ct}^{l} \qquad 1)$$

where E is an exchange rate. Transaction costs depend on the market pairs and are also commodity and time specific. This dependence comes both from the differences in the physical costs of storage and transport, but also potentially includes characteristics peculiar to the commodity markets. Examples include different policy treatment, market liquidity and the cost of acquiring cost and quality information. Implicit in the transaction costs are several forms of fixed factors, s, – some of which are relevant for many markets (road, communications and port infrastructure) and some of

which are commodity specific (*i.e.* quality standards) or even location specific (social capital.) Factors that are fixed in the short-run change over time as will available technologies. Moreover some policies are likely commodity specific, while most policies will vary with time and – especially in the case of international trade – location. It is worth noting that the arbitrage condition itself is atemporal; however, when explicit measure of time-varying factors that explain transaction costs are unavailable, time-effects must be accounted for.

In anticipation of the analysis to follow, note that P can be decomposed into variations along each dimension of a two-dimensioned panel of observations. Regressions based on a panel of data will attempt to explain the observed total variation of the dependent variable, which is, itself, an average of variations in the dimensions of the panel. Consequently, the regression coefficient produced by pooling observations across both dimensions of the panel will depend on the relative variation in dimension of the panel. To be more concrete, allowing lower case letters to signify natural logs, average over location and time to produce $p_{c.}$ and over all observations to produce $p_{..}$ The following sums-of-squares (SS)—taken over all observations – holds:

$$SS(p_{ct} - p_{..}) = SS(p_{ct} - p_{c.}) + SS(p_{c.} - p_{..}) \qquad 2)$$

that is, the total sum-of-squares will equal the within (first term) and between (second term) sum-of-squares. For the sake of illustration consider the regression p_{ct} against p^*_{ct} (pooled), $[p_{ct} - p_{c.}]$ against $[p^*_{ct} - p^*_{c.}]$ (within), and $[p_{c.} - p_{..}]$ against $[p^*_{ct} - p^*_{..}]$ (between) to produce the slope coefficients β, $\beta(w)$ and $\beta(b)$ respectively, the following relationship holds:

$$\beta = \phi\beta(w) + (1-\phi)\beta(b) \qquad 3)$$

where ϕ is a weight determined by the relative shares of within and between sums-of-squares of p_{ct}. Additional relationships hold as well. See Mundlak (1978) and Mundlak and Larson (1992) for more detail.

Although abstract, these relationships are relevant for trade in the following way. Models that try to measure and anticipate the consequences of trade reform depend on empirical measures of the transmission of price signals from international to domestic markets and also among domestic markets. From theory, we have good reason to suspect that markets themselves depend on attributes that vary according to time, location and commodity. However, panels that allow measurement over all three dimensions are rare. Moreover, studies that consider the relationship between the same commodity in two markets across time are most prevalent in the literature. Since composition of the panel brought to the estimation problem potentially matters, reliance on relatively few datasets and a reliance on time-series measures can result in limited measurement of how markets work.

Empirical models and results

Using sector data

Producer prices for this exercise are taken from the on-line database of the Food and Agriculture Organisation of the United Nations (FAO[1]). The data are annual averages for the period 1966-1995 for 17 commodities in 36 African countries. Not all commodities are produced in all countries. World prices are annual OECD import unit value averages. Exchange rates are annual average dollar rates as reported by the International Monetary Fund.

FAO reports producer prices in local currencies. In some of the analysis producer prices are converted to nominal US dollars. Table 1 reports the decomposed sum-of-squares for both the local and the converted series. The series are converted to logs (indicated by lower case letters), that is, $\tilde{p}^{l}_{ct} = p^{l}_{ct} - e^{l}_{t}$.

The sums-of-squares from both series are reported in Table 1. Between variations are differences among averages – for example, for a time-commodity panel, the between commodity sum-of-squares measures the tendency for differences among commodities from their average over time. The within-commodity sum-of-squares measures the remaining variation. The table shows that between variations account for a small portion of total variation for time and commodities, but that the between variation comprises a larger share of the country-variation. This is consistent with the notion that there are large policy and institutional differences among African countries that affect market efficiency.

The table also shows that common and sensible manipulations of the data are not neutral in their effects on the composition of variation. Note that the between-country variation is proportionately larger than the between commodity variation in local currencies. Converting to US dollars enhances the country-share of variation. This result is tautological, since the exchange rate is country, but not commodity specific. Consequently, introducing the country-subscripted variable increases the variation of price in one direction only.

Table 1. **Decomposition of the producer prices sums-of-squares**

Producer prices	Observations	Total	Year		Country		Commodity	
			Within	Between	Within	Between	Within	Between
Local	11 360	98 030	80 292	17 738	41 727	56 303	83 348	14 683
Share		1	0.82	0.18	0.43	0.57	0.85	0.15
$US	11 360	435 911	432 853	3 059	23 577	412 334	418 310	17 602
Share		1	0.99	0.01	0.05	0.95	0.96	0.04

Written in logs and converted into a common currency and with the addition of a random error term, the data can be pooled to test for a restricted version of the spatial arbitrage condition:

$$\tilde{p}^{l}_{ct} = r + \beta^{1} p^{*}_{ct} + v^{1} \qquad 5)$$

1. FAO provides the data on-line at www.fao.org.

where β^1, the price-transmission elasticity, is expected to equal 1 when transaction costs are strictly fixed, but may be less than 1.[2]

In this version of the model, fixed and proportionate transaction costs are constant across commodities and countries; changes in exchange rate levels and world price levels are expected to be fully transmitted to all commodities. The estimated parameters, t-scores and adjusted R^2 for the regression are given under Model 1 in Table 2. As might be expected, the equation performs poorly and leaves most variation unexplained.

Equation 5 can be expanded to take into account transaction costs related to exchange rates as follows:

$$p_{ct}^{l} = r + \beta^1 p_{ct}^{*} + \beta^2 e_t^{l} + v^2 \qquad 6)$$

where r remains fixed, but where $(1-\beta^1)$ is interpreted as the transaction cost related to price and $(1-\beta^2)$ as the transaction cost related to the exchange rate. Normally exchange-related fees are small, but here the effect also includes policy-related costs that may well be much higher. Moreover, since the exchange rate is constant across countries, the exchange rate variable picks up country-specific effects in addition to exchange-specific policy effects.

The estimated results from this regression (model 2) are given in the second column of Table 2. This model explains a significantly larger portion of the variation in producer prices. The price transmission elasticity increases to about 80% while the transmission elasticity for the exchange rate is quite low at 17%.

The exercise was repeated allowing for fixed costs that vary by commodity, country and time. The regression equation becomes:

$$p_{ct}^{l} = r_c + r_l + r_t + \beta^1 p_{ct}^{*} + \beta^2 e_t^{l} + v^3 \qquad 7)$$

The regression result (model 3) is reported in column three of Table 2. With the addition of county, commodity and year-effects, the parameters remain statistically significant, however the transmission elasticity drops while the exchange rate increases. Tests on the three groups of fixed effects proved significant.

Table 2. **Summary results from the pooled models**

	Model 1	Model 2	Model 3
Summary statistics			
R2	0.02	0.26	0.94
Parameters			
Intercept	7.69	8.72	
Price	0.66	0.82	0.10
Exchange		0.17	0.56
Fixed effects F-test			
Country			2 655
Time			92
Commodity			727

Note: Model 1 R^2 is based on dollar prices and not comparable to others in table.
All parameter estimates and F-test scores were significantly different from zero with 99% confidence.

2. Here and for the remainder of the section, the subscripts on the error term (c,t,l) are implied.

The preceding model provides a measure of average transmission elasticities. However, policies vary significantly among countries and over time. Moreover, market-related institutions, transport and information infrastructure and technologies can also change with time. Large and significant differences among the fixed effects suggest this is true. Consequently, estimates of average transmission rates may mask a wide spread in country-specific transmission rates.

To get at country specific measures, country-specific between and within-commodity estimates of transmission elasticities are measured. Between-commodity estimates measure the average relationship between domestic and international commodity prices. Since the exchange rate is not commodity indexed, the average over time is a scalar that falls into the intercept. Specifically, the equation for the between-commodity estimates is given by:

$$p_{c.} = \tilde{r} + \beta^1 p^*_{c.} + v_{ct} \qquad 8)$$

Within-commodity regressions measure how observations differ from average commodity prices. The equation is given by:

$$p_{ct} - p_{c.} = \hat{r} + \beta^1 \left(p^*_{ct} - p^*_{c.}\right) + \beta^2 \left(e_t - e_{.}\right) + \hat{v}_{ct} \qquad 9)$$

The estimated price transmission elasticities from the between and within-commodity regressions are given in Table 3. The within-commodity regressions do a good job of explaining most of the variation in the country producer prices. That is, once commodity effects are taken into account, international prices and domestic exchange rates can explain most of the sample variation. The results also yield estimates for price and exchange rate elasticities that are close to one for many of the countries. Because the equations are cast in logs, this does not imply that transaction costs are low in these African countries, or that they pursue free-trade policies. Rather, the estimates suggest that these are relatively constant features of the important commodity markets in Africa.

As discussed, the between-commodity variation is a small component of the total variation in the country-commodity-time panel; however the between-commodity regressions leave much of this variation unexplained - perhaps due to commodity-specific state variables that go unobserved.

Community data from Uganda

How general are the results given in Table 3? In this section a similar model of the spatial arbitrage condition is tested using a cross-sectional survey of households and of community crop markets in Uganda from 1992. The data contain observations from 666 communities and 31 crops. No community produces all crops and most trade in a handful, so that the dataset comprises 3 326 observations and is unbalanced. For the purpose of estimation, all continuous variables were expressed in natural logs[3].

Table 4 repeats the decomposition exercise for the community data. As with the sectoral data, variation relating to location – in this instance community – is large relative to commodity-related variance. Consequently, the pooled regressions methods will give greater weight to the community spread.

3. For a more detailed discussion see Larson and Deininger (2000.)

For the sectoral data, transaction costs were taken as either fixed or proportional to price and the exchange rate. In the community data, variables are present, which potentially proxy variable costs – distance to market, to communications, to good roads and to public transport.

Table 3. **Country-specific between and within commodity regression estimates**

	Within-commodity			Between commodity	
	Price	Exchange rate	R-Square	Price	R-square
Algeria	1.01	1.12	0.94	0.29	0.19
Angola	1.50	0.30	0.69	0.51	0.35
Botswana	0.60	1.09	0.90	-0.15	0.11
Burundi	0.90	0.83	0.96	0.72	0.54
Cameroon	0.94	0.90	0.84	0.58	0.49
Congo, Dem. Rep.	2.90	0.40	0.83	0.37	0.20
Congo, Rep.	0.89	0.97	0.87	0.36	0.22
Cote d'Ivoire	1.01	0.61	0.92	0.48	0.27
Egypt, Arab Rep.	1.04	1.03	0.90	-0.17	0.02
Gabon	1.01	0.81	0.92	0.43	0.19
Gambia, The	1.02	0.85	0.95	0.25	0.11
Ghana	1.71	0.81	0.93	0.49	0.20
Guinea	1.30	0.79	0.97	0.71	0.41
Kenya	0.85	0.96	0.97	0.83	0.49
Libya	1.39	1.09	0.84	0.59	0.93
Madagascar	0.75	0.77	0.92	0.61	0.38
Malawi	0.54	1.02	0.95	0.68	0.57
Mali	1.21	1.04	0.96	0.80	0.36
Mauritania	1.10	0.63	0.89	0.49	0.64
Mauritius	0.86	1.28	0.96	0.90	0.54
Morocco	0.93	1.20	0.92	0.48	0.20
Niger	1.47	1.30	0.89	0.19	0.05
Nigeria	1.32	0.96	0.95	0.46	0.33
Rwanda	1.01	1.34	0.92	0.73	0.56
Sao Tome and Principe	0.50	0.30	0.96	0.88	1.00
Senegal	1.04	0.61	0.95	0.33	0.13
Sierra Leone	1.06	0.81	0.97	0.67	0.93
South Africa	0.79	1.06	0.98	0.89	0.47
Sudan	1.49	0.88	0.94	0.00	0.00
Swaziland	0.72	1.10	0.97	0.57	0.30
Tanzania	1.03	0.78	0.95	0.67	0.41
Togo	0.93	0.83	0.90	0.37	0.31
Tunisia	0.92	1.08	0.97	0.35	0.34
Uganda	1.28	0.99	0.98	0.12	0.05
Zambia	0.94	0.71	0.97	0.81	0.46
Zimbabwe	0.90	0.82	0.95	0.72	0.47

Note: the between and within R^2s are based on differing transformations and therefore not comparable.

Table 4. **Uganda community data: decomposition of the sums-of-squares for local prices**

	Within			Between	
Total	crop	community	crop-community	Community	crop
11,236	10,259	4,248	3,271	6,988	977

Pooled and between regression results are given in Table 5. In the case of Uganda, even though the community and commodity dimensions of the panel differ in variability, the estimated results are not especially sensitive. In all three models, the price transmission elasticity is high. This is a strong result since, in 1992, Uganda was still emerging from years of turmoil. Pooling changes the statistical significance of the distance-related variables, but in both cases, the impact of the variables is quantitatively small.

There is significant variation in the data that community effects explain unrelated to the distance to market variables. Since the transmission elasticity on prices is quite close to one, while the combination of fixed factors varies greatly among communities and commodities, the results support the notion that domestic markets are characterised by highly variable transaction costs. To the extent these costs are the outcome of low levels of fixed investments in institutions, human and social capital, these markets exhibit varying levels of efficiency in North's sense of the word.

Table 5. **Uganda panel results.**

	Pooled		Between-crop		between-community	
R^2	0.948		0.965		0.975	
Variable	estimate	t-score	Estimate	t-score	Estimate	t-score
Price	0.961	243.3	0.929	303.81	0.958	350.81
Distance						
to market	-0.005	-1.66[2]			-0.005	-2.93[1]
to phone	-0.003	-0.71			-0.003	-1.45
to all-weather road	-0.004	-2.26[1]			-0.004	-4.17[1]
to public transport	-0.003	-1.55			-0.003	-2.83[1]

1. Significant at 95% confidence level.
2. Significant at 90% confidence level.

Implications for market reforms

Market reforms redefine opportunities for trade and generally broaden opportunities for exchange, and the boundaries for exchange are defined in part by policy. Market efficiency and the capacity to transmit prices are also potentially limited by other factors. Consequently, the success of reform depends on markets that are also defined by fixed factors – including institutions, human and physical capital.

The datasets in this paper indicate spatial differences – either among communities or countries. A large portion may be policy related, but key country and commodity-market-related differences in transaction costs may be present as well that are indistinguishable from policy effects. This is especially true for domestic markets. To the extent that the countries and domestic regions that are the poorest are also poor in market-related factors such as good roads, good communications and law-and-

order, policy-related costs will constitute a smaller portion of total transaction costs. Consequently, the benefits of reform, though substantial generally, may be proportionately less for the poor.

It would be nice to know beforehand how reforms will work. But this is difficult. Models that predict the consequences of trade reform must work across multiple sectors and require, as inputs, measures of market efficiencies. The characteristics of market relate to time, commodity and location, but panels that encompass these characteristics are rare, and studies that focus on time-related differences in a single commodity market are the primary source of empirical measures of how markets work.

Having a limited ability to predict outcomes does not mean that reforms should be avoided, since policy-related inefficiencies can affect all. However, it does mean that distributional differences in opportunity may persevere following reform that are directly result from short-comings in markets. Strengthening markets – or compensating for their shortfalls - should be a part of the reform process.

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PART 3: HOUSEHOLD LEVEL IMPACTS

OECD AND NON-OECD TRADE LIBERALISATION AND POVERTY REDUCTION IN SEVEN DEVELOPING COUNTRIES

Thomas W. Hertel, Paul V. Preckel, John A.L. Cranfield and Maros Ivanic[*]

Abstract

Poverty reduction is an increasingly important consideration in the deliberations over multilateral trade liberalisation. Within this debate, the agricultural sector has assumed a prominent role, in part due to the potential for significantly higher agricultural prices which may translate into large real income losses for low income consumers. Competing with this consumption side effect is the income side. Since most of the world's poor live in rural areas, where agriculture is the dominant economic enterprise, higher agricultural prices following global trade liberalization serve to boost the incomes of many poor households. Which of these forces dominates depends on the particular country/household/trade policy combination in question. This paper aims to sort out the relative importance of these two competing effects for seven developing countries.

In our analysis we use the combination of a global trade model and individual household models for 100 representative household groups in each of the focus countries to assess the short run poverty impacts of both national and international trade policy changes. Our analysis is short run in nature because we assume a limited degree of factor mobility in response to the trade policy shocks. In particular, self-employed workers are not able to find wage labour if prospects in their industry (e.g., farming) turn sour. We also assume that capital cannot be reallocated to other activities over the time frame in question. Our findings suggest that trade liberalization reduces national poverty in six of the seven developing countries studied. However, these aggregate results mask substantial variation in poverty changes by individual household groups and by type of policy. When one focuses specifically on OECD trade policies, it becomes clear that agricultural policies are most important. This is due to three things. Firstly, this sector has relatively larger trade distortions than non-agriculture in OECD countries. This means that liberalisation of agriculture generates larger world price effects. Secondly, the budget share of the poor devoted to food products is very high, so they are vulnerable to food price shocks. Finally, in many of the focus economies, a number of the poor are highly dependent on agriculture for their earnings.

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Multilateral trade liberalisation and poverty reduction

Poverty reduction is an increasingly important consideration in the deliberations over multilateral trade liberalisation. Within this debate, the agricultural sector has assumed a prominent role (McCullogh, Winters and Cirera, 2001). This is due to two facts. Firstly, food is a critical item in the budgets of the poor, so anything that happens to its price will strongly affect the well being of the poorest households. In particular, a price rise following the elimination of farm support in the OECD countries could have a strong income effect – potentially forcing additional households into poverty and worsening the situation for the abject poor. On the other hand, there is a second key fact that comes into play on the income side of things - most of the world's poor live in rural areas, where agriculture is the dominant economic enterprise. Higher agricultural prices serve to stimulate agricultural incomes and household spending in rural areas - thereby boosting non-farm, rural incomes. Which of these forces dominates depends on the particular combination of country/household/trade policy in question.

To this one must also add consideration of the impact of non-agricultural trade liberalisation. While manufacturing tariffs are generally quite low in the OECD countries, they remain high in many developing countries, and the elimination of this protection for domestic industry can also have an impact on poverty. To the extent that these protected sectors employ unskilled labour, there is the potential for increased unemployment or reduced wages, which may adversely affect the poor. On the other hand, elimination of support for capital intensive manufacturing sectors could free up scarce resources for use elsewhere in the economy, thereby potentially increasing the demand for unskilled labour and reducing poverty. Clearly, the linkages between trade liberalisation and poverty are complex and likely to vary greatly across countries and trade policies. The goal of this paper is to explore these linkages in considerable detail, for seven developing countries. By using a common methodology in each country/case study, we are able to draw some general conclusions about the impact of OECD and non-OECD trade liberalisation on poverty.

There is now a great deal of work being undertaken to analyse the links between trade and poverty. Some of this focuses on the consumption side of the problem (*e.g.* Levinsohn, Barry and Friedman, 1999; Case, 1998), while abstracting from the income effects of trade on poverty. Others have used single-region computable general equilibrium (CGE) models to bring in the income side of the picture (Devarajan and van der Mensbrugghe, 2000; Harrison, Rutherford and Tarr, 2000; Löfgren, 1999; Taylor, 2002). A final group of studies have used a combination of multi-region, CGE models and single region models and household surveys to analyse the link between multilateral trade liberalisation and poverty (Evans, 2001; Friedman, 2001; Ianchovichina, Nicita and Solaga, 2000). One of the key findings to date is that, while factor markets are critical to determining the trade-poverty linkage, they are relatively neglected in much of the poverty research. This point is also emphasised in the recent paper by Decaluwé, Patry, Savard and Thorbecke (1999), as well as in the pathbreaking work of Adelman and Robinson (1978). Part of the problem stems from the tendency of poverty researchers to focus their attention on the expenditure side of household surveys due to its greater reliability for purposes of measuring poverty. This may be fine for poverty measurement, however, when it comes to counterfactual analysis of policies and poverty, it is impossible to proceed without proper treatment of the factor markets.[1] CGE modellers are fundamentally constrained by data obtained from the household surveys, since this is the only way to identify the mapping from factor

1. By way of example, Coxhead and Warr (1995) report that substantially more of the poverty reduction from technological change in agriculture is transmitted through the factor markets than through the consumer goods markets. In a more recent paper utilizing CGE models of archetype economies from Africa, Asia and Latin America, De Janvry and Sadoulet (2002) also emphasize the importance of factor markets for transmitting poverty impacts of changes in agricultural technology – particularly in the cases of Asia and Latin America.

earnings to specific household groups (*e.g.* how heavily reliant are the poor on unskilled wages?). In light of this state of affairs, we have chosen to focus the present paper squarely on the factor earnings effects of trade liberalisation and their role in determining the subsequent poverty impacts.

To date, there has been a great deficit in the area of multi-region trade policy analysis and poverty.[2] Such studies are very difficult to accomplish, due to the country-specificity of the household surveys. So, when it comes to multi-country, or global trade liberalisation analyses, researchers are typically forced to focus only on average, or *per capita* effects (*e.g.* the paper by Beghin *et al.*, 2002, in the present volume). This severely limits the potential for addressing the poverty question.

In this paper, we extend the typical multi-country trade analysis in a direction that permits us to assess the likely impacts of trade liberalisation on the incidence of poverty. The approach builds on a combination of seven national household surveys available through the World Bank, and multi-country data sources, including: the International Comparisons Project (ICP) database on *per capita* consumption (Kravis, Heston, and Summers 1982), the Deninger and Squire income distribution data set (Deninger and Squire, 1996), and the Global Trade Analysis Project (GTAP) database (Dimaranan and McDougall, 2002). The proposed approach is flexible enough to incorporate improved national databases as they become available.

The ideal approach to analysing the poverty implications of multilateral trade liberalisation would incorporate a highly disaggregate set of households directly into a multi-region general equilibrium model, which could then be used for policy simulations. In a major research undertaking supported by the World Bank, Harrison *et al*., (2002) have done so for one country – Brazil – and a modest number of household groups (20). However, incorporation of disaggregated household data into a global model on a larger scale (multiple countries and hundreds of households) has yet to be accomplished. Therefore, the present analysis is conducted in two parts. First, we simulate a global model to determine regional price changes owing to the policy experiment. Then we utilise a second, household model to conduct the detailed analysis of household incidence and implications for poverty.

Stratification of households

In our analysis of poverty, we find it useful to stratify the population into five groups, depending on their primary source of income. Otherwise one is left with the impression that all households are diversified in their income sources, with the composition of their earnings reflecting the average for their income level. We believe that in the short run, which is the time frame for our analysis, household incomes will be differentially affected depending on their reliance on sector-specific factors of production. For example, a household which earns all of its income from a family run farm will be heavily dependent on the prices of agricultural products. If prices rise, they will likely have a hard time gaining access to land and credit with which to expand production in the short run. If prices fall, they may eventually be able to find other employment, but this is likely to be difficult in the short run – particularly if they are not currently employed off-farm. Therefore, our first stratum identifies self-employed households specialising in agricultural production (95% or more of income). Any approach which aggregates households across this specialisation dimension will miss much of the impact, by giving an artificial impression of diversification. Similarly, the second stratum comprises households specialising in non-agricultural enterprises, (*i.e.* income from profits for non-agricultural enterprises). The third and fourth strata are comprised of households that work for others, and are specialised in wages/salaries (95% or more), and those relying almost exclusively (95% or more) on transfers (both public and private) for their income, respectively. The fifth stratum represents the remaining

2. See, for example, the recent survey of papers in the trade and poverty area authored by Reimer (2002).

"diversified" households. Note that this final category comprises all those households that get less than 95% of their income from any single one of the four sources: transfers, agricultural profits, non-agricultural profits and labour – hence the label "diversified".

The sources for the earnings data are national household surveys for seven countries for which such surveys are readily available, and which are also representative of diverse income, and geographic and trade policy circumstances: Brazil, Chile, Indonesia, Philippines, Thailand, Uganda, and Zambia.[3] Before conducting an analysis of trade policy, household earnings and poverty, we first had to reconcile the household income data with the macroeconomic data on earnings. The most important part of this process is obtaining an accurate split between self-employed earnings and wage income. This division is often ambiguous in national accounts data. We also rely on the household surveys to adjust the aggregate composition of skilled and unskilled labour earnings, as estimated in the GTAP data base.

Given the likely differential impact of trade liberalisation on the diverse household groups, it is also important to examine the relative importance of each stratum in overall poverty. The bottom row of Table 1 reports the percentage of the total population living on less than $1/day as reported in the World Development Report: 2000/2001.[4] These figures range from lows of 2% in Thailand, 4% in Chile and 5% in Brazil, to a high of nearly 73% in Zambia. The body of Table 1 reports the estimated rate of poverty, by stratum, as a percentage of the total population. Referring to Brazil (the first column), we see that, of the 5.1% of the population living in poverty, about one-third (1.58% of the entire population) are dependent on wage labour. Agriculture-specialised households follow in importance (1.22% of the population). Of course, this understates the importance of agriculture in the poverty picture since many of the poorest wage labour households work in agriculture, as do many of the diversified households. A similar situation applies in Chile. By contrast in Indonesia, one-third of the poor households are specialised in agricultural earnings (presumably reflecting returns to small-holdings of land and family labour). The relative importance of agriculture-specialised households in the total poverty picture also applies in Philippines, and Zambia, whereas in Thailand and Uganda, most poor households are diversified.

3. The sources of these surveys are as follows: Pesquisa Nacional por Amostra de Domicilios (1998), Brazilian Institute of Geography and Statistics (IBGE); Characterisation Socioeconomica Nacional, 1998, Ministerio de Plantificacion y Cooperacion, Santiago, Chile; SUSENAS: Indonesia's Socio-Economic Survey (1993) Biro Pusat Statistik, Jakarta, Indonesia; Annual Poverty Indicator Survey (1999) National Statistics Office, Manila, Philippines, World Bank Mission and the United Nations Development Programme; Thailand Socio-Economic Survey (1996) National Statistics Division, Bangkok, Thailand; National Household Survey 1999, Uganda Bureau of Statistics, Entebbe, Uganda; and the Living Conditions Monitoring Survey II (1998) Central Statistical Office, Lusaka, Zambia.

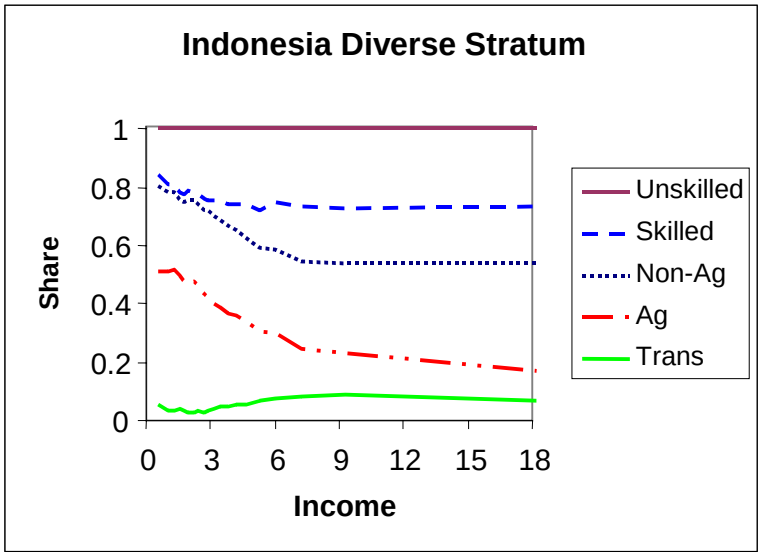
4. We have calibrated the poverty level of utility in each country to reproduce this total. An alternative would be to use the AIDADS model and the $1/day definition for 1996 ICP dollars to predict poverty in each country. However, this appears to result in an over-estimate of poverty – likely due to the presence of under-reporting of income in the household surveys. Therefore, we prefer to benchmark the model to independent estimates of the poverty level.

Table 1. **Estimated rate of poverty, by stratum (fraction of total population)**

Strata	Brazil	Chile	Indonesia	Philippines	Thailand	Uganda	Zambia
Ag	0.012185	0.006127	0.052168	0.028174	0.000622	0.034290	0.203416
Non-Ag	0.007519	0.001518	0.017124	0.006356	0.000677	0.010754	0.181239
Labour	0.015823	0.008154	0.010371	0.006338	0.002342	0.010446	0.137406
Trans	0.005080	0.009985	0.003932	0.002191	0.001503	0.011478	0.045809
Diverse	0.010394	0.016217	0.068406	0.080942	0.014855	0.300039	0.158610
Total	0.051000	0.042000	0.152000	0.124000	0.020000	0.367007	0.726479

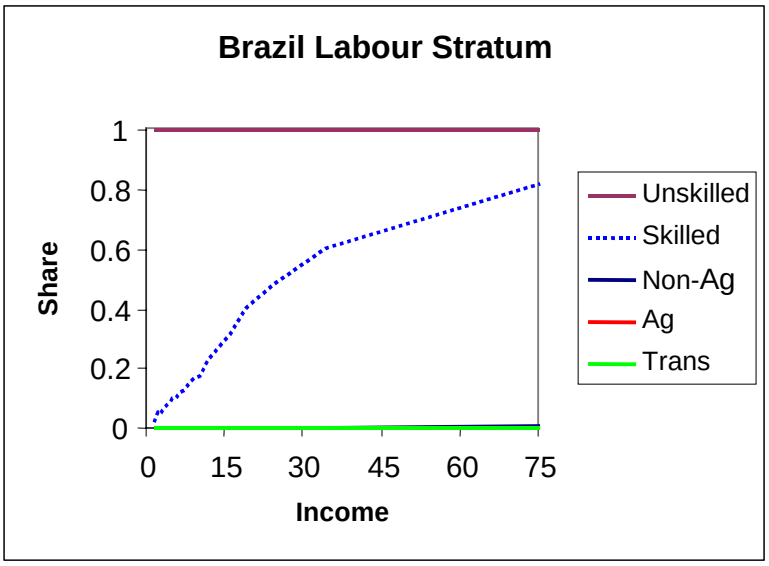
The importance of agricultural earnings to the poor in Indonesia is further reinforced when one examines Figure 1, which displays the composition of incomes (cumulative share of earnings from each source) for the diversified households. Here, agricultural profits are quite important at the lower income levels. A similar situation also applies in Uganda, where agricultural earnings are dominant throughout the diversified household group – and especially so at the lowest income level where they comprise more than half of all income. However, this income source does not play such a large role in the diversified household stratum in the other five economies. Non-agricultural profits dominate diversified household income at the upper income levels in all countries, but they also play an important role for poor, diversified households in Southeast Asia and in Zambia. Unskilled wages are important for low income, diversified households in all countries. They are especially dominant in Chile, where they comprise the lion's share of diversified household income at the lower end of the income spectrum. In Brazil and Thailand, this is also quite important, whereas the share of unskilled wages in poor, diversified household income in Uganda is quite small. Finally, transfers comprise between 10% and one-quarter of diversified incomes for the poorest household groups in the seven countries.

