Rural Household Heterogeneity in Access to Assets, Inputs and Markets: A Cross Country Comparison

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based on joint work with

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Abstract

This paper characterizes access to assets and agrarian institutions of households engaged in agricultural activities in a sample of developing countries. The evidence presented in the paper draws from 15 nationally representative household surveys from four regions of the developing world. We first describe the extent and distribution of the access of rural households to a range of agricultural-specific assets and institutions. We further show how it is essential that this heterogeneity be taken into account when analyzing the impact of shocks or agricultural policy decisions on different household types. We do that by looking at two examples: households' ability to engage successfully in commercial farming and the impact of high food prices on rural households. The paper concludes that it is essential for agricultural policy modeling in developing countries to be able to account for this heterogeneity.

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1. Context: Assets, institutions, agriculture and poverty reduction

Assets are key determinants of household welfare. Ownership or access to a range of assets determines to a large extent the livelihood strategies of poor rural households and whether they manage to stay or get out of poverty. In agriculture, the combination of assets endowments and access to *agrarian institutions* is crucial in forming the incentives faced by agricultural households and their ability to respond to changes in markets and policy. This is why a sizeable share of the agricultural economics literature, particularly of that concerned with developing regions, is devoted to the study of issues such as the availability of different forms of capital, the performance of input, output, and factor markets, the delivery of agricultural support services and the generation and adoption of agricultural technology.

Although a significant amount of theoretical and empirical work focuses on the analysis of assets and agrarian institutions, we are not aware of any study that has carried out this type of analysis in a large cross section of countries using internally consistent data. The objective of this paper is to describe the asset position of rural agricultural households in a sample of developing and transitioning countries to document access to agrarian institutions and ultimately to characterize the heterogeneity of access to these assets and institutions. We then relate this to some measures of agricultural market orientation and successful engagement in agricultural production and commercialisation, to assess the extent to which constraints in access to assets and basic inputs limit households' ability to fully exploit the potential of agriculture to serve as a pathway out of poverty. We also relate that to the likely impact of high staple food prices on household level welfare.

The present paper collates and updates information produced by the Rural Income Generating Activities (RIGA)[2] project of FAO and the World Bank in some earlier studies (e.g. Zezza et al., 2008a and Zezza et al., 2008b). The paper has been prepared for the OECD Global Agricultural Forum with the aim of (a) describing household-level heterogeneity in access to markets and assets within the rural economy of developing countries, and (b) describing a new dataset created by FAO and the World Bank (the RIGA dataset) that can eventually be integrated with OECD's agricultural policy modelling efforts (Brooks et al., 2008) to derive parameters that would help taking into account these structural features in the modelling.

After describing the RIGA dataset in section 2, the paper is organized in two main parts. The first part (sections 3-6) is eminently descriptive, while the second (sections 7 and 8) uses two examples of possible agricultural policy analysis cases to highlight how any such analysis needs to take into account the various dimensions of heterogeneity describe in the first part. In particular, section 3 then focuses on household ownership of three key assets: land, livestock and infrastructure. Section 4 begins the examination of agrarian institutions by analyzing the utilization of productive inputs which reflects access to and functioning of markets for such inputs. This is followed in section 5 by an examination of the participation of agricultural households in output markets. In section 6 we characterize the support provided to rural households in terms of technology delivery, extension services and credit access, all of which are areas where governments have historically provided support to agricultural households. Section 7 presents results of a multivariate analysis aiming at investigating how access to assets, inputs and agrarian institutions relate to performance on agricultural output markets. Section 8 performs a simple analysis of the differential impact of high prices on different household types. The final section presents some concluding remarks.

[2] More information on the RIGA project can be obtained at http://www.fao.org/es/ESA/riga/index_en.htm .

2. The RIGA database and the analytical approach

The analysis presented in this paper utilizes the RIGA database, which is constructed from a pool of several dozen Living Standards Measurement Study (LSMS) and other multi-purpose household surveys. From this pool of possible surveys, the choice of particular countries was guided by the desire to ensure geographic coverage across the four principal development regions – Asia, Africa, Eastern Europe and Latin America, as well as adequate quality and sufficient comparability in codification and nomenclatures. Furthermore, an effort was made to include a number of IDA (International Development Association) countries as these represent developing countries with higher levels of poverty and are therefore of particular interest to the development and poverty reduction debate.

Using these criteria, survey data from the following countries were utilized (survey years in parentheses): Ghana (1998), Madagascar (1993), Malawi (2004), Nigeria (2004); Bangladesh (2000), Indonesia (2000), Nepal (1996), Pakistan (2001), Vietnam (1998); Albania (2005), Bulgaria (2001); Ecuador (1995), Guatemala (2000), Nicaragua (2001), Panama (2003). While clearly not representative of all developing countries, the list does represent a significant range of countries and regions and has proved useful in providing insights into the fundamental aspects of livelihood strategies of rural households in the developing world. In this paper most of the analysis is performed on a sub-sample of rural households that are engaged in agricultural production to any extent. These are approximately 85 to 100 percent of the rural sample, depending on the country.

We analyze various dimensions of heterogeneity of access. A first dimension is across expenditure quintiles which serve as a proxy of well-being of rural households, thus allowing a comparison of access across poorer versus richer households. A second dimension of comparing households is by examining a particular asset to see if those with greater accumulation of that asset, such as land, have similar access to other assets or agrarian institutions. Finally, by virtue of examining data across a range of countries, we can also assess the heterogeneity of household variables across countries and regions.

In each of these cases, the objective is to identify the existence and degree of heterogeneity of access and establish conditions under which access varies. It should be noted, however, that in all of these comparisons establishing causality is difficult; what we are presenting are associations. Furthermore, it is also difficult to establish the reasons why heterogeneity exists in a particular context. As with any descriptive cross sectional analysis of this type, the inferences made in this paper serve to characterize heterogeneity of access, but cannot identify the factors which generate this heterogeneity. In particular we do not attempt to discriminate supply and demand side issues in access to assets and input markets.

3. Household access to key assets

In this section, we examine the access of rural households to two key assets: i) land, and ii) infrastructure. In Zezza et al. (2008a) we perform a similar analysis for livestock ownership.

3.1 Land

Land is the asset that has historically been most closely linked to rural development. Policies for promoting rural development have often centred on providing access through a variety of

types of land reform, under the assumption that land access is critical for agricultural production and thus food security and income generation for rural households. In this section, we examine land access by looking at ownership, the link between land ownership and expenditure quintile, and alternative mechanisms of access to land.

Most rural households have no land, or only small plots of land, as seen in Figure 1, which presents histograms of the different land ownership categories by country for each region. Landlessness is most prevalent in Latin America and Asia, reaching from 40 to over 60 percent of households, as can also be seen in Table 1. The prevalence in Ghana is also high, though we suspect that these numbers mask collective forms of land access which are not captured in this variable; we follow up on this suspicion below. Landlessness is least prevalent in Vietnam, Malawi and Albania, at around 10 percent. In some of these countries alternative forms of access to land are common, again which we discuss below.

Not owning agricultural land does not necessarily represent a situation of disadvantage for rural households, as landlessness may signal either transition out of agriculture into higher return activities, or a land-constrained household desirous of producing agricultural output. Indeed, we find in Table 1 that the share of rural households that own land tends to decrease with increasing levels of household wealth. This is true in all four of the Latin American countries, as well as Nigeria and Indonesia. In the other three African countries land ownership is more or less constant across quintiles, as is also the case in Nepal, Vietnam and Albania. Only in Bangladesh, Pakistan and Bulgaria does the share of rural households owning agricultural land increase with expenditure quintile.

Table 1. Percentage of rural households owning land, by expenditure quintiles

	Percentage of Land-Owning Households					
	Expenditure Quintiles					
	1	2	3	4	5	All
Africa						
Ghana 1998	11.6	27.1	35.0	34.9	34.2	28.5
Madagascar 1993	73.5	81.0	75.3	73.3	69.8	74.6
Malawi 2004	94.7	94.9	93.4	91.7	82.3	91.4
Nigeria 2004	65.4	70.2	70.2	72.2	73.0	70.2
Asia						
Bangladesh 2000	32.7	40.7	52.5	55.9	63.6	49.1
Indonesia 2000	n/a	n/a	n/a	n/a	n/a	n/a
Nepal 1996	75.5	79.4	79.4	78.4	80.5	78.6
Pakistan 2001	20.4	27.9	35.2	37.9	42.1	32.7
Vietnam 1998	91.8	93.3	90.8	90.8	84.5	90.2
Eastern Europe						
Albania 2005	92.0	91.8	94.2	97.0	95.1	93.9
Bulgaria 2001	34.1	61.7	76.1	78.9	75.4	65.2
Latin America						
Ecuador 1995	63.7	63.3	56.0	52.2	53.2	57.7
Guatemala 2000	62.9	59.8	53.0	44.6	37.7	51.6
Nicaragua 2001	45.8	44.0	45.3	40.1	32.9	41.7
Panama 2003	68.7	54.1	49.3	45.1	36.5	50.8

Landholdings in most countries are small, with the vast majority less then one hectare in size. A greater number of larger landholdings are found in Latin America, as reflected in Figure 1 and Table 2, the latter of which provides mean land ownership for all rural households and agricultural households along with a breakdown of ownership by expenditure quintiles. The size of average landholding varies from 0.2 hectares in Vietnam to around 6 hectares in Panama for all rural households and similarly for agricultural households with a higher value of nearly 8 hectares for Panama. Average land holdings are smallest in Asia and Eastern Europe and largest in Latin America most likely reflecting differences in population densities and, for transition countries in Eastern Europe, the specific patterns of decollectivisation followed by these two countries following the collapse of the socialist system.

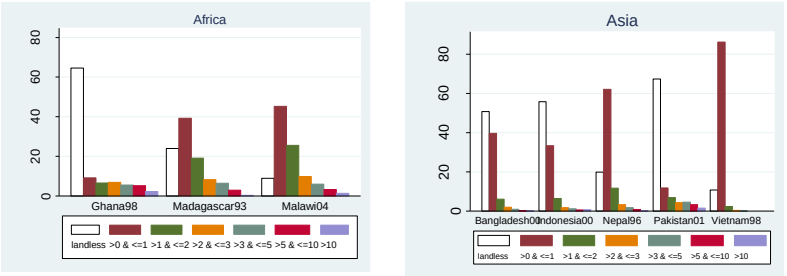
Table 2. Land ownership (has), by expenditure quintiles

	Average Land Size (has, Rural Households)						Average Land Size (has, Agricultural Households)					
	Expenditure Quintiles						Expenditure Quintiles					
	1	2	3	4	5	All	1	2	3	4	5	All
Africa												
Ghana 1998	0.88	0.92	1.23	1.30	1.34	1.14	0.91	0.97	1.34	1.47	1.82	1.29
Madagascar 1993	0.90	1.19	1.05	1.18	1.40	1.14	0.92	1.21	1.11	1.26	1.51	1.20
Malawi 2004	1.21	1.42	1.57	1.63	1.67	1.50	1.24	1.45	1.62	1.69	1.85	1.57
Nigeria 2004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asia												
Bangladesh 2000	0.12	0.20	0.28	0.44	0.73	0.35	0.15	0.24	0.33	0.54	0.84	0.43
Indonesia 2000	1.09	0.86	0.71	0.80	0.68	0.83	1.51	1.37	1.23	1.56	1.52	1.43
Nepal 1996	0.41	0.61	0.54	0.73	0.70	0.60	0.46	0.65	0.57	0.77	0.75	0.64
Pakistan 2001	0.47	0.57	0.85	1.05	1.55	0.90	0.73	0.84	1.19	1.45	2.11	1.28
Vietnam1998	0.15	0.19	0.20	0.21	0.27	0.20	0.15	0.19	0.21	0.21	0.27	0.21
Eastern Europe												
Albania 2005	0.68	0.71	0.84	0.85	0.96	0.81	0.72	0.73	0.87	0.88	0.99	0.84
Bulgaria 2001	0.44	0.56	0.75	0.64	0.96	0.67	0.81	0.66	0.74	0.75	1.12	0.82
Latin America												
Ecuador 1995	4.22	3.73	4.10	5.92	10.41	5.67	4.57	3.90	4.42	6.60	9.06	5.62
Guatemala 2000	1.70	1.99	1.61	1.26	2.97	1.91	1.81	2.07	1.77	1.42	3.74	2.12
Nicaragua 2001	3.62	4.77	7.87	5.35	7.52	5.81	3.87	5.16	8.38	5.88	8.51	6.33
Panama 2003	5.66	4.37	5.16	7.16	9.02	6.27	6.24	5.16	6.10	8.80	12.85	7.61
mean	*1.54*	*1.58*	*1.91*	*2.04*	*2.87*	*1.99*	*1.72*	*1.76*	*2.13*	*2.38*	*3.35*	*2.24*
max	*5.66*	*4.77*	*7.87*	*7.16*	*10.41*	*6.27*	*6.24*	*5.16*	*8.38*	*8.80*	*12.85*	*7.61*
min	*0.12*	*0.19*	*0.20*	*0.21*	*0.27*	*0.20*	*0.15*	*0.19*	*0.21*	*0.21*	*0.27*	*0.21*

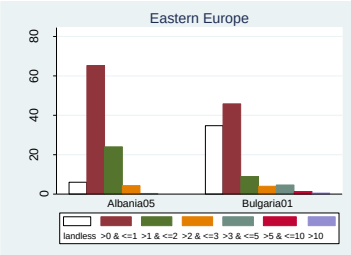
Landholdings tend to be concentrated, although this varies by country and region. Landholdings in the Latin American countries are the most concentrated, with between 70 and 80 percent of total land held by the top quintile of land owners. For most of the countries in Asia, around 60 percent of total land is held by the largest quintile (Indonesia is the exception, with 83 percent), while the African countries follow with around 55 percent. Albania is the country where land is most equitably distributed, with only 43 percent held by the top quintile.

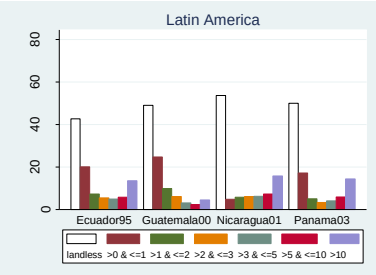
Looking back at Table 2, there is generally a positive relationship between average size of land owned and welfare, although in Indonesia the poor own on average larger plots and in other cases it is apparent at the extremes but not in the central part of the welfare distribution (as in the four Latin American countries). This can be read as confirmation that for a number of these households, even if landed and to some extent involved in agriculture, assets other than land are proving more crucial in determining welfare levels.[3]

Figure 1. Land distribution, by region and land category (in hectares)



[3] The fact that our land ownership variable does not account for differences in land quality can also be part of the explanation.

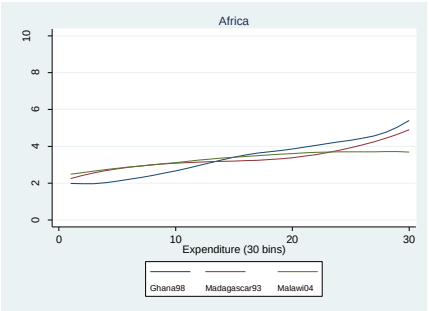


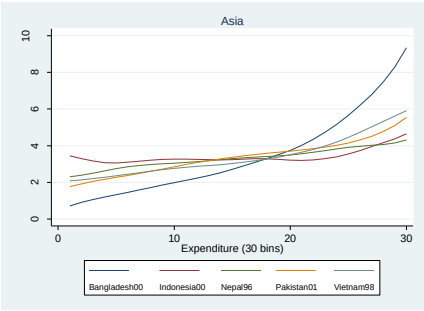


To get a sense of who in the distribution owns the greatest share of land in a given country, Figure 2 presents the relationship between expenditures levels and the share of total land owned, smoothed using a Lowess distribution. In all countries, the line is upward sloping indicating that wealthier agricultural households[4] own a greater share of total agricultural land than poorer households. In Asia, for example, the lower expenditure groups each own around 2-3% of total land while the highest groups own twice that amount, with particular concentration in Bangladesh[5]. In Latin America, particularly sharp increases are seen at the higher end of the distribution suggesting greater land concentration among the wealthiest.

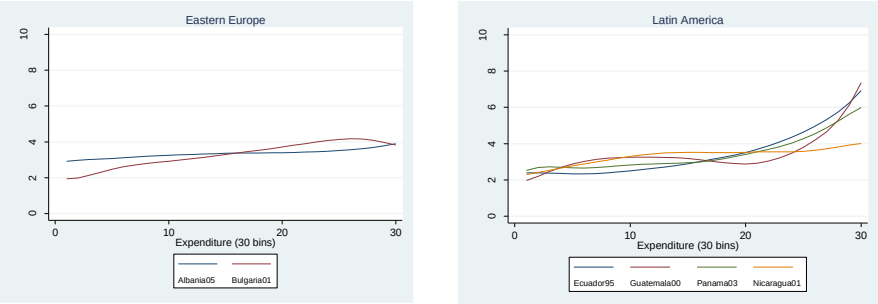
In addition to ownership, rural households access productive land through other forms of tenancy. These mechanisms may include land in exchange for payment (whether cash or in kind), or through reciprocity or traditional exchanges. We focus first on exchange for payment, which includes rental and sharecropping. Figures 3 and 4 below report the share of households by rural household land ownership quintile that, respectively, rent and sharecrop in and rent and sharecrop out land in the set of countries analyzed. For renting/sharecropping out, the landless category (category 0) is, of course, excluded.

Figure 2. Land concentration by expenditure (30 bins), by region (Lowess distribution)



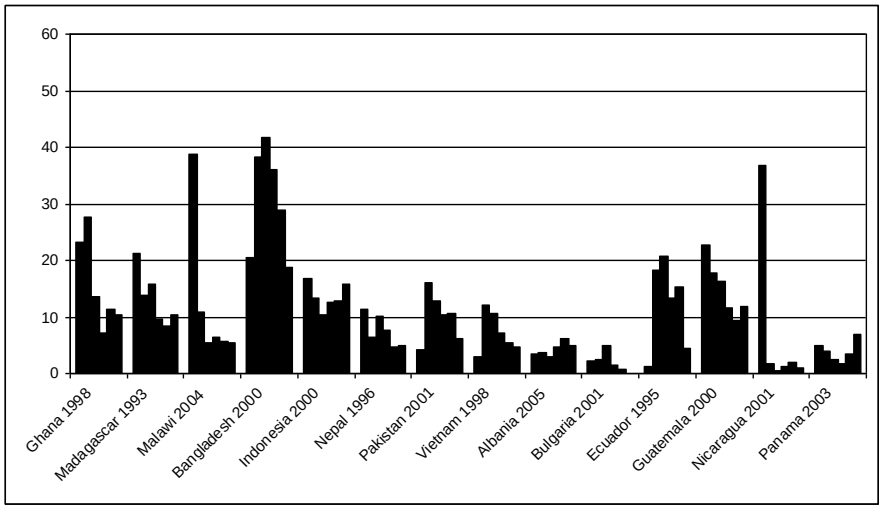


[4] Agricultural households are defined as those with non zero agricultural income.
[5] In Vietnam we classify as landowners those who have land classified in the survey as owned, allocated, auctioned, private land, or land of long term use.