Figure 1. **Composition of income in the diversified households for Indonesia**



It is also interesting to explore the composition of earnings in the households that rely almost exclusively on wages or salaries for their incomes. For purposes of this study, we define skilled labour based on the available occupational information in the household surveys. In particular, individuals working as managers and professionals were deemed skilled, with all others classified as unskilled. In some cases income and occupational data were not available for each household member so we assigned the household's total labour income based on the occupational status of the head of the household. The earnings splits for the labour-specialised households in Brazil are displayed in Figure 2 (as a cumulative share of earnings from each source). Not surprisingly, unskilled labour dominates at the lowest income levels and subsequently diminishes in importance as income increases. However, it also persists at the higher income levels (top 5% of the stratum's households, by income) – reflecting the limitations of our occupational-based splits, as well as the presence of multiple earners in households where individual earnings were not available.

Figure 2. **Composition of income in labour-specialised households for Brazil**



Estimating household consumption patterns across income levels

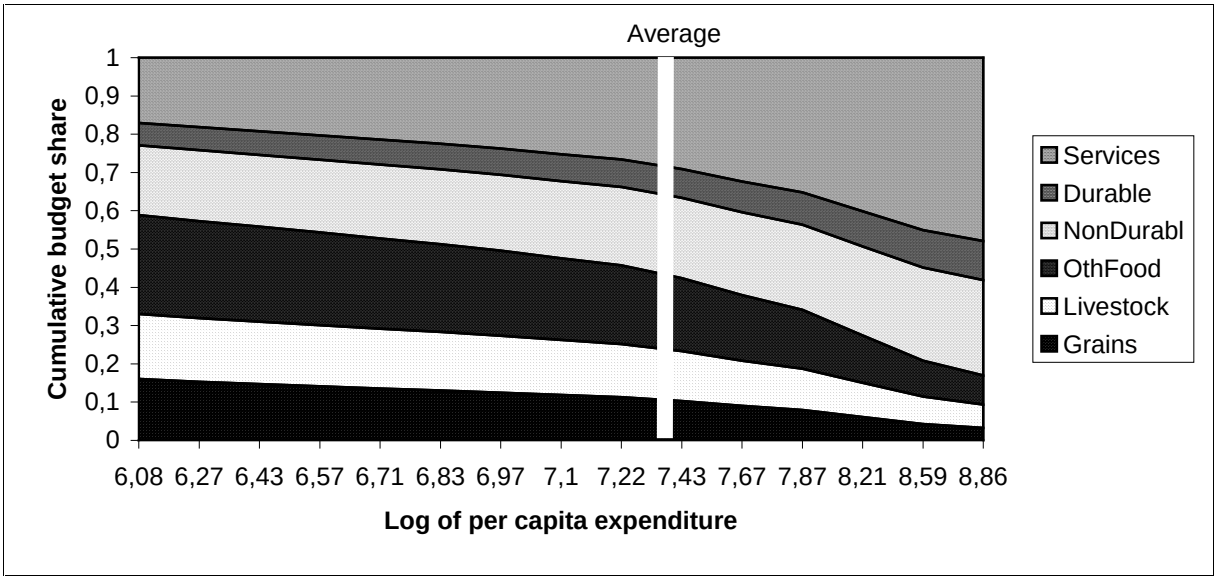
Thusfar we have only talked about the impact of trade liberalisation on earnings. However, we must also be concerned with the impact on consumer prices, and hence the households' ability to purchase goods and services. This impact will depend fundamentally on the share of household spending on different categories of goods. We obtain these spending patterns from an international, cross-section, econometrically estimated demand system. Specifically, we draw on recent work by Cranfield (1999) who estimates the parameters of a complete demand system while simultaneously utilising data on the distribution of expenditures by quintile in order to permit recovery of the unobservable distribution of expenditure for each quintile. This approach requires data typically used in demand system estimation (*i.e.* prices, *per capita* quantities and *per capita* expenditure from the International Comparisons Project), in addition to summary measures of the distribution of expenditure (or income), such as variance, skewness, kurtosis, or quintiles and the relevant range of expenditure in each observation. The latter are obtained from the Deninger and Squire (1996) database and the World Bank's *World Development Reports*. Rather than estimating a model that predicts a budget share for each good on a *per capita* basis at each observation, the framework approximates the distribution of expenditure,

estimates demand system parameters consistent with the demand and expenditure data (including the distribution information), and predicted budget shares for each good *across expenditure levels within each national observation*. Our sample contains 113 countries from the 1996 ICP data set. The ICP consumption and price data are aggregated up to six goods: staple grains, livestock products, other food products, other non-durable goods, durable goods, and services. The emphasis on food products (three of the six categories) is appropriate for this study, since we are focusing on poverty and poor households spend a large share of their income on food products.

Since we are using the demand system to estimate consumer expenditure at different income and price levels, both within and across countries, it is vital that this demand system is sufficiently flexible to capture the wide range of consumer behaviour that might arise over the global income spectrum. In this study, we adopt Rimmer and Powell's (1992a, 1992b, 1996), AIDADS system[5], due to its capability for capturing expenditure patterns across the development spectrum (see also Cranfield *et al.*, 2000). This may be viewed as a generalisation of the popular, but restrictive, Linear Expenditure System (LES). Unlike the LES, AIDADS allows for non-linear Engel responses, while maintaining a parsimonious parameterisation of consumer preferences.

Figure 3 illustrates the predicted pattern of household spending over a range of expenditure levels for Thailand. The grains budget share for the poorest households reaches about 16%, whereas it is much smaller for the average, or *per capita*, household. When one considers all food products, this budget share ranges from about 60% for the poorest households to less than one-fifth for the richest households. Since budget shares must sum to one, by definition, we see that the share of total spending on non-food products – especially services – rises with income. Overall, it is clear that the poorest households are most vulnerable to food price shocks following trade liberalization.

Figure 3. **Predicted budget shares in 1997 across income levels in Thailand**



5. AIDADS stands for *A*n *I*mplicitly, *D*irectly-*A*dditive *D*emand *S*ystem.

Modelling the price effects of multilateral trade liberalisation

In the interests of tractability, we have taken a fairly simple approach to modelling trade liberalisation. We draw on the Global Trade Analysis Project (GTAP) modelling framework (Hertel, 1997), using the latest version (6.1) of that model in conjunction with the most recent, version 5.0, GTAP data base (Dimaranan and McDougall, 2002), and solved using the GEMPACK software suite (Harrison and Pearson). This data base incorporates the latest tariff information for merchandise trade and agricultural protection. Agricultural tariffs are derived from the Agricultural Market Access Database (AMAD) and are for 1998. The non-agricultural tariff data are for 1997, or the most recent year, and come from the WITS system maintained by UN Conference on Trade and Development (UNCTAD) and the World Bank. The only non-tariff trade barriers in the data base relate to export measures. In the case of agriculture, export subsidies for 1998, reported to the World Trade Organization (WTO), are incorporated. Also, the quota rents associated with restrictions on textile and apparel exports to North America and Europe are reflected in the database. In our trade liberalisation experiment, we remove the tariffs and quotas. We do not attempt to capture the impact of prospective liberalisation of direct trade in services or barriers to international investment or the movement of people in the services sectors. Also, we leave domestic agricultural subsidies in place. Appropriate modelling of these subsidies requires considerable care – given the decoupled nature of many of these programs. We will tackle this in future work.

Table 2. **Average rates of protection, by region and merchandise commodity**

Commodity	Brazil	Chile	Indon.	Philip.	Thailand	Uganda	Zambia	Other LDCs	DC	Total
Rice	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*
Wheat	6	11	1	18	0	64	23	28	65	39
Feed grains	7	11	4	30	0	55	3	69	17	39
Other agriculture	9	11	7	11	21	22	9	26	10	13
Oil seeds	6	11	7	11	39	30	12	53	20	28
Raw sugar	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*
Meat, livestock	5	12	6	14	16	4	9	14	8	10
Raw milk	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*	n.a.*
Forestry	5	12	1	1	2	2	26	2	0	1
Fishing	9	10	7	6	45	3	10	8	2	3
Primary agriculture (subtotal)	**8**	**11**	**5**	**14**	**19**	**45**	**5**	**31**	**13**	**17**
Processed meat	12	11	18	26	47	12	7	38	25	27
Fats, oils	12	11	8	11	26	26	15	29	8	17
Processed dairy	19	11	15	8	29	6	13	48	30	33
Processed rice	15	11	0	50	0	20	10	18	73	39
Processed sugar	19	11	3	49	44	21	13	19	39	29
Other processed food	16	11	16	17	40	26	15	26	19	20
Beverages, tobacco	23	11	86	17	51	17	21	48	11	20
Processed food (subtotal)	**17**	**11**	**15**	**19**	**37**	**21**	**14**	**33**	**20**	**23**
Textiles	16	11	15	13	25	19	20	17	6	10
Apparel	20	11	25	23	41	20	25	16	10	11
Textiles apparel (subtotal)	**17**	**11**	**16**	**14**	**27**	**19**	**21**	**17**	**8**	**10**
Autos	39	11	41	17	48	17	17	19	2	5
Electronics	14	11	8	3	9	13	18	5	2	3
Other manufactures	15	11	4	6	10	15	11	8	2	4
Manufactures (subtotl)	**19**	**11**	**10**	**5**	**13**	**15**	**13**	**8**	**2**	**4**
Wood, paper	10	11	6	11	13	13	14	10	1	3
Mining	4	11	3	1	0	6	20	4	0	1
Petrochemicals, minerals	9	11	7	7	16	13	11	10	2	4
Metals	12	11	8	8	12	16	14	9	2	4
6	14	11	9	7	14	15	13	11	4	6

*These raw products are essentially non-tradable. They are protected by tariffs on processed rice, sugar and milk, respectively.

Source: GTAP version 5.0 data base, Dimaranan and McDougall, 2001.

A summary of the average import tariffs used in this study of multilateral trade liberalisation is provided in Table 2 for the seven focus economies, other developing countries (other LDCs) and OECD countries (DC). For purposes of this table, services sectors are omitted. (The GTAP database does not incorporate protection on services trade.) Chile's uniform tariff structure is immediately obvious from the second column in Table 2. This relatively efficient profile of protection means that own-liberalisation will generate smaller efficiency gains than elsewhere. In the case of Brazil, protection levels are higher, on average, in processed food, textiles and manufactures and slightly lower in primary agricultural commodities. The highest protection on agricultural products is found in Uganda. For processed food products, the highest average tariffs are for Thailand, followed by other LDCs and the Developed Countries. Tariffs on textiles and apparel are uniformly high, while average tariffs on other manufactures are highest for Brazil, followed by Uganda, Thailand and Zambia.

For the purpose of this study, we have modified the standard GTAP model closure in a number of important respects. First of all, we have introduced an explicit revenue replacement assumption in all regions. Specifically, we maintain a constant ratio of tax receipts, relative to net national income.[6] This is achieved by endogenising the rate of consumption taxation. Secondly, we fix the trade balance, relative to net national income. When combined with the usual GTAP assumption that consumption, domestic saving (private and government combined) and government spending are also fixed relative to net national income[7], we deduce that transfers (not explicit in the GTAP model) must also be fixed relative to net national income. A careful treatment of transfers is important, since, as we have seen above, they represent a significant component of income for some of the poorest households in many countries.

The other major modification with respect to earlier studies of multilateral trade liberalisation involves the use of a short run closure with respect to the factor markets. This is designed to permit us to match up more closely to information available in the household surveys. Specifically, we assume that wage and salaried labour are mobile across sectors, but capital, land and self-employed labour are immobile and the returns to the latter factors are combined into sectoral "profits". As a consequence of this factor immobility, supply response is considerably smaller in this model, and price changes larger, than in most such studies – as would be expected in the short run.[8]

Disaggregated commodity price changes (at producer prices), as well as factor prices are reported in Table 3. All of these price changes are relative to the numeraire in this model, which is the average price of primary factors, world-wide. A rise in all primary factor prices, as is observed in all of the seven countries except for Brazil, means that they experience a real appreciation as a result of this liberalisation experiment. That is, increased demand for their exports bids up their prices, relative to the world average. In the case of Brazil, the situation is mixed, with agricultural profits rising, while

6. GTAP users will recognize that the MFA quota rents are treated as export taxes in the model. However these rents rarely accrue in full to the government price, so we have omitted them from the tax replacement equations.

7. This fixed share assumption is not strictly true in the standard closure for version 6.1 of the GTAP model – due to non-homotheticity of private consumption. Therefore, since we want this to hold exactly, we introduce a preference shift for regional household utility function such that the shares of private and public consumption and savings in net national income remain fixed.

8. Of course a WTO agreement would typically be phased in over a number of years, so this short run closure is somewhat stylized. However, it highlights the most extreme outcome and is therefore a useful benchmark. Also, as noted in the text, this short run closure permits us to match price changes with the income sources from the household survey. In future work, we plan to explore the implications of alternative factor mobility assumptions.

wages and non-agricultural profits fall, relative to the numeraire. However, the weighted average of these primary factor prices does rise, relative to the world average, indicating a real appreciation for Brazil and as well. On the commodity side (at producer prices) food prices rise in most regions, as countries reduce their production and the EU and the US curb their exports of subsidised products. Non-durable and durable prices fall in most regions, while services prices rise.

Table 3. **Disaggregate market price changes for the seven focus economies**

Commodity	Brazil	Chile	Indonesia	Philippines	Thailand	Uganda	Zambia
Land	15.2	26.9	6.4	7.5	29.5	4.3	7.3
Unskilled labour	-0.7	3.3	5.4	5.9	2.8	3.9	2.1
Skilled labour	-0.5	2.2	4.6	2.9	-0.4	4.2	2
Capital	1	3.1	4.2	3.8	1.5	3.4	2.9
Natural resources	-5.2	8.6	-3	5.7	-6.2	3.5	11.5
Rice	1.6	5.8	6.7	-5.4	33.5	1.9	1
Wheat	9.2	14.8	1.9	4	35.8	-5.6	1.8
Feed grains	1.4	2.1	3.2	-5	8.8	2.4	-1.9
Other agriculture	2.9	14.1	5.3	14.7	1	3.8	0.7
Oil seeds	15.3	16.1	1.1	-2.1	-12.7	5.3	0.4
Raw sugar	11	4.9	3.3	10.9	8.9	5.7	36.4
Meat, livestock	19.7	8.8	3.1	-0.9	3.6	4.4	1.3
Raw milk	-3.3	9.7	3.7	-14.8	11.3	3.9	0.2
Forestry	1.3	0.6	5.9	0.6	-0.5	1.2	2.2
Fishing	0.7	10.2	1.7	4.7	-1.9	4.3	0.3
Processed meat	11.5	6.5	1.5	-0.6	2.9	5.7	0.9
Fats, oils	7.5	2	2.3	2	-10.9	-8.9	1.5
Processed dairy	-2.3	3.9	2.4	6.7	-2.4	2.9	1.1
Processed rice	1.1	1.9	6.2	-3.8	27.5	-5.7	-0.4
Processed sugar	4.4	4	3.2	9.8	4.9	3.9	25.1
Other processed food	0.9	5.6	5.2	2.8	3.3	3.4	0.4
Beverages, tobacco	-0.1	5.1	-8.7	-2.4	-5.6	-0.1	0.3
Textiles	-2.3	-2.6	1.7	-0.4	2	-0.9	-3.2
Apparel	-2.7	-1.8	5	-0.3	2.8	-11.5	-5.7
Wood, paper	-1.1	-0.4	3.6	-0.8	-1.1	-1	-4.4
Mining	-3.2	-1.7	-1.5	-0.6	-2.6	-0.8	-5.3
Petrochemicals, minerals	-2.1	-3	0	-1.8	-1.5	-4	-7.5
Metals	-2	-1.6	-1.7	-3.3	-3.1	-3.6	0.7
Autos	-8.9	-6.4	-12.9	-6.3	-12.5	-10.1	-8.7
Electronics	-5.2	-3.8	-2	-3.3	-1.6	0.7	-7.5
Other manufactures	-2.9	-2.7	3.2	-1.1	-0.2	-6.2	-0.5
House utilities	-0.9	0.8	1.8	2.3	-0.7	2.2	0.9
Trade, transportation	-1.3	1.6	3.3	2.5	0.5	1.4	-0.6
Construction	-1.3	0.4	2.6	0.5	-1.4	1.4	-4
Business, finance	-0.8	1.9	3.1	1.1	-1	1.4	-1.3
Government service	-0.7	1.1	3.5	1.6	-0.2	1.7	-1.2

Source: Authors' simulation
Note: All price changes are relative to the numerare, which is the global average return to primary factors.

Poverty impacts

Once we know the changes in factor prices, we can compute the changes in household income for each income level and each stratum. Combining this new income level, with the changes in consumer prices, we can then use the AIDADS demand system to compute the change in utility of each household group. This is compared to the benchmark level of utility associated with the $1/day poverty level and we are able to evaluate how many households move into, or out of, poverty in light of a given trade liberalisation scenario. Table 4 reports the percentage change in the headcount measure of poverty for each stratum/country combination due to trade liberalisation. In creating this table, we have decomposed the impacts, grouping the policy shocks according to the countries doing the liberalisation: own (*i.e.* Brazil, Chile, etc., as the case may be), other LDC (including the other six focus economies) and Developed Country (DC). For each country group, we have distinguished between farm and food liberalisation (in agr. com) and other merchandise trade liberalisation (in non-agr. com). The total row refers to the impact of all of the shocks, combined, on a given stratum's poverty measure.

Let us begin by looking at the combined impact of all liberalisation measures (total row) on poverty across strata. The percentage reduction in the poverty headcount is particularly striking in the case of agriculture-specialised households in Chile (27%), Thailand (17%), Brazil (13%) and Philippines (10%). In each of these countries, agricultural liberalisation fuels a strong increase in agricultural profits and hence incomes for the agriculture-specialised households. Poverty also falls substantially for the diversified households in Brazil, Indonesia and Philippines, and for the wage labour specialized households in the case of the latter two economies. In these two economies, developed country liberalisation of trade barriers to apparel and other light manufactures boosts unskilled wages, thereby benefiting the poor. On the other hand, there are very substantial increases in poverty among the self employed, non-agricultural households in Brazil, Chile and Thailand, as they face increased foreign competition. The transfer specialised households in Thailand also experience a substantial increase in poverty.

Combining the changes in poverty in individual strata, together with the relative importance of these strata in the overall poverty picture (Table 1), we are able to obtain an assessment of the impact on national poverty. This is reported, again as a percentage change, in the lower right hand corner of each section of Table 4. Here we see that national poverty falls in every country except for Thailand. Thailand's poverty increase is driven by the fact that staple grains prices rise very sharply (see Table 3), and the poorest households spend quite a bit of their income on these products (Figure 3).

Table 4 also permits us to decompose these total poverty changes, as well as the stratum changes, by source, *i.e.* by liberalising policy. Consider first, the case of Brazil. Here, poverty among agriculture-specialised households rises by 4.95% following own-agricultural liberalisation, as agricultural profits fall with the reduction in protection for that sector. On the other hand, poverty among non-agriculture specialized households falls as a result of own-agricultural liberalisation (-1.5%), as food prices fall and the non-agricultural sector becomes relatively more competitive. The same goes for the labour, transfer, and diversified household strata. In the case of non-agricultural liberalisation in Brazil, the opposite pattern emerges. Poverty falls among agricultural households (-4.69%) since manufacturing tariffs act as an indirect tax on agriculture. Reducing these tariffs serves to lower input costs for agriculture and leads to a real depreciation, making it easier to export agricultural products. Cheaper non-agricultural commodities also benefit consumers, including the poor. On the other hand, the reduction in non-agricultural protection increases poverty amongst the households reliant on wage labour and transfers for their incomes.

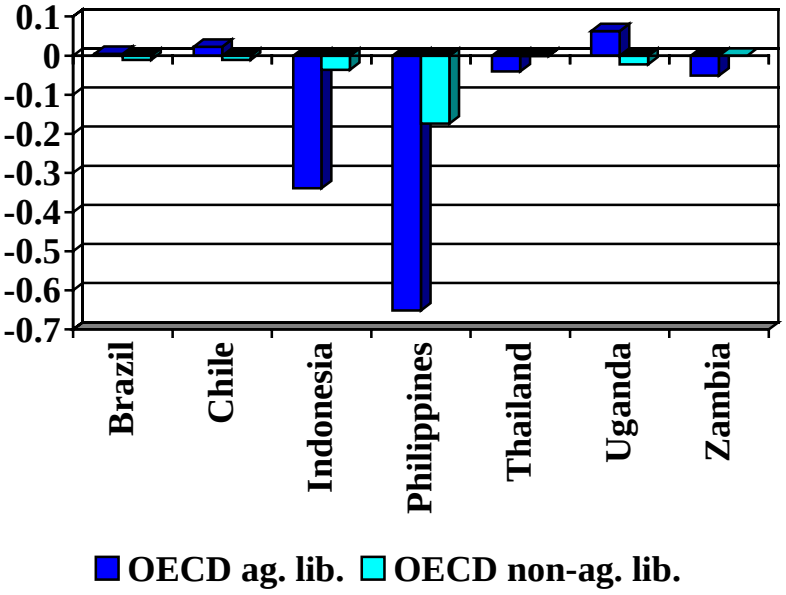
Table 4. **Sources of poverty headcount change (%), by liberalising sector/region**

Country/Source of Liberalisation		Agr.stratum	Nonagr. stratum	Labour stratum	Transfer stratum	Diversified stratum	Total
Brazil							
Country's own	in agr. com.	4.95	-1.51	-0.69	-0.49	-0.06	-0.26
	in nonagr. com.	-4.69	1.98	1.62	0.87	0.24	0.84
Rest of Latin America	in agr. com.	-6.09	1.39	0.56	0.06	-0.93	-0.24
	in nonagr. com.	0.99	-0.76	-0.42	-0.35	-0.22	-0.31
NAFTA	in agr. com.	-7.58	2.51	1.06	0.48	-0.78	0.09
	in nonagr. com.	0.23	-0.47	-0.23	-0.22	-0.20	-0.21
Total		-13.45	3.11	1.86	0.32	-1.96	-0.18
Chile							
Country's own	in agr. com.	3.36	-1.51	-1.45	-0.51	-0.72	-0.70
	in nonagr. com.	-2.07	1.69	2.29	0.83	1.48	1.47
Rest of Latin America	in agr. com.	-11.97	0.54	0.41	-0.07	-1.45	-1.43
	in nonagr. com.	0.83	0.01	-0.30	-0.07	-0.09	-0.09
NAFTA	in agr. com.	-19.29	5.06	4.45	1.37	0.47	0.54
	in nonagr. com.	-0.56	-0.37	-0.19	-0.11	-0.26	-0.25
Total		-27.42	5.46	5.22	1.44	-0.51	-0.34
Indonesia							
Country's own	in agr. com.	-0.13	-0.17	-1.14	-0.40	-0.35	-0.32
	in nonagr. com.	4.00	-0.02	-0.43	0.06	1.75	2.10
Rest of Latin America	in agr. com.	-1.23	-0.05	0.00	-0.17	-0.63	-0.71
	in nonagr. com.	-0.34	0.34	-0.92	-0.29	-0.28	-0.29
NAFTA	in agr. com.	-5.51	2.83	1.85	0.76	-1.73	-2.23
	in nonagr. com.	1.01	-1.38	-2.83	-1.07	-0.44	-0.24
Total		-2.61	1.43	-3.42	-1.11	-1.69	-1.81
Philippines							
Country's own	in agr. com.	6.11	-1.83	0.08	-1.01	2.74	2.81
	in nonagr. com.	4.46	0.92	0.39	1.25	3.07	3.07
Rest of Latin America	in agr. com.	-10.33	1.26	-1.01	-0.53	-5.87	-5.93
	in nonagr. com.	-0.02	-0.61	-0.09	-0.34	-0.30	-0.28
NAFTA	in agr. com.	-9.20	1.22	-0.90	-0.16	-5.19	-5.25
	in nonagr. com.	-0.60	-1.30	-1.01	-0.69	-1.44	-1.40
Total		-10.12	-0.22	-2.48	-1.36	-7.18	-7.18
Thailand							
Country's own	in agr. com.	15.46	-2.40	-1.59	-1.06	0.55	0.46
	in nonagr. com.	11.20	4.84	4.23	3.17	3.51	3.57
Rest of Latin America	in agr. com.	-13.29	2.86	1.38	1.15	-0.48	-0.39
	in nonagr. com.	1.69	0.04	-0.24	-0.09	0.06	0.05
NAFTA	in agr. com.	-31.73	4.44	1.92	1.54	-2.22	-2.03
	in nonagr. com.	5.29	-1.42	-1.14	-0.48	0.00	-0.05
Total		-17.15	7.94	4.23	4.00	1.03	1.20
Uganda							
Country's own	in agr. com.	-1.63	-2.38	-2.06	-0.65	-2.44	-2.43
	in nonagr. com.	0.26	0.00	0.21	0.05	0.29	0.29
Rest of Latin America	in agr. com.	0.09	0.54	0.24	0.07	0.23	0.22
	in nonagr. com.	0.35	-0.71	-0.17	-0.01	0.21	0.21
NAFTA	in agr. com.	0.01	0.72	0.21	0.06	0.17	0.17
	in nonagr. com.	-0.05	-0.02	-0.06	-0.02	-0.06	-0.06
Total		-0.91	-1.73	-1.53	-0.47	-1.52	-1.51
Zambia							
Country's own	in agr. com.	0.00	-0.05	0.05	0.00	0.03	0.00
	in nonagr. com.	0.00	-0.61	-0.06	0.00	-0.41	-0.29
Rest of Latin America	in agr. com.	0.00	-0.07	-0.01	0.00	-0.04	-0.03
	in nonagr. com.	0.00	-0.48	-0.48	0.00	-0.62	-0.38
NAFTA	in agr. com.	0.00	0.36	-0.49	0.00	-0.32	-0.07
	in nonagr. com.	0.00	0.03	-0.02	0.00	-0.01	0.00
Total		0.00	-0.82	-1.01	0.00	-1.34	-0.76

When we turn to the impact on Brazilian poverty of liberalising policies in other countries of the world, we see that the sign pattern is reversed – now agricultural liberalisation elsewhere boosts agricultural prices, production and profits and lowers poverty among ag-specialised households. And these reductions are quite substantial – 6.0% in the case of other LDC policies, and -7.58% in the case of DC agricultural policies. On the other hand, poverty among households dependent on wage labour and transfers increases in the face of higher food prices. Looking down the Ag stratum column for Brazil, we see that the greatest impact on poverty is due to liberalisation of developed country agricultural policies, followed by LDC agricultural liberalisation, and then Own-Nonagr liberalisation. In the case of the other poor households in Brazil, the strongest increases in poverty come from Own-Nonagr liberalisation and DC Agr liberalisation.

In order to facilitate comparison across countries with very different levels of poverty, it is useful to consider the changes in poverty *as a fraction of the total population*. This is done in Figure 4 which emphasises the impact of OECD trade policies on poverty in the seven focus countries. This figure highlights a number of important points. First of all, OECD agricultural policies generally have a bigger absolute impact on poverty in these developing countries than do non-agricultural trade policies. However, unlike non-agricultural trade liberalisation, the short run poverty impacts of agricultural liberalisation are ambiguous. In Brazil, Chile, and Uganda, the adverse impact on food prices and hence poverty among the majority of the poor that are not agr specialised dominates the beneficial impact on self-employed agricultural households. Thus OECD agricultural trade liberalisation increases poverty in these countries, *in the short run*. In contrast, the largest reductions in poverty, as a percentage of the population, arise in Indonesia and the Philippines – also as a consequence of OECD liberalisation of agricultural trade policies. Here, small-holder agriculture plays an important role amongst the poor and the subsequent reduction in poverty among this group is dominant in the aggregate poverty reduction.

Figure 4. **Poverty impacts of OECD agricultural and non-agricultural trade liberalisation: Percentage of total population, by focus country**



Summary and conclusions

Definitive assessments of the impact of trade liberalisation on poverty must be done on a case-by-case basis, with greater attention provided to the sources of household income amongst the poor. Many such research efforts are now underway, focusing on the national impacts of unilateral trade liberalisation measures. In this paper we employ a methodology for assessing the *short run* poverty impacts of both national and international trade policy changes. Our analysis is short run in nature because we assume a limited degree of factor mobility in response to the trade policy shocks. In particular, self-employed workers are not able to find wage labour if prospects in their industry (*e.g.* farming) turn sour. We also assume that capital cannot be reallocated to other activities over the time frame in question.

Our findings suggest that there is substantial variation in poverty changes by individual household groups and by type of policy. When one focuses specifically on OECD trade policies, it becomes clear that agricultural policies are most important. This is due to three things. Firstly, this sector has relatively larger trade distortions than non-agriculture in OECD countries. This means that liberalisation of agriculture generates larger world price effects. Secondly, the budget share of the poor devoted to food products is very high, so they are vulnerable to food price shocks. Finally, in many of the focus economies, the share of the poor that is highly dependent on agriculture for their incomes is quite high.

As with any ambitious research undertaking, there are many limitations associated with this study. Given the importance of the factor earnings profile for poor households in determining the impact of trade liberalisation on poverty, further efforts should be made to evaluate the discrepancies between the household survey data and the macro-economic data. A second limitation has to do with the short run nature of our analysis. In the long run, it is possible that the poverty impacts could be altered. This is because when self employed labour and capital are fully mobile across sectors, the key to poverty reduction is likely to be the impact of trade liberalization on unskilled wages (see the paper by Harrison, Rutherford, Tarr and Gurgel, 2002). And as we know from the vast literature on trade and wages, the impact of liberalization on wage inequality is not clear-cut. A final limitation – and a potential avenue for future research – relates to our methodology for assessing the incidence of trade liberalisation. Our current approach involves simple, *post-simulation* incidence analysis using the factor income mappings and our household demand model. Thus, we abstract from the potential impact that resulting changes in income distribution might have on relative prices. Given the relatively modest shifts in income, coupled with modest differences in consumption shares, we do not believe the resulting approximation error to be very severe.

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THE MICROECONOMICS OF GLOBALISATION: EVIDENCE FROM CHINA AND MEXICO

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Abstract

Economic research on globalisation focuses on nations or groups of nations, yet it is through the actions of economic actors within nations that communities, regions, and countries become inserted into global markets, directly or indirectly. This paper offers an alternative, intra-national perspective on globalisation. It presents and illustrates a methodology to understand decisions by economic actors within nations and the economic linkages through which ever-widening circles of individuals, households, and firms become inserted, directly or indirectly, into the global economy. Applications to Mexico and China demonstrate myriad ways in which directly affected economic actors transmit the influences of globalisation to others in local and regional economies. The modeling approach proposed here combines the advantages of micro models, which focus on individuals, households, and firms, with economywide models, which highlight economic linkages among economic actors but traditionally have been implemented at an aggregate (national or multi-national) level. It explicitly takes into account the market structures that govern economic interactions and promote or retard the spread of globalisation within countries. By focusing either on nations or on directly affected economic actors within nations, we may be looking for the economic impacts of globalisation in the wrong places.

Introduction

Economic globalisation, or integration with world markets, is a cornerstone of economic change and a central preoccupation of economic policy at the start of the new millennium. Increasingly, domestic policies cannot be designed in isolation of global markets and trade agreements, for two reasons: first, trade agreements change the rules of the game for policy makers; and second, integration with outside markets influences the economic behaviour of economic actors within nations, and thus, the local impacts of government policies. Understanding how market integration and related policies play out within nations is therefore critical for policy formation.