As expected, renting in land and sharecropping are particularly widespread in South Asia, but the phenomenon is also significant in several African and Latin American countries. In Pakistan and Bangladesh, 15 and 27 percent of households, respectively, rent in land. In Africa, the total share is about 20 and 15 percent in Ghana and Malawi, and in Latin America 18 percent in Guatemala and 14 percent in Panama. Not only the landless rent or sharecrop. It is, however, the landless and the smaller land classes in particular that access land through these alternative forms of tenancy, although in some cases (Bangladesh and Nepal) this is more of an option for the households in the middle of the land distribution. Rental markets and sharecropping are thus an important avenue for smallholders to access more land and more income, but, depending on the country, are also used by households in the middle of the distribution.

Figure 3. Percentage of agricultural households that rent and/or sharecrop in land, by land ownership quintile

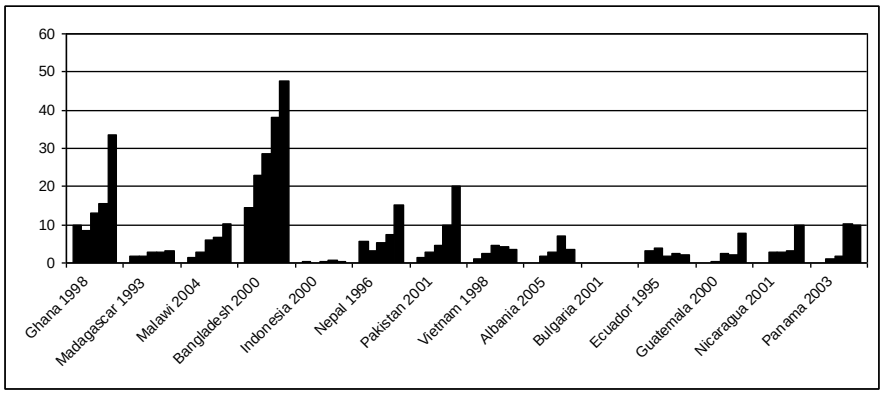


Note: The bars represent the six land categories (from left to right landless and the five land quintiles).

Renting and/or sharecropping land out, on the other hand, is generally associated with larger landholdings. There are, however, a few cases in which there appears to be more renting out among the smallest category than in the middle of the distribution. This may reflect an inability to gain economies of scale in production that push smallholders to rent out land, or if land is fragmented it may suggest some land is rented out while other is rented in. Taken together, this again suggests that land rental markets play an important role in reallocating

land use towards smaller landholdings and may be allowing poorer farming households to put together more economically viable farm units.[6]

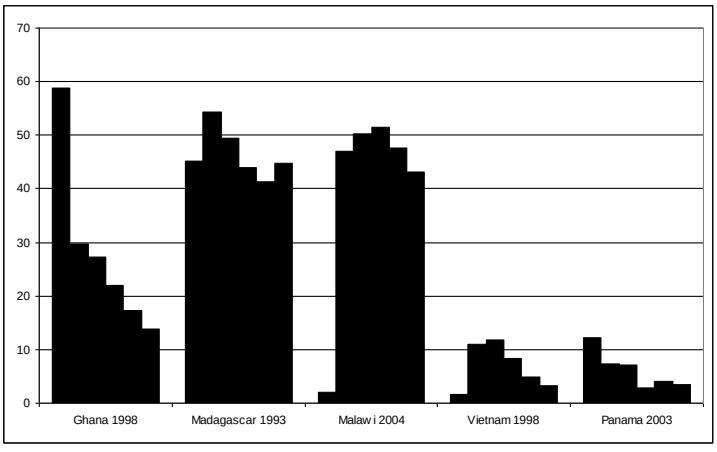
Figure 4. Percentage of agricultural households that rent and/or sharecrop out land, by land ownership quintile



Note: The bars represent the five land quintiles (from left/smallest to right/largest).

Mechanisms via reciprocity or traditional exchanges which do not involve payment, such as communal or village land or free exchanges from family or friends are also important. Figure 5 below reports the share of households by land ownership quintile that access land via non payment mechanisms. As was expected, these forms of access are particularly important in the African countries. In the case of Ghana, almost 60 percent of landless households had access to communal land, explaining, as we hypothesized earlier, the high share of landless among rural households in that country. Access via reciprocal or traditional exchange is also important for households in all land categories in Madagascar and Malawi.

Figure 5. Percentage of agricultural households that access land via reciprocal or traditional means, by land ownership quintile



Note: The bars represent the six land categories (from left to right landless and the five land quintiles).

[6] And, to the extent that an inverse farm size-productivity relationship holds, this may also be contributing to improving the productivity of the farm sector.

3.2 Infrastructure

Greater access to infrastructure is assumed to imply reduced time and distance to urban centres and facilitated access to markets. Households with greater access to electricity, water, communication, roads and other forms of infrastructure will have a broader range of economic opportunities compared to those with less access, who may be limited to agricultural activities for subsistence or near subsistence. Access to infrastructure, as a proxy for access to input and product markets, may also positively influence the type of agricultural activity towards more remunerative production technologies.

The difficulty in examining infrastructure is in identifying a measure comparable across countries. While most surveys include questions on infrastructure and distances to urban areas and key services, few of the variables are comparable. To address this issue, an infrastructure access index, including both public goods (electricity, telephone, etc.) and distance to infrastructure (schools, health centres, towns, etc.) was created using principal components analysis (following Filmer and Pritchett, 2001). The variables included in the index vary by country depending on data availability. Since infrastructure is generally linked to proximity to urban areas, the measure captures both jointly. In Table 3, the infrastructure index, which is normalized to have a mean zero in all cases, is presented for each country, by expenditure quintile. The higher the value of the index, the greater is the access to infrastructure. As can be seen in the table, not surprisingly, access to infrastructure increases with wealth, illustrating the constraints in terms of opportunities and services for the poor in all of the countries of the RIGA dataset.

Table 3. Infrastructure index

	Infrastructure Index					
	Expenditure Quintiles					
	1	2	3	4	5	All
Africa						
Ghana 1998	-0.58	-0.22	0.01	0.30	0.48	0.00
Madagascar 1993	-0.20	-0.17	0.03	0.08	0.25	0.00
Malawi 2004	-0.18	-0.16	-0.12	0.00	0.45	0.00
Nigeria 2004	-0.43	-0.19	-0.05	0.17	0.39	-0.03
Asia						
Bangladesh 2000	-0.40	-0.28	-0.10	-0.08	0.70	0.00
Indonesia 2000	-0.35	-0.15	0.01	0.11	0.38	0.00
Nepal 1996	-0.30	-0.27	-0.18	0.12	0.65	0.00
Pakistan 2001	-0.25	-0.15	-0.04	0.08	0.36	0.00
Vietnam 1998	-0.42	-0.12	-0.04	0.18	0.41	0.00
Eastern Europe						
Albania 2005	-0.31	-0.18	0.00	0.12	0.37	0.00
Bulgaria 2001	-0.59	-0.08	0.07	0.21	0.40	0.00
Latin America						
Ecuador 1995	-0.21	-0.14	0.01	0.11	0.24	0.00
Guatemala 2000	-0.40	-0.22	0.00	0.06	0.57	0.00
Nicaragua 2001	-0.37	-0.11	-0.09	0.10	0.47	0.00
Panama 2003	-0.91	-0.41	0.08	0.32	0.93	0.00

4. The utilization of productive inputs

Access to both input and output markets, and the economic opportunities they offer, is a key factor for households which depend on agricultural and other self employment activities for their livelihoods. Ideally one would hope to have information on access to markets, exogenous to the household decision to participate in a given market. This decision is typically influenced by household characteristics, such as its asset position, as well as the economic context. Unfortunately, such a measure is not available, so the best proxy is whether they actually did purchase and sell in input and output markets. This presumes that non use implies non access which is not necessarily the case. It does, however, provide a reasonable

approximation for access, and comparison across land ownership quintile allows an assessment of how access varies with farm size.

In this section, we focus on looking at access to input markets for agricultural households. Four inputs in particular are considered: i) fertilizer, ii) pesticides, iii) mechanisation, and iv) hiring of labour. For agricultural households in each country, Tables 4 and 5 present data on the share of households that use the four inputs, both overall and by land ownership category. These categories include the landless (category 0) that own no land but do earn income from some agricultural activity and then the five quintiles of land ownership (categories 1-5) with 1 being the smallest landholding category and 5 the largest. Note that we only have information on whether fertilizers were used, and not how much was used, which could lead to an underestimation in terms of differences in actual fertilizer use among households.

Overall the results suggest a wide range of access to inputs across the countries studied. For fertiliser use, we see generally lower prevalence of use in Africa compared to Asia and Eastern Europe, except in Malawi where the Starter Pack program and tobacco production led to raised input use. Similarly, the countries of Latin America have lower use, with the exception of Guatemala where the production of non-traditional exports may have influenced results. Fertilizer use is highest in Albania and Vietnam, covering almost 90 percent of households. Few significant differences are evident in the use of fertilizers between the smallest and largest landholders, not surprisingly since no distinction is made between organic and inorganic sources of fertilizer. A lower share of landless agricultural households, however, in most countries used fertilizers.

Pesticide use appears generally lower than fertiliser use but varies widely by country and within regions, responding to climate, policy and the nature of pesticide products. Vietnam and Albania again have the highest prevalence of use, with 81 and 51 percent of agricultural households, respectively, while only 3 percent of agricultural households in Malawi used pesticides. A consistent one third of the agricultural households in each of the Latin American countries also used pesticides. Much larger variation among small and larger landholders is evident for almost all of the countries, however, then in the case of fertilizer. Again this is not surprising, since pesticides nearly always involve a monetary payment. One exception is Vietnam, where use is over 80 percent in all categories, suggesting that government policy may be playing a role. Finally, with the exception of Latin America, very few landless agricultural households used pesticides.

Table 4. Utilization of productive inputs: fertilizer and pesticides, by land quintiles

	Share (%) of agricultural households using fertiliser						
	Land Quintiles						
	0	1	2	3	4	5	All
Africa							
Ghana 1998	20.6	24.9	18.8	23.0	24.8	23.1	21.6
Madagascar 1993	12.7	24.6	19.0	13.0	11.1	13.1	15.5
Malawi 2004	51.1	56.7	63.5	71.0	73.1	78.9	67.6
Asia							
Bangladesh 2000	29.1	73.3	86.4	88.3	88.2	89.0	62.2
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	30.2	49.6	56.3	59.5	65.6	65.4	55.2
Pakistan 2001	27.0	77.9	84.4	86.9	88.1	88.6	54.1
Vietnam 1998	12.9	96.6	96.8	95.1	95.4	96.3	89.1
Eastern Europe							
Albania 2005	20.5	79.1	85.0	92.1	91.1	95.2	87.7
Bulgaria 2001	7.0	58.1	65.7	69.1	64.5	55.2	53.4
Latin America							
Ecuador 1995	19.4	16.6	37.0	44.9	33.1	26.7	27.9
Guatemala 2000	39.1	85.9	87.8	85.7	86.2	71.1	64.6
Nicaragua 2001	23.4	40.6	36.8	40.2	36.8	39.6	30.3
Panama 2003	10.9	21.0	21.0	22.4	27.0	20.1	21.6

	Share (%) of agricultural households using pesticides						
	Land Quintiles						
	0	1	2	3	4	5	All
Africa							
Ghana 1998	12.9	18.4	18.5	21.4	30.8	46.2	18.0
Madagascar 1993	12.4	9.0	11.1	13.0	10.3	12.8	11.5
Malawi 2004	2.4	0.7	2.1	3.2	3.7	7.4	3.3
Asia							
Bangladesh 2000	16.6	44.6	54.4	62.2	63.5	71.5	41.8
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	0.9	3.4	4.1	8.3	13.1	15.2	7.8
Pakistan 2001	15.8	33.6	43.8	54.6	62.4	66.5	32.7
Vietnam 1998	7.5	85.2	87.6	88.4	87.3	91.9	81.1
Eastern Europe							
Albania 2005	5.1	33.0	38.2	47.1	57.5	71.8	50.9
Bulgaria 2001	1.8	12.0	26.5	27.6	31.5	24.1	20.5
Latin America							
Ecuador 1995	22.4	20.6	39.8	48.2	46.8	39.7	33.5
Guatemala 2000	28.4	22.2	30.1	31.1	50.0	59.8	34.2
Nicaragua 2001	23.5	38.0	42.3	51.3	43.5	65.2	34.1
Panama 2003	9.5	12.4	24.7	25.8	34.7	40.6	20.1

Mechanization—which is defined as using an input that uses a motor of some form— is limited among the agricultural households in the countries of the RIGA dataset, reaching over 20 percent in only 5 countries (Bulgaria, Nicaragua, Ecuador, Vietnam and Panama). The use of mechanisation, however, shows the clearest influence of land size on input use. In every country greater land size is associated with greater mechanisation. These general results, of course, may be due to the fact that larger farms substitute capital for labour since they are likely to have lower labour to land ratios. Alternatively, it could indicate a lack of access of smallholders who cannot afford to pay for access to mechanical inputs or lack access to necessary credit, as mechanization typically requires a monetary payment.

Table 5. Utilization of productive inputs: mechanisation and hired labour, by land quintiles

	Land Quintiles						
	0	1	2	3	4	5	All
Africa							
Ghana 1998	2.2	3.4	2.3	3.4	6.1	13.8	3.5
Madagascar 1993	9.1	10.2	14.4	18.6	27.6	32.0	17.5
Malawi 2004	4.9	1.3	1.3	2.3	4.5	6.7	3.3
Asia							
Bangladesh 2000	0.8	1.0	4.5	4.7	10.0	20.0	5.1
Indonesia 2000	0.5	2.7	4.0	4.2	4.2	10.9	2.4
Nepal 1996	0.5	1.6	1.9	3.4	8.4	28.6	7.6
Pakistan 2001	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vietnam 1998	1.6	16.2	23.5	21.5	23.4	33.7	21.3
Eastern Europe							
Albania 2005	9.0	6.2	17.1	16.2	24.8	29.5	19.8
Bulgaria 2001	16.7	16.2	30.4	40.7	46.8	51.7	33.1
Latin America							
Ecuador 1995	11.3	12.2	22.8	31.3	38.7	59.6	24.7
Guatemala 2000	4.5	13.4	8.3	13.1	13.3	17.6	9.4
Nicaragua 2001	14.7	35.4	41.0	56.3	55.5	71.7	31.0
Panama 2003	6.9	10.8	20.8	28.1	39.9	63.6	21.3

	Land Quintiles						
	0	1	2	3	4	5	All
Africa							
Ghana 1998	64.0	68.2	61.4	70.8	78.5	88.2	67.5
Madagascar 1993	32.8	41.1	39.7	34.9	34.9	45.2	37.6
Malawi 2004	29.2	16.5	18.6	20.8	26.9	31.7	23.3
Asia							
Bangladesh 2000	18.6	38.6	59.6	69.4	73.8	74.9	44.9
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	22.8	21.8	32.5	34.0	45.2	60.4	37.3
Pakistan 2001	15.3	16.6	27.7	46.0	62.4	67.5	28.6
Vietnam 1998	1.6	16.2	23.5	21.5	23.4	33.7	21.3
Eastern Europe							
Albania 2005	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bulgaria 2001	1.8	0.0	2.0	0.8	1.6	4.6	1.6
Latin America							
Ecuador 1995	12.0	11.1	19.4	33.4	44.7	50.3	24.3
Guatemala 2000	18.7	33.0	43.3	40.2	45.8	55.1	32.8
Nicaragua 2001	6.4	10.1	13.8	23.4	24.3	27.4	12.2
Panama 2003*	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The share of households that hire in agricultural labour is more evenly distributed across countries, ranging from around 20 to 40 percent of agricultural households in most countries, with the exception of Ghana, where two-thirds of households hired in labour. As expected, the hiring in of agricultural labour increases with land size in most countries. This is particularly true in the Latin American and Asian countries, while in the Eastern European countries agricultural labour markets are practically non existent.

5. Access to product markets

Moving from input to output markets, in Table 6 the share of agricultural households having made any sale of an agricultural (crop or livestock) product is presented both overall and across expenditure quintiles. The results show that in general about 70 percent of rural households participate in some sort of market for agricultural output. This varies though across countries, with lower rates for countries where non-agricultural activities may dominate. In many cases, particularly in Africa (Ghana, Madagascar and Nigeria) and Latin America (Ecuador, Guatemala and Panama) the poorest quintile tends to participate more in output markets suggesting that even the poor have access to output markets. In Asia and Eastern Europe, the poor seem to have less access except in Vietnam. Overall, the results do not show dramatic differences between the different categories. The results may be deceptive,

however, since it may be the case that those with higher income have chosen not to produce for the market since there are better opportunities for them, such as non-agricultural activities, while those at the bottom of the distribution are excluded because of production or market constraints.

In Figure 6, we look more closely at the 'depth' of this participation, by plotting kernel densities of the share of output sold by agricultural households. We do this separately for crop and livestock sales. The focus is on agricultural households in the different land categories, including the top quintile of land owners the bottom quintile, and when relevant, the landless. These categories are included to get a sense of whether market integration is linked to land ownership. In general, a very mixed picture emerges.