Impacts of trade integration within nations are complex, involving three sets of interdependent actors. First, some economic actors become inserted into the global economy directly, by participating in world markets either as buyers or sellers. These "global" actors include migrants who supply labour abroad while remitting income back to their home countries, firms supplying output and/or purchasing inputs from abroad, and households whose members cross national borders to purchase goods directly from foreign firms.

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A second group of actors are integrated with the global economy through policy. Policy is one of the most important avenues through which globalisation may influence economic actors. For example, in China, opening up to world markets stimulates income growth and urbanisation, which in turn create new demands for rural production and rural-to-urban migration. In Mexico, where staples have been protected by government policies, changes mandated by NAFTA lower the economic returns from staple production and encourage farmers to shift resources into other activities, possibly including internal or international migration. The migrant-source household in rural China or the farmer who changes production in response to trade reforms in Mexico is thus affected by market and policy changes that might not have occurred without trade integration.

Many others are integrated with world markets indirectly, through their market interactions with global actors or with others who interact with global actors. Chinese farmers convert rice paddies into fish ponds to supply a growing local and city demand for fish - possibly using remittances from children who have migrated to finance this investment. A Mexican family hires a local bricklayer to build a new house and pays him with remittances from a migrant in the United States. Both the Chinese aquaculturalist and the Mexican bricklayer are integrated with global markets indirectly, in the sense that their activities depend upon others who are integrated, directly or indirectly, with global markets. The activities of still others may be influences by the aquaculturalist's or bricklayer's new-found incomes, and so on - like ripples in a pond.

Any factors influencing interactions among economic actors shape the ways in which globalisation plays out within countries, regions, and communities. These include local market structures that promote or retard demand linkages among firms and households.

Almost all economic research on globalisation focuses on nations or groups of nations, offering little or no insight into how globalisation plays out within nations. This is surprising, because it is through the actions of economic actors within nations that communities, regions, and countries become inserted into global markets, directly or indirectly. This paper offers an alternative, intra-national perspective on globalisation. Its focus is on economic actors within nations and the economic linkages through which ever-widening circles of individuals, households, and firms become inserted, directly or indirectly, into the global economy. The principal tool of this analysis is "micro economywide modelling," based on village-wide models pioneered by Taylor and Adelman (1996). This approach combines the advantages of micro models, which focus on individuals, households, and firms, with economywide models, which highlight economic linkages among economic actors but traditionally have been implemented at an aggregate (national or multi-national) level. Micro economywide models explicitly take into account the market structures that govern economic interactions and that promote or retard the spread of globalisation within countries.

Part 1 of this paper provides an intuitive explanation of the avenues through which globalisation plays out within nations, highlighting the need for a micro economywide analytical approach to understand globalisation. Findings from a study of migration and rural incomes in northern China show how migration to China's new global cities transform the economies of migrant-sending village households. Part 2 describes the micro economywide approach and its implementation. The model is estimated using household survey data from rural Mexico and used to explore the impacts of migration and NAFTA-related agricultural policy reforms on communities and regional economies, taking into account market linkages that transmit impacts from global to other economic actors. The Conclusion, Part 3, summarises findings and their ramifications for economic development policy.

1. Microeconomics of globalisation and migration in small farm economies

A major limitation of trade integration studies is their lack of an intra-nation focus. At the other extreme, there are many micro-economic studies of impacts of policy and market changes in rural areas, but they generally focus only on the households and activities that are directly affected by these changes. Research that focuses on the directly affected households and activities miss the myriad ways in which globalisation and policy changes influence rural economies indirectly. Two examples are international migration - the most frequent way in which LDC households are integrated directly with the global economy - and policy changes related to trade realisation. Let us consider each of these in turn.

Migration and rural income change

A vast literature examines impacts of migration and remittances on migrant-sending households (Massey, *et al.*, 1998), but few studies consider the impacts of migration and remittances on production inside or outside of the households that send migrants and receive remittances. Typically, although individuals migrate, migrants do not sever their ties with their source households after they migrate. Family members who remain behind (often, parents and siblings) may reorganise both their consumption and production activities in response to the migrant's departure, and migrants (often, children) typically share part of their earnings with their household of origin, through remittances. Continuing interactions between migrants and rural households suggest that a household model would be more appropriate than an individual-level (*e.g.* Todaro) model of migration decisions. Indeed, in individual-focused migration models, there is no rationale for migrants to share their earnings with the place of origin; we are left with the puzzle of why geographically extended families are prevalent in LDCs but less so in high-income countries (Rosenzweig, 1988) and few insights into the likely impacts of migration and remittances on rural economies.

In the new economics of labour migration (NELM; see collection of works by various authors in Stark, 1991) view, migration decisions are not entirely the domain of individuals. They take place within a larger context - typically the household, which potentially consists of individuals with diverse preferences and differential access to income - and they are influenced by the social milieu. The perspective that migration decisions are not taken by isolated actors but by larger units of related people, typically households or families, is a trademark of the NELM. So is the contention that people act collectively not only to maximise income, but also to minimise risks and loosen constraints created by a variety of market failures, including missing or incomplete capital, insurance, and labour markets.

The NELM represents a fundamental departure from past migration research. Determinants and impacts of migration are explicitly recognised as being interrelated. For example, if lack of liquidity or credit to invest in a new technology is a determinant of migration, then migrant remittances should provide liquidity and stimulate technological change. This kind of production effect is ruled out both by Todaro and by traditional, neoclassical agricultural household models that assume perfect markets (*e.g.* Singh, Squire and Strauss, 1986). In the standard neoclassical household-farm model, migrant remittances are simply an income transfer. They affect consumption, by shifting the budget constraint outward, but they do not affect production, because an income transfer leaves the conditions for farm profit maximisation unchanged. However, in an NELM model, market imperfections result in household-specific "shadow prices" that transmit remittance impacts to the production side of the household-farm economy.

Migration and the transformation of household economies in rural China

With more than 75 million migrants, China is experiencing the largest flow of labour out of agriculture ever witnessed in world history (Solinger, 1999; Rozelle *et al*., 1999). The role of migration in economic growth is perhaps most evident in China's global cities, where a construction workforce comprised largely of migrants is transforming urban skylines. Migration transforms China's rural household economies, as well. Family members who remain behind in the village (*e.g.* parents and siblings) reorganise consumption and production activities in the wake of the migrant's departure, and migrants typically share part of their earnings with their household of origin, through remittances.

Table 1 presents findings from a recent study of migration from rural Chinese households that tests some basic tenets of the NELM (De Brauw, Taylor, and Rozelle, 2000). Migration from these households is driven by globalisation, as villagers move to expanding global cities in eastern China. Using simultaneous-equation econometric techniques and household survey data from China, we tested the NELM hypothesis that migrant remittances promote investment in production activities (by loosening credit and risk constraints) in households with migrants. We also tested the hypothesis that imperfect rural labour markets create negative "lost labour" effects of migration on production, as households are unable to substitute hired workers for those who migrate.

Table 1. **Estimated effects of migration and remittances on income sources in a sample of Chinese village households**

	Marginal Effect on Income Source (yuan)			
Explanatory Variables	Remittances	Farm Income	Self-Employment Income	Wage Income
Number of Migrants	824**	-3001*	-7167**	-452
Remittances (yuan)		2.78**	4.50**	0.03

* (**) denotes significance at the .10 (.01) level.
Source: DeBrauw, Taylor and Rozelle, 2001.

The findings summarised in Table 1 show that, in almost all household production activities, the loss of labour to migration reduces net income. Self-employment income is especially negatively affected; it falls by an estimated 7 167 yuan (just under USD 900) per migrant. However, migrants generate remittances, and remittances, in turn, significantly increase net incomes in both farm and self-employment activities. The positive impacts of remittances on production are large: nearly 3 yuan of net farm income and more than 4 yuan of self-employment income per yuan remitted. Taking into account both the negative lost-labour effect and the positive remittance effect, migration sharply increases per-capita income in households that engage only in crop production, and it has generally positive but complex effects on households with income from both farm production and self employment. Rozelle, Taylor and deBrauw (1999) found a similar pattern of negative lost labour and positive remittance effects on maize production in households in northern China. Maize production fell by 462 jin per mu when households "lost" a family member to migration, other things being equal; however, it increased by .44 jin per mu for every yuan (US$.12) of remittances.[1]

1. 1 jin is roughly equal to 1/2 kilogram and 1 hectare is 15 mu.

These results from China mirror findings from studies of impacts of migration in South Africa (Lucas, 1987) and Mexico (Taylor, 1992). However, a limitation of all of these studies is that they focus only on households with migrants. They illustrate ways in which globalisation may reshape migrant household economies; however, they do not offer insights into how migration by some households may integrate local economies, of which these households are part, with the global economy. As some economic agents become inserted into global markets directly, via migration or other means, other economic actors and the activities in which they engage may be inserted into the global economy indirectly, in myriad ways.

Trade liberalisation policies and small farm economies in Mexico

The negotiation of a North American Free Trade Agreement (NAFTA) in the early 1990s presented itself as an opportunity to integrate the liberalisation of Mexico's maize sector with that taking place in the rest of the economy, and to harness peasant resources more efficiently in other sectors of the economy (Tellez, 1993; Bartra, 2000; Nadal, 2001). Studies in the 1990s of the likely impacts of NAFTA in rural Mexico tended to focus on maize production in isolation of other rural production activities, thereby producing unrealistic estimates of the effects of NAFTA on the rural economy and on migration.

The cornerstone of the maize sector's liberalisation consisted of the disappearance of support prices (then paid through the state trading agency, CONASUPO) and the simultaneous removal of trade barriers, which would allow American maize imports to fill the growing gap between domestic supply and demand. Macroeconomic models available at the time predicted that Mexican maize output would decline by up to 20% (depending on the specific rules of the agreement), while that of other agricultural sectors (*i.e.* fruits and vegetables) would increase. Liberalisation was expected to discourage commercial maize agriculture and trigger a shift of irrigated lands to other crops. Maize agriculture in rain-fed areas, and particularly subsistence maize agriculture, was not expected to compete favourably with imports (Robinson *et al.*, 1993; Levy and van Wijnbergen, 1994). According to forecasts, farmers with irrigated lands would benefit from liberalisation, while commercial (*i.e.* surplus) maize growers in rain-fed areas would be slightly hurt by liberalisation, since the costs of labour would decrease with falling rural wages. For the same reason, subsistence growers and landless workers would suffer loss of jobs and lower wage income; many of them would migrate to urban areas and the United States (Levy and van Wijnbergen, 1994).

Criticism soon surfaced regarding the adequacy of macroeconomic models and their forecasts; these models necessarily neglect the microeconomics of the farm-household, including their diversified economies and participation in markets. According to Taylor, *et al.*, (1999) and de Janvry *et al.*, (1995), heterogeneity across households meant that the effect of price declines would be felt differentially across household types: surplus growers would be seriously and adversely affected, but market failures (*i.e.* transaction costs) would buffer subsistence producers (about half of all maize producers) from the change in the sales price. Adding up the responses of these different groups (evident through the microeconomic analysis), we could expect rain-fed maize agriculture to contract somewhat, but the predictions of macroeconomic models came out greatly exaggerated.

The government addressed the production and welfare implications of agricultural liberalisation simultaneously through its PROCAMPO program, targeting exclusively producers. PROCAMPO's cash transfers were designed to compensate growers affected by trade liberalisation without contravening the rules of current international trade agreements (*i.e.* NAFTA and GATT) (Appendini, 1994). The program was also intended as an incentive to increase productivity while remaining decoupled from current production. The incentive was expected to arise from the certainty given to

growers' income (SAGAR, 2002). Transfers consist of per-hectare payments based on the area cultivated by households (in nine different crops) immediately prior to the program's implementation. PROCAMPO was scheduled to last for the duration of the liberalisation process, ending in 2008.

NAFTA and PROCAMPO are now in their eighth year, and maize imports have soared, but the expected slump in domestic maize supply has not occurred. In fact, domestic supply of maize has remained above the record 1990 level since the initiation of NAFTA and PROCAMPO, and in 2001, the total area cultivated in maize surpassed its historical (1965) maximum (INEGI, 2001).

Economic studies of the 1990s produced overly pessimistic estimates of NAFTA's effects on maize production and rural incomes because they ignored indirect influences (the ripples in the pond) and market structures shaping these influences in rural areas.

The immediate impact of eliminating the government-guaranteed price of staples in Mexico is to decrease the profitability of growing staples for households with access to the high policy price. However, to see the full impact on these households, one must view staples in the context of other income activities of these households. Households in rural Mexico, including those producing staples, tend to be highly diversified. Table 2 summarises the diversification of income sources in a sample of 391 households surveyed in 8 Mexican villages between 1993 and 1996. Most farmers engaged in staple production on rain-fed lands: just over half (52%) received income from staple production, including imputed income from subsistence production. However, most of these staple-producing households also received income from several other sources, and staples (including subsistence production) accounted for an average of only 6% of total income. In additional to staples, households received income from Mexico-to-U.S. migration, internal migration, local wage work, cash-crops and non-crop production. Households directly affected by a staple price decrease react by shifting resources into these other income-earning activities. As a result, a 50% decrease in the staple price would be expected to produce less than a 5% decrease in staple income.

Table 2. **Mexico village-town household income diversification**

Of households with income from…			**Shares with at least some income from…**					
	Households					Noncrop		Internal
Sector	Number	%	Staples	Cash Crops	Wages	Production	US Migration	Migration
Staple	101	52%	1.00	0.84	0.54	0.55	0.52	0.33
Cash crop	118	60%	0.72	1.00	0.52	0.57	0.53	0.36
Wage	105	54%	0.52	0.58	1.00	0.53	0.39	0.25
Noncrop	106	54%	0.53	0.63	0.53	1.00	0.45	0.34
US migration	85	43%	0.62	0.73	0.48	0.56	1.00	0.33
Internal migration	55	28%	0.60	0.78	0.47	0.65	0.51	1.00

In households with income from…	**Share in total household income of…**					
				Noncrop		Internal
Sector	Staples	Cash Crops	Wages	Production	US Migration	Migration
Staple	0.06	0.14	0.27	0.32	0.18	0.03
Cash crop	0.08	0.14	0.26	0.27	0.21	0.04
Wage	0.06	0.04	0.58	0.18	0.13	0.02
Noncrop	0.04	0.04	0.26	0.46	0.15	0.04
US migration	0.05	0.13	0.18	0.31	0.31	0.02
Internal migration	0.06	0.05	0.27	0.27	0.19	0.16

Market imperfections, created by high transaction costs, are a second reason why phasing out guaranteed prices for maize did not reduce maize production. Most of Mexico's staple farmers did not sell to the government, because of high transaction costs. In our surveys, we elicited farmers' reasons for not selling to CONASUPO, the government staple marketing agency offering the high guaranteed price. Typically, farmers responded that CONASUPO purchase points were too far away from their villages; transportation costs and marketing uncertainties discouraged them from taking their harvests there. Guaranteed prices were not high enough to overcome these transaction costs and uncertainties.

High transaction costs isolate farmers from other kinds of markets, as well, often leading to surprising impacts of policy changes on directly affected households. For example, imperfect labour markets make it difficult to hire substitutes for family labour on the farm, creating tradeoffs between production activities. (These are illustrated by negative "lost-labour" effects of migration on production in the China research cited previously). Lack of access to credit forces most small farmers to self-finance their production activities, and missing insurance markets make households seek alternative ways to protect themselves against income risk. Income transfers to rural households, in the form of migrant remittances (Taylor and Martin, 2001; Taylor, 1992) or government income policies, can stimulate production in unexpected ways by providing liquidity and income security. Sadoulet and de Janvry (2001) find evidence that Mexico's direct income transfers to maize farmers under the PROCAMPO program stimulated production activities on small farms.

Beyond the household: the transformation of rural economies

The research on impacts of migration and policy changes cited above all focuses on directly-affected agricultural households, in isolation of the larger economies of which they are part. Economic interactions within the rural economy transmit the impacts of migration and policy changes beyond the directly affected household. Several hypothetical examples can illustrate the ripples in the pond:

Example 1: Labour market linkages

Migrant remittances or a PROCAMPO transfer enable a household to hire labour from another village household. This expenditure transmits the benefits of PROCAMPO or remittances outside of the directly affected household. To understand the impact of the transfer on village incomes, investments, etc., it is necessary to follow expenditure linkages to the labour-supplying household. Note that, even if the transfer is "squandered on consumption" (*e.g.* house construction, a frequent criticism of migrant households' remittance use), it nevertheless stimulates income growth in households that sell consumption goods or services to the household receiving the transfer.

Example 2: Capital market linkages

Because it receives the transfer, a household loans money to another household in the village, and the second household invests the funds in a new production activity. If the first household did not receive the transfer (*e.g.* by sending a migrant abroad), the second household would not have access to funds to invest.

Example 3: Missing staple market

Imagine a village isolated from regional staple markets by poor infrastructure; high transaction costs make villagers rely on local production to satisfy their consumption demands, and producers, finding it too costly to market their output outside, must seek markets for their surplus production within the village. These conditions create a local market for the staple; the staple price is determined by local supply and demand, not by outside markets or government policy. A household within this isolated village receives a PROCAMPO or migrant income transfer. This new income increases the household's demand for staples (directly or indirectly, *e.g.* through demand for livestock products). The local staple price increases. The higher staple price transmits benefits from the transfer-receiving household to local staple-surplus producers.

In all three of these examples, market structures are critical in shaping local economy-wide impacts of the government or migrant transfer. In Example 1, without a local labour market, benefits from the transfer cannot be transmitted to the worker household. Example 2 depends on the existence of a local credit market to channel savings among households, so that, for example, one household can invest its labour in migration, while another invests the proceeds from this migration in a local production activity. In the third example, the local staple price is the link between the transfer-receiving household and the staple producer.

In all of these examples, new households become integrated with the global economy indirectly, through their economic relations with households directly affected by trade policies or migration. Many or possibly most of the impacts of the policy or migration may, in fact, lie outside the households that actually receive the government transfer or send migrants and receive remittances. Demand linkages create income multipliers and transmit impacts of migration and policy changes within local economies - and ultimately, to regional commercial centres with which these economies interact.

Migration and policy changes may unleash a variety of other general-equilibrium effects on rural economies. For example, if the loss of labour to migration drives up local wages, rural economies may restructure themselves around labour scarcity, shifting to less labour-intensive (and more remittance-capital-intensive) activities and production technologies. An ever-widening circle of economic actors then becomes inserted into the global economy indirectly, even if they do not engage directly in migration or trade outside their country's borders. Paths of insertion may be even less direct than this. For example, increasing integration with global markets leads to new construction in a regional urban centre, for which migrants from rural Mexican households supply labour. Rising incomes linked directly or indirectly to globalisation increase the demand for meat produced on pastures where corn once grew. The migrant-sending or livestock-producing village household is inserted into global markets, in the sense that its activities have been reshaped by the country's integration with world markets. The new livestock production may also be financed, directly or indirectly, by migrant remittances.

In all of these examples, as already noted, access to markets is the key to economic insertion, direct or indirect, into the global economy. Access to a foreign market for goods or factors (*e.g.* migration) is a prerequisite for direct insertion, while access to regional or local markets that are linked in some way (perhaps very indirectly) to global markets is a sine qua non for indirect insertion. The existence of markets creates the possibility for linkages to transmit impacts of foreign-market integration to local actors. High transaction costs in rural markets do the opposite. For example, high costs of migrating - due to lack of information, etc. - inhibit some households from sending migrants abroad or to domestic urban centres. High costs of transacting in product markets limit the ability of households to market their output or obtain inputs. Missing or incomplete credit markets prevent capital from being

channelled to its most efficient uses in rural areas and constrain rural households to self-finance investments. These market imperfections are like stones that block or distort the ripples in a pond.

Imperfections in rural commodity and factor markets may either promote or retard economic actors' integration with global markets. For example, high transaction costs in markets for goods or labour limit the possibilities for direct insertion of rural households into the global economy through trade or migration - even if the countries in which these households are situated are part of a free-trade area. High transaction costs in this case inhibit trade, much as restrictive trade policies would. On the other hand, lack of access to local credit may encourage migration. If, as the NELM posits, migrants play the role of financial intermediaries who obtain capital in the form of remittances for their households, then rural capital market imperfections may result in "too much" migration - in other words, excessive insertion into foreign or domestic-urban labour markets.

The structure of local and regional markets is outside the purview of existing applied models of trade integration. However, its importance is recognised by some microeconomic studies of household-farm economies (de Janvry, Fafchamps, and Sadoulet, 1991; Strauss, 1986; Rozelle, Taylor, and de Brauw, 1999), which explore household behaviour in the absence of selected markets. Recently, a nascent body of research has begun to explore local impacts of policy changes using "micro" economy-wide modelling techniques (Taylor, Yúnez-Naude, and Dyer, 1998; Taylor and Adelman, 1996). These studies take into account the ways in which agricultural households and firms interact in local markets, even when high transaction costs isolate them from larger, regional and global markets.

Within countries, there are winners and losers from insertion into the global economy. This is certainly true among individual economic actors, but it also may be true among sectors and even regions within countries. In general, reducing barriers to engagement with the global economy adversely affects actors involved in activities that were protected by those barriers. High transactions costs in rural markets, like restrictionist trade policies, may benefit some economic actors, *i.e.* those who produce for the "protected" local market. Insertion into the global economy, whether through policy reforms or a reduction in transaction costs, will adversely affect such agents, unless they are able to reorient their activities towards supplying goods or services to outside markets.

For example, in Example 3, above, where high transaction costs isolate households from low prices in regional grain markets, grain farmers capture rents by producing for local demand. If the country joins a customs union and begins importing cheap grain from abroad, this may have little or no impact on "protected" prices in the village. Selective insertion into global markets (*e.g.* through migration) that increases incomes in some village households may increase the demand for grain - for human consumption, feed for livestock purchased with remittances, etc. High transaction costs in this case transmit benefits from remittances to grain producers in the village. Lowering transaction costs in grain markets would do the opposite, dissipating rents to local grain producers by making the low regional grain price accessible to village households.

Understanding direct and indirect influences of migration and trade policies requires an approach that goes beyond both the aggregate country and micro household focus, elucidating market structures and the complex linkages that connect economic actors in the regional economies of which they are part. Part 2 presents a micro economy-wide modelling approach designed for this purpose.

2. A micro economy-wide modelling approach

Understanding the impacts of globalisation and migration in rural economies requires understanding micro responses, the complex linkages among economic agents within rural economies, and the

linkages between rural economies and the outside world. Most economic research on rural economies entails the microeconomic modelling of individual agents' economic behaviour, in most cases the behaviour of agricultural households. However, that approach misses the linkages among economic agents that indirectly integrate rural people into global markets.

Village or "micro economywide" models make it possible to include linkages among households into an analysis of impacts of globalisation and migration on migrant-source economies. Micro economywide models occupy a middle ground between household-farm models and aggregate (national) CGE models for policy analysis. Like household-farm models, they are rooted in the micro economy and constructed "from the bottom up," using household-farm survey data. However, they integrate models of household-farm activity into a local (*e.g.* village or regional) general-equilibrium framework. This makes it possible to capture complex linkages and general-equilibrium feedbacks among household-farms that shape the effects of exogenous shocks on local economies.

Simulations using micro-economywide models are unique in their ground-level view of the likely impacts of exogenous policy and market changes on local economies, which is critical for understanding globalisation's impacts and designing rural development policies. Village or micro economywide models are described in detail in Taylor and Adelman (1996) and Taylor (1997).

A micro economywide (computable general equilibrium) model was estimated for a migrant-sending village-town economy of Michoacán, using original survey data. It was used to explore the short-run implications of international (Mexico-to-U.S.) migration as well as NAFTA-related agricultural policy reforms in this economy.

The model

The Mexico village-town model was estimated using data from a 1993 survey of 196 households in Michoacán, which traditionally has been the largest supplier of migrants to the United States among all Mexican states. The sample includes 53 households in a town or county seat and 143 in the surrounding villages that, together with the town, make up the municipio (analogous to U.S. county). Most land in the surveyed households is ejido (reform-sector) land. Total cultivated landholdings ranged from 0 to 19 hectares, with an average of 2.8 (0.4 for the 115 subsistence households and 6.3 for the 81 commercial, or marketed surplus-producing, households in the sample.)

The village-town model is really two models, one for the town and the other for the three villages. These two models are linked to each other spatially, through trade. Each model has 5 components: (1) household-farm production, (2) household-farm income, (3) expenditures, (4) a set of general equilibrium closure equations, which insure that local markets clear or else the village-town is a net buyer ("importer") from or seller ("exporter" of marketed surplus) to outside markets; and (5) a price-determination component, which sets village-town prices equal to outside market prices for tradables. For non-tradables (*i.e.* goods or factors for which high transaction costs isolate the village-town from regional or national markets), local prices are endogenous "equilibrium" prices, at which local supply and demand are in balance.

The production component of the model requires putting values on family inputs and on output. This is not always straightforward in the imperfect market environments characterising LDC rural areas. The Mexico survey took care to obtain information on inputs of all factors (land, family labour, hired labour, animal power, tractors and other physical capital) in crop and non-crop production, and also on prices whenever market exchanges took place. Market prices were usually observed for intermediate inputs. The chief exception was maize seed, which usually was selected from the previous year's

harvest. We valued seed and crop output at their prevailing local market prices. Valuing hired labour and tractor services (most households did not own their own tractor) is straightforward, using market prices. Most families used their own animal power in production; however, in a few cases animal services were hired, and we used the observed prices to value all animal capital inputs. Subtracting the costs of intermediate inputs, hired labour, and mechanical and animal capital services from the gross value of production yields a residual representing family labour and land value-added. Ejido land could not be rented at the time of the survey; this resulted in what essentially was a missing land rental market, which means that land rents had to be imputed to obtain land value-added. One way to value family labour is to use the local wage. However, our experience in other parts of Mexico taught us that valuing family labour at the local wage frequently results in total costs exceeding gross revenue, suggesting that the true opportunity cost of family time is less than observed wages (workers usually are hired during periods of peak labour demand, when wages are highest). The alternative to using market wages is to impute family labour value-added (together with land rents) econometrically, from regressions of total (land plus family labour) value-added from crops and livestock on land and family labour inputs. This is how we obtained family labour and land value-added shares to model household-farm production.

Household-farm savings and expenditures were estimated using a linear expenditure system (LES) approach and savings and expenditure data gathered in the survey.

In addition to value-added from production, many households received remittances from migrants in the United States (principally California) or from internal migrants (principally in Mexico City and Guadalajara). Aggregate CGE models assume that migration occurs until wages at the migrant origin and destination equilibrate (or that the disparity in wages remains the same before and after the policy shocks that the researchers simulate in their models). From a micro household-farm point of view, this is the wrong migration condition to impose. Households may allocate their members' labour either to local production (obtaining the value of the marginal contribution of the member's labour to local production) or else to migration (obtaining migrant remittances). We estimated remittance elasticities econometrically, from a regression of the log of households' migrant remittance receipts (net of amortised migration costs) for households that participated in migration on the log of their labour allocated to migration, controlling for family migration networks and correcting for potential sample selectivity bias. These elasticities were allowed to vary across household groups in the village-town model, reflecting differences among households in their access to foreign and domestic migrant labour markets (especially household "migration networks," or family contacts at prospective migrant destinations). The "migration equilibrium" condition in our model is that the value of the marginal product of family labour in the village-town equals the marginal effect of migration on remittance income (and the imputed family wage).

The village-town model is described in detail in Taylor, Yúnez-Naude, and Dyer (1999).

Impacts of migration in a village-town economy

The study of migration impacts in northern China, cited above, illustrated how migration and remittances transform migrant-sending households. Table 3 reports the simulated *micro economy-wide* impacts of a 10% increase in Mexico-to-U.S. migration on village production, household incomes, investments, and linkages with outside (regional) markets in Mexico. (No such model is currently available for China.) Although the initial impacts of the migration increase are in households with migrants, the village-town model captures the transmission of these impacts from migrant to non-migrant households in the local economy, as well as to the rest of Mexico, through trade.

Table 3. **Reorganisation of village production around Mexico-to-U.S. migration**

Effect of a 10% increase in Mexico-to-U.S. Migration on…	Degree of village integration with outside staple and livestock markets	
	A	B
Village production	High Integration	Low Integration
Staples	-0.46	1.49
Other crops	-0.51	-1.14
Livestock	0.61	0.71
Non-agricultural	-0.65	-3.87
Migration		
Mexico-to-U.S.	10.00	10.00
Internal	-0.93	-1.16
Household incomes		
Subsistence	3.19	2.94
Commercial	1.28	0.98
Investment		
Physical capital	2.53	2.26
Human capital	2.05	1.77
Net village "imports" from rest of Mexico		
Before migration change	21 332	-53 330
After migration change	51 976	31 013

Source: Estimates using village CGE model for Mexico.

Estimated influences of international migration on local economies depend critically on two considerations: first, whether these influences are estimated in the short or long run; and second, the degree to which the local economy is integrated with outside (regional) markets. The simulations presented in the Table represent short-run impacts of migration; they do not include ways in which investment of remittances may stimulate production in the long run, as in the Chinese household study findings reported earlier. Most of these short-run impacts involve adjustments of local production to lost migrant labour and increases in household income, through remittances and the new demand for locally supplied goods and services that they stimulate.

Local demand linkages depend critically on the degree to which the migrant-sending economy is integrated with outside markets. With high levels of outside-market integration, remittances stimulate demand for goods and services produced elsewhere in Mexico and "imported" into the village. The more closely integrated the local economy is with outside markets, the more the impacts of remittances become diffused and eventually concentrated in regional urban centres. We explore two scenarios. In the first, the village-town economy is highly integrated with outside markets. In the second, it is cut off from outside markets for agricultural and livestock products. When high transaction costs force local economies to be self-sufficient in, say, food, local food prices are endogenous. In this case, changes in demand resulting from remittances influence production, through their effect on local food prices. Column A reports simulated impacts of migration under the first scenario; Column B under the second.

Increased migration reduces local availability of labour. This adversely affects production in most sectors and encourages households to shift their production from more labour-intensive activities (*e.g.* crops and non-agricultural production) to less labour-intensive activities (*e.g.* livestock). Integration with outside markets makes this production transformation possible without constraining households' consumption.

Column A reports reductions in crop and non-agricultural production and a sharp increase in village "imports" from the rest of Mexico. It also reports a decrease in internal migration, which competes with international migration; a sharp increase in household income (through remittances), especially to subsistence households; and a rise in village investments in physical capital and human capital (schooling). The negative impacts of labour "lost" to migration on local production mirror findings from past studies at the household level (*e.g.* Taylor, 1992 and Rozelle, Taylor and de Brauw, 1999). They reflect a village analogue of the "Dutch disease" phenomenon, by which production of tradables contracts as new village resources (labour) are channelled into "migrant exports". The one exception, livestock production, appears to be complementary with migration, because it uses little labour; it is also the major producer of "investment goods" (live animals) in this micro-economy. The simulation results in Column A reflect a process documented by other studies in Mexico, *i.e.* the expansion of livestock production concurrent with increased migration from rural areas (*e.g.* Fletcher, 1998). More generally, migration is likely to stimulate commercial production of goods that do not compete strongly with migration for scarce labour.

Column B illustrates the sensitivity of migration's impacts to regional market integration. As in Column A, increased incomes in households with migrants stimulate demand for normal goods, including food. However, when local economies are constrained to be self-sufficient in food, this increased demand puts upward pressure on local prices, which in turn stimulate production. This transmits the impact of remittances from migrant households to local food producers. In our example, "other crop," non-agricultural production, and internal migration all decrease, as in Column A. However, food production expands to satisfy the new demand stimulated by remittances. This may benefit some food producers in the village. However, it represents a limitation on village households' ability to adapt to new (in this case, migration) opportunities; resources must be kept in food production because of the village self-sufficiency constraint. Because of this, migration stimulates incomes, investments, and regional demand linkages less in this, than in the first, scenario.

These simulation results illustrate some of the ways in which migrant-source economies may be transformed in the short run by their direct insertion into the global economy, through migration. In the long run, migration and remittances may have additional impacts, by loosening liquidity and risk constraints on investments in new and existing production activities (Stark, 1991; Taylor and Adelman, 1996; Massey, *et al*., 1998).

NAFTA, price reforms, and the rural Mexican economy: Do "decoupling" schemes really decouple?

The North American Free Trade Agreement (NAFTA) calls for a gradual (15-year) phase-out of price supports for staples. Studies using aggregate CGE models concluded that a reduction in the government support price of corn would decrease rural incomes, employment and wages and stimulate a sharp increase in rural out-migration (Hinojosa-Ojeda and Robinson, Levy and van Wijnbergen; Cornelius and Martin). These negative impacts of agricultural policy reforms have not materialised. Despite an 18% real drop in the support price for white corn between 1994 and 1997, corn output declined only slightly, from 18.13 to 18.02 million metric tons (Mexican Ministry of Agriculture). There is no evidence that rural workers suffered disproportionately from structural reforms in Mexico, nor that Mexico-to-U.S. migration increased above its (rising) trend of recent years.

Under the PROCAMPO policy, initiated in 1994-95, output price supports were replaced by direct income payments to maize farmers. As the share of price supports in total value of maize production fell, from 49% in 1992-93 to 19% in 1998-99, the share of direct income transfers increased, from 0 to 21%. PROCAMPO was designed as a "decoupling" scheme. That is, it replaced a high government-

guaranteed price for maize, which distorted production incentives and encouraged "too much" maize production, with income transfers that, in theory, should not affect production decisions. However, income payments to farmers are "decoupled" from production only if perfect and complete markets exist for maize output and inputs. Decoupling is likely to break down in the imperfect market environments characterising rural Mexico. The PROCAMPO policy experiment results presented below illustrate conditions under which PROCAMPO payments influence maize production, offering an explanation for the small observed effect of agricultural policy changes on maize production in Mexico as well as on rural incomes, employment, and migration.

The Mexico village-town model captures two critical aspects of the rural Mexican economy that are absent from aggregate NAFTA models: diversification in household income activities and local market imperfections that alter, and in some cases may even reverse, the expected impacts of policy changes on local economies.

The Mexico model was used to explore the likely impacts of the PROCAMPO policy reforms on a rural economy under three alternative market scenarios. The policy experiments simulate the village-town economy-wide impacts of a 10% decrease in the support price for staples combined with a compensating lump-sum income transfer to staple producers, similar to what actually occurred under Mexico's PROCAMPO program.[2] The three market specifications correspond to increasingly imperfect rural market conditions: (1) a perfect-markets specification, in which the village-town micro-economy is a price taker in all markets with the exception of capital and land (which are in fixed supply); (2) an endogenous wage scenario, in which wages are determined by the interplay of village-town labour supply, on one hand, and local labour demand and migration, on the other; and (3) endogenous village and town wages and staple prices.

The third scenario corresponds to a world in which costs of transacting in outside staple markets - including with government marketing agents - are high for village producers and consumers. In areas with high costs of transacting with outside grain markets, the local price of staples is likely to be endogenous, determined by the interplay of local supply and demand, not by the government guaranteed price. In our sample, a number of surplus-producing farmers sold their excess production locally, rather than selling to the government at the high guarantee price. When asked why, most responded that it was too costly to transport their harvest to the nearest government (CONASUPO) purchase point, approximately 40 miles away. Others cited cases in which neighbours had paid to transport their maize, only to have it rejected on the grounds that the quality was not sufficiently high or the silo was already full; this added marketing uncertainty, discouraging farmers from selling unless there was a sufficient price spread to cover not only transportation but also an implicit marketing risk premium. Some farmers complained that, lacking their own vehicles, they would have had to sell to intermediaries at a price below the guarantee price (reflecting the high transaction costs and marketing risks in this region).

The experiments presented here explore the impacts of PROCAMPO both in the short run (during which land cannot be shifted among production activities) and in the long run (when land is mobile across activities). Total land and capital are fixed in all scenarios.

Table 4 reports the results of the policy experiment for the three villages. The columns in the Table correspond to the market scenarios and short versus long run; the rows, to village outcomes of interest.

2. Under the PROCAMPO "decoupling" scheme, payments were made on a per-hectare basis, an administratively necessary design when output is not known or information about output is asymmetric. In the policy experiment, farmers receive an income transfer equal to 10% of the base value of their staple production.

Table 4. **Mexico village-town CGE model PROCAMPO experiment: Estimated percentage effects of a 10% decrease in grain prices and compensating income transfer* under alternative market closure rules**

	A Neo-classical Perfect Markets		B Endogenous Local Wage		C Endogenous Village Staple Price	
Land factor	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run
Basic grain prices	-10.0	-10.0	-10.0	-10.0	0.5	0.2
Output						
Staple	-8.1	-25.8	-8.0	-25.7	0.4	0.7
Other crop	0.0	3.3	0.1	3.5	0.0	-0.1
Livestock	0.1	4.3	0.1	4.3	0.0	-0.1
Non. Ag.[1]	0.0	0.0	0.7	1.2	0.2	0.3
Mexico-US migration	0.0	0.0	0.2	0.4	0.1	0.1
Labour factor demand	-1.2	-2.0	-0.8	-1.3	0.2	0.3
Wage	n/a	n/a	-0.1	-0.1	0.0	0.0
Village real GDP	-2.4	-3.1	-2.1	-2.5	0.2	0.2
Household real income						
Commercial	0.4	0.1	0.6	0.5	1.5	1.6
Subsistence	1.1	0.7	1.3	1.1	0.7	0.8
Capital investment	-0.5	-0.8	-0.2	-0.5	1.1	1.1
Marketed surplus[2]	126.4*	245.7*	127.7*	247.7*	n/a	n/a

1. Includes renewable resource extraction, retail and "other" activities.
2. Large percentages are a consequence of a small (*=negative) marketed surplus in base.
* Transfer equal to 10% of base value of staple production

Source: Taylor, Yúnez-Naude and Dyer, 1999.

The policy's direct effects on the village economy are twofold. First, lower staple prices induce households to shift production out of staples and into competing, nonstaple activities. Second, the PROCAMPO income transfer adds to the income of households receiving the subsidy, increasing their demand for normal goods (including staples and grain-fed livestock). However, economic linkages quickly transmit the impacts of the policy from the directly affected households to others inside and outside the village-town. The results in the table represent the total (direct plus indirect) effects of the policy in the villages.[3]

In all market-closure scenarios except (C), the combination of the price and PROCAMPO transfer effects sharply reduces staple output. Under Scenario A, the staple price falls and the income transfer has no effect on local production. This is the outcome that is assumed under decoupling; however, it depends upon the local maize market being integrated with outside markets, so that any increase in maize demand (stimulated by the transfer) can be met by purchasing grain outside the villages (or decreasing the part of marketed surplus sold in regional, as opposed to local, markets). In the short run, when land is immobile across agricultural and livestock activities, staple production falls by an estimated 8%. Livestock output increases slightly because feedgrain prices drop, but cash-crop and non-agricultural activities are unaffected, because they are not linked in any significant way to maize production.

When land is mobile, the decreased profitability of staples together with lower feedgrain prices provoke a reallocation of land towards livestock and other crops. Staple production falls by 26%, but the outputs of livestock and other crops increase by 3 to 4%. In this scenario, the fixed wage (implying

3. Results for the town appear in Taylor, Yúnez-Naude and Dyer, 1999.

an elastic supply of labour) insures that labour is readily available to sectors whose production increases. Migration is completely unaffected, as the fixed local wage leaves the condition for migration equilibrium (equating the local wage to marginal remittances) unchanged.

The aggregate CGE models cited earlier predicted an increase in migration because lower staple prices depress rural wages relative to wages at migrant destinations in Mexico and in the United States. If local wages adjust in response to the price liberalisation and PROCAMPO policies (market scenario B), the expanding non-staple sectors actually absorb much of the labour released from staple production. Local wages are almost unaffected; they decrease by only 0.1%. In striking contrast to the aggregate CGE models, the effect of the policy change on migration is minimal, only 0.2 to 0.4%.

In market Scenarios A and B, lower staple production coupled with a positive income transfer effect on demand reduce the marketed surplus of staples outside the local economy. In Scenario C, however, high costs of transacting in outside staple markets buffer village producers and consumers from the government support-price change. Because of this, the negative effect of the change in government staple price in the villages is minimal. However, the PROCAMPO income transfer raises the incomes of staple-producing households benefiting from the subsidy.[4] This increases the demand for "normal" goods, including both staples and livestock that consume locally produced grain. The positive effect of the transfer on demand drives up the village staple price. There is a slight increase in staple production (by 0.4 to 0.7%) - exactly the opposite of what is predicted by aggregate CGE models. These small impacts of price changes on staple production are consistent with what actually transpired in Mexico. The decline in staple (corn and beans) production in Mexico was small and confined primarily to large commercial farms, not the small-farm sector where most of Mexico's producers are found and where most migration originates (SARH). In rural economies that were largely isolated from the price policy (*i.e.* distant from government purchase points), the agricultural reforms may, paradoxically, have had a small expansionary effect on staple production - or at least not significantly discouraged it.

Because of the diversification of rural household economies, the PROCAMPO income subsidy is never income-neutral, and in the case of imperfect local markets for staples or other goods, it is not truly "decoupled". In most cases, real incomes increase, as families benefit on the consumption side from the income transfer and lower staple prices and respond on the production side by shifting resources to other production activities. When high transaction costs buffer village households from outside staple markets, the PROCAMPO subsidy clearly affects staple production. Market Scenario C illustrates one of several ways in which the agricultural policy may fail to decouple: local prices link changes in consumption to production. Imperfections in other markets also may lead to a failure to decouple. For example, if small farmers cannot obtain capital from other means (*e.g.* banks), the PROCAMPO payments may provide investment funds that influence production of maize and other goods. If these payments are perceived as being relatively secure, they also may affect risk-related incentives to invest in local production. Capital market imperfections are only partially represented in the model used here, and the model does not consider production or income risk.

3. Conclusions

Through trade integration and migration, some economic agents are inserted directly into the global economy. These agents have complex economic interactions with other agents in the local, regional, and national economies of which they are part. Through these interactions, other agents become

4. PROCAMPO payments depend only on past production; they are not contingent on sales. This means that even if high transaction costs discouraged sales and buffered producers from the price change, farmers could still be eligible to receive the income subsidy.

integrated with the global economy indirectly, and the economies of households, communities, and regions are transformed. This paper utilises new micro-economy-wide modelling techniques to explore the transformation of local economies through migration and market integration-related policy changes. In northern China, household economies are transformed as sons and daughters migrate to work in the country's rapidly growing global cities. In a traditional migrant-sending region in Mexico, migration increases village incomes, stimulates some production activities while causing others to contract, and transforms the structure of the rural economy, while households adjust their production to NAFTA-related policy reforms.

This analysis has important ramifications for development economics research, policy, and project evaluation.

Theoretical and empirical studies with an aggregate or macro focus on nations or groups of nations miss the ways in which market integration and migration influences play out in local economies, and they do not offer insights into how policies and development projects may influence this process. On the other hand, microeconomic models focusing on individual actors (individuals, households, or firms) are likely to miss many of the influences of policy changes and migration, as well as potential influences of public policies and development programs on rural economies. Impacts on economic agents directly affected by migration or government policies are only part - and perhaps only a small part - of the story of how influences unfold within rural economies. Many other economic agents are influenced indirectly, through local market interactions, and they are a key part of the process by which market integration policies and migration transform local, regional, and ultimately national economies. A clear example of this is the impact of migration on nonmigrant households in rural Mexico.

The conclusion that directly affected agents transmit the influences of migration to others has relevance beyond understanding how globalisation and migration processes play out within nations. For example, project evaluation methods need to have an expanded vision that includes economic actors not directly affected by the project under consideration. Assessing the impacts of agricultural programs or policy reforms requires going beyond the agricultural households directly affected by those reforms. For example, "decoupling" schemes in Mexico, which replace food price supports with direct income payments to farmers, have impacts on the rural economy that extend beyond the households receiving PROCAMPO payments, as we saw above. In fact, market imperfections in rural areas cast doubt on whether such transfers are truly "decoupled" from production, once the full impact of the transfers unfolds within local and regional economies. Rural education policies create private benefits, to the households whose members' schooling increases, as well as social benefits, which unfold through these households' interactions with others in the rural economy. Technological change has both direct effects (on the adopting households) as well as indirect "social" effects (on households interacting with adopters through factor and commodity markets). By concentrating on directly affected economic actors, we may be looking for the impacts of policy, market, and other changes in the wrong places.

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EXAMINING THE LINKS BETWEEN ECONOMIC POLICY AND POVERTY: EXAMPLES FROM GHANA AND INDIA

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Abstract

Linking globalisation or, even more simply, free trade to poverty changes has not proved very simple for several reasons. Firstly, from a theoretical perspective, trade expansion and growth are essentially macro phenomena whereas poverty is fundamentally a micro phenomenon. Secondly, from an empirical perspective, neither poverty nor trade liberalisation is easily measurable, and isolating a trade shock from a myriad of other international or domestic economic shocks is very difficult. By considering two case studies for Ghana and India, this paper clearly demonstrates the variability of poverty effects due to differences in the micro or macro level of analysis, to the choice of macro-economic policies adopted to counter-balance trade liberalisation, or to the time frame of the analysis, the functioning of the labour market, and other non standard elements such as transaction costs. In summary, these case studies point out that without a sound knowledge base there is increased risk of adopting overly simplistic formulae in poverty reduction policies. Unfortunately, accounting for all direct as well as indirect links between poverty and economic policy means that not very often best practises can be identified and that a case-by-case approach, based on sound empirical analyses, must be adopted.

Introduction

Openness and trade liberalisation have been at the centre of policy advice to developing countries for almost two decades. Their positive effects on efficiency and growth have not yet received unmistakable proof, yet most economists agree that closed economies are more prone to inefficiencies, resource waste, and on average have performed poorly in terms of overall development. From an economist's point of view, free trade among nations is nothing more than an extension of Adam Smith's invisible hand: free market forces produce an aggregate (international/global) beneficial outcome that is beyond any individual's (single country) control. However, as in the case of market failures, free trade too may not always succeed in producing benefits for every participant. Although one may be comfortable with aggregate results derived from standard trade theory, such as those predicting increased specialisation of developing countries in sectors that use labour more intensively and entail wage rate increases, those are still aggregate results, and tell us little about results at the individual or smaller group levels. In particular, a topical question is: "what happens to poor people when trade is liberalised and growth rates increase?" This apparently innocuous question has been at the centre of a hot debate that has been involving not only economists but also policy makers and the public at large.

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Linking free trade and growth to poverty changes has not proved very simple for several reasons. Firstly, from a theoretical perspective, trade expansion and growth are essentially macro phenomena whereas poverty is fundamentally a micro phenomenon. This has created a sort of cleavage separating economists dealing with international trade issues from those preoccupied by poverty and income distribution. The first group built its own arsenal of analytic tools, which rarely communicated well with those of the second group. Indeed, as explained in a recent series of papers by Winters *et al.*, the literature dealing directly with trade-*and*-poverty is "surprisingly patchy". Secondly from an empirical perspective, neither poverty nor trade liberalisation is easily measurable, and isolating a trade shock from a myriad of other international or domestic economic shocks is very difficult. In fact, even the word shock may be inappropriate here: countries liberalise their international trade over multi-year periods and usually implement additional policies and are simultaneously hit by other shocks. Poverty causes are multiple and poor people do not always share amongst themselves the same demographic/social/economic characteristics, therefore measuring causality or even correlation between trade liberalisation and poverty is problematic.

Unfortunately poor people seldom live or vote in the constituencies of incumbent policy makers, so that lack of accountability and feedback from the recipients of poverty initiatives further complicates policy making in this area. Guiding principles have often been looked for in terms of "best practices", however this is a precarious tendency, which should be avoided. Ideas such as "aid flows produce stronger positive results when the right policies are in place" can easily be misinterpreted when taken out of context, and since they have a huge appeal with policy makers, large mistakes can be made in their name. This presentation starting point is a humble admission that we do not know enough and that careful case-by-case discretion should be used rather than universal rules. Even the simple observation of changes in apparently well-crafted poverty measures based on accepted theoretical principle suffers serious drawbacks.[1] As Kanbur (2002) points out: "at the same time that the World Bank issues reports about the disastrous consequences of smoking among poor in developing countries, its poverty measures must treat this increase as a contribution to reduction in poverty."[2] Other paradoxes arise when we consider poverty and death.[3] Should we believe a poverty measure that records less poverty in Botswana when we know that this measurement does not take into account increases in mortality rates due to the AIDS pandemic and the fact that AIDS affects disproportionately the rural poor?

In this presentation, two examples from the recent research projects on poverty at the OECD Development Centre are used to illustrate the complexities of poverty evolution and the wide variety of potential causal mechanisms that link economic development, economic policies and poverty.

Case 1. How should poverty alleviation programmes be financed?

The first example concerns a case study for Ghana. The central question here is about what governments can do to protect the poor when needed structural adjustment policies are implemented or more specifically: "how to finance a poverty alleviating policy in an adjusting country". Interestingly, the answer changes when different time frames are considered or different levels (macro or micro) are examined.

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1. Namely poverty measures based on Foster, Greer and Thorbecke, (1984).

2. This is due by the way changes in well-being are calculated in empirical work, namely as a simple sum of optimal expenditures on consumption goods. Therefore a ceteris paribus increase in expenditure on addictive goods like cigarettes would count as an increase in well-being. If this increase happens for poor households, measured poverty would decline. See Kanbur (2002).

3. See again Kanbur (2002).

Case 2. The role of transactions costs.

The second example introduces into the analysis of poverty and growth some non-standard elements that have been recently re-discovered: transaction costs. This case addresses the question of how our view of the development process of a large country such as India can change when these elements are explicitly taken into account. Almost always what characterises the poor is their isolation from the rest of the society and the economy, and thus from the potential benefits of increasing aggregate incomes. In order to design winning pro-poor policies, the causes of this low connectedness must be fully understood and dealt with. This entails in-depth analysis of transaction costs related not only to geography and inappropriate policies (such as high and sectorally dispersed protection measures), but also to other less obvious causes, such as infrastructure development and maintenance, and institutional arrangements.

These two examples are directly linked to the issue of agricultural trade liberalisation by virtue of the simple fact that most of the poor people of Ghana, and India are rural farmers. Any shock to the price of food or cash crops or to their technology of producing and trading them, being the origin of the shock in developed or developing countries, will have a large effect on poverty levels, probably initially larger than a shock affecting the manufacturing sector.

The Ghana Example: the level of analysis

Introduction

The stylised *facts* about Ghana are that this country has been a good adjuster and implemented with success Structural Adjustment Programs (SAPs). However, the disaggregated poverty results are not encouraging. The *question* posed here is thus "What should be done to alleviate poverty?", or more precisely how to best to assess the potential results of a simple poverty alleviation transfer policy before its actual implementation. The *problem* for this type of study and its final users is to give a clear sense of the robustness of the results, in other words their plausibility, and to strike a balance between level of detail – closeness to reality, and cost of gathering data and handling complexity. Some *results* are offered here.

Ghana has often been regarded as one of the major success stories in Africa in terms of the implementation of structural adjustment and liberalisation reform programmes during the 1980s and 1990s. In terms of broad aggregate indicators, the most recent evidence is promising and even impressive, certainly in comparison with the pre-SAP reform era. However, analyses of the impact of the reform process, especially in terms of poverty profiles of household groups containing significant proportions of the poor, suggests that the distribution of benefits may have been unevenly distributed and that the poor may not have benefited from policy reform in either absolute or relative terms. This raises questions as to what kinds of social policy interventions may be appropriate in helping to mitigate some of the adverse effects of reform and promote positive outcomes for the poor.

This is a broad and ambitious objective, which can be tackled in several ways. One way is to use computable general equilibrium models to conduct counterfactual numerical simulation experiments on the alternative policy options. A general approach is set out by Dervis, de Melo and Robinson (1982) and subsequently by Sarris (1990) in terms of modelling distributional mechanisms. Particular studies have been carried out by Adelman and Robinson, Chia, Wahba and Whalley (1992), Demery and Demery, Sahn, Dorosh and Younger, among others. While there are some general similarities between these studies, there are significant conceptual differences in their scope, and in the

experiments and approaches adopted. In this study the multisectoral CGE modelling approach has been used to simulate the possible effects of a range of redistributive policies on poverty incidence in Ghana, very much in the tradition of Adelman and Robinson and of Chia *et al*. The particular claims to novelty are twofold. The first is that the model is based on the first detailed and authoritative social accounting matrix (SAM) for Ghana, estimated for 1993, which is well inside the post-reform era. The second is that, rather than constructing one single (definitive) model several variants are constructed with the aim of seeing just how sensitive the results are to variations in the parameterisation, specification and closure rules. One particular aim is, therefore, to address some of the criticisms of De Maio, Stewart and van der Hoeven (1999) in respect both of the study by Sahn, Dorosh and Younger and of CGE modelling more generally.

Analysing poverty requires dealing with individual, or at least very disaggregated, data, whereas, studying economic growth or trade reforms means, normally, examining macro or quite aggregate phenomena. The potential tension between these micro and macro approaches is nothing new in economics, but acknowledging and trying to accommodate it can be very fruitful when poverty reduction is the final objective of both research and policy making. In what follows some of the crucial steps necessary to link macro and micro analyses are explicitly discussed. This discussion extends that on the sensitivity of results mentioned above, should provide additional evidence of the complexities of poverty analysis, and should call for additional caution when poverty reduction policies are examined.

The level of analysis: Macro-Meso-Micro

CGE models are frequently used to simulate the effects of changes in policy-determined or exogenously-determined variables (*e.g.* tax rates, world prices, exogenous export demand shocks, etc.) on endogenous variables (usually domestic variables such as sectoral outputs, relative prices of products and factors, household incomes or welfare, etc). CGE models are often regarded as extensions of input-output and linear programming models in the sense that they are multisectoral models and capture interdependence between sectors. But in addition they capture the interdependence between other agents in the economic system such as households and other domestic institutions, as well as the external sector. The core of a real-side CGE model is a representation of the markets for products and factors. Decisions by producers and consumers determine supplies and demands for products and factors, which become mutually consistent through adjustments in relative prices.

Macro-meso models

CGE models may be regarded as a class of macro-meso models (World Bank, 1990). On the macro side CGE models are always firmly rooted within a macroeconomic framework: they integrally involve macro variables and are conditioned by macro 'closures' (that is, the rules which determine how the external, capital and government accounts are brought into balance). Similarly on the meso side the models explicitly involve markets and often portray some degree of institutional structure of the economy. What is important therefore is the extent to which the representation of markets and the level of institutional detail in the models adequately captures the characteristics of the meso economy and the effects of exogenous shocks. Whether the model usefully addresses the impact of policies at the meso level is dependent on three key factors. First, it will depend on the macro-meso framework underpinning the model; second, whether the model specification is representative of technology and behaviour in the economy; and third, it will depend on the quality and detail of the benchmark dataset used to calibrate the model. The benchmark dataset mainly consists of a SAM. In this sense the classification detail in the SAM, the number and kinds of product and factor accounts and the

classifications of household groups and other institutional features are crucial to determining the integrity of the model structure as a whole.

Recently De Maio, Stewart and van der Hoeven have been critical of the work of Sahn and others, and of the work of the Cornell Nutrition Program, on the grounds that their choice of classifications, in particular of factors and household groups, conceals some crucial within-group variations. Clearly, if the average effects of policies on household groups do not reflect the effects on household sub-groups, either in magnitude or direction, then this will undermine the value of the model in its ability to examine policy consequences at the meso level. The issue is most clearly exemplified in the case of rural households where sub-groups may have quite different degrees of exposure to agricultural export markets. Some agricultural households produce and sell export crops and/or their household members work in farms producing for export, while others are small landowners who are mainly subsistence farmers and/or are net purchasers of food. There is also a varying degree of rural non-farm economic activity. Obviously each group may be affected differently by exogenous shocks, and if such households are classified in a single group then the results could be misleading. These criticisms can partly be offset by a careful choice of classifications. For instance De Maio *et al.* rightly criticise Sahn *et al.* for basing their household classifications on the level of income (poor vs non-poor) and argue instead in favour of other classifications such as those based on socio-economic and locality criteria. Their general point is that classifications should be chosen to minimise the effect of mobility between household groups (which income-based criteria would allow) as well as maximising the between-group effect relative to the within-group effect.

Meso-micro extensions

The above considerations are clearly important in determining how well CGE models capture meso-level effects: the effects on markets, households and other institutional groups. Clearly, whatever classifications of products, factors, households and other institutions are chosen, they are usually too aggregative to assess the policy effects at a micro-level. Only if the group classifications happen to be perfectly homogeneous (so there is no intra-group variation) would the meso-level results be sufficient to describe the micro-level outcomes. It is therefore necessary to introduce a further 'meso-micro' interface in order to assess the effects of policies on levels of poverty and on other distribution-related outcomes.

One approach to adding a micro extension has been examined by Dervis, de Melo and Robinson and implemented by Demery and Demery for Malaysia and by Chia, Wahba and Whalley in a poverty-focused policy model for the Côte d'Ivoire. This is also similar to a recent model of an 'archetypal' African economy proposed by Decaluwé *et al.*, (1999). The methodology rests on the availability of (or the ability to derive) a distribution of income (or expenditure) for each household group identified in the SAM. A poverty line is then defined (either in relative or in absolute terms) and the part of population whose incomes falls below the line is categorised as poor. While the determination of a poverty line involves important conceptual as well as data problems, a major difficulty is to estimate the distribution of income both in the base case and how it might change in response to shocks. Sample surveys of households are the main data source for this: although the data produced refer generally to households or families, they can nevertheless be used to provide an approximate distribution for individuals as well. In generalising from households to individuals, it is usually assumed that household income (or consumption) is equally distributed to all its members so that if the household's total income (or expenditure) falls below the poverty line, all its members are deemed to be poor. In other words, any intra-household inequality is ignored although there is evidence that this assumption may lead to a considerable understatement of poverty (Haddad and Kanbur, 1990).

A quantitative analysis of poverty requires the specification of a poverty index. The headcount index (P_0) is simple and has well-known properties within the broad class of Foster, Greer and Thorbecke P_α measures. In order to calculate this measure, the distribution of income (or expenditure) within each group, must be specified. One approach is to estimate the distribution for each household group directly from data provided by household surveys. Another approach is to instead assume that the distribution can be approximated by a theoretical frequency density function and then to estimate the parameters characterising the functional form by using the information from the household surveys. This has the advantage that one can manipulate distributional changes resulting from exogenous impacts. The theoretical distribution most widely used in this context is the two-parameter lognormal distribution, although Ducaluwé *et al.* have suggested that the Beta distribution may have preferred properties. One major disadvantage of the lognormal distribution is its poor description at the upper tail, although this deficiency is less serious when the function is separately parameterised for different and diverse household groups rather than for the population as a whole. On the other hand a prime advantage of using this distribution is relationship to the normal distribution, and therefore, its simplicity for statistical analysis. The use of the lognormal distribution in this context is examined by Dervis *et al.*

The essential pieces of information required from the household survey are first, estimates of the mean and variance of the lognormal distribution for each household group and second, a measure of the poverty line. Data from the Ghana Living Standards Survey (GLSS) 1991-1992 has provided us with information on the mean and variance of income of separate decompositions of the population by household group, and the standard relationships between the mean and variance of the distribution of Y (where Y is per capita income) and the mean (μ) and variance (σ^2) of the distribution of $\ln Y$ means that base year estimates can be derived. As regards the poverty line, it is by now standard to by-pass the conceptual difficulties of measuring absolute poverty lines and instead to establish a poverty line based on a given percentage of mean per capita household income (or expenditure) in the base year. This baseline poverty line (z) is then fixed in real terms throughout the simulations.

The extension of the meso-level analysis on to the micro-level (in terms of assessing the impact of policies on poverty levels) is now almost complete. Macro-meso level policy shocks are applied and the CGE model computes the differential impact that these policies have on the mean incomes of each household group ($\overline{Y}_h$). The effect on poverty is then measured by translating the change in $\overline{Y}_h$ into a shift in μ_h based on the assumption that the variance of $\ln \overline{Y}_h$ (that is σ_h^2) is unchanged. This assumption is largely (though not entirely) pragmatic; it rests on an assumption that there is some degree of uniformity in the effects of policies across all households within a group although it does not amount to a uniform shift. The shift in μ_h (with a fixed σ_h^2) represents a shift in the distribution of $\ln Y_h$, and the change in the cumulative density below z (which is equivalent to a change in P_0) can be calculated.

It is important to stress that, under this approach, any meso-micro application is bound to be a technically contrived extension of the meso outcomes and will rest on a range of assumptions. Therefore some general observations can be made at the outset, as these will determine areas where sensitivity experiments may need to be applied later. Clearly, changes in the headcount index will be sensitive to the position of both the poverty line z and the value of σ_h^2. The sensitivity of P_0 to the poverty line is well-known: an incremental shift in a high-level poverty line will affect the headcount index more than the same incremental shift in a low-level poverty line. However, P_0 is also sensitive

to the value of σ_h^2 and for similar reasons. If σ_h^2 is relatively large then the change in P_0 resulting from a given change in $\overline{Y}_h$ will be a smaller than if σ_h^2 is small[4]. So the relative variability of incomes within each group will be a crucial determinant of the simulated effects of policy shocks on P_0.

Finally, note that there are some potential omitted effects on poverty of certain kinds of policy changes. Chia *et al.* refer to this omission in connection with the 'social adjustments' that accompany structural adjustment policy changes[5]. For example, a reduction of government expenditures on social services (*e.g.* health, education, etc) will often have two sets of effects on households; first, the direct and indirect income effects due to reduced expenditures and, secondly, the welfare losses that stem from the reduction in the social benefits. This problem is by-passed here by concentrating on the general equilibrium effects of pure income redistributive transfers in a fiscal-neutral environment.

Poverty analysis in Ghana: how to measure it and how to test the robustness of measurements

It is common practice to begin a poverty analysis with the identification of an indicator of individual welfare. This is usually a monetary indicator such as total consumption expenditure or total income. The second step is to define (single or multiple) poverty lines and finally, a summary poverty measure has to be identified. In the literature each step is considered controversial. For example, there is an issue as to whether a welfare indicator should be a monetary value or an anthropometric measure, and if it is a monetary measure the issue is then what should be included and how it should be valued. There is dispute on the definition of the poverty line, whether it should be set at an absolute or relative value, and whether it should be defined differently across individuals, by location or over time. In this study we follow Chia *et al.* and base our welfare measure on per capita expenditure (cash and imputed in kind); the poverty line is set initially at a percentage of mean expenditure; and the poverty measure is based on P_0 (the headcount index). Per capita expenditure has often been argued to be a better measure of 'permanent' income; the choice of the poverty line, though initially arbitrary, becomes an absolute benchmark in the subsequent simulations; and P_0 is sufficient for making poverty comparisons providing first order dominance holds.