Table 6. Output market participation, by expenditure quintile

	Percentage of HHs Selling Any Agricultural Production					
	Expenditure Quintiles					
	1	2	3	4	5	All
Africa						
Ghana 1998	81.0	76.7	73.5	66.1	55.6	70.6
Madagascar 1993	95.6	98.1	94.1	93.6	89.9	94.3
Malawi 2004	63.7	71.0	74.0	73.7	69.2	70.3
Nigeria 2004	73.5	72.3	71.4	70.7	62.9	70.2
Asia						
Bangladesh 2000	65.3	74.1	79.9	77.8	80.5	75.5
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	59.4	69.7	71.9	76.1	68.5	69.1
Pakistan 2001	45.7	50.8	53.2	54.5	56.6	52.1
Vietnam 1998	93.3	93.7	92.4	92.8	87.0	91.8
Eastern Europe						
Albania 2005	74.0	79.1	80.1	81.2	78.2	78.5
Bulgaria 2001	11.4	30.9	32.4	32.6	34.3	28.3
Latin America						
Ecuador 1995	62.0	68.0	65.1	60.0	52.9	61.6
Guatemala 2000	58.6	67.3	58.5	53.5	44.8	56.5
Nicaragua 2001	79.5	82.2	84.3	77.5	77.1	80.1
Panama 2003	57.5	49.0	47.2	48.1	43.0	49.0

The peaks in the kernel distributions plotted in our graphs are rarely located towards the right-end of the horizontal axis, indicating that relatively few households sell the majority of their output. Exceptions are Malawi and the larger farmers in Vietnam, Ecuador and to some extent Guatemala. Another finding that emerges with a good deal of consistency from the graphs is how land ownership does have a significant association with market orientation. In most of the cases observed, the distribution of the top land quintile is shifted significantly to the right compared to the distribution of the smallest land owners and the landless. This association is however not as strong as one might have expected in some of the cases where it is observed, while in a few others (Albania, Malawi, Madagascar) hardly any association can be detected as the distributions track each other very closely[7].

In the case of livestock production on the other hand (Figure 7), the peaks in the distributions are more often than not located in the right-end half of the graphs, indicating a much greater degree of commercialization of livestock products when compared to crops. This is an expected results as livestock products are more difficult to store and are hence more often commercialised. In this respect it is very interesting to note how in a few countries (Malawi,

[7] When we plotted similar distributions by expenditure quintile (not reported) the results where broadly similar, but the difference across quintiles tended to be reduced even further.

Figure 7. Distribution of share of crop production sold, by 1st and 5th land ownership quintiles and landless (kernel density)

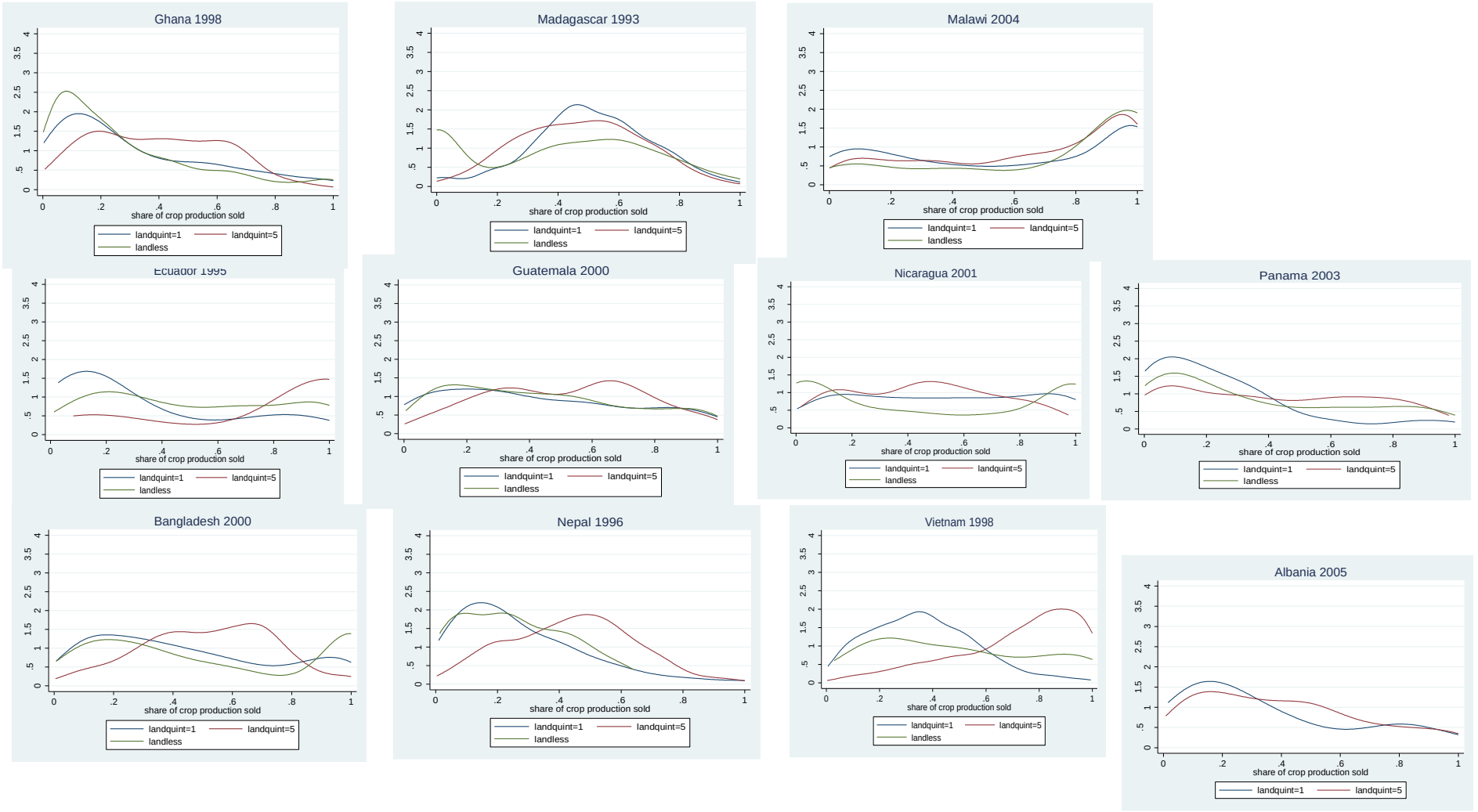
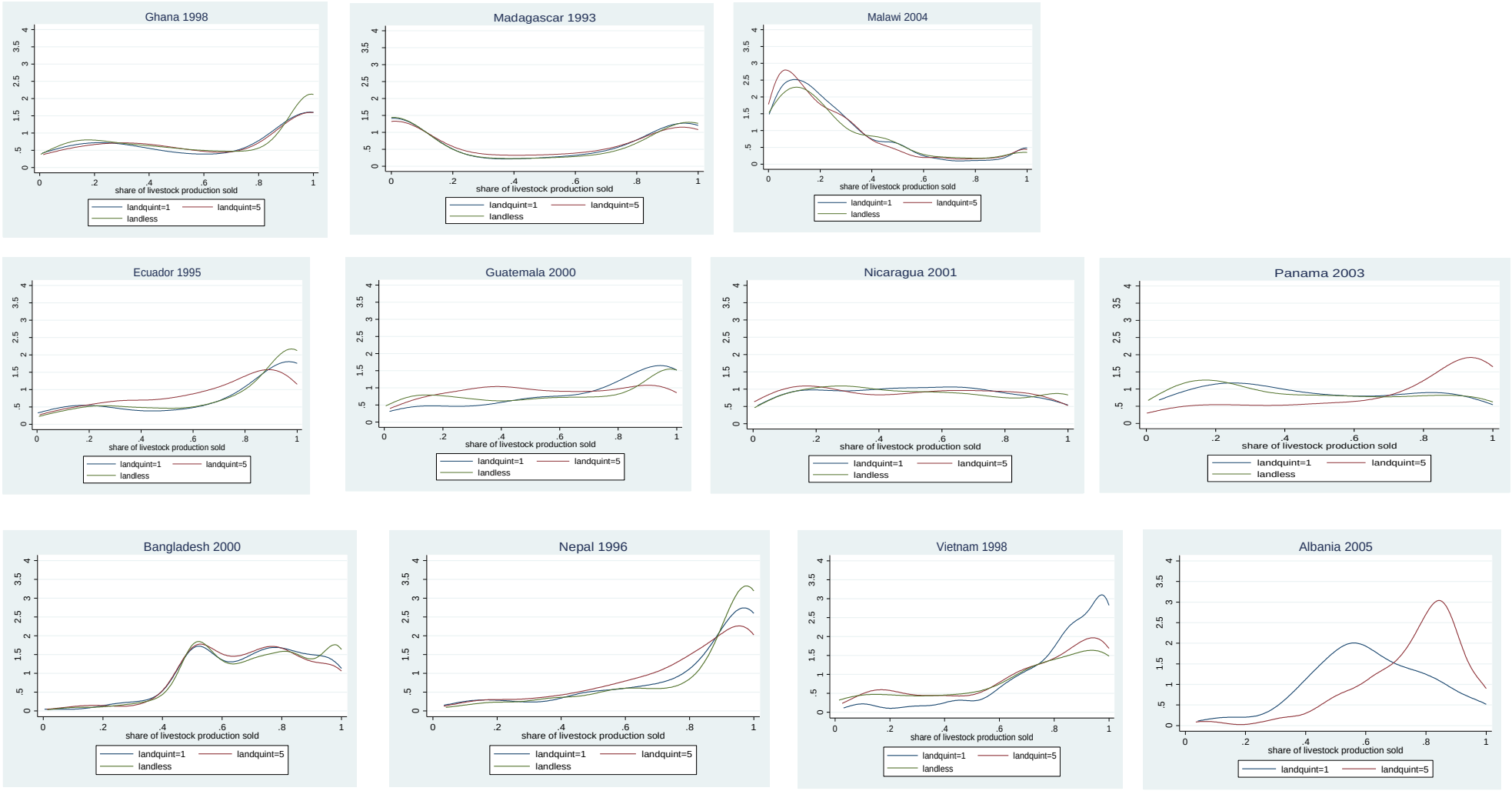


Figure 7. Distribution of share of livestock production sold, by 1st and 5th land ownership quintiles and landless (kernel density)