Previous studies on Ghana have highlighted the fact that poverty is highly concentrated in rural areas. This applies whether the study is based on the period prior to the economic reform programme (ERP) or subsequently; and whether poverty is defined through monetary measures or in terms of nutritional standards. The results obtained from an analysis of the 1993 Ghana SAM and 1992/93 GLSS are in line with these findings.

Table 1 shows some summary statistics, which are used as a basis for the model and simulations. It reports data relative to households and to per-capita cash expenditure as derived from the GLSS for the period 1992-93. For Ghana as a whole, the contrasts between household groups are quite substantial. For example, while only 7% of the population belong to households in the "urban skilled" category this household group accounts for 21.8% of total household consumption. On the other hand 17.8% of the population belong to 'Savannah farm' households whereas this group accounts for only

4. If $F(x)$ is the lognormal distribution function then if $d^2F/dx^2 > 0$ will ensure this result providing the poverty line is below the median income. If the poverty line is above the median income then the opposite result is true.

5. Chia *et al.*, (1992); p 3.

3.3% of total household consumption. The comparisons across urban and rural households as a whole are also borne out by the figures: 66.8% of the population belong to rural households, whereas only 41.2% of total consumption expenditure is incurred by rural households. The column for per capita consumption confirms significant disparities between household groups.

Table 1. **1992-93 Ghana poverty assessment**

						High z (129.199)		Low z (64.599)	
	Number of individuals	Total consumption 10^9 cedis	Per capita consumption 10^3 cedis	μ	σ2	Poverty ratio	% of total poverty	Poverty ratio	% of total poverty
Rural Farmer Head Savannah	2,728,753	98	36	3.4	0.3	99.3	33.9	90.2	48.8
Rural Farmer Head Forest	2,919,500	210	72	4.1	0.4	89.3	32.6	56.0	32.4
Rural Farmer Head Coast	1,168,915	117	100	4.4	0.4	76.8	11.2	33.2	7.7
Rural Non Agr. Head Savannah	803,056	327	407	5.8	0.3	4.3	0.4	0.2	0.0
Rural Non Agr. Head Forest	1,603,251	169	106	4.4	0.4	73.8	14.8	33.2	10.6
Rural Non Agr. Head Coast	991,167	302	304	5.6	0.3	7.9	1.0	0.3	0.1
Other Urban Unskilled	2,743,123	664	242	5.4	0.2	12.4	4.3	0.4	0.2
Other Urban Skilled	1,074,731	646	602	6.2	0.3	0.7	0.1	0.0	0.0
Accra Skilled Head	489,385	235	481	6.0	0.3	2.3	0.1	0.1	0.0
Accra Unskilled Head	765,519	195	255	5.4	0.3	17.3	1.7	1.4	0.2
Rural	10,214,642	1,222	120			73.5	93.9	49.2	99.6
Urban	5,072,758	1,740	343			9.7	6.1	0.4	0.4
Ghana	15,287,400	2,963	194			52.3	100.0	33.0	100.0

Source: author's calculations.

As noted earlier, within group information is needed in order to calculate poverty measures and track changes in these measures between the simulations. Following Dervis, *et al.*, (1982) and Chia *et al.*, (1992) and others, we assume expenditure in each group is lognormally distributed, with log-mean μ and log-variance σ^2. Hence for each household group (*h*) the mean (μ_h) can be derived from the benchmark data set as follows:

$$\mu_h = \ln \overline{Y}_h - \tfrac{1}{2}\sigma_h^2 \qquad (1)$$

where $\overline{Y}_h$ is per capita expenditure in group *h* and the log-variance σ_h^2 must be estimated. The GLSS is the source for estimating the log-variance but the disaggregations and hence the estimates differ from those used here. Working from the estimates of σ_h^2 shown in Table 1, the group log-means are estimated from the benchmark data set. These are also shown in the table.

Two poverty lines are derived and the same poverty lines are used for each group. The higher poverty line is set at 129,199 cedis (two-thirds of the mean per capita expenditure in 1993), while the lower ("hard core") poverty line is set at 64 599 cedis (one third of the mean per capita expenditure). On this basis, and using the lognormal assumptions the poverty profiles can be calculated and the results are shown in the final columns of Table 1. It confirms the more general picture suggested earlier and more directly: poverty in Ghana is clearly substantially a rural phenomenon. On the basis of the "high-level" poverty line 93.9 % of poverty is in rural areas; this rises to 99.6% if one restricts attention to a 'low-level' (hard core) poverty line. Also, poverty incidence is substantially higher in "Forest farm", "Forest non-agricultural", "Coastal farm" and "Savannah farm'" household groups: the incidence is

correspondingly negligible in the "Urban skilled", "Accra skilled" and "Coastal non-agricultural" household groups. The between-group disparities are really very high indeed.

Model structure

The CGE model is a real-side model of a small open economy and is purposely simple, having many standard features in common with existing models. The exchange rate is fixed and acts as the numeraire; the balance of payments is always in equilibrium, with foreign savings fixed and equal to the current account deficit. At the same time, it is assumed that the economy is savings-driven: the quantity of investment adjusts to the level of savings and the government has a fixed budget for a pre-defined consumption plan. Domestic savings, adjust through changes in institutional income. For example household income changes endogenously due to changes in factor income (via employment, wage rates, mixed income and returns to capital) and government income depends endogenously on direct and indirect tax receipts. Investment must equal the sum of domestic and foreign savings, and the latter is fixed and equal to the current balance of payments deficit. Domestically-produced and imported commodities are combined to produce composite goods in accordance with the Armington hypothesis; this is equivalent to assuming a degree of imperfect substitution between domestically-produced and imported goods.

The labour and factor markets are an important aspect of the model structure, and deserve special mention in view of their direct link with the distribution of income across household groups. The factor market specification is still embryonic although it is indicative of a possibly more sophisticated treatment of the informal sector and perceptions of how it interacts with the formal sector. In the SAM, and following the guidelines of the new System of National Accounts (1993), there are separate accounts for "compensation of employees" and "mixed income" further distinguished by location and skill. The category 'mixed income' is the income of the self-employed or employers in household sector unincorporated enterprises and it represents the return to both labour and capital. Household enterprises will include formal as well as informal activities, but we may broadly characterise the compensation of employees as the formal sector labour market and mixed income as the informal labour market.

One of De Maio *et al.*'s main criticisms of the use of CGEs in poverty analysis concerns the sensitivity of the results to the model closures and to concerns about distinguishing the short run consequences from those of the long run. This leads us to a central aspect of our simulations, where we set up alternative closures for the factor markets. We broadly characterise and distinguish between long run and short run closures in the following way. To mimic the long run we assume that capital and labour are perfectly mobile across sectors and that both factors are in excess supply; in other words the model is very close to a traditional Leontief model given that supply constraints have been removed by exogenously fixing the rental and wage rates. All demand shocks arising from the transfer policy will be accommodated by variations in factors' supplies and or crowding in/out of other demand components. In the short run, capital mobility is reduced to zero so we that we have sector specific capital supplies and rental rates. Labour is still mobile across sectors but its aggregate supply is fixed. These rules make factor markets completely inflexible and all shocks are accommodated via changes in prices. These two opposing factor markets adjusting modes have been labelled long and short run, however it should be pointed out that no realistic time period is considered here, given that the model has no dynamic features. As for the Leontief model, one can only hint to a long run as a sufficiently extended time period for which supply constraints are not binding; correspondingly, the opposite situation of full employment and no slack in capacity has been named the short run scenario.

Policy experiments

The main issue addressed in the experimental analysis previously conducted by Chia *et al.* was to examine the general equilibrium effects of implementing a targeting program for the eradication of extreme poverty. Specifically, their aim was to examine whether the size of transfers calculated in a partial equilibrium framework would eliminate poverty when both direct and indirect effects are accounted for. Two other aims have been added. First, in the case of the Côte d'Ivoire the targeting program was financed only by increases in the taxes on household income. Here we consider the consequences of alternative financing schemes, by raising additional domestic taxes via import duties, indirect taxes on production and direct corporate taxes. The second aim is to examine the sensitivity of the results to the alternative short run and long run closures.

Determining the poverty-alleviating transfers

The first step of the analysis is to determine the total transfers necessary to eliminate poverty. In a perfect targeting scheme only individuals who are poor would be targeted and they would receive a transfer equal to the amount required to raise them above the poverty line. But this scheme is costly and difficult to administer. A polar alternative to this is to administer a universalistic scheme in which all individuals receive *z*, which would be a sufficient amount to eliminate poverty. But the cost of the transfers in this scheme is very high. Here we confine our attention to quasi-universalistic schemes whereby transfers are targeted to each socio-economic group separately, and are self-financed. In a true universalistic scheme each individual in each group would receive a transfer from government equal to the poverty line income, z ; so the total transfers T_h in household group h would simply be the number of individuals in each group times z. There is a technical difficulty in effecting these (essentially micro) transfer payments in the macro-meso model. Ideally, the result of the transfer payments would involve a rightwards shift in the income distribution by an amount z. However, this is not easy to achieve if income is assumed to be log-normally distributed. It would seem that the best one can do is to shift the mean from $\overline{Y}_h$ to $\left(\overline{Y}_h + z\right)$ which has the effect of creating a lower degree of rightwards skew in the income distribution; as the lognormal distribution must always begin at the origin. Equivalently, this means that although we can simulate the effect of an average transfer payment of z to each group (*i.e.* a quasi-universalistic scheme) we cannot ensure that the payments are distributed uniformly to all individuals with the group.

In this paper four alternative financing schemes are considered: increasing household income taxes, tariffs, indirect taxes on production, and corporate direct taxes. The simulations cover a range of counterfactual scenarios for each of the financing schemes for transfers to the different household groups, and under alternative long run and short run closures. Finally, it should be noted that on the fiscal side the financing rules are set on the basis of the need to raise an amount equal to the transfers, to maintain the same real government savings.

Table 2. **Redistributive policy effects on Poverty Ratios**

	Long Run				Short Run			
	Corp. taxes	Direct taxes	Indirect taxes	Tariffs	Corp. taxes	Direct taxes	Indirect taxes	Tariffs
	Percent variations of Poverty Ratio (high z) w.r.t. base run							
Rural Farmer Head Savannah	-19	0	-4	-4	-18	0	-1	-2
Rural Farmer Head Forest	-29	-9	-17	-17	-18	-9	1	-6
Rural Farmer Head Coast	-32	2	-23	-23	-14	1	7	-6
Other Urban Unskilled	-83	73	-65	-65	-63	62	85	10
Accra Unskilled Head	-25	-3	-53	-53	92	-7	70	1
Rural	-25	2	-14	-14	-8	1	4	-4
Urban	-64	67	-62	-62	35	57	85	9
Ghana	-28	6	-17	-17	-5	4	9	-3

Source: author's calculations.

Table 2 summarises some of the initial results produced by our numerical model. For brevity, it reports variations in poverty ratios for the most poverty prone subsets of households considered in the study. This table allows two types of comparisons: one across type of financing rule and one across factor market closure rules. Given its lack of consideration of indirect effects, partial equilibrium analysis would not allow these comparisons, which, on the contrary, represent a paramount advantage of general equilibrium approaches.

Considering first how poverty alleviation transfers are financed under the long run scenario, an overall ranking of alternative compensating taxes is possible: total Ghana poverty ratios are reduced more intensively if corporate taxes are used to fund the transfer program, tariffs follow, then indirect taxes, and finally direct personal taxes. It should be noticed that, within this scenario, the initial increase in household income boosts private final demand and, given lack of supply constraints, output is expanded through employment of slack capacity. This real GDP expansion dominates all other effects for the indirect taxes and tariffs scenarios: in fact, given the flat factor supplies, prices are fixed (in the long-run scenario the model behaves similarly to a Leontief model), however, when output expands to respond to increased private demand, indirect taxes revenues go up and their rate can be reduced instead of raised to balance the government budget. This reduction in indirect taxes (or tariff) rates produces and additional large effect through an overall reduction of purchaser prices, which further stimulates intermediate and final demand. This virtuous cycle converges to a large increase in real GDP. Clearly this is plausible only under a strict Keynesian-Leontief scenario where supply is not constrained and it is not likely to apply in Ghana unless a very long-term future is considered. These effects (reduction of purchaser prices due to a reduction of tax rates) do not apply when direct (corporate or personal) taxes are examined. In these latter cases the results depend much more on the initial structures of the taxes and the transfers of corporate gains to households. Clearly, the corporate sector transfers most of its income to the richest urban households, thus taxing corporations to finance a poverty alleviation program is basically equivalent to a strongly progressive redistribution policy. Taxing directly households does not produce any effects on the aggregate poverty levels, but generates a mild redistribution due to differential tax rates across households groups.

When the short run is considered, the above results are not replicated. Indeed the different adjustment mechanisms in the factor markets matter for the poverty effects, especially at the disaggregate household groups level. Notice first of all that the real GDP expansion that was dominating the indirect tax and tariffs cases does not operate here and that in fact increasing these taxes to fund the transfer programs raises the inefficiencies of the Ghanaian economy and produces increases in poverty levels. The only case where poverty is reduced significantly is via a redistribution policy through

higher taxation of the corporate sector. And even in this case, the ranking of poverty results among the poorest rural groups is different than under the long-run scenario.

These preliminary results clearly demonstrate the variability of poverty effects according to the financing rule of the simple transfer program and to the macro adjustment mechanism implemented. We abstracted here from any micro adjustment variations, namely we assumed that the within household groups' variance in their income distribution is fixed. This may certainly generate over or under estimation of the policy effects and requires further testing.

The India Example: how our view of the development process can change when transaction costs are explicitly considered

Introduction

The stylised *facts* about India's recent economic performance are that after a long period (1960 to 1987) of growth at around 3.5%, the economy reached a decisively higher level of growth at about 5.7%, with a peaks of 6.2 (in the period 1994-99). At the same time, India's isolationism and economic policies were changed by a wave of market friendly reforms at the end of the 1980s, and education levels and overall welfare have been considerably raised. Once again though, poverty and inequality results are still not fully satisfactory. The *question* is thus "how can the recent sustained growth rates help further alleviate poverty in India?" or, more precisely, "which factor among technological progress, economic policy reforms, demography, or external shocks affects more intensively India's poverty record?" The *problem* for this type of study is to discriminate clearly among the various factors affecting poverty by identifying transmission mechanisms and by testing their sensitivity to changes in elasticities and other parameters. Some *results* are offered here.

Many recent growth and trade models have incorporated the insights of a large literature that emphasises the important role of openness in boosting economic performances and growth. In a variety of theoretical approaches, a liberal external policy, by facilitating financial and trade flows, helps an economy to get its domestic prices right, to allocate its resources to their best uses, to acquire new technologies, to increase its primary factors' productivity, to increase competition and X-efficiency, to reduce rent seeking, and even to improve its domestic governance. The strength of the links between trade policy and some of these positive effects is challenged by some authors and indeed the debate is still open. However, instead of disputing the introduction of dynamic and non-convex features in recent models, our study proposes a complementary approach by considering transaction costs reductions as an important factor explaining developing countries' performance in the real world. This approach has also recently been advocated to explain the development failures of numerous African countries. According to Collier (1997, 1998), many African countries face unusually high, and policy-induced, transaction costs that, by generating comparative disadvantages in manufactured exports, lower growth performance. Elbadawi (1998) and Elbadawi, Mengistae and Zeufack (2001) and argue that this transaction costs hypothesis is supported by empirical evidence, even when specific geographic and endowment variables are controlled for. This study – rather than presenting econometric estimates of transaction costs from *reduced form* equations, as for the cited studies – explicitly introduces transaction costs in a system of *structural form* equations to build a general equilibrium simulation model. A clear mapping of the analytical channels through which changes of transaction costs affect the economic performance of an economy is thus a primary objective of this study.

In addition to the effect on aggregate income, we examine how transaction costs influence income distribution or, more simply, affect factors relative prices. In the simplest Heckscher-Ohlin-Samuelson (H-O-S) model of comparative advantage, trade liberalisation leads to a reallocation of resources and to production specialisation in those sectors that use intensively the country's most abundant factor. This model predicts output shifts towards low-skill-labour intensive goods, increased demand for unskilled workers, and upward changes in their wage relative to the other factors' rewards. However, several authors have emphasised that empirical evidence contrasts with this prediction: increased relative wages for skilled labour are observed in many developing countries. Without rejecting the H-O-S model, most studies explain this puzzling inter-skill widening wage gap by considering skill-biased technological change the primary cause for it and by attributing just a minor role to trade. By considering the distributional effects of a reduction in transaction costs in addition to those due to productivity changes, some fresh insights in the trade and wage gap debate are offered here.

Beyond the analytical motivation for this exercise, the direct exploration of the effects of transaction costs on aggregate incomes and relative wages has valuable policy relevance. Firstly, showing that transaction costs reduction may be an important channel through which trade liberalisation affects incomes, in addition to the mentioned productivity enhancing mechanisms, should help policy makers in gaining support for an outward-oriented development strategy. Secondly, domestic as well as international trade policies can influence transaction costs and given that these policies are often implemented as parts of comprehensive packages, their correct co-ordination becomes essential to their success. Because of the scope of indirect effects, the signs and magnitudes of induced adjustments are difficult to ascertain and the need for numerical simulation models of the type presented here becomes evident.

Transaction costs theory

Since the seminal work of Coase (1937), transaction costs economics has tried to resolve the apparent inconsistency in the co-existence of markets and firms or, in current terms, of markets and institutions. Coase observed that if markets were perfect at organising production and exchange there would not be a need for firms to emerge or, by turning the argument around, if firms had advantages over markets why shouldn't we observe a single giant firm producing all that is demanded. His fundamental intuition was that differential transaction costs generate situations where both firms, or institutions, and markets are observed. This has been an extremely significant contribution and is probably one of the founding ideas of the voluminous transaction costs and institutional economics literature that followed.[6] This literature is not free from criticism, in particular sceptics point out the difficulty in making the concept of transaction cost operational. In Goldberg's (1985) words, explaining economic phenomena by appeals to transaction costs "is the all encompassing answer that tells us nothing".

Another approach uses the concept of transaction costs in a less abstract and perhaps less interesting way but one that may nevertheless be more helpful for the purpose of understanding how changes in transaction costs may explain developing countries performance. Rather than being concerned about changes in transaction costs that may explain the creation of a market, this approach considers how an already operating market may be affected by variations in transaction costs.

The antecedents to this approach may be found in general equilibrium theory and international trade. In an effort to enrich the theory of general equilibrium as formulated by Arrow and Debreu (1959) a few authors (Foley, 1970; Hahn, 1971; Kurz, 1974) have studied how this should be modified to

6. A few fundamental contributions can be found in Williamson (1975, 1985). For a recent survey see Williamson (2000).

incorporate transaction costs and what would be the consequences of such a modification on the major predictions of the standard theory. In Foley's words "the key aspect of the modification I propose is an alteration in the notion of 'price'. In the present model there are…a buyer's and a lower seller's price [and their] difference yields an income which compensate the real resources used up in the operation of the markets". When the operation of a market needs intermediaries that provide information or other services to buyers and sellers so that they can realise an exchange, then these intermediaries would receive the income generated by charging a transaction *fee* (=cost).

Another form of transaction costs has been considered in international trade and explicitly incorporated into models since Samuelson's (1954) paper on transport costs. The basic idea here is that trade involves transaction costs and that these may be simply thought of as a fraction of the traded good itself, as if "only a fraction of the ice exported reaches its destination as un-melted ice". This "iceberg model" clarifies how a reduction in transaction costs saves real resources and makes an economy more efficient.

Transaction costs: empirical basis

Real world situations present disparate examples of transaction costs, however it is possible to group them in three broad categories, namely geography-, technology/infrastructure-, and institution/policy-related transaction costs. Notwithstanding their overlapping, these categories allow an organisation of a large and disperse body of empirical evidence.

A major example of the first category is given by transportation margins. These are also probably the easiest to observe and possibly to measure. In an international context they can be measured by the c.i.f./f.o.b. ratio giving the 'cost, insurance and freight' charge for countries' imports. Henderson, Shalizi, and Venables (2001) estimate that they can "range from a few percent of the value of trade, up to 30-40% for the most remote and landlocked (and typically African) economies." Limao and Venables (2002) find that being landlocked raises transport costs by more than 50% and that the level of infrastructure development is an important variable in explaining differences in shipping costs. Estimates for within country trade and transport costs are not easily available, however, even if smaller, distances may still play a role in generating transaction costs in national markets. In a recent study on Africa, Elbadawi *et al.* show that domestic transportation costs are an even stronger influence on export (and growth) performance than international transport costs.

Additionally, in developing countries, poor people usually living in rural or remote areas are often victims of high transaction costs that partially disconnect them from the rest of the society. Jalan and Ravallion (1998) find that road density was one of the significant determinants of household-level prospects of escaping poverty in rural China.[8] Any technological advance providing the poor with better and cheaper access to national and international markets should, at least in principle, help them.

The second category of transaction costs includes those related to technology and infrastructure. It is clear that drastic technological innovations affecting the whole infrastructure of an economy and having the potential to be used in a variety of sectors, such as steam power, electricity, telecommunications, can have profound effects on transaction costs and indirectly on an economy's

8. See also Antle, J.M. (1983) and Fan *et al.* (1999).

growth and poverty record.[9] As shown in Table 3, the room for improvement in access to basic infrastructure for the poor is quite large.

Table 3. **Percent of poor households with infrastructure in home, in poorest urban and rural deciles in each country**

	Electricity		In-house water		Sewer		Telephone	
Country	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Asia								
Pakistan	88	44	34	5	20	0	1	0
Vietnam	57	16	4	0	-	-	-	-
Nepal	43	1	7	4	7	0	0	0
Eastern Europe & Central Asia								
Russia	-	-	84	31	78	12	39	13
Kazakhstan	100	100	78	12	70	8	38	20
Bulgaria	100	100	84	27	86	18	51	20
Albania	100	100	90	0	-	-	0	0
Kyrgyz	99	99	54	5	22	3	20	5
Latin America & the Caribbean								
Panama	91	2	36	4	25	0	20	0
Jamaica	55	44	23	2	15	6	10	6
Ecuador	92	63	25	7	42	5	5	0
Nicaragua	71	13	44	4	9	0	0	0
Sub-Saharan Africa								
South Africa	32	8	23	1	-	-	6	0
Cote D'Ivoire	39	8	7	0	-	-	-	-
Ghana	38	0	2	0	-	-	-	-

Jalan and Ravallion (1998)

A clear example of technology/infrastructure transaction costs can be seen in the information and communication sector. The Internet explosion and its connected technologies have dramatically reduced exchange and search costs in most OECD countries (KPMG, 1999).

Indirect evidence of technology/infrastructure-related transaction costs is found by looking at the level of manufacturing inventories across countries. Guasch and Kogan (2000) report on huge inter country differences in inventory levels. Table 4, taken from Guasch and Kogan, reports on the very large disadvantage of Latin American economies vis-à-vis the United States with respect to inventories: on average these countries hold twice as much raw material and finished products as the United States. According to the authors, higher transaction costs explain a relevant part of these inventories discrepancies: Latin American countries faced with uncertain demand, longer delays in shipments, and larger costs for small frequent shipments, choose to maintain larger reserves. Considering that the cost of capital is normally higher in Latin America than in the United States, the authors point out that these high inventory levels translate into considerable costs and ultimately in lower competitiveness and diminished growth.

9. A recent literature labels these technologies as 'General Purpose Technologies'. See Helpman, Elhanan (1998), and Bresnahan, T. and Manuel Tratjenberg (1995).

Table 4**. Latin America Ratios to U.S. Inventories (all industries)**

Raw Materials Inventory Level Ratios: Ratio to U.S. Level by Industry (average of all available data for 1990s)								
	Chile	Venezuela	Peru	Bolivia	Colombia	Ecuador	Mexico	Brazil
Mean	2.17	2.82	4.19	4.20	2.22	5.06	1.58	2.98
Minimum	0.00	0.30	0.10	0.11	0.52	0.86	0.42	0.8
1st Quartile	0.36	1.87	1.25	1.39	1.45	2.55	1.06	1.6
Median	1.28	2.61	2.30	2.90	1.80	3.80	1.36	2.00
3rd Quartile	2.66	3.12	3.90	4.49	2.52	5.64	2.06	3.1
Maximum	68.92	7.21	31.1	34.97	13.59	20.61	3.26	7.1
Final Goods Inventory Levels: Ration to U.S. Level by Industry (average of all available data for 1990s)								
	Chile	Venezuela	Peru	Bolivia	Colombia	Ecuador	Mexico	Brazil
Mean	1.76	1.63	1.65	2.74	1.38	2.57	1.46	1.98
Minimum	0.01	0.10	0.39	0.11	0.19	0.67	0.35	0.75
1st Quartile	0.17	0.87	1.17	1.13	1.05	1.67	0.82	1.1
Median	0.72	1.60	1.54	2.02	1.28	1.98	1.36	1.60
3rd Quartile	1.38	2.14	2.11	3.18	1.63	2.86	2.14	2.00
Maximum	31.61	5.29	3.87	21.31	5.31	7.94	4.91	5.2

Source: Guasch and Kogan (2000).

The last category of transaction costs includes those related to institutions or economic policies. Rent seeking is probably the most well known example, however, even by just considering trade policy, a few others are worth mentioning.

A well-established literature finds that an international border has a large dampening effect on trade. This has also been termed the home bias in trade. Most of the literature is focussed on the Canada-US trade, but this empirical phenomenon applies to any region of the world. Obstfeld and Rogoff (2000) label the home bias in trade one of the “six major puzzles in international macroeconomics”. With the existence of large home biases firmly established, the search for explanations has begun. Evans (2000) finds little support for the hypothesis that the home bias is not due to the border itself but instead to inherent differences in domestic and foreign goods; Obstfeld and Rogoff argue that empirically reasonable trade (*i.e.* transaction) costs can explain much of the home bias; and Anderson (2000) points to information costs and imperfect contract enforcement as worthwhile avenues of inquiry.

Deep policy switches such as the creation of the common European market in 1992 have also induced researchers to evaluate their economic impacts. A large collection of studies known as the "Costs of Non-Europe", supported by the European Commission, mainly consists of detailed estimations of the costs of the borders in Europe. The most cited reference is the Checchini report that finds that these costs are considerable (up to a small percentage of European GDP). Harrison, Rutherford and Tarr (1996) explicitly model these costs in a general equilibrium framework and reach similar conclusions.

Another more recent example of trade-policy related transaction costs is found in Hertel, Walmsley and Itakura (2001). The particular trade liberalisation policy evaluated in their study includes a series of measures intended to lower non-tariff trade costs between Japan and Singapore. In fact, by imposing the adoption of computerised procedures, an explicit objective of this policy was a reduction of the costs of customs clearance, a clear policy-related transaction cost. For the case of the Japan-Singapore FTA, the effect of linking the two customs’ systems is expected to generate additional reductions in effective prices amounting to 0.065% in Japanese imports from Singapore and 0.013% in Singaporean imports from Japan, and these cost saving refer solely to the cost of reduced paperwork, storage and transit expenses. However, in addition to the direct cost savings, there are indirect savings associated with the elimination of customs-related delays in merchandise flows between these two

countries. Hummels (2000) emphasises that such time-savings can have a profound effect on international trade by reducing both "spoilage" and inventory holding costs. He argues that spoilage can occur for many types of reasons. The most obvious might be agricultural and horticultural products that physically deteriorate with the passage of time. However, products with information content (newspapers), as well as highly seasonable (fashion) goods may also experience spoilage. Hummels points out that inventory costs include not only the capital costs of the goods while they are in transit, but also the need to hold larger inventories to accommodate variation in arrival time. He finds that the average value of firms' willingness to pay for one day saved in trade is estimated to be 0.5% ad valorem (*i.e.* one-half percent of the value of the good itself). This value of time-savings varies widely by product category, with the low values for bulk commodities and the highest values for intermediate goods.

In summary, even if in identifying empirical estimates for transaction costs we have stretched their definition to include quite different things, it seems clear that geographic characteristics, poor transportation and communication infrastructure, and bad economic policies may directly affect transaction costs, and that their presence can be documented in a variety of ways.

A simple trade model with transaction costs

Before examining how the analysis of India's recent economic performance can be affected by the explicit introduction of transaction costs, the basic structure of a simple trade model is described in this section.

The model includes two tradable homogeneous commodities, two factors of production and two households.

Production. The economy produces two goods, an aggregate exportable commodity (X) and an importable commodity (M), using combinations of skilled and unskilled labour in a Cobb-Douglas constant returns to scale technology as follows:

$$Q_i = \eta_i Ls_i^{\alpha_i} Lu_i^{1-\alpha_i} \qquad \text{with the commodities index i = X, M} \qquad (1)$$

where Q_i represents the quantity produced of the two goods, η_i a parameter standing for sector specific technical level, and α_i and (1- α_i) the Cobb-Douglas output elasticities with respect to skilled and unskilled labour (*Ls* and *Lu*). Factor neutral technology shocks similar to those mentioned above would entail changes in the parameter η_i.

Factor markets. We assume full employment of fixed endowments of skilled ($\overline{Ls}$) and unskilled ($\overline{Lu}$) labour, so that their supplies will be completely un-elastic with respect to their prices. These are thus determined by firms' demands that, in competitive markets, are equal to their marginal product in value:

$$ws = \alpha_i P_i \frac{Q_i}{Ls_i} \qquad \text{i = X, M} \qquad (2)$$

$$wu = (1-\alpha_i) P_i \frac{Q_i}{Lu_i} \qquad \text{i = X, M} \qquad (3)$$

where *ws* and *wu* are the wages for the two types of labour respectively, and P_i is the producer commodity sale price.

Transaction costs. These are modelled as a mark-up on commodity prices. This is equivalent to an excise tax or a transport margin and, since they do not increase with the value of the exchanged commodity but are proportional to their quantity, they are consistent with the empirical hypotheses on transaction costs described above:

$$Pt_i = P_i + t_i \qquad \text{i = X, M} \qquad (4)$$

revenues generated by the wedge t_i between the seller and buyer's price are equal to $\sum_i t_i Q_i$, and are used to buy transaction services from both sectors of the economy according to the fixed structure described above.

Consumption. The model includes two households, a skilled headed (HHs) and an unskilled headed (HHu) household, that receive income from selling factor services and demand commodities via an optimisation of a Cobb-Douglas utility function. Households are thus differentiated by their consumption patterns and according to their ownership shares, with the skilled-headed household representing loosely the rich household. Derived consumption demands are as follows:

$$Qd_{H\,i} = \beta_{H\,i} \frac{Y_H}{Pt_i} \qquad \text{with the household index H = hs, hu and i = X, M} \qquad (5)$$

where Qd represents the household-specific quantity demanded, β an utility share parameter, and Y the household's income.

Trade and equilibrium conditions. Imports, exports and domestically produced goods are homogeneous, so that trade, in any of the two goods, can only be one-way (either import or export) and it originates only when domestic demand and supply differ. In equilibrium, trade balance as shown below will hold:

$$\sum_i Pw_i T_i = 0 \qquad \text{i = X, M} \qquad (6)$$

Producers' prices are equal to the world prices given the small country assumption, and export or import flows quantities will be derived from the equality of supply and demand where the latter includes final consumption as well as transaction services demands:

$$P_i = Pw_i \qquad \text{i = X, M} \qquad (7)$$

$$Q_i + M_i = \sum_H Qd_{H\,i} + Qt_i + X_i \qquad \text{i = X, M} \qquad (8)$$

Factors' market-clearing conditions simply state that the sums of factors demands must equal the fixed factors' endowments.

$$\sum_i L_i = \overline{L} \qquad \text{and} \qquad \sum_i K_i = \overline{K} \qquad \text{i = X, M} \qquad (9)$$

In this simple model the poverty measure is a relative poverty index equal to the ratio of skilled to unskilled labour rewards. Given fixed factors ownership shares for the rural and urban households and a poverty line, it would not be difficult to calculate absolute households' poverty measures. The advantage of considering household-specific absolute poverty indices is that we would be able not only to trace the effects of changes in transaction costs on the supply/income generation side, but also on the demand/income use side.