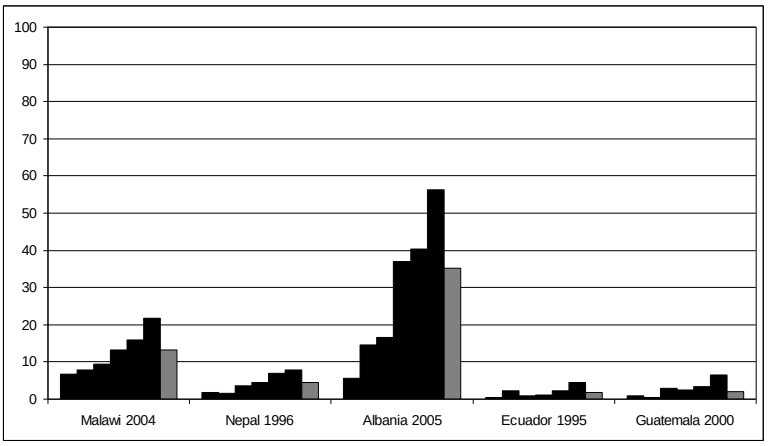


Madagascar, Nicaragua) this relationship is either negative or weaker, which may be suggestive of livestock being owned more for savings purposes than for cash generation under certain circumstances. Also, unlike what we observed on crop sales, not much difference is found here with the shape of the distributions across land (or expenditure, not reported) quintiles, confirming the important role of livestock production as a cash earner even for the poorer strata of the population.

6. Agrarian support for producers

Given the pervasiveness of incomplete markets in rural areas, the ability of agricultural households to use assets efficiently is linked to the support available to them as producers. Two key types of support are examined in this section: technical assistance and credit. Historically, both have often been provided by governments through agricultural extension agencies and government supported agrarian development banks. More recently, there has been a withdrawal of the state from providing this type of support, particularly credit which along with being burdensome on budgets has also been plagued with inefficiency and management problems.

Figure 8. Percentage of agricultural households receiving technical assistance, by land category



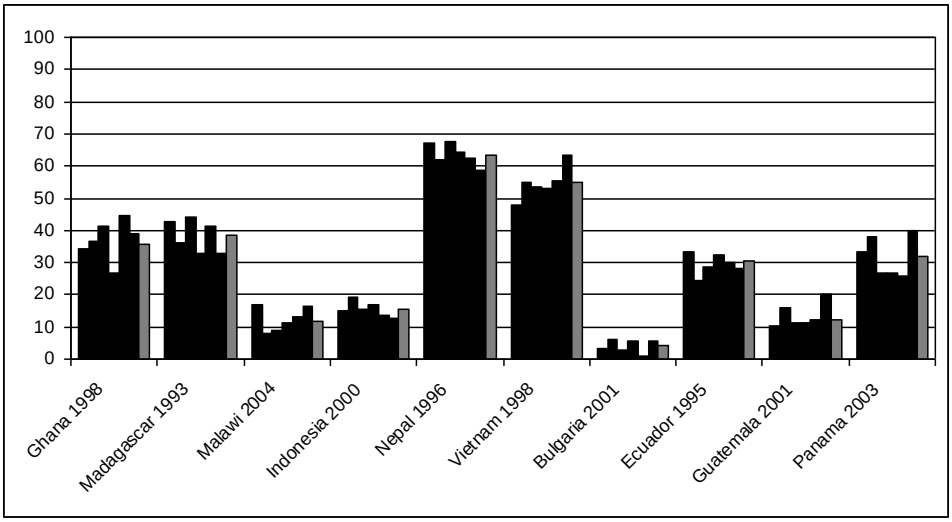
Note: Black bars represent the six land categories (from left to right landless and the five land quintiles) while the grey bar represents overall access.

Data on technical assistance are limited to only five countries, presented in Figure 8. The dark bars represent the land categories noted in the previous section and the grey bar overall access. In general, technical assistance levels are low with no more than a third of households receiving assistance, and for Nepal, Guatemala and Ecuador less than five percent of households received technical assistance. The probability of receiving technical assistance is significantly higher among large landholders, in all countries. The results, while limited to five countries, suggest a critical lack of technical assistance, and that in particular public and private providers of technical assistance are failing to cater to poorer, smaller farmers.

Ideally, to get a sense of credit access, data on whether households demanded credit, or an additional amount of credit under the same terms and conditions, would be used. Unfortunately, only in a small subset of surveys are such detailed questions available. For reasons of comparability, therefore, the simple question of whether households receive credit from any source is used in this analysis. This at least provides a sense of the variation in access across countries and land/expenditure categories. Both land and expenditure categories

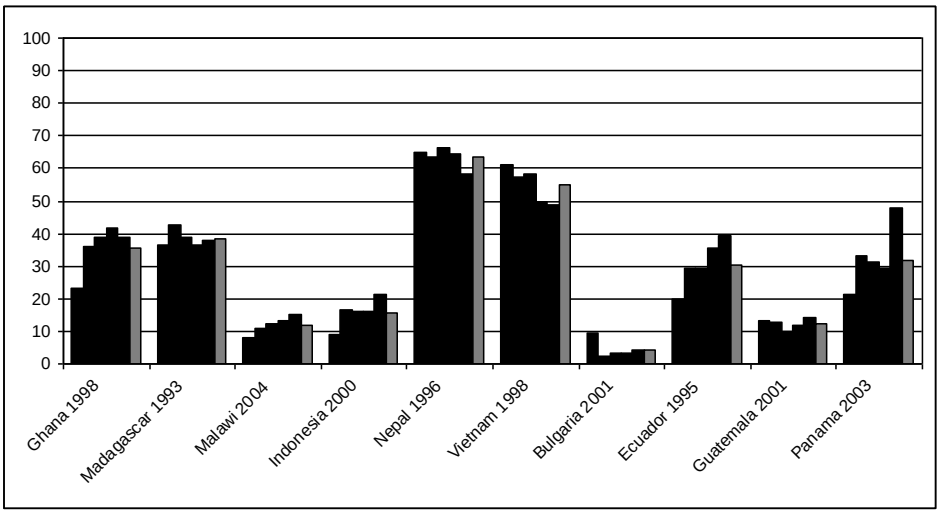
are considered since credit can be considered a function of each. The use of credit (including loans from family members and relatives), is on average no more than 40 percent of agricultural households and in most countries no more than about one in ten agricultural households have access to credit (Figures 9 and 10). In several countries the use of credit appears to be more strongly related to the income level than to land ownership.

Figure 9. Percentage of agricultural households using credit, by land category



Note: Black bars represent the six land categories (from left to right landless and the five land quintiles) while the grey bar represents overall access.

Figure 10. Percentage of agricultural households using credit, by expenditure quintile



Note: Black bars represent the five expenditure quintiles (poorest to the left, richest to the right) while the grey bar represents overall access.

7. Weaving the threads: How does 'success' in farming relate to access to inputs, assets and services?

In this section we attempt to weave together the threads we have laid so far by investigating the hypothesis that success in farming is in fact constrained by the lack of access to basic assets, inputs and services. The idea is that if farmers are not in a position to exploit the

opportunities offered by agricultural markets and remain trapped in a subsistence strategy, it is highly unlikely that for them agriculture will become a workable pathway out of poverty.

To investigate this proposition we look at the extent to which, controlling for a vector of household, individual, and geographical characteristics, access to land, basic agricultural inputs, and credit and technical assistance services are still associated with a lower ability to participate in the market. We do this by estimating two models that have as dependent variables respectively (a) the share of crop production sold, and (b) the log of the value of the crop production sold (in local currency). The right-hand side of the models is otherwise identical and so is the estimation procedure.

The theoretical motivation and model for this analysis follows the agricultural output market access literature (Goetz 1992; Key et al., 2000; Bellemare and Barrett., 2006; Boughton et al., 2006). We assume that the decisions of whether to sell and how much to sell are sequential, not simultaneous. Our model is specified as a Heckman sample selection model, estimated by using full maximum likelihood[8]. Our model includes four sets of explanatory variables: a vector of household demographic characteristics, one of household assets (education, labour, land, other non-agricultural physical assets), one of access to agricultural inputs and services (fertilisers, pesticides, irrigation, mechanisation and a principal component index measuring access to public infrastructure), and finally a set of country-specific geographic dummies.

Table 7. Number of country share and value regressions in which a given independent variable was positive/negative and statistically significant

	Log value of crop production sold		Share of crop production sold	
	Log Value	Selection	Shares	Selection
Fertilizers	4/2	12/0	3/3	11/2
	(12)	*(12)*	*(12)*	*(13)*
Pesticides	6/0	10/0	4/0	10/0
	(11)	*(11)*	*(11)*	*(11)*
Mechanization	9/0	10/0	6/1	9/0
	(11)	*(11)*	*(11)*	*(11)*
Irrigation	1/0	2/1	0/0	2/0
	(5)	*(5)*	*(5)*	*(5)*
Technical assistance	0/0	1/0	0/0	1/0
	(2)	*(2)*	*(2)*	*(2)*
Hh Labour	10/0	5/0	0/5	7/0
	(12)	(12)	(12)	(12)
Land	10/0	8/0	7/1	7/0
	(12)	(12)	(12)	(12)
Non-ag wealth	7/2	2/5	4/1	1/6
	(12)	(12)	(11)	(12)

Note: The table reports the number of cases in which the coefficient on the given variable was positive and significant / Negative & significant (out of # of countries analyzed).

Exclusion restriction variables in our selection equations are, following Boughton et al. (2006), variables that may affect the household reliance on agricultural sales as a source of income, as these might affect farmers perceptions of the risks associated to participating in the agricultural markets. In particular these variables are a migration network dummy (identifying whether the household head has migrated to the current residence), variables on participation in key non-farming activities (non-agricultural self-employment, and agricultural and non-agricultural wage), and a religion dummy (identifying whether the household head

[8] Exceptions are the Albania and Bulgaria share regressions and the Madagascar log value regression, which are estimated using the two-step Heckman since the ML procedure would not converge.

belongs to the main religious group in the country). We also include a distance variable in the first stage to capture fixed transaction costs.

As each model is estimated separately on each country dataset, it would be too cumbersome to report the full results, and we therefore only present a synthesis of the results in Table 7. Results overwhelmingly support the idea that access to basic agricultural inputs and key agricultural assets is strongly associated to farmers' ability to successfully engage in agricultural output markets. Fertilizers, pesticides, mechanization and irrigation use are all positively associated with greater participation in agricultural output markets, and greater share and value of agricultural sales.

Results are somewhat stronger in the participation equation, but they are similarly robust in the second stage equation, particularly in the log value regressions. In the latter, pesticide use is significantly positively associated with the probability ('intensity') of the participation in agricultural output markets in ten (six) study countries. The same holds for the use of mechanized agricultural implements in nine (ten) countries.

These findings are clearly not unexpected, but taken together with the very low level of access to assets, inputs and services documented in the first part of the paper, they raise serious issues for concern in areas where government policy and other development efforts can have an important role. Anti-poverty strategies, policies and programmes that rely on smallholder agriculture as an engine of growth and a motor of poverty reduction should not ignore this basic message if they are to have a chance at succeeding.

8. The impact of high food prices on poor rural households

In this section we once again emphasize the importance of looking at household heterogeneity in rural areas, but linking it somewhat more explicitly to an analysis of the impact of a change in some exogenous condition, in this case the international price of food staples. While the application we present is extremely simple and completely static, the heterogeneity of the results according to some key household characteristics points to the need for accounting for this heterogeneity when attempting to analyze policies within a more sophisticated policy framework.

In the very short term the impact of soaring food prices on households depends crucially on their position on agricultural output and food markets as producers and consumers. Low income households that spend a large proportion of their income on those tradable staple products whose prices increase substantially, are likely to be the ones whose overall welfare is worst affected. Households that derive a large proportion of their income from the production and sale of those goods will, on the contrary, be positively affected.

The effect for households that are both producers and consumers is ambiguous, and will depend on their net position in the specific market. The first step in the analysis is therefore to identify the proportion of households that are net-sellers or net-buyers, and their characteristics. The first three columns in Table 8 report on the share of net seller households in our sample of countries. The range of net seller households varies between 4 and 54 percent in this sample, while the range in rural areas varies between 7 and 68 percent. On average (unweighted), only 18 percent of all households and 25 percent of rural households in these countries are net food sellers. The data clearly demonstrate that in this sample a large majority of households are net buyers of staple foods. This finding should not come as a surprise, as it confirms what much of the literature on the subject already suggests.

To take a further look into this and understand how the poor are represented within this group of net sellers, the last three columns of Table 8 report the proportion of the poor that are net sellers, using the dollar a day international PPP poverty line. The bottom line is that even in rural areas, where agriculture and staple food production is the main occupation for a majority of the poor, a vast share of them are net food buyers and stand to be hurt, or at least not to gain, from an increase in the price of tradable staple foods. At the same time, a substantial share of the poor is net food sellers and might therefore benefit from the higher prices. Therefore, even among the rural poor, the impact of the recent price trends can be heterogeneous – both within and across countries. This, once again, points to the need to look further into the question of who stands to lose or gain from the price rise, and in what proportion.

Table 8. Share of households that are net sellers of food staples

	Share of Households			Share of dollar-day poor households		
in percent	*Urban*	*Rural*	*All*	*Urban*	*Rural*	*All*
Bangladesh, 2000	4.1	28.0	23.2	4.5	16.6	15.8
Pakistan, 2001	2.1	21.5	15.9	3.6	16.9	14.6
Nepal, 2003	10.7	35.5	31.5	13.8	25.3	25.1
Tajikistan, 2003	0.4	11	7.4	2.9	21.1	16.9
Vietnam, 1998	8.9	67.9	53.7	0.0	59.4	58.8
Guatemala, 2000	2.5	13.6	8.8	1.7	17.8	16.9
Nicaragua, 2001	2.1	21.5	9.6	6.2	27.0	21.0
Panama, 2003	0.2	10.3	3.8	0.0	11.8	11.4
Ghana, 1998	8.0	28.0	20.7	16.8	30.9	28.5
Malawi, 2004	3.4	7.2	6.7	1.0	5.2	5.0
Albania, 2005	0.9	32.4	17.1	*	*	*
Max	10.7	67.9	53.7	16.8	59.4	58.8
Min.	0.2	7.2	3.8	0.0	5.2	5.0
Unweighted average	3.9	25.2	18.0	5.0	23.2	21.4

Source: Authors' calculations using RIGA data. A household is defined as a net food seller when the value of food staples produced by the household is greater than the value of food staples consumed.

* Few observations

Having characterized households in terms of their position in the market for the main food staples, and understood the relative importance of tradable staples in household production and consumption, the next step is to gauge the likely welfare impact of a change in the price on different household types.

To quantify this change in welfare in an intuitive manner a useful notion is that of compensating variation, which equals the gain/loss to the income/monetary transfer needed to restore the household to the position it was before the (price) shock occurred. In this paper the compensating variation is expressed as a percentage of the initial welfare level.

The methodology used in this paper has several antecedents, starting with Deaton (1989), and many other empirical applications thereafter, including Budd (1993), Barrett and Dorosh (1996), Minot and Goletti (2000) and, recently, Ivanic and Martin (2008) and Rios et al. (2008a). Formally, the immediate welfare effect of changes in the price of a staple food is given by[9]:

[9] This discussion follows, with minor adaptations, from Minot and Goletti (2000). For a full derivation of the equations, see their Appendix 2.

$$\frac{\Delta w_i}{x_{0i}} = \frac{\Delta p^p}{p_0^p} PR_i - \frac{\Delta p^c}{p_0^c} CR_i \qquad (1)$$

where Δw_i is the first-order approximation of the change in welfare for household *i* of a change in the staple food price, x_{0i} is the original income (here proxied by total consumption expenditure) of household *i*, $p^p{}_0$ is the original price of the staple at which production is valued, $p^c{}_0$ is the original price of the staple at which consumption is valued, PR_i is the value of the production of this staple for household *i* as a proportion of x_{0i}, and CR_i is the value of the consumption of this same staple for household *i* as a proportion of x_{0i}.

The above is what Minot and Goletti call a "before-response" effect. An "after-response" short term effect, which takes into account household responses in production and consumption decisions, can also be calculated by simply adding the short-term own-price elasticity of staple supply, and the own-price Hicksian elasticity of staple demand on the production and consumption side, respectively. We also carried out an estimate accounting for the possibility of short term adjustments in supply and demand of the main staple, using short-term elasticity parameters borrowed from the literature. The results of that analysis are not qualitatively different from the results without elasticities and are not reported.

The above equation can be readily adapted to account for different degrees of transmission of changes in producer and consumer prices, to account for regional variations in price changes within each country, and to account for different prices changes for different commodities. In this paper, however, we want to preserve some degree of cross-country comparability of the results and our preferred strategy is therefore that of simulating an identical flat, hypothetical 10 percent increase in both producers and consumer prices, limited to the three main tradable food staples in each country. Imputing differing price changes across countries (for instance to reflect actual price increases recorded on local markets) would have rendered the international comparison less straightforward. Thus, equation (1) reduces to

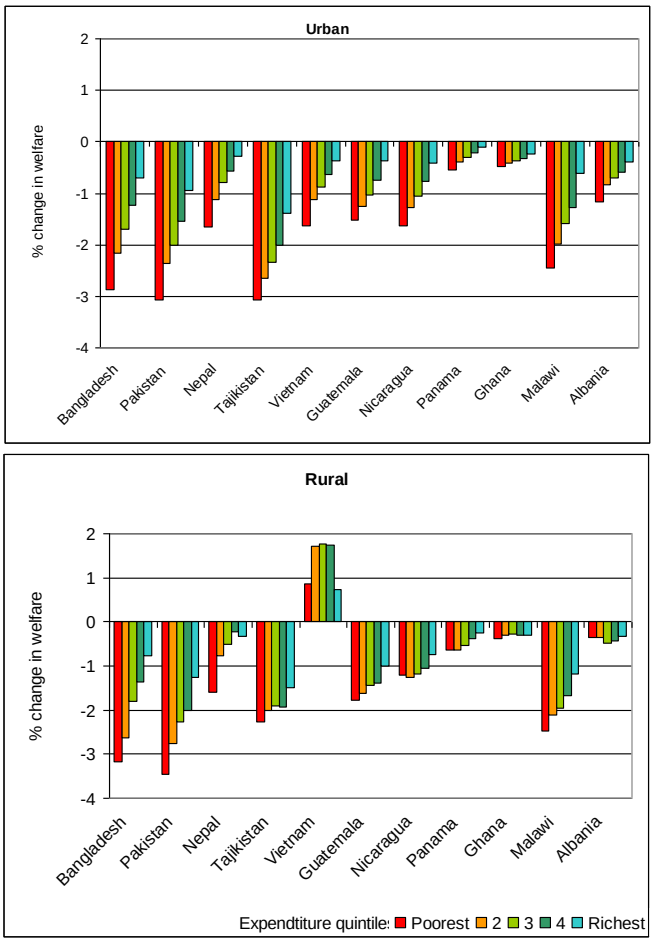
$$\frac{\Delta w_i}{x_{0i}} = 0.1\left(PR_i - CR_i\right) \qquad (2)$$

The analysis focused on tradable staples (and staple products) only, as these are at the centre of the current international debate, but the same analysis can be easily extended to cover non-tradable staples as these, over time, may also increase due to growth in demand.