Some straightforward variations to this basic structure can entail the following:

A) The use of intermediate goods in the production process. Intermediates are modelled as fixed proportion to production with a standard Leontief structure, so that equations (7) and (8) now become:

$$P_i = Pw_i - \sum_i \left(Pw_i + tc_i\right) a_{ji} \qquad \text{i = X, M} \qquad (7b)$$

$$Q_i + M_i = \sum_H Qd_{H\,i} + \sum_i Q_i a_{ji} + Qt_i + X_i \qquad \text{i = X, M} \qquad (8b)$$

where a_{ji} are the Leontief intermediate shares; notice that P_i's now become value added prices and these are equal to world prices minus the cost of intermediates which are valued at world prices plus transaction cost mark-ups.

B) Transaction costs can be modelled as iceberg wedges, *i.e.* the quantities sold by suppliers reach the purchasers with a certain fractional loss (some quantity of the commodity melts away). In this way transaction costs do not generate any income (or revenue) and they are in fact denominated in the same units of measurement (*i.e.* real value or quantity) of the good exchanged. In simplified terms the quantity equilibrium in a specific market would be:

$$Q_i^S = Q_i^D tc_i \qquad (9)$$

where *tc* is a number greater than 1 representing the "melting" due to the transaction cost. In addition one can consider transaction costs not only in the goods markets but also in factor markets.

C) Imports and domestically produced goods can be imperfect substitutes in consumption. Of the domestically produced goods one is not traded and only consumed at home and the other is either exported or consumed. These changes alter the fixed world price structure of the homogeneous goods model and allow for the price of the domestically good, which is imperfectly substitutable with the imported one, to differ from the world price. This type of model has been extensively used in the literature and its properties are well known. With this last variation, the model has three goods which enter the consumer utility function, an import good M, a domestic non traded good D, and an export good X. Domestic production occurs only for D and M with a CES technology that includes only skilled and unskilled inputs (the CES function represents another difference form the model shown above).

The production function is:

$$Q_i = \left[\beta u_i \left(Lu_i\right)^{-\rho_i} + \beta s_i \left(Ls_i\right)^{-\rho_i}\right]^{1/\rho_i} \qquad \text{i = M, D}$$

Numerical results

The simple general equilibrium model described above can be used to conduct basic experiments aimed at investigating the analytics of the link between relative poverty and transaction costs and the aggregate effects of a reduction of the latter; the following numerical results should not be considered exact estimates, but just indications on the potential magnitude and sign of effects.

An important novelty is introduced here: instead of interpreting the model's calculated equilibrium as the potential projected behaviour of the economy when ex-ante changes in exogenous variables shock it, we use the model to explain the observed historical changes. By shocking the model with the available observed variations in factor supplies, technological progress and economic policies, the 1988-1994 total change of the wage gap and growth rate can be decomposed in different components attributable to each of these causes. Most likely though, the model outcomes for the wage gap and the growth rate will deviate from the actual final 1994-observed values and we can interpret these

deviations in new interesting ways: they can represent the variations in transaction costs that, once accounted for, would make the model "fit" the observations. In short, this way of using the simulation model allows indirect estimation of transaction costs, which usually cannot be measured directly.

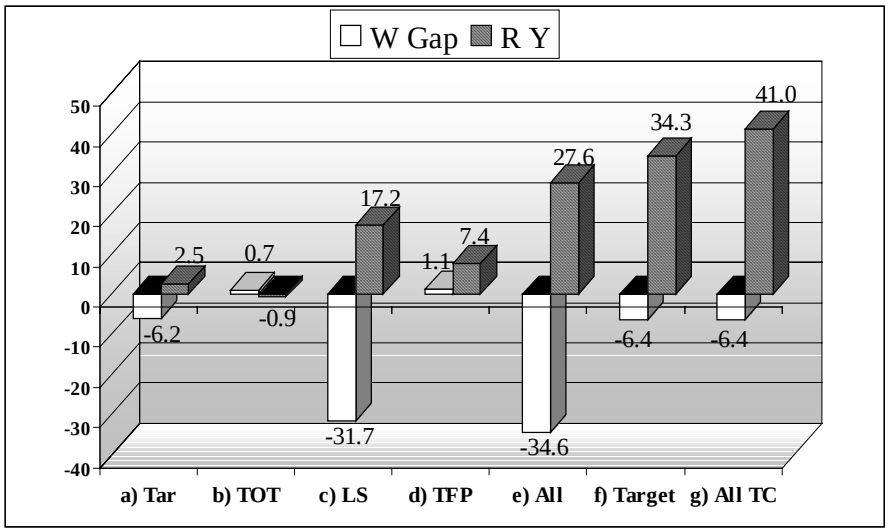
Table 5. **India's recent economic performance**

Variables \ Periods	**1988**	**1994**	**1988/94 change**
GDP constant 1988 price LCU (millions)	4 194 400	5 633 150	34.30
Wage Skilled	47.1	84.6	79.70
Wage Unskilled	18.8	36.1	91.92
Ratio (S / U)	2.5	2.3	-6.36
Labor Skilled (millions)	29	39	34.18
Labor Unskilled (millions)	223	246	10.40
Tariff (average weighted in %)	87	46	-47.13
TFP index (economy wide)	100	115	15.00
	1960-1987	**1988-1999**	
Average yearly GDP growth rate	3.88	5.69	

Table 5 displays the recent evolution of the Indian economy and serves as the basis to calculate the decomposition of the total real GDP and relative poverty for India during the period 1988-94. This table is not exhaustive but nevertheless includes all the major factors considered by the standard literature that focuses on growth/trade and poverty; it includes wage rates, factor supplies, tariff protection levels, and total factor productivity changes. In addition, but not shown here, the model considers changes in terms of trade.

Figure 1 summarises the results obtained with the model. In sequence from left to right, it displays the model estimation of the variations in wage gap (W Gap) and real GDP (R Y) due to the following individual shocks: (a) tariff changes; (b) terms of trade, (c) labour supply, (d) total factor productivity. The following columns (e) represent the result of combining all the different changes mentioned earlier and columns (f) represent the observed true variations in real GDP and wage gap.

Figure 1. **India: 1988-94 growth and wage gap decomposition analysis**



The underlying theory of the model gets quite near to the actual real GDP change but seems to overestimate the effect on the wage gap. In particular, we notice that, taken one at a time: (a) the international opening of the economy would decrease wage inequality due to India specialisation in unskilled intensive exportables and would increase GDP by a small fraction in comparison with the observed change; (b) that this is contrasted by the terms of trade shock that increases importables prices against exportables; (c) that the largest shock is due by the demographic/educational/human capital shock, which, by dramatically increasing the skilled labour force, diminishes its wage premium and boosts production; (d) finally productivity gains slightly increase the skilled wage premium and contribute to the overall growth of the economy. As shown above, when all these changes are combined into a single shock the model results over-estimate the equalitarian effects on the wage gap. Indeed up to this point the model has dealt with reforms in the standard way: trade reform through tariff reduction eliminates deadweight loss triangles and induces production specialisation according to Indian comparative advantage, but it does not directly increases factors productivity; better labour market policies and education reforms are simply translated into a larger supply of skilled workers. However, deeper structural changes have affected the recent development process in India and these can be accounted for by changes in transaction costs. In a first instance we model transaction costs reduction as a decrease in urban unskilled labour transaction costs; in other words we assume that for the largest part of Indian workers finding a job becomes easier, and symmetrically firms hiring of these workers becomes profitable: the functioning of this important factor market becomes more efficient. This is equivalent to an increased supply of unskilled labour, or symmetrically to a reduction in their relative wage. Therefore, in this case, a reduction of labour transaction costs produces an overall increase in real GDP and a reduction of unskilled wage relative to skilled wage. The reduction in transaction costs is calculated so that the observed wage gap's change of –6.4% [in column (f)] is respected. This estimation procedure results into a 65% reduction of transaction costs during the observed period.[10]

10. It should be noticed that the model endogenously determines one instrument (transaction costs) for one objective (the observed wage-gap) and does not obviously estimate real GDP exactly, yet the results shown in column g) are very close to the observed facts of column f), and it will be easy to chose an additional instrument to target real GDP.

Case study conclusions

In this Indian case study some important points have emerged. First of all, the process of development is complex and examining more carefully which factors have contributed to it and by how much may provide useful insights. We showed that when transaction costs, normally quite large for developing economies, are explicitly considered, observed changes in relative poverty and real GDP growth can be easily accommodated; in fact dealing with transaction costs reductions allows to take directly into account some of the deep structural transformations entailed by economic development and not only, as in standard cases of trade liberalization, to consider minor efficiency gains.

Conditional on model structure distributional results can be neutral with respect to sector biases in transaction costs technology. In most realistic cases, factor intensity of sector with larger cost savings determines distributional results, Business-to-Business (B2B) or Leontief idea is vindicated. In other words, poor people would benefit when the sectors, which enjoy large savings because of transaction costs reductions, are those that employ intensively factors of production owned by poor people.

Finally, policies reducing transaction costs may have initially perverse effects on relative income distribution; but they would normally have positive absolute poverty results, and transaction costs may depend on policy but not exclusively. There is a need for more empirical research on this.

Summary

During the last two decades, bilateral and multilateral donors' policy advice to developing countries has been centred on greater market openness and better integration into the global economy. This advice is based on two major assumptions. First, that outward-oriented economies are not only more efficient and less prone to resource waste, but have also performed well in terms of overall development. Second, that raising average incomes benefits all groups within countries, i.e., the notion that as long as inequality is not increasing, economic progress will reduce poverty. However, these assumptions have recently been challenged, and the effects of globalisation on poverty are generating growing concern.

The point of departure of this paper is that despite the new concerns, the relationship between trade policy or globalisation and poverty remains inadequately researched and poorly understood. An important objective of the paper is to show some examples of why knowledge advancement in this area is difficult to achieve. Trade policy and development as well as poverty reductions materialize in the midst of many other changes and their isolation as well as measurement can be very difficult. Our assessment of the links between development, poverty and economic policy depends on whether we analyse impacts at the micro or macro level of analysis, the choice of macro-economic policies adopted to counter-balance trade liberalization or poverty transfers, the time frame of the analysis, the functioning of the labour market, transaction costs, and other factors. This paper also points out that without a sound knowledge base there is an increased risk of adopting overly simplistic formulae in poverty reduction policies. Unfortunately, accounting for all direct as well as indirect links between poverty and economic policy means that very often best practises cannot be identified and that a case-by-case approach, based on sound empirical analyses, must be adopted.

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INSTITUTIONAL DIMENSIONS OF TRADE LIBERALISATION AND POVERTY

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Abstract

Trade policy liberalisation requires institutional change, in the sense of a change in the rules of the game. The question is whether these changes produce "superior institutions" judged in terms of a reduction of transactions costs; improved co-ordination; stronger strategic commitment to investing in needed specific assets; and allocative efficiency. In conventional approaches to the analysis of liberalisation, changed institutional arrangements are studied, but they tend to be considered in the category of "practical details": important but not especially intellectually interesting. In contrast, this paper argues for a parallel approach to the study of the effects of liberalisation on the rural poor, in which institutional matters are central. A broad range of institutional issues is considered, informed by a theoretical framework provided by the various strands within institutional economics. The framework set out and discussed leads to the contention that smallholder agriculture in poor countries needs co-ordinated market economy (CME) type institutions if it is to develop, at least at the earlier stages. Ideally, these would be based on deliberative institutions, working horizontally inside a sector, and also vertically along the supply chain. It is argued that the way forward is likely to involve a rethinking of the role of the state (at sub-national, national and international - aid donor - levels) and of the roles of producer organisations and other stakeholder (including trader) associations. The aim must be to find a way in which the state and other powerful actors can initiate deliberative processes and take a lead in encouraging appropriate asset specific investments, while at the same time planning to fade into the background as initial success is achieved. These conclusions challenge conventional analysis of trade policy liberalisation in poor countries and also challenge institutional specialists to provide insights, ideally quantifiable, into the consequences of those liberalisation policies which drive changes in such features as "non-standard institutional arrangements"; non-market co-ordination; and the roles of government.

Introduction

Trade Liberalisation drives Institutional Change

Except where relatively minor adjustments are made to tariff rates, trade policy liberalisation requires institutional change, in the sense of a change in the rules of the game. Furthermore, it is rare not to find a link between trade liberalisation and domestic policy liberalisation more generally, as trade liberalisation renders particular domestic policies inoperable, or at least requires substantial modification. This is particularly so in the case of agriculture, where government intervention is commonplace, with policy instruments which include a mixture of trade and domestic instruments

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such as: tariffs, quotas (including trade bans), licensing, variable levies, state trading to defend minimum prices and maintain maximum prices, credit subsidies, input subsidies, state marketing monopolies (which may, relative to world prices, tax, subsidise or cross subsidise), restrictions on inter-district or inter-provincial movement of produce, transport subsidies and public sector research and extension. Trade liberalisation entails substantial changes to items on this list.

Therefore, in a general sense, it can be said that liberalisation brings about institutional changes, often quite profound. The obvious question is whether these changes produce "*superior institutions*": judged in terms of a reduction of transactions costs; improved co-ordination; stronger strategic commitment to investing in needed specific assets; and, finally, allocative efficiency. Even if this is the case, perhaps liberalisation policy might be reconsidered to produce even better results in terms of institutional change.

Liberalisation and the rural poor: institutional dimensions

This paper is concerned with a large section – probably a majority – of the world's poor people, who are rural dwellers, and whose livelihoods are highly dependent, directly or indirectly, on agriculture. Improvement of their incomes from agriculture must be a leading component of pro-poor growth trajectories out of poverty, so it is crucial that trade liberalisation and related domestic market liberalisation supports broad based agricultural growth.

In agriculture, conventional approaches to the analysis of the effects of trade liberalisation tend to focus on understanding the effects of policy changes on prices at borders and other key reference points; the price transmission mechanisms; and the implications for the spatial and temporal distribution of prices across the national economy. Building on this, producer responses can be modelled and general equilibrium effects considered. The specific poverty dimensions of the analysis tend to be handled by ensuring that the models are relatively well disaggregated with respect to effects of particular relevance to poorer groups, on the consumption and production sides.

In these conventional approaches, institutions enter the analysis in a number of ways. It is frequently remarked that the credibility of government commitment to new policies is an important influence on firms' responses. Furthermore, liberalisation frequently alters, replaces or abolishes those policy instruments which have had the character of institutional arrangements (*e.g.* arrangements for market quotas, variable levies, producer subsidies, marketing monopolies etc). The operation of these changed institutional arrangements is studied, but they tend to be considered in the category of "practical details": they are important but not especially intellectually interesting, and hence are not studied in much detail, and are not given much emphasis. In some situations this may be a major omission, as some of the disappointing impacts and failures of liberalisation may be due to the importance of these 'practical details'.

This paper argues for a parallel approach to the study of the effects of liberalisation on the rural poor, in which institutional matters are central. A broad range of institutional issues must be considered, informed by a theoretical framework provided by the various strands within institutional economics, especially the new institutional economics (NIE). The results of this work will yield insights, which are valuable on their own, but especially valuable when combined with conventional modelling approaches. A group at Imperial College Wye (ICW) is currently collaborating with the International Food Policy Research Institute (IFPRI) in such an endeavour.

Several years ago, the ICW group was stimulated to develop an institutional economies perspective on liberalisation by the observation that, in poor countries, smallholder farmers frequently face market

failure, or at best weak markets (Dorward, Kydd & Poulton, 1998). Prior to liberalisation, approaches to dealing with these problems had included: state sponsored co-operatives; crop authorities, usually operating under state direction; parastatal marketing agencies; and various kinds of credit suppliers, operating the "old credit model" which included subsidised credit. The framework of international trade policies was usually co-ordinated with these domestic institutional arrangements, if only loosely, and often incoherently. This co-ordination with international trade instruments had objectives which included (a) maintaining the financial viability of state marketing and credit providing organisations; and (b) concerns for farmer incomes and national consumer welfare (through modifying price levels and volatility).

These institutional arrangements in developing country agriculture had been heavily criticised in the course of the 1980s, with criticisms focused on rent-seeking; allocative inefficiency; low operational efficiency; and failures to foster connections with world markets, with inhibited access to market opportunities and new technology. In the subsequent decade, they were reformed to a greater or lesser extent in their international trade and domestic market dimensions. The driving ideas behind the reforms were to introduce more competition; to gain allocative efficiency by aligning domestic price relativities with world prices; to encourage capital inflows by removing constraints on investors and strengthening links to international supply chains.

The ICW approach to liberalisation debates recognised the considerable merit in these general arguments, but argued that, for specific cases, these had to be tempered by an understanding of the challenges of transacting in rural areas of poor countries. Detailed understanding of the causes of market failures and of weak markets led to the conclusion, in an important number of cases, that transactions costs can only be reduced to an acceptable level by "non-standard" institutional arrangements. In other words, by arrangements other than the "free market ideal", which can be characterised, for the case of farmers, as the availability of an independent competitive offer in all relevant markets, including inputs, finance, and outputs markets.

An example of a non-standard institutional arrangement is interlocking (the basis of what is often called "contract farming"), whereby a producer has a relationship with a trader who covers more than one market, and where transactions in one market (say finance) are conditional on the producer also transacting with the same trader in other markets (say, output). In certain situations, interlocking can reduce transactions costs, by providing lenders with an improved likelihood that they will be able to recover their loans, and also providing farmers with greater certainty that there will be a market for their produce. Interlocking can take many forms. In the past, it was practised by parastatal marketing agencies (promoted by the World Bank, among others, in the 1970s and 1980s). Post liberalisation, it is emerging in Africa as the most viable institutional arrangement for enabling transactions in certain cash crops (most obviously cotton).

Under liberalisation, interlocking poses some delicate challenges for policy makers: excessive competition renders the model unviable, but strong competition in liberalised markets will not necessarily provide a better performance, indeed, often the reverse as competitive markets may undermine the interlocking transactions which are needed to overcome high transaction costs. Yet absence of competition can lead to exploitation of farmers. Often what is required is a balance in which suppliers of interlocked services engage in both competition and non-market co-ordination. For example, in the manner of insurance companies, they may compete to provide services to customers, but co-ordinate to reduce adverse selection by exchanging information about individuals who have behaved dishonestly, or otherwise defected on contracts.

A key question about interlocking as a desirable institutional arrangement for poor farmers is that of the limits of its applicability. It may not be appropriate for staple foods, because a proportion of these

crops may be consumed by the producing household. Furthermore, it is easy to market foodstuffs through channels which are invisible to providers of credit and/or inputs. Another challenging issue arises from the hypothesis, based on observation of the pre-liberalisation era, that encompassing marketing organisations, with effective spatial monopolies, can operate institutional arrangements which overcome market failures affecting poor producers, in ways in which straightforward competitive markets could not. The dilemma here is that the area monopoly of such organisations would normally derive from a relationship with the state; these could be old-fashioned parastatal marketing agencies, or private firms operating under a state licence and/or regulation. In the extreme case of "weak states", local organisations may develop state-like characteristics (in the sense that the state has a monopoly of legitimate violence) in which producers face local mafias.

In all countries, the involvement of the state in productive activities is problematic, especially so in poor countries, where accountability is typically weak and the quality of government administration is unsatisfactory. However, as will be argued later in this paper, it is often impossible to get the state entirely out of the picture, as spatially dispersed poor producers have great difficulties in undertaking the co-ordination necessary to reduce transactions costs. There may be powerful non-state actors who can perform co-ordinating roles, but their motives and accountability pose major questions.

Theoretical frameworks

The approach taken by the ICW group has been to adopt theory developed largely for developed economies, and to adapt the ideas to the circumstances of the agricultural and agri-business sector of poorer economies, with a particular interest in poor farmers.

Transactions costs, institutions and the processes of economic development

The broad orientation comes from North (1990, 1995) and Davis and North (1971), whose writing is sufficiently general to encompass both the richer and poorer economies of the contemporary world. Key ideas include:

- The distinction between *transactions costs* which are the costs of doing business, and *transformation costs* which are the costs incurred directly in making a product and/or providing a service.

- There are two broad types of transactions costs:

  - *Transaction risk reducing costs*, *i.e.* the conventional (Williamsonian) definition of transactions costs which includes identifying and screening counter-parties; defining and measuring what is to be exchanged; agreeing the terms of the exchange (prices and relevant time periods); monitoring contract performance; and in the case of disputes, arbitration, adjudication and enforcement. Firms invest in these costs to reduce their exposure to risk.

  - *System compliance costs*, which fall into two categories: *rents* and *market compliance*. The former have been the subject of much attention from development economists and political scientists. Both of these are costs incurred in meeting the requirements of trading in a particular market, but whereas the latter support the efficient operation of the market by reducing the transactions risks facing market players, the former are, at best, an unproductive cost.

North's highly stylised account of long-run economic development follows Adam Smith in specifying increased exchange and specialisation as the key drivers. However, this necessarily increases transactions costs in business, as individuals have to deal with more distant counter-parties, of whom they will have little personal knowledge. Also, as the economy becomes more diverse and sophisticated, it will require more complex transactions. So it is inevitable that with economic development, the share of transactions costs in total economic activity will increase. However, the basis of successful sustained economic development is a growth path that minimises the increases in transactions costs needed to undertake distant and more complex transactions.

The definition of *institutions* and the distinction of these from *organisations.* The former are the "rules of the game" and the latter the "players of the game". Nonetheless, organisations will have specific institutional characteristics embedded in them, and these contribute to the overall institutional framework. There are macro, meso and micro level institutions.

- The distinction between formal and informal institutions, and the recognition that the latter may be persistent and equally, if not more influential, in determining both the performance of the economy as a whole and the feasibility and outcome of individual contractual arrangements.

- Recognition that particular institutions may be development enhancing, if they are crafted to facilitate trade and exchange, or development retarding, if they are crafted to control and limit trade and exchange.

- Institutional change is strongly influenced by the interests of elites, as perceived through the ideas by which they interpret their economic interests. In some cases, elites tend to create transactions facilitating institutions because they see their interests being served by the expansion of trade. That this is also in the interests of other less influential groups is incidental, *i.e.* in this case, poorer and less influential groups in the economy may benefit as free-riders from actions taken by the elites in their own self-interests. In other cases, elites may see that their self interest lies principally in rent-seeking, in which case they will support institutions which restrict trade and exchange.

- "Path dependency" is a key Northian idea. For a particular political economy, there has been over time a co-evolution of institutions, economic structures and elite interests, which defines a path from which it is hard to break out.

To bring together these points: economic development will be based on a path whereby transactions costs will rise as a proportion of total economic activity, yet the increase in transactions costs is parsimonious, such that it is more than compensated for by transformation cost reductions (efficiency gains) arising from specialisation in production. However, some countries may develop only slowly, or may fail to develop, because of insufficient evolution/introduction of transactions enabling institutions, and/or emphasis on the maintenance or introduction of rent-seeking (transactions inhibiting) institutions. Much depends on how sections of the national elites perceive their self-interests, perceptions which will have been conditioned by their historical experience. In a study of north and south America, North argues that from the time of European colonisation of these continents, north American elites have been relatively better disposed to transactions enabling institutions than their southern counterparts. This is partly a matter of the institutions that the colonists brought with them (British rule in north America being looser, less extractive and less bureaucratic than the Spanish empire) and partly a matter of the resources which the early colonists encountered (in the north, resources for farming, fishing, forestry and hunting were found, encouraging production, innovation and trade; in the south, precious metals encouraged a bureaucratic approach to controlling extraction).

North's account of economic development is perhaps rather pessimistic. The concept of path dependency implies that countries making only slow progress with economic development do so because they suffer an institutional framework crafted in the interests of rent-seeking elites. This raises the issue of how ingrained paths may be changed. Historically, one way of changing path has been for successful polities, dominated by elites favourable to transactions reducing institutions, to conquer those that have been rendered weak due to the rent-seeking predictions of their elites. However, there are also examples from history of the opposite process. In the contemporary world, to achieve a change of path, we have to rely on national elites revising their perceptions of what kinds of institutions may be in their longer-run self-interests.

In the contemporary world, developing countries appear to be split between those which are participating in globalisation (as measured by increased integration in recent years) and others which are moving in the opposite direction ("deglobalising" in the sense of being less integrated) (World Bank 2002). It may be speculated that in the former group the balance of interests among the governing elite has swung behind the view that it is their interests to reform national institutions to conform to the "basic rules of globalisation", whereas in the latter group the elite may be unprepared to give up existing mechanisms of rent extraction and/or may be intellectually unconvinced of the long run benefits of participating in globalisation.

However, as this paper argues below, there needs to be a well-informed discussion about what should constitute the "basic rules of globalisation". In poor countries, a purely competitive model may prove unable to achieve broad-based rural development, and the large scale poverty reduction which would flow from this.

Transactions costs and economic organisation

The ICW group (Dorward *et al.*, 1998) has hitherto largely taken the account by Williamson of the economic organisation of capitalism and adapted it to the circumstances of developing countries and, in particular, poor rural areas. Key points from Williamson (1985, 1991, 1995) include:

- Producers create and structure firms to reduce overall costs by structuring and balancing against each other transaction costs, transaction risks and those production costs discussed in conventional microeconomics. Thus, except in a centrally planned economy, the organisation of sectors in terms of size of firms and extent of vertical integration is a function not only of such matters as technology and economies of scale, but also of the particular transactions challenges found in the sector. Transactions challenges include both *information problems* affecting the degree of uncertainty in transactions (issues of moral hazard, adverse selection and incomplete contracts) and *problems of risk exposure*. We first consider information problems which increase uncertainty in transactions.

    - In the case of moral hazard, people are able to cheat or shirk on contracts because the other party (*e.g.* a purchaser of a good or an employer of a worker) cannot, at acceptable cost, obtain sufficient information about the real qualities of a good, or the true effort and skill level of a worker.

    - Adverse selection is a transaction problem whereby a firm unwittingly contracts with parties with characteristics that make them less reliable and desirable transaction partners. Adverse selection problems are particularly acute and well known in insurance contracts, where the insurer does not have sufficient information on clients and in the absence of action to address

the problem is likely to contract with individuals with risks higher than those expected by the insurer.

- Incomplete contracts occur most commonly in employment contracts, as it is frequently impossible to state the employees' duties in great detail as these cannot be anticipated precisely. The solution is to create hierarchical organisations in which employees are required to follow directions from their superiors, subject to limitations set out in formal rules and in the general culture of the organisation.

– Williamson examines risk exposure problems in terms of *specific assets*, meaning assets which have little value except when used in a certain process or transaction. In investment decisions, asset specificity looms large as an issue. Before committing funds to a specific asset, investors seek institutional arrangements to ensure that such investments retain their value. An aspect of the problem is that once investors have committed to an asset that is specific to a particular set of transactions with other parties, power relationships shift. The investor in the specific asset is then to some extent at the mercy of other actors in the supply chain. An obvious developing country example is that the owner of a sugar mill is vulnerable to decisions by cane farmers (who may stop growing, or divert raw material to another mill) and also to decisions by buyers (who may source elsewhere) and governments (who may reduce protection). However, we also need to recognise a critical distinction between conditions in the developed economies examined by Williamson and those prevailing in the rural areas of many developing countries. In the latter case, many product markets are "thin" and disposal of second-hand assets can be subject to high transportation or other costs. Thus, a large proportion of investments (even, say, the decision by a rural input stockist to order a consignment of fertiliser) entail a degree of specificity in a way that would not be the case in a more developed economic setting.

  The policy dilemma created by asset specificity is that firms and individuals need to make such investments, and it is in the interests of the economy as a whole that this investment takes place (as long as this is in industries which have good prospects for being competitive, *i.e.* "sunrise" rather than "sunset").

– Williamson describes firms' responses to these transaction challenges in terms of three broad categories of economic organisation: "market", "hierarchy", and a third intermediate 'hybrid' category. Markets are generally used for firm-to-consumer relations and for many inter-firm relations and are often a very efficient framework for transactions. Compared to hierarchies and hybrid arrangements they are more competitive and flexible. However, where the transaction information and risk problems discussed above are acute, market relations do not provide firms with enough protection against losses arising from opportunistic behaviour by transacting parties and other forms of economic organisation become necessary. *Vertical integration*, encompassing upstream and/or downstream activities within a single hierarchy, provides a degree of assurance that the specific asset has a secure position within the supply chain. However, it also carries a cost in terms of the attenuated performance incentives for individual actors within the chain. *Hybrid market-hierarchy arrangements*, in which firms at different levels in a vertical supply chain make strategic commitments to each other, based on formal contacts or informal understandings, aim to combine some of the investment security provided by vertical integration with stronger performance incentives than vertical integration can provide. [An example is the procurement activities of the major supermarkets in a number of OECD countries, which often have close relationships with their suppliers, who tend to be smaller firms with less market power. Supermarkets tend to manage the relationship in order that well-performing suppliers (in terms of quality, prices and ability to be flexible about volumes) are kept in business, even if this involves paying them relatively generously in bad years.]

The boundaries between markets, hierarchy and hybrid relations are constantly shifting, driven by technological change on the "transformation" side, but also technological and wider institutional change affecting information and management, which could either reinforce or undermine the rationale for different organisational forms.

Transactions in smallholder agriculture

Another example of industry organisation, alluded to in the introduction, is the possibility of horizontal relationships between firms based on "*competitive co-ordination*". Here firms compete in one market, but agree to co-ordinate in a linked market. Typically the co-ordination consists of information sharing, as in the insurance company example given above. Dorward, Kydd and Poulton (1998) examined cases where "interlocking" is the most feasible institutional arrangement for providing credit to smallholder producers of cash crops in poor rural areas. This is due to credit market failure in relation to poor producers, who lack collateral, face severe production and price risks, and require small loans, which entail high unit transactions costs. The "interlocking" solution, widely encountered in African and Asian peasant agriculture, is for firms to advance inputs to farmers and to require the resulting produce to be marketed through them. The farmers will be paid a price that, in a normal year, allows the "interlocker" to recover the cost of credit, plus a margin. The Achilles Heel of these arrangements is that borrowing farmers may avoid repayment, in whole or in part, by diverting produce to other buyers. The feasibility of farmer defection will vary from crop to crop: for example it will be low if the product is highly perishable (such as plucked tea which has to be within the processing factory within hours or else it has no value) and high for food crops. There are a number of possible solutions to the repayment problem, including:

- Interlocking firms gain area monopolies, enforced by law and/or extra-legal coercion. It is possible to imagine the state granting monopolies for limited terms subject to regulation and performance criteria. Unfortunately, in weak states, the area monopoly may be enforced by feudal elements or by more recently emerged mafias, giving three possible forms of monopoly:

  - A state supervised area monopoly, run by the private sector - in poorer countries there must be worries about the quality of governance and the likelihood of rent-seeking;

  - The state controlled area monopoly - this was often the pre-liberalisation solution and was typically characterised by rent-seeking and inefficiency. Nevertheless, in some places and particularly for food crops, it can be seen, in retrospect, to have performed a tolerable job relative to the post-liberalisation situation of widespread market failure (Kydd, Dorward and Poulton, 2002);

  - The feudal/mafia outcome of area monopolies in weak states.

- Competitive co-ordination, whereby firms compete to supply services, but co-ordinate in sharing information about defaulting farmers. This approach requires considerable trust and strategic commitment to the industry by the players, because, in the short term, a way for the firm to beat the competition is to seek a more effective private mechanism avoiding adverse selection, while hoping that competitors suffer from greater adverse selection, and hence drop out of the market. (In other words, if a supplier of interlocking services thinks that it has a much better way of reducing adverse selection – in selecting non-defecting farmers - then it may judge that its business strategy should be based on driving its competitors out of business, rather than co-operating with them to share information about farmer performance.) Competitive co-ordination seems to be a highly desirable, if not always attainable, goal in the organisation of smallholder

agriculture, and probably of other poor rural and urban producers because it tends to look attractive in relation to the alternatives outlined above.

It must however be kept in mind that none of these alternatives may be present or work, in which case, there will be credit market failure, and farmers will not be able to produce the crop(s) in question, unless they can obtain finance from some other source (such as remittances, off-farm employment etc). In wealthier and more diversified rural areas, quite large numbers of farmers may be able to finance agriculture from other sources, but in the poor rural areas of the developing world this is unlikely to be possible on a large scale.

The achievement of strategic co-ordination is problematic in poor rural areas, not least because its importance is not appreciated by many policy analysts and advisers who see it as a non-standard institutional arrangement, not widely understood or approved of in the political economies from which they originate.

Roles of co-ordination and deliberative mechanisms

In recent work following broadly in the tradition of North and Williamson, Hall and Soskice (2001) (hereafter "H&S") have set out an approach termed "Varieties of Capitalism". As is the case with Williamson, H&S are concerned with developed OECD economies, but their approach is rich in implications for poorer economies. H&S describe their theory as "work in progress rather than settled wisdom" and they are interested in cross country differences in political and economic organisation, which they argue can be seen either as:

A. deviations from best practice, which will dissolve as laggards catch up with the technological or organisational leader; or

B. as H&S prefer, the distillation of durable historical choices, because economic institutions condition certain degrees of social protection, distribution of income, availability of collective goods etc., *i.e.* features of the social solidarity of the nation.

H&S use North's distinction between institutions and organisation, but offer a broader set arguments as to why people follow rules: "Institutions are a set of rules, formal or informal, that actors follow for normative, cognitive or material reasons". Organisations are durable entities with formally recognised members, whose rules also contribute to the institutions of the political economy. For H&S, markets are a category of institution that support particular types of relationships (arms-length relationships characterised by high levels of competition).

The "Varieties of Capitalism Approach", is used to understand institutional variation and its relation to questions concerning:

- Choice of appropriate policies for improving the performance of a particular economy;
- The nature of trade-offs for a particular nation as between developing one kind of political economy or another;
- Causes of differences in structures and strategies of firms;
- National differences in the pace and character of innovation;

- National interests in international trade negotiations;

- Expectations of institutional convergence between nations due to technological progress and the competitive pressures of globalisation.

Basic elements of the varieties of capitalism approach

H&S construe the key relationships in the political economy in game theoretic terms, and *focus on the kinds of institutions that alter the outcomes of strategic interactions*. They see an economy as being populated by different actors seeking to advance their interests in a rational way through strategic interaction with other. Businesses are the key agents of adjustment to technological change, international competition etc. and their aggregated activities determine economic performance of the economy. The conception of the firm is relational, following Williamson and subsequent work by business economists:

- Firms are actors seeking to exploit core competencies or dynamic capabilities;

- Various relationships are critical to a firm establishing these: (i) with its own employees; and (ii) with external actors (suppliers, customers, collaborators, shareholders, trade unions, business associations and governments);

- All of these relationships are problematic: hierarchies are used to ensure co-operation of internal actors, but there is still the problem of moral hazard, adverse selection and shirking; and

- Effective operation within the firm is often based on implicit (and incomplete) contracts. Even contracts with outsiders are often incomplete (as in the supermarket supply chain example above).

These relationship challenges can be expressed as *co-ordination problems*, and *the success of firms depends on their ability to co-ordinate with a wide range of actors*. H&S set out five spheres in which firms have to develop relationships to solve co-ordination problems relevant to their core competencies.

- *Industrial relations*: how to bargain over conditions with employees, their representative organisations and other employers.

- *Vocational training and education*: firms need a workforce with suitable skills, and workers need to decide how much to invest and in what skills.

- *Corporate governance*: "the sphere in which firms turn for access to finance and investors for assurance of returns". The solutions adopted affect the availability and price of finance.

- *Inter-firm relations:* relations up and down the supply chain to secure stable demand for products, appropriate supplies of inputs, access to technology (examples are standard setting, technology transfer, collaborative research and development). Issues include sharing of proprietary information when there is the risk of exploitation by one partner in a joint venture (common issues in private sector agricultural research).

- *With their own employees*: key issues include employees' competencies, co-operation and willingness to share information, given that workers have ability to withdraw information and effort. Particular solutions to these problems are a key part of a firm's competencies.

Liberal market versus co-ordinated market economies

National political economies can be compared in terms of the means by which firms within these economies solve co-ordination problems within these five spheres. H&S distinguish two "ideal types", at poles of a spectrum:

- *Liberal Market Economies (LMEs),* which co-ordinate activities via hierarchies and competitive market arrangements, classically described by Williamson. The LME system is based on arms length exchange of goods and services, in the context of competition and formal contracting. Actors adjust to the price signals generated by markets. In many cases an effective co-ordination is achieved and equilibrium outcomes of firm behaviour are given by supply and demand.

- *Co-ordinated market economies (CMEs)* are distinguished by the fact that they make more use of "non market relations to co-ordinate endeavours and to construct core competencies". Key elements of non-market relations are, compared to LMEs:

  - More extensive relational investment;

  - More incomplete contracts; and

  - Network monitoring – based on the exchange of private information within networks (as opposed to competitive behaviour).

In CMEs, equilibrium outcomes are less a function of supply and demand in competitive markets and more a function of supply and demand within firms. Of course, LME and CME are ideal types: even in LME countries firms enter into relationships which are not fully mediated by market forces. And markets and hierarchies are important to all capitalist economies. H&S contend is that "in any national economy, firms will gravitate towards the mode of co-ordination for which there is institutional support".

H&S argue that LMEs broadly fit the Williamsonian description of the organisation of the capitalist economy. In LMEs, the principal institutions on which firms rely for co-ordination are markets and hierarchies (firms), together with vertical hybrid arrangements between firms in a supply chain. CMEs differ because they draw on a further set of organisations and institutions, those supporting more horizontal or networked *strategic interaction*, both across and within supply chains. In general these will be institutions which reduce the uncertainty that actors have about the behaviour of others and will allow them to make credible commitments to each other. In the tradition of the Ostroms, H&S suggest that these are institutions providing capacity for:

- Exchange of information;

- Monitoring of behaviour; and

- Sanctioning of defection from co-operative endeavour.

Examples of institutions which can support strategic interaction include: powerful employers' organisations; extensive networks of cross-shareholdings; and legal or regulatory systems designed to facilitate information sharing and collaboration.

Deliberative institutions

An example, which is likely to be particularly relevant to developing country agriculture, is the role in CMEs of *deliberative institutions*. These are institutions within which actors engage in collective discussions which, when successful, endow participants with a strategic capacity which they would not otherwise enjoy, because it leads to co-operation. More specifically, deliberative institutions achieve co-operation by:

- Thickening common knowledge and increasing confidence in the strategies likely to be taken by others;
- Facilitating agreement about what may constitute a broadly acceptable distributive outcome, which is often a pre-requisite for effective co-operation; and
- Enhancing the ability of actors to take strategic action in the face of shocks, through common diagnosis and common action.

H&S argue that strategic interaction is dependent on informal rules based on experience with a familiar set of actors; the shared understandings that accumulate from this experience (a "common culture"); and a set of shared understandings of available "strategies for action" developed from experience of operating in a particular environment. This shared set of understandings is evolutionary and fragile: H&S conclude that institutions of the political economy need constant reinforcement by the active endeavours of the participants.

The key competitive advantage for CMEs, which results from effective non-market co-ordination, is that firms and other actors should then be willing to invest more in *specific* and *co-specific* assets (assets which cannot readily be turned into another use, and assets the returns to which depend heavily on the active co-operation of others). In LMEs there is a greater interest in *switchable assets*, such as general skills or multipurpose technologies.

The theory of comparative institutional advantage

In discussing the performance of LMEs and CMEs, H&S claim not to be partisan, stating that both seem able to deliver satisfactory long-run performance. However, they argue that the two types of economy have distinctly different capacities for innovation, and have different income distributions.

These different capacities for innovation are the basis for a theory of *comparative institutional advantage*. Neoclassical trade theory implies that free trade will, under certain assumptions, raise available welfare for all participants. It is used to explain the expansion of world trade and international product specialisation. Stolper-Samuelson theory predicts that a nation will specialise in the production of goods using most intensively its most abundant factor. Whilst this basic contention is still defended by many, challenges to neo-classical views have come from the observation of huge expansion in inter-industry trade and greater mobility of capital. Post-neo-classical trade theories have, therefore, focused on new explanations: concentration of production to achieve returns to scale and positive externalities from industry agglomeration (so similar companies will band together).

However, H&S argue that while arguments about returns to scale and agglomeration are valuable, they do not go far enough because they cannot tell us what types of activity will take place in particular places.

To answer the "what activity" question we need *a theory of comparative institutional advantage*. For H&S the institutional structures of a particular political economy provide firms with advantages for engaging with specific types of activity, a contention which receives support from literature on endogenous growth, which suggests that the institutional setting for production seems to matter (the residual after explaining increments to capital stock and technical change). Endogenous growth theorists have been particularly interested in network externalities among firms engaging in same activity and also in the nature of property rights. But, hitherto, attempts to specify the institutions needed *have focused on market relations and the legal framework*. In contrast, H&S's notion of comparative institutional advantage encompasses the importance of variations in institutions for non-market relations. In essence: different modes of co-ordination condition the efficiency with which firms can undertake various categories of activity.

Here, H&S focus on a firm's capacity to innovate, which is key to its long-run success. A key distinction is between:

- *Radical innovation*, which requires substantial shifts in product lines, entirely new goods or major changes in the production process. Thus for example LMEs are good at fast moving technology, biotech, software, and semi-conductors, and they are also good at complex system-based products such as telecoms, advertising, airlines, and corporate finance. Here competitiveness demands a capacity both for taking risks on new product strategies and for rapid implementation of these strategies within large, tightly coupled organisations with diverse personnel.

- *Incremental innovation:* continuous small-scale improvements to product lines and processes (for example capital goods, machine tools, and consumer goods).

LMEs have limited capacity for incremental technical innovation, as the workforce will co-operate less fully in innovation processes due to: (i) financial market relationships that emphasise current profitability at the expense of employee job security; and (ii) corporate structures that concentrate universal control at the top. It is more rational for employees to focus on their own personal careers rather than the success of the firm and the development of industry and company specific skills. Contract and anti-trust law limits firms' capacity for intra-sector co-operation.

However, LME institutions do foster radical innovation:

- Flexible labour markets reduce the risk of investing in new enterprises as staff can be laid off if these fail;

- Firms can enter new businesses easily by acquisition;

- Equity markets with dispersed ownership plus venture capital allows scientists and engineers to bring ideas to the market quickly;

- Concentration of power at the top of the organisation makes it relatively easy for new management to implement new business strategies;

- Subsidiaries can be acquired or divested quickly.

Typical CME institutions include training systems for high levels of skills; contract laws which support dense networks of inter-corporate linkages; and systems of corporate governance that insulate firms against hostile take-overs. These characteristics support processes of incremental innovation. Finally, a reputation for risk taking and cut-throat competition is *not* an asset.

H&S test the theory of comparative institutional advantage against data from OECD countries, and it performs well empirically. First, the LME/CME distinction within the OECD turns out to be a distinction between the English speaking countries and the rest. Second, the CMEs are specialised in activities characterised by continuous technical innovation, and the LMEs are in areas of radical innovation, with the exception of pharmaceuticals, where it is argued that LME institutions will lead to substantial investment as property rights are strong.

For the purposes of later discussion, it is worth remarking that H&D distinguish three sub-types of CME:

- Industry based (or intra-sectoral) co-ordination, typically Northern European based on intense intra-sectoral co-operation;

- Group-based (Japan and Korea) where co-operation is based within a family of companies (vertical keiretsu). Firms offer lifetime employment within the group and hence strong employee loyalty, but this system does not induce intense intra-sectoral co-operation; and

- State-led co-ordination, where senior industry managers have strong connections to the state (France and Southern Europe). For reasons explored in the next section, H&S are sceptical of the state taking a strong role in co-ordination.

Implications of comparative institutional advantage

Roles of Government: General principles

H&S argue that the key policy challenge is to induce economic actors to co-operate with each other, as *"When firms co-ordinate more effectively, their performance will be better, and the result will be better overall economic performance. … Accordingly, one of the principal ways in which policy makers can improve national economic performance is to secure better forms of co-ordination among private sector actors."*

In some cases markets can be used to secure this co-ordination, so the task of policy makers is simply to improve the functioning of markets. In other cases, the challenge is to improve co-ordination in the context of strategic interactions. Much less is known about how to accomplish this, but "*It entails persuading private actors to share information, improving their ability to make credible commitments, and altering their expectations about what others will do*."

H&S see the "strong state" as a potential source of disadvantage. The key challenge to states is that they cannot simply tell economic actors what to do, as they lack the information needed to specify appropriate strategies. States can establish agencies – but what agencies can do is limited. So much depends on the existence of appropriately organised "social organisations". Where such organisations exist, then it is possible to work with them to improve their co-operation (*e.g.* if the state improves the way in which it regulates), *but "it is difficult to induce such co-operation ex nihilo*." Thus effective

economic policies have to be "incentive compatible" which from an H&S perspective means "*complementary to the co-ordinating capacities embedded in the existing political economy*."

Strong states can be problematic because "incentive compatible policies to improve co-ordination" have to be backed by credible commitment. Firms will be wary of committing themselves to strategic co-operation (based on intense information sharing) where they have grounds to fear that government may change the rules of the game in a more LME direction, allowing individual firms to gain advantage by defecting from strategic co-operation.

This leads to some basic insights as to how appropriate policies may differ by types of political economy:

- For LMEs successful intervention policies to improve performance are likely to require quite blunt instruments such as subsidies for basic research or regional development schemes based on tax incentives.

- In CMEs there has been a co-evolution as participants in strategic co-ordination led by non-government actors have over time pressured governments to be supportive in terms of further policy and legal changes which support their strategic co-ordination. This tends to lead to regimes based on coalitions and multiple veto points. These political regimes are well placed to provide the incentive framework to support asset-specific investments.

National interests in international negotiations

H&S take the example of the bargaining that has occurred over the construction of the institutions of the European Union, which has been an area of struggle between different states' conceptions of their national interests. There is a strong tension between (the majority) "who seek institutions conducive to the formation of implicit contracts between public authorities and business associations" and the only LME within the European Union (*i.e.* Britain – perhaps also Ireland) which wishes to avoid crafting agencies interventionist enough to interfere with the operation of market mechanisms. Thus, Britain negotiated hard for its opt-out under Maastricht Treaty, behaviour which can be interpreted as an attempt to protect institutions of a LME. Similarly, German resistance to deep financial deregulation is not simply a defence of rent-seeking, but a concern to preserve to capacities for network monitoring, in order to sustain the attractive growth-supporting terms in which domestic capital is available to firms.

Globalisation will reinforce institutional differences

The conventional view is that globalisation will drive all participating economies towards a common institutional framework, the LME model. Three reasons are given for this: (i) firms are seen as the same across countries in terms of basic structure and strategies; (ii) competitiveness of firms is based on unit labour costs – so firms will move abroad in search of lower costs, thereby spreading the dominant LME framework; and (iii) governments are thought to be weakened in bargaining with large businesses, which can threaten to move abroad: *i.e.* firms face lower exit costs than governments. So governments will have to concede what businesses are thought to want, *i.e.* altered institutional frameworks to lower labour costs, reduce taxation and expand internal markets via deregulation.

H&S are sceptical of this view, arguing that:

- Globalisation has not (yet) had as far reaching effects as claimed;

- There is evidence that firms are different and react differently to globalisation; and

- Firms will not necessarily exit in search for cheaper labour if a substantial part of their comparative advantage is based in institutions of the political economies in which they are presently located.

H&S concede that firms based in LMEs may be more footloose in the search for lower labour costs. However, their more general hypothesis is that firms may engage in a form of *institutional arbitrage*, *i.e.* they may distribute activities around nations to maximise the fit between the economic activities and the political economy within which they are located. (So they will put design facilities in LMEs, to benefit from the fostering of radical innovation, but production facilities in CMEs to benefit from capacities for incremental innovation.) The implication is that as each political economy plays to its institutionally based comparative advantage, national institutional frameworks may diverge further. In summary, there will be divergent political dynamics: within LMEs, the pressure will be on them to become better LMEs through further deregulation to sharpen competitive edges. In contrast, CMEs will resist deregulation, as this undermines the basis of national competitive advantage. H&S claim that this bifurcated response is the observed pattern in OECD countries in recent years.

H&S recognise an important objection to their argument that globalisation will cause national institutional frameworks to diverge. Massive expansion of international financial flows has put huge pressure on CME firms to deliver "shareholder value". However, while CME firms are undoubtedly under pressure to increase returns, H&S think that they are likely to achieve this via internal management practices, which maximise comparative institutional advantage. It is not a rational option for shareholders to insist on LME practices if this lowers the rate of return. In summary, in CMEs, the market for corporate governance is changing, but at a pace which allows firms to retain many of their long-standing relationships.

Implications for research into trade liberalisation and rural poverty

Institutional factors to consider in studying liberalisation and poverty

The foregoing discussion has discussed a number of factors which are rarely considered in research on agricultural liberalisation in poor countries. We argue that the following concepts and themes need to be borrowed from the predominantly rich-country focused literature of institutional economics:

- Asset specificity versus switchable (generic) assets, especially in light of the general observation about asset specificity made earlier;

- Incomplete markets;

- Non-standard contractual forms (interlocking and competitive co-ordination as examples);

- High levels of investment in specific assets are often essential for economic development, and encouraged by non-market co-ordination which leads to strategic commitment;

- The role of deliberative institutions in facilitating non-market co-ordination to achieve strategic commitment;

- The importance of consensus around a broadly defined concept of distributive justice for effective operation of deliberative mechanisms;

- Strategic commitment and deliberative institutions are somewhat fragile, and need constant maintenance though repeated engagement by the players;

- The distinction between LME and CME political economies;

- The notion that LME and CME institutions support different types of economic activity, having comparative advantages in, respectively, *radical* versus *continuous* innovation*;*

- The theory that comparative advantage can be based on institutional differences as well as factor endowments, with the former often being very influential;

- The implications of this theory that globalisation will not lead to full convergence among economies with respect to institutions. Rather, increased trade and capital flows will cause countries to focus on their areas of comparative advantage, which are partly determined by their institutional endowment. This will reinforce the largely institutional differences between political economies, because specialising in activities in which they have a comparative institutional advantage will deepen their commitment to the kinds of institutions which are a source of comparative advantage;[1]

- Negotiations about supra-national institutional changes (whether at a global level, or the level of the EU or similar) will always be difficult, because countries will struggle to maintain the institutional basis of their competitive advantage;

- A scepticism about the value of over-strong states (and equally of very weak states, unable to enforce the law). The ambiguous attitude to the state is based on the notion that while states should participate in deliberation and strategic co-ordination, nevertheless, when the state dominates the process this can act as a disincentive to strategic commitment by other parties, who are concerned that the state will change the rules without being subject to serious constraints. H&S argue that strategic commitment is highest when all parties to deliberation are able to sanction each other, implying that non-state actors need to be able to sanction the state.

Institutional pre-requisites for agricultural development in poor countries

The agriculture sector's contribution to poverty reduction will be made, principally, where broad-based growth is achieved in smallholder farming communities. Important historical examples of the strategic contribution of agriculture to development are the Green Revolution in areas of India and China. Both of these occurred within specific and well-defined institutional frameworks, including strong state intervention in irrigation infrastructure and in delivery systems that influenced prices,

1. An example of this interaction between comparative advantage and institutional endowment, at sector rather than macro level, is provided by Ponte (2001) who discusses changes in the international coffee trade and how the three different East African producers have responded.

transaction costs and transaction risks in inputs, finance and output markets. In contemporary India and China the emerging challenges are to find means to modify the institutions which underpinned the Green Revolution to support urbanisation and a diversifying rural economy. However, in much of Sub-Saharan Africa, and some parts of South Asia, sustainable broad-based agricultural intensification has yet to occur. In other words, agriculture has not yet made its strategic contribution to economic development.

In Sub-Saharan Africa, the following institutional aspects of the challenge of smallholder development need to be noted:

- Development of smallholder agriculture requires high investments in co-specific assets by a variety of different players, in situations with significant information problems, high opportunity costs for capital and, for some parties, significant risk aversion. Therefore, a CME institutional set may be more appropriate than an LME set.

- It is also an industry in which continuous technical innovation seems more likely and appropriate than discontinuous innovation, again suggesting that the CME institutional set may be more appropriate than the LME set;

- There is currently a serious (desperate) lack of the asset specific investment needed for development in input supply systems, in agricultural finance, in processing and marketing, and in transport and water infrastructure.

- If strategic commitment to asset specific investment could be secured, both horizontally (among specific categories of players such as traders and farmers), and vertically (within supply chains) then it seems very likely that much higher growth rates could be achieved.

- Institutions needed to promote strategic commitment to asset specific investment are largely lacking.

- With regard to the previous point, up to the end of the 1980s, the state had (with mixed success) played the central role as a provider of infrastructure and subsidised finance and of input and output marketing services. Processors were often state owned and/or operated under policies of protection. In the last 10 to 15 years, however, liberalisation policies have been pursued, mainly under pressure from the Washington institutions (to a much lesser extent WTO pressures) and informed by what the present authors (Kydd and Dorward, 2001) have called “The Washington Consensus on Agriculture” (WCA).

- The results have, by and large, been unsatisfactory, and a debate has been joined between:

    - Those who argue that liberalisation policies have not yet been pursued with sufficient determination and credibility to elicit a strong supply response;

    - The current authors (for example Kydd and Dorward, 2001; Dorward *et al*., 2002), who, while not unsympathetic to many of the aspects the WCA, nevertheless argue that it has tried to introduce elements of institutional change which are regressive, while failing to see opportunities for progressive institutional change.

- The view of the current authors can be summarised by saying that the WCA is trying to impose LME institutions on poor rural areas, whereas what is needed is an evolution in a more CME direction. To paraphrase further, an Anglo-Saxon model is being pushed, whereas elements of the European/East Asian institutional model could be more helpful. [Ultimately African economies should have more freedom to develop models which seek to understand and build on their own comparative institutional advantages.]

The rural impasse in SSA

The present authors (Kydd & Dorward, 2001) have written about "AID" the "agricultural investment dilemma" in smallholder agriculture in poor countries. Most analysts agree that this is very important, but few can see how it may be done, particularly done profitably. Institutional economics provides insights into the current impasse in rural Africa. Non-market co-ordination is urgently needed to induce asset specific investment, but this turns on the availability of effective deliberative institutions. Furthermore, these deliberative institutions need to be able to develop a vision shared by all participants of what might constitute socially just outcomes. This is notably absent in many African states, where high levels of inequality persist or are increasing and liberalisation itself remains highly contentious. Thus, when policy towards a given agricultural sector is discussed in public fora, technocratic debate is readily displaced by political point-scoring that pits traders against producers against government agencies.

Given the spatial dispersion of smallholders, the small size of their businesses and their poverty, low levels of education, large cultural variation (*e.g.* in language and inheritance traditions) and weak information (in terms of accessible reliable media, and farmers' understanding of the roles of other actors in the supply chain), it can be seen that the development of effective deliberative mechanisms is highly problematic.

From the late colonial period to the end of the 1980s (alternatively, the point at which the liberalisation agenda could no longer be ignored by African governments) we argue that governments often attempted to fill this gap, with different degrees of success (often related to varying participation in or control of the rent seeking opportunities that these institutions also offered). In other words, governments intervened as a substitute for autonomous, deliberative mechanisms to promote intra-industry co-ordination and strategic commitment, because the material conditions were unfavourable to this being done spontaneously. Thus governments made the lumpy asset-specific investments thought necessary (usually with development aid), and encouraged asset-specific investment from farmers by a policy framework which attempted to boost the profitability and reduce the risk of farming. (However, these last two aims were often outweighed, over time, by the negative effects on agricultural tradables caused by inefficiency, patronage, corruption, exchange rate overvaluation and industrial protection).

As discussed above, H&S theorise that state-dominated institutions for encouraging strategic commitment by the actors within a sector are likely to be less effective than those in which the state is co-equal with other actors. Reasons for this include:

- Where the state is dominant, its commitments are less credible, as it can quickly reverse policies without suffering severe sanctions from other actors.

- Weak accountability and limited information allows state employees considerable scope for rent-seeking.

- State actors are usually less sensitive to the dynamics of an industry than its private participants, so state dominated activities tend to fall behind in terms of product quality, technological development and productivity.

However, it could be argued that, in Africa, there was little choice but for the state to take the lead in efforts at non-market co-ordination. Except in cases where private processors were present on a large scale, there were few alternatives to a state led approach. The alternative, feasible for certain cash crops only, of co-ordination being led by a dominant private interlocker, was politically unpalatable, and perhaps had nearly as much scope for rent-seeking.

This discussion gives us a very different perspective on liberalisation in poor rural areas. Rolling back the state is, for sure, eliminating organisations and a policy framework which has created scope for rent-seeking, while being technologically and managerially slothful. However, what has been largely ignored in the liberalisation literature was that the state was involved in the first place because:

- Co-ordination to encourage asset specific investment was vital, and frequently the state was the only actor available for this.

- The state itself made asset specific investments that others would not have made (given the material conditions and institutional environment of smallholder agriculture).

- The state sometimes overcame market failure, particularly the near pervasive issue of credit market failure, though practising a form of interlocking, based on area monopolies and state power.

The current predicament in liberalised smallholder farming areas of Africa is the assumption that policy reform has created space for the flourishing of LME-type institutions, markets and hierarchies, with little non-market co-ordination. We argue that this is somewhat of an illusion, as neither the demand nor supply conditions nor the infrastructural or informational prerequisites are in place for a self-sustaining LME growth path to be attained. Players (farms and input and output marketers) are typically small, lacking in effective loan collateral and subject to high climatic and price risk. Transport costs are high and other forms of communication are underdeveloped. There is widespread market failure in smallholder finance, leading to weak use of inputs and failure to make much headway in intensifying production. This is a discouraging market for processors to invest in. The result is a low level equilibrium trap, arguably aggravated by the "institutional naivety" of liberalisation policies.

Conclusions

We should approach the topic of liberalisation and poverty with a broader theoretical framework, informed by the considerations discussed above. Our contention is that smallholder agriculture in poor countries needs CME-type institutions if it is to develop, at least at the earlier stages. Ideally, these would be based on deliberative institutions, working horizontally inside a sector, and also vertically along the supply chain, based on a consensus about what may constitute a "just" outcome. (If participants in deliberation do not accept the outcome of the process, then they will simply argue, and fail to engage in strategic commitment).

In practice, the conditions of smallholder agriculture may force the government to take a greater role than is suggested by any of the OECD models (LME or CME) studied by Hall and Soskice. Intervention by the state almost inevitably encourages some rent-seeking, inadequate deliberation, and

a certain lack of dynamism. At the same time, however, as in the achievement of India's and China's Green Revolutions, a degree of success may be achieved which is difficult to imagine under a pure LME model[2] due to inadequate strategic commitment to asset specific investment and, possibly, an unwillingness to support non-standard contractual arrangements (such as interlocking).

The present authors believe that the way forward is likely to involve a rethinking of the role of the state (at sub-national, national and international - aid donor - levels) and of the roles of producer organisations and other stakeholder (including trader) associations. The aim must be to find a way in which the state and other powerful actors can initiate deliberative processes and take a lead in encouraging appropriate asset specific investments, while at the same time planning to fade into the background as initial success is achieved. The second stage of a successful path of institutional development will have the state and other stakeholders (prominent among these producers) acting as equal partners.

Research on liberalisation and poverty needs to be "institutionally informed". The challenge to the institutional specialists is to be able to provide insights, ideally quantifiable, into the consequences of liberalisation policies driving changes in such features as "non-standard institutional arrangements"; non-market co-ordination; and the role of the government. Those of us engaged in institutional analysis are still far from meeting these challenges.

2. A key question here is: what were the incentives that led state agents (individually and collectively) to pursue development goals with sufficient vigour that this more than offset the costs imposed by rent-seeking? Can similar conditions be created in Africa?

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TRADE REFORM, AGRICULTURE AND POVERTY IN DEVELOPING COUNTRIES: A REVIEW OF THE EMPIRICAL EVIDENCE

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Abstract

There is ample evidence to expect that trade reform that offers more access to international markets will encourage agricultural growth in the developing countries. Historically, the removal of physical, technical and legal restrictions to producing crops for export has led to commodity production booms, and in some cases the bulk of the production has come from small farms. But does agricultural growth help the poor? In theory, there are as many as twelve possible linkages, both direct and indirect, between increased farm production and reductions in poverty. Empirical studies suggest that these linkages often function, and indeed that where one possible link is weak or absent, others may apply just as strongly. Making the links work is a matter for policy. Of the structural obstacles to functioning links, a common and important one is failing factor markets - above all those for credit and insurance. Structural adjustment and economic liberalisation have usually meant the end of public provision of farm credit and inputs, yet unfortunately market failures have prevented private provision of these factors. Indeed, in the worst of cases - as seen for smallholder communities in rural Mexico - product markets have all too well transmitted to rural households the effects of depressed aggregate demand and inflation, while chronic failures in the markets for finance and information have severely hindered attempts by households to adjust. In conclusion, trade reform promises to help reduce poverty in rural areas of the developing world. But to make the effects strong and positive, detailed work is needed to generate the institutional innovations necessary to overcome factor market failures.

This paper will briefly state the case for expecting increased trade consequent on reform to lead to more agricultural production. The links between agricultural growth and poverty reduction are then examined, followed by a section that looks at the implications of failures in factor markets on those linkages.

Trade and agricultural growth

It may be argued that the links from trade to economic growth are difficult to prove, but there are longstanding theoretical reasons to expect trade opportunities to stimulate agricultural development and much empirical evidence that trade can encourage farming.

In theory, trade should allow countries to specialise in production of commodities in which they have comparative advantage. Not only does trade potentially allow higher levels of consumption in both trading partners, but also may lead to higher levels of productivity through allowing specialisation in production. Theories of comparative advantage predict that countries will tend to specialise in

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commodities that use intensively the factors of production that they have in relative abundance. For most developing countries these will be land or labour or both. Agriculture, particularly relatively extensive agriculture, typically can produce crops and livestock using these factors, while making limited use of capital. By specialising in labour-intensive production, we may also expect that there will be upward pressure on wage rates - with advantages to landless labourers (and smallholders who also work for others) who often constitute a large fraction of the rural poor.

Another theory that may apply is that of 'vent-for-surplus', in which the possibility of trade creates international demand for agricultural commodities as a substitute for the limited domestic demand in largely rural developing economies. Exports of farm produce allow otherwise under-employed factors of production - land and perhaps also rural unskilled labour - to be put to work, as well as allowing agriculture to grow without depending on domestic industrialisation and urbanisation. Indeed, farm exports may become the motor force for development in other sectors, as foreign exchange is generated and savings become a source for domestic investment, as well as a prime source of public revenues through taxes.

Trade, it seems, should bring both comparative static and dynamic advantages for agriculture in many developing countries.[1]

Empirically, there have been many cases over the last 150 years or so - ever since the costs of sea transport fell with the advent of steam-powered ships - where developing countries have seen commodity booms based on farm exports. In some of these cases, the bulk of the exports have come from small-scale farms. In the process, new levels of local wealth and prosperity have been created, evident in housing, possession of consumer durables, and the building of productive and social infrastructure. Equally there have been multipliers into local rural economies, with processing facilities, and retailing and other services catering to the expanded local demand.

Examples of this include the remarkable expansion of first oil palm, then subsequently cocoa in the forests of southern Ghana in the last decades of the 19th century and the first half of the 20th century (Hill 1986). In Kenya, the freeing of restrictions on smallholders producing coffee and tea after 1954 led to a transformation of the "native reserves" of Central and Eastern Provinces. Highland Machakos, for example, was able to accommodate a vastly expanded rural population from the 1950s to the 1990s, as cash crops were intensified and output per hectare rose faster than population (Tiffin *et al.*, 1994). Within the last twenty years, there has been a major expansion of cotton farming across the guinea savannah zones of northern Côte d'Ivoire, Benin, southern Mali and Burkina Faso (Chaléard 1996).

It may be that integration in world markets has left such areas subject to the vagaries of international commodity prices[2] and that the gains arising from such exports have not been equitably distributed amongst the region's population. But for any of these regions, it would be difficult to imagine that

1. Not everyone agrees with these expectations: trade plays an equally important role in models, such as dependency, that show countries suffering processes of underdevelopment. In this case, it is argued that the terms of trade are so disadvantageous to exporters of primary produce from the periphery of the world system, that participation in trade acts to extract surplus from developing countries - to their absolute disadvantage.

2. It might be more convincingly argued, however, that for most farmers that participating in export production has left them vulnerable not so much to the price risks of the world market, as to domestic hazards - namely, high and onerous taxes, excessive government regulation, and the management weaknesses and rent-seeking temptations of monopolists (often public marketing boards, or cooperatives) in the marketing chain.

they would have fared better without the chance for their farmers to export and participate in world trade.

A simple test of this would compare the regions mentioned with other parts of the same countries that did not produce export crops. Differences in resource endowments, physical isolation and levels of investment in infrastructure confound such comparisons, but it is striking to see that almost the only cases where rural areas without export crops have generated similar wealth to those with export crops, concern those areas that supply (often high value) foodstuffs to cities. For example, it is common to find that in the peri-urban zone around major cities, farmers producing perishable vegetables, fruits, milk, pigs, chickens and eggs for the urban markets. But these apparent exceptions reinforce the argument. The point about international trade reform is to remove obstacles to participation in a wider market. There are usually fewer obstacles to selling in domestic markets. Thus, if the only other farmers who can realise returns comparable to those growing export crops are those producing for a domestic market, the general point of the advantages of market participation is proved *a fortiori*.

But this exception does remind us that international trade is but one way that farmers can market surpluses and earn income. In a world where the bulk of population growth takes place in the developing countries, and as urbanisation in those countries proceeds rapidly, there are increasingly impressive opportunities to sell surpluses within country, to regional market centres and national metropoli. Recent reviews of changes in the patterns of African agricultural production during the last quarter of the 20th century stress the importance of domestic marketing over international exports (Snrech 1995, Wiggins 1995, 2000).

Agricultural growth and poverty: The linkages

Just as for the link from international trade to agricultural development, there are both theoretical and empirical reasons to expect that agricultural growth can contribute to reducing poverty.

In theory, agricultural growth should help to reduce poverty through one or more of the following direct and indirect influences seen in Table 1 (Irz *et al.*, 2001).

Table 1. **The consequences of agricultural growth**

Effect of agricultural growth	Qualifications & necessary conditions
Farm economy	
Higher incomes for farmers, including smallholders	Extent to which the poor have access to farmland, and their production levels. Output prices sustained, do not fall as output increases. The more tradable the output, the less the risk of over-supplying the market. Input prices may rise more than proportionately to output. Increased land rents may offset higher gross earnings for tenant and sharecropping farmers. Distribution of land ownership and abundance of land affects ability of landowners to capture rents. Ability of the poor to adopt improved technology - scale biases in techniques, increased exposure to risks, access to inputs, complementary services and credit.
More employment on-farm as labour demand rises per hectare, the area cultivated expands, or frequency of cropping increases. Rise in farm wage rates.	Degree to which rural poor depend on farm labouring for their incomes. Nature of technical change - labour-displacing technology (machinery, herbicides, etc.) may reduce labour demand per hectare. Changes in output mix. A move to crops and livestock that use less labour per unit output might reduce employment. Changes in the supply of rural labour for farm work. Affected by population growth, out-migration, availability of non-farm jobs, etc.
Rural economy	
More jobs in agricultural and food chain upstream and downstream of the farm	Strength of linkages. Much depends on technology of production and need for processing. Location of linked activities: based locally or in distant cities? Depends on need for timely processing or the degree to which bulk can be reduced.
More jobs or higher incomes in the non-farm economy as farmers and farm labourers spend additional incomes	Kinds of goods and services demanded. Local linkages are especially strong when the demand is for non-tradables. Supply elasticity of goods and services produced by the non-farm rural economy.
Increased jobs and incomes in rural economy allow better nutrition, better health and increased investment in education amongst rural population. Leads directly to improved welfare, and indirectly to higher labour productivity.	Distribution of incomes and marginal propensities to spend on food, health care and schooling.
Higher local tax revenues and demand for better infrastructure — roads, power supplies, communications. Leads to second-round effects promoting the rural economy.	Local tax regime, quality of local government and support from central government.
Linkages in the production chain generate trust and information, build social capital and makes non-farm investment easier.	Nature of linkages and social characteristics of actors.
Reduced prices of food for rural inhabitants who buy in food net.	Rural economy sufficiently isolated by distance from national and international markets so as to make local food non-tradable.
National economy	
Reduced prices of food and raw materials raises real wages or urban poor, reduces wage costs of non-farm sectors.	Extent to which the economy is closed to international markets. If the economy is open, increased farm production will not affect price levels.
Enhanced savings and taxes from farming allow investment in non-farm sector, creating jobs and incomes in other sectors.	Institutions and conditions that mediate these flows, and the extent to which they are channelled into productive investments.
Earning of foreign exchange allows the import of capital goods and essential inputs for non-farm production.	Degree to which farm production is tradable, either as an export crop or an import substitute.
Release of farm labour allows production in other sectors.	Willingness of labourers to migrate, and on their skills and capabilities for employment in other sectors.

Source: adapted from Irz *et al.,* 2001

Not all of these linkages can be expected to apply in any one case, and indeed some are mutually exclusive. For example, increased farm production will not reduce the prices in either the local rural economy or the domestic economy if local markets are well integrated into international markets. In such a case the benefits of extra farm production may be seen in an improved balance of trade and foreign exchange earnings.

But even if not all will apply in any one case, this list is striking in the variety and range of possible linkages. Consequently, the potential exists for agricultural growth to transmit benefits widely in society, and in different contexts.

But is the theoretical promise realised in reality? The empirical literature may perhaps be divided into three groups that offer different insights into the functioning of these linkages.

One approach observes the end points in the presumed causal chain from increased farm output to reduced poverty and estimates the relationship. A recent attempt quantified at national level the relationship between agricultural productivity (measured primarily as value added per unit area) and the numbers in poverty (Irz *et al.*, 2001, Thirtle *et al.*, 2002). This gave (reasonably robust) estimates that yield increases translated into reductions of the numbers living in poverty at elasticities of between 0.35 and 0.65.[3] Moreover, it seemed that comparable improvements in the productivity of manufacturing and services showed no such relation at all. The strength of the observed elasticities suggests that there are high returns to public investment in agricultural research and extension in terms of reducing the numbers counted as poor - indeed, few other investments would appear to have the same potential impact on poverty.

The problem with this kind of study, using national estimates, is that it tells us little about how causality works - that is, about the who, how and where of poverty alleviation. It thus does not help to identify the detail of policy that might be followed. A second set of studies, more detailed, has used input-output models to compute some of the specific linkages. Estimated multipliers arising from links in production and consumption as farmers spend their enhanced incomes have produced values ranging from 1.3 to 4.6, see Table 2.

Table 2. **Multipliers from increases in farm output to other sectors**

Study location and time	Multiplier estimated	Source
Muda Valley, Malaysia, 1972	1.83	Haggblade, Hazell & Brown 1989
	[1.71]	[Haggblade, Hammer & Hazell 1991]
North Arcot District, Tamil Nadu, India, 1982–83	1.87	Hazell & Ramasamy 1991
Sierra Leone, Rural, 1974–75	1.35	Haggblade, Hammer & Hazell 1991
Burkina 1984–85 Niger 1989–90 Senegal 1989–90 Zambia 1985–86	Range: from 1.31 to 4.62	Delgado et al., 1994, Delgado, Hopkins & Kelly 1994

Source: Irz *et al.,* 2001.

3. Incidentally, the models used in this study also show that trade itself apparently helps reduce poverty independently of its contribution to economic growth.

De Janvry & Sadoulet (2002) also use models, this time Computable General Equilibrium (CGE) models, to examine how agricultural technology improvement can help reduce poverty in different stylised continental cases. They find that in a stereotypical African case, the benefits to the poor from better farm technology should arise through direct impacts on farmer incomes and consumption. In an Asian scenario, the poor should gain through rural labour markets as more jobs are created on the land and in activities upstream and downstream of farming. Finally, in the Latin American case the key linkages arise through general equilibrium effects in the wider economy, as increased farm output stimulates a range of industries and activities in the national economy, creating jobs for the poor. Their work shows that there can be beneficial linkages from improved farm production to poverty reduction for quite different economic structures - thus confirming the intuitions presented in Table 1.

A third set of studies examines change in detail at village and district levels, in which observed changes can be interpreted in the light of the many contextual factors that affect specific cases. Although there will always be doubt about the extent to which the findings from such small-scale studies may be generalised, they offer a rich view of the processes that may apply in particular cases. Village studies show differing relations between agricultural growth and poverty reduction. Indeed, in some studies links from the growth of farm output to poverty reduction are weak, haphazard or difficult to see at all. For example, in a study of one village in West Bengal 1986–89, Beck (1995) observed only slight benefits from the green revolution and irrigation to the poor. Most of the benefits went to the better-off farmers and inequality increased. For Machakos District, Kenya, Murton's detailed study (1999) of one village in the high potential zone shows the extent to which the well-documented economic growth in Machakos has been concentrated, leaving 40% of households dependent on farm labouring for their livelihoods, their food intake subject to the fluctuating demand for their labour. For Mutoko, Zimbabwe, Berkvens (1997) describes an evolving rural scene in which most households struggle to survive, increasingly dependent on petty off-farm jobs and food-for-work programmes.

There are, on the other hand, small-scale studies that do show strong linkages from agricultural growth to poverty reduction. One of the best known and most remarkable of these comes from a comparison of villages in North Arcot, Tamil Nadu, India between the early 1970s and the early 1980s (Hazell and Ramasamy 1991). The analysis suggests that very modest increases in farm output arising from the adoption of green revolution packages led to disproportionately large increases in incomes for landless rural workers and very small-scale farmers, partly through production links and partly from the stimulus to the non-farm economy created by the consumption demands from the farmers.

Hence we have a somewhat mixed picture. There are linkages, and encouragingly many of them, that can translate a growing agricultural sector into reduced poverty. But they do not always function as well as they might, even if there is some substantial evidence that on balance they probably more often function to good effect than not. Under what conditions the links work is the next question addressed.

Structural limitations to linkages: factor markets

Analyses using Social Accounting Matrices (SAM) and CGE models (see, for example, Taylor, 2002) show the importance of structures in generating jobs and incomes for households from changes in macro variables such as international agricultural prices. That structures matter hardly surprises. But which of the many dimensions of structural differences - access to resources, assets and factors of

production; the production mix of typical farms; distribution of incomes; missing markets, market failures and other institutional factors, etc. - matters most in these linkages?[4]

A detailed consideration of this question is well beyond the scope of this commentary. And what matters will surely be case specific. But even so, it is plausible that in many cases having markets that function well matters a great deal.[5] And unlike some other structural matters, such as the distribution of income and land, policy to correct market failure is far less politically charged and thus may be more feasible in a wide range of circumstances.

Market failures may be asymmetric, in as much as they may be more prevalent in some rural markets than others. Markets for farm produce may be the least prone to failure: by and large they consist of on-the-spot transactions in goods the quantity and quality of which can be readily checked by both parties to the deal.[6] It is in factor markets that failures become particularly troublesome. The markets for production inputs such as improved seeds, veterinary drugs, pesticides, and above all the markets for credit and insurance, are examples where transactions suffer from severe problems of imperfect knowledge[7] (asymmetric information, better said) generating formidable potential levels of moral hazard or adverse selection or both.

Structural adjustment and economic liberalisation has led to the widespread withdrawal of the state from the supply of goods and services for agricultural development, including public provision of credit and inputs. The private sector, unfortunately, has not been able to offer the same level of supply of these, owing to the market failures outlined. Hence markets for these factors of production function poorly, if at all.[8]

It is possible for the rural poor to suffer simultaneously from product markets that function well and dysfunctional factor markets. For example, studies in Mexican villages (Wiggins *et al.*, 2002) of the impacts of policy liberalisation on the livelihoods of the poor from the late 1980s to the late 1990s

4. It might be argued that this does not matter: the usefulness of the models lies in showing how a set of structures will generate outcomes from particular policies. But this assumes that 'structures' are not themselves the potential target of policy. Since this assumption often does not hold, the question stands: which structures typically matter most, and could readily be altered by policy?

5. Kydd, Dorward and Poulton (2002) also see failing factor markets as a major obstacle to progress in African rural development.

6. Product markets fail when there is monopoly power, or when trade takes place at points where one party to the deal has little information on market conditions - as for example, when a farmer sells at the farm gate to a trader. There may also be product market failures that arise from failures in other markets: as, for example, when traders cannot get enough working capital, or invest in transport or storage, owing to deficient credit markets.

7. Credit and insurance problems of knowing the character of customers, their capabilities and the risks they face are well documented. Slightly less well known are the problems that face would-be traders in seed, drugs and chemicals and their customers. The buyers face high risks since the quality and effectiveness of new products is often only clear once the product has been bought and tried - finding out in advance is costly. Sellers, for their part, face a formidable problem in estimating demand for such products, and thus potentially run the risks of overstocking their inventories.

8. Other factor markets may fail to some degree. Labour markets are dogged by the costs of recruitment, selection and supervision of hired workers. (Machinery is often an attractive option, not because it is cheaper, but simply that there are far fewer transactions costs involved in operating a tractor, harvester or thresher.) The supply of land for rent is distorted by fears of expropriation; while that for sale is distorted by the value of land as an insurance or as collateral for bank loans (a case where failures in insurance and credit markets lead to further failures in land markets).

showed the sensitivity of the lives of the poor to national and international conditions, transmitted through commodity markets or through reductions in the direct provision of public services. In these cases, national problems of inflation raised their costs of living, while weak aggregate demand for artisan non-farm products (furniture, wire pan-scrubbers, and embroidered leather belts) turned the terms of trade against them. As farmers, they were further affected by the withdrawal of the state from providing technical assistance, subsidised inputs and credit for agriculture. Yet at the same time they were disadvantaged by failures in factor markets. In the absence of publicly-supplied credit, formal credit all but ceased to exist. Technical know-how for farming and other activities, and information about possible new markets, were simply not supplied once the state withdrew services. Many of the households studied were thus hit by a double blow, national problems having transmitted only too well - since product markets worked; but at the same time, failings in factor markets stymied some possible responses and adjustments. Damned by effective commodity markets, and blighted by failing factor markets, they suffered the worst of both worlds.

The market for labour is well documented as acting to offset capital and insurance market failures, as migrants remit earnings back to their areas of origin (Taylor 2002, Regmi and Tisdell 2002). If correcting the failures of capital and insurance markets proves difficult, then facilitating migration and the remittance of incomes may provide some partial remedy (McDowell and de Haan 1997).

Conclusion: Taking advantage of trade reform

To return to the overall question, can we expect agricultural trade reform to reduce poverty? A qualified 'yes' may be offered.

But equally, should we expect trade reform alone - just as with structural adjustment or technology generation - to reach all policy targets, including poverty reduction? Surely not. In certain cases, owing to structural problems, trade reform may fail to help the poor or even harm them. But this does not imply that trade should not be reformed, but rather that policy-makers should strive to remedy the structural problems so that trade reforms can realise their potential to assist in poverty reduction.

For reformers optimistic about markets, the agenda for reducing poverty includes making sure that markets, and in particular factor markets, function. The agenda set out by Professor Kydd and colleagues at Imperial College (Kydd *et al.*, 2002, Dorward 2002), to look for appropriate institutional innovations to remedy market failures, is thus to be commended. In some cases, facilitating migration may be important.

Finally, important as such institutional innovation may be, it is but one part of the agenda for poverty reduction - one that includes measures to stimulate the non-agricultural economy, to invest in education and health, and to provide transfers of social assistance to those unable to benefit from economic growth owing to their age, illnesses or disabilities.

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A NOTE ON THE EFFECTS OF AGRICULTURAL TRADE REFORM ON KENYA'S SUGAR SECTOR

Ann Herbert[*]

To understand more fully the linkages between agricultural trade policy and poverty, one should consider the impact of reform on agricultural enterprises and their employees in developing countries. Partial liberalisation of trade in agriculture – without resolving the problems of price supports and export subsidies – has resulted in a very uneven playing field on which even efficient producers in developing countries could find it difficult to compete.

Consider the example of a sugar company in Kenya which produced for the domestic market. The company grew sugar cane on its nucleus estate and had a refinery, which processed the sugar from its own fields as well as the cane produced by 65 000 outgrowers in the region. Until 1999, the company employed a permanent staff of 5 100. The company came under heavy financial pressure when cheap sugar imports began to enter Kenya at artificially low prices, lower in fact than the domestic cost of production. Management took measures to reduce costs sharply and focussed their activities on the sugar processing aspect of the business. More than 35% of the sugar workers were dismissed, with more retrenchments expected. There being no other major employer in the region, former employees had few options for re-employment under comparable conditions. Some migrated out of the area, in order to look for work in other parts of Kenya, a serious challenge in a country with a high unemployment rate and a large informal sector. Others remained in the region and were hired by contractors or outgrowers to work as day labourers in the cane fields. The conditions of their employment were radically different from what they had previously known. Whereas formerly these workers had had stable jobs with benefits, such as housing, health care, schooling for their children and some company-provided welfare facilities, now they find themselves in precarious employment, working intermittently at much lower pay and with no benefits of any kind. In many cases, the earnings of two working adults are insufficient to pay the school fees for their children. Unsurprisingly, rates of completion of primary school are in decline and child labour is widespread. Poverty is on the rise.

The availability of decent jobs is key to poverty alleviation. Productive employment enables people to meet their basic needs, to live in dignity, and to work for a better future for their children. Trade liberalisation offers opportunities for economic growth and with it, improved social welfare, but the playing field has to be level if agricultural enterprises in developing countries are to benefit fully from their comparative advantage and remain both competitive and socially responsible employers.

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A NOTE ON SOUTH AFRICA'S EXPERIENCE OF TRADE LIBERALISATION AT THE HOUSEHOLD LEVEL

Ian Steuart[*]

When asked to share South Africa's experience of trade liberalisation at the household level, I thought my discussion would be very brief indeed because the short answer, regrettably, is that very few studies, to my knowledge, have been conducted. However, I would like to shed some light on the peculiarities of the South African case, which may pose some difficulties and which may be evident to varying degrees in other developing countries.

Firstly, I would like to flag the distinction between deregulation and liberalisation, alluded to by Mr. Bussolo. The deregulation of the South African agricultural sector started before the Agreement on Agriculture was implemented in 1995. The process of exposure of farmers to a progressively deregulated environment has arguably had more far-reaching consequences for South African farmers than the Agreement on Agriculture itself. I am not sure whether the effects of deregulation can be decoupled from the effects of liberalisation and how this may be done in studies at the household level. Also, there is strong evidence to suggest that the process of deregulation has resulted in a net welfare gain to the commercial agricultural sector and, thus, to the South African economy. Whether this has had any effect on the marginal households (to use Professor Hertel's terminology) is debatable, since they stand on the periphery of the commercial agricultural sector if at all. Thirdly, the potential impact of liberalisation at the household level during the 1990s will have been dampened by the "natural" level of protection afforded by the progressive depreciation of the Rand over the same period.

There are other, no less important, concerns with respect to studying the link between trade liberalisation and poverty at the household level. The assumption that non-tradables are less labour intensive than tradables may not hold and, hence, the Stolper-Samuelson conclusion that real wages in terms of non-traded goods will rise and that the poor will be net-gainers as a result will not hold either. This is especially true of South Africa where non-tradables, such as the products and services of the informal sector, are likely to be more labour intensive than tradables. Secondly, researchers should attempt to take into account the potential for trade liberalisation to affect the level of poverty in the household and bring about changes in household dynamics through, for example, the migration of earning adult members of households or the arrival of family members in the household following job losses. This was discussed by Ed Taylor. Thirdly, it should be noted that the bulk of trade reforms in South Africa during the 1990s have occurred not only in tandem with deregulation but also with a plethora of policy instruments streaming simultaneously with trade policy, which have had a direct impact on poverty and labour market dynamics. It is for these reasons that studies of the effect of trade

* Department of Trade and Industry, South Africa. I would like to thank Rashad Cassim, Director of Trade and Industrial Policy Strategies (TIPS) for his thoughts and assistance in writing this note. Interested parties are welcome to contact Rashad (Rashad@tips.org.za) for further information regarding studies of this nature or visit the TIPS website (www.tips.org.za) for information on research in trade and industrial policy in South Africa.

liberalisation on poverty at the household level in the South African context in particular, notwithstanding severe data constraints, would generally be replete with a large amount of noise.

Having said all that, there are currently attempts to design a research program to empirically investigate these issues within a clearly defined, partial-equilibrium framework, even if it is at this stage to establish plausible ranges of relevant parameter values. I do believe though that studies of this type would have to follow rather than precede a better understanding of the South African labour market and there has been much good work on this by Deaton and Case (Princeton), Kingdon and Knight (Oxford), Wittenberg (University of the Witwatersrand), and Boorhat and Leibrandt (University of Cape Town). Nevertheless, data on the lower segments of the labour market are scanty. There is little solid information on the informal sector. Official information largely excludes household-based and/or non-monetised but economically productive activities. The lines of demarcation between the informally employed, the openly unemployed, and the discouraged worker are fuzzy.

There are also problems regarding the measurement of poverty. Almost all of the poverty measurement exercises in South Africa are carried out in the single dimensional space of income poverty.

Income poverty is difficult to measure in developing countries for a number of well-known reasons. Income measures are likely to be doubly inadequate in South Africa because, unlike many other developing countries, South Africa can boast of a fairly good social safety net, especially in terms of old-age pensions, child support measures and health care delivery. It would be worthwhile, therefore, to develop multi-dimensional poverty measures although I am unfamiliar with the literature in this field and how these measures might be applied to studies of this nature.

In conclusion, I hope that the points I have raised are relevant and that developing country researchers take them on board.

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AGENDA

OECD GLOBAL FORUM ON AGRICULTURE: AGRICULTURAL TRADE REFORM, ADJUSTMENT AND POVERTY

Paris, 23-24 May 2002

This meeting of the OECD Global Forum on Agriculture, organised in partnership with the World Bank, seeks to examine the links between agricultural trade reform and poverty in developing countries. It builds upon the two previous meetings of the Global Forum, which focused on how well the interests of developing countries have been served by the Uruguay Round Agreement on Agriculture and other WTO provisions. A key recognition in these meetings has been that while agricultural trade reform offers the prospect of substantial economic gains to developing countries, notably through improved access to OECD country markets, it nevertheless imposes stresses on sectors that hitherto benefited from protection. With a complex pattern of short-term costs and benefits, a primary concern for policy-makers in developing countries is what will happen to the poor over the short, medium and long term. Who will be made better off? Who will be made worse off? How should domestic and trade policies be formulated to address these impacts? At the international level, the need for trade negotiations to take account of the specific concerns of developing countries features prominently in the WTO Ministerial Declaration from Doha. What can OECD and non-OECD countries do to ensure that these concerns are properly reflected in a prospective WTO agreement?

To help answer these questions, the focus of this Global Forum on Agriculture will be on identifying the mechanisms through which trade reform may affect poverty, assessing the progress that has been made in measuring the effects of interest, drawing policy conclusions where possible, and establishing priorities for further work.

The workshop will bring together policy-makers from OECD countries and a wide range of non-OECD countries, including Argentina, Brazil, Bulgaria, Chile, China, Egypt, Estonia, India, Indonesia, Nigeria, Romania, Russia and South Africa. In addition, there will be presentations by experts from international organisations, academia and other applied research organisations. The aim of the dialogue will be to assess what steps policy-makers in OECD and non-OECD countries can take to ensure that trade reform is made to work for the poor, where further information is required, and what specific contribution the OECD can make to filling important information gaps. While the OECD's expertise in agricultural policy analysis does not lie in the broader development issues pertaining to the reduction of poverty and hunger, there are important areas where OECD may have a comparative advantage. These include assessing the impact of OECD countries' agricultural policies, utilising elements of the OECD methodology for the measurement of support (the PSE), and examining a range of OECD/non-OECD market and policy linkages.

Thursday, 23 May

9.30-10.30 **SESSION 1: Overview**

Chair: Mr. Antero Tuominen (Finland)

10 minutes **Opening statement:** Mr. Stefan Tangermann, Director, Food, Agriculture and Fisheries (OECD).

15 minutes **Introductory presentation:** Mr Jonathan Brooks of the Secretariat will make a brief presentation identifying the channels through which trade reform affects poverty, and raising issues for discussion in the subsequent sessions. The emphasis will be on our ability to quantify the impacts of policy reform on the poor and thus reach policy implications for both OECD and non-OECD countries.

Discussion: Mr. R.C.A. Jain, Additional Secretary, Ministry for Agriculture, India (tbc)

10.30-10.45 ***Coffee***

10.45-13.00 **SESSION 2: AGRICULTURAL TRADE REFORM & WORLD MARKET IMPACTS**

Chair: Mr. John Nash, World Bank

The aim of this session is to quantify the impacts that agricultural trade reform will have on world markets. Key questions to be addressed include: How are OECD and non-OECD country markets linked? What impacts do OECD agricultural policies have on non-OECD country markets? How will agricultural trade reform affect market risks and what will the consequences be for developing countries? How reliable are our economic models?

15 minutes *"The Impacts of Agricultural Trade Liberalisation on non-OECD Countries"*, Mr. Wyatt Thompson (OECD) to present results from the OECD's AGLINK model.

CCNM/GF/AGR(2002)4

15 minutes *"How will agricultural trade reforms in OECD countries affect the trading relationships of developing countries?"* Mr. John Beghin (Iowa State University) to present the results of a GTAP application.

CCNM/GF/AGR(2002)5

15 minutes *"Trade, Food Security and WTO negotiations: Some Reflections on Boxes and Their Contents"*, Mr. Eugenio Diaz-Bonilla and Mr. Sherman Robinson from IFPRI.

CCNM/GF/AGR(2002)6

20 minutes *Discussants:* Mr. Graeme Justice (IMF), Mr. Josef Schmidhuber (FAO), Australia (tbc), and Mr. Tang Zhengping, Head International Co-operation Department (MOA), China (tbc).

Plenary Discussion

13.00-15.00 ***Lunch***

15.00-18.00 **SESSION 3: PRICE DISTORTIONS AND PRICE TRANSMISSION**

This session aims to assess the extent to which changes in world markets affect developing countries. Key questions to be addressed include: How are changes in imported prices transmitted across borders? What impacts do exchange rate changes have? How do price changes at the border affect the prices paid by consumers and received by producers?

Chair: Mr. David Colman (University of Manchester)

15 minutes *"Agricultural price distortions and price transmission in developing and transition countries"*, Mr. Alberto Valdés (Chile).

CCNM/GF/AGR(2002)7

15 minutes "*Policy and non-policy sources of agricultural price distortions in transition economies"*, Ms. Olga Melyukhina (OECD).

CCNM/GF/AGR(2002)8

15 minutes "*Exchange rate pass-through and domestic price transmission: Methodology and application"*, Mr. Don Larson (World Bank).

CCNM/GF/AGR(2002)9

15 minutes *"Trade liberalisation and price transmission: Evidence from Asia and Africa"*, Mr. Ramesh Sharma (FAO).

CCNM/GF/AGR(2002)10

20 minutes *Discussants***:** Ms. Nedka Ivanova (Bulgaria); Mr. Gerrit Meester (The Netherlands); Mr. Ruve Schank (Estonia).

Plenary Discussion

Friday, 24 May 2002

9.30-13.00 **SESSION 4: HOUSEHOLD LEVEL IMPACTS**

The purpose of this session is to examine how market and economy-wide impacts will affect household incomes in developing countries, and specifically how they will affect the numbers of households in poverty. Key questions to be addressed include: How do changes in the prices paid by consumers and received by producers feed through to the household level? In addition to the static impacts of trade reform there are also dynamic impacts. For example, how important is agricultural trade as a source of sectoral growth? How does agricultural growth contribute to poverty alleviation? How do the experiences of different developing countries compare?

Chair: Mr. Ashok Gulati (IFPRI)

15 minutes *"Multilateral trade liberalisation and poverty impacts at the household level: Five country applications"*, Mr. Tom Hertel (Purdue University).

CCNM/GF/AGR(2002)11

15 minutes *"The structure of growth and its impact on poverty: Examples from Colombia, Ghana and India"*, Mr. Maurizio Bussolo (OECD Development Centre).

CCNM/GF/AGR(2002)12

15 minutes *"The microeconomics of globalisation, with a focus on Mexico and China"*, Mr. Ed Taylor (University of California, Davis).

CCNM/GF/AGR(2002)13

15 minutes *"The contribution of agricultural trade reform to economic development in sub-Saharan Africa"*, Mr. Jonathan Kydd (Imperial College, London).

CCNM/GF/AGR(2002)14

20 minutes *Discussants:* Mr. Steve Wiggins (University of Reading, UK); Mr. Antônio Salazar Brandão (Federação das Indústrias do Estado do Rio de Janeiro, Brazil); Korea (tbc) and South Africa (tbc).

Plenary Discussion

13.00-15.00 ***Lunch***

15.00-18.00 **SESSION 5: ROUNDTABLE DISCUSSION**

Chair: Mr. Paul Isenman (OECD)

2 hours 15 minutes ***Policy implications for OECD and non-OECD countries and priorities for future work***

Broad participation from OECD and non-OECD country policymakers

45 minutes ***Conclusions and next steps***

Panel discussion *with session chairs and representatives from OECD and non-OECD country governments*

OECD GLOBAL FORUM ON AGRICULTURE:
AGRICULTURAL TRADE REFORM, ADJUSTMENT AND POVERTY

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