8.1 The poor lose the most from an increase in staple food prices

Figure 11 graphs the median welfare change (in terms of a percent loss in total expenditure) by expenditure quintiles, separately for urban and rural samples. First, and as expected from both intuition and the discussion above, urban consumers are expected to lose in all countries. In rural areas the situation is somewhat more mixed, but overall gains are still only found in Vietnam—the one country where tradable staples constitute a large share of income for rural households.

Figure 11. Median welfare effect of a 10 percent increase in the price of the main tradable staples, by expenditure quintiles (percentage)



Households in the poorest expenditure quintiles are the worst affected in both urban and rural areas, across the board. In Bangladesh, for instance, both rural and urban households are adversely affected by the increase in the price of rice, and the impact is on average of a similar magnitude at 1.6 to 1.8 percent of their initial total expenditure level. However, in both rural and urban areas the poorest of the poor (the bottom 20 percent) face the largest relative net loss (around 3 percent), with the second poorest quintile losing over 2 percent. In rural Malawi the median losses are around 1.9 percent, but in the poorest quintile they are twice as large as in the richest (2.5 versus 1.2).

This disturbing pattern is observed in all the countries in the sample, albeit with different magnitudes. Vietnam is a case in point. Here in fact rural households are expected to see their welfare increase by 1.4 percent following a 10 percent increase in rice prices. These gains are not, however, evenly distributed and the poorest quintile only gains 0.9 percent, with the larger gains (1.7 to 1.8 percent) accruing to the three middle quintiles. Poor urban consumers are the group whose estimated welfare loss is greatest in Vietnam (1.6 percent).

In Central America, Guatemala presents particularly bleak prospects for urban and rural households alike following a simulated 10 percent increase in the price of maize, wheat and beans, the basic ingredients in the diet of most households. Rural households will, according to these simulations, lose 1.4 percent on average, while urban households will lose about 1 percent. Once again the poorest lose the most: 1.8 percent in rural and 1.5 percent in urban areas. Nicaragua displays a very similar pattern.

Finally, the composition of diets can have implications for the magnitude and distribution of rising staple food prices. Households in countries where the diet is largely composed of non-tradable food staples tend to be less affected, to the extent that the prices of non-tradables do not trail the prices of tradables. For example, in our simulations Ghanaian households appear to be relatively insulated from swings in international food markets, because a large share of their diet is based on non-tradable staples such as cassava and sorghum. Should the price of these non-tradables also increase, as demand for them increases, rising food prices would have a much sharper impact.

The fact that the poor are hit the hardest by rising food prices in both urban and rural areas is clearly a cause for concern. The erosion of real income in poor households not only harms their current ability to cover basic needs but has the potential to do so for some time to come, thus diminishing their prospects of escaping poverty. Poor households may be forced to cope with the added stress of high food prices by depleting their asset base, reducing the number or variety of meals they consume, or reducing spending on essential non food expenditures, such as health and education.

8.2 Towards a household profile of changes in welfare

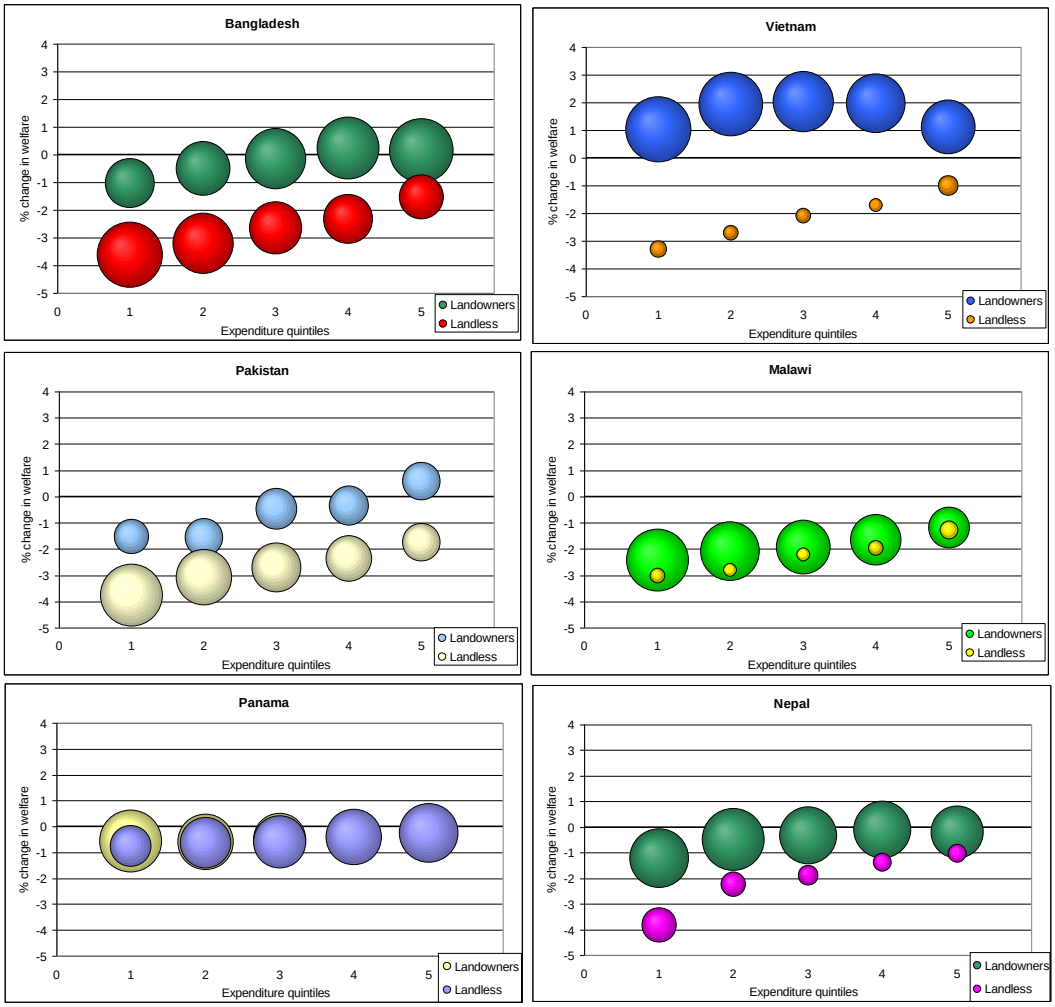
As the above analysis suggests, it is extremely important to unpack the average impact estimates in order to understand how specific population subgroups stand to be affected, depending on household characteristics, their access to key assets and livelihood strategies. In particular, we focus on access to land, use of agricultural inputs, livelihood strategies and gender.

The outlook is systematically worse for the poor landless, as can be seen in Figure 12, which graphs the estimated welfare change separately for the rural landless and landowners, by expenditure quintiles. To give an idea of the relative importance of each group in each country, the size of the bubbles in the graphs is proportional to the share of rural population in each subgroup.

With the exception of Panama, the losses are consistently larger for the landless than for landowners. Taking again the example of Bangladesh, the welfare losses for the landless are as high as 3.6 percent in the bottom quintile, and 3.2 percent in the second last. Even in rural Vietnam, where gains are estimated to accrue to a large share of the rural population, the one group that is expected to lose according to our estimates are the landless, whose average loss is estimated at 1.7 percent, with a peak of 3.3 percent in the bottom fifth of the expenditure distribution.

The comparison of Vietnam and Bangladesh is particularly telling. In both countries, rice is the main food staple and also the main food crop grown by small farmers. Vietnam has a fairly egalitarian distribution of land, with most farmers participating in the production and sale of rice. With impressive gains in smallholder productivity over the past couple of decades, Vietnam has become one of the world's leading exporters of rice. By contrast, most farmers in Bangladesh have limited access to land, often only through tenure arrangements such as sharecropping. Given the different land tenure arrangements, and in the importance of staple food production in household income (highlighted in Figure 2), high rice prices have a substantially different impact on rural welfare in the two countries. In Vietnam, even poor rural households gain from rising prices. In Bangladesh, the impact is negative and large across different income groups, and is particularly high for the poorest households.

Figure 12. Median welfare effects for landowners and landless households by expenditure quintiles (rural sample only; selected countries)



The fact that a household is engaged in farming does not, by itself, say much about the extent of the losses a rural household might face. We split the sample of rural households for which our welfare change variable is negative in two groups, the moderate losers and the extreme losers. These are defined respectively as households with a net loss lower in absolute value than the median among the losers, and households with a net loss higher than the median. As can be seen in Figure 13, in several of the countries households engaged in farming are more represented among the extreme than the moderate losers. However, factors related to the household's capacity to engage successfully in farming through access to agricultural specific inputs (such as land and the use of fertilizers and pesticides) are, on the contrary, markedly and consistently related to being in a condition to limit the losses from an adverse price shock. Households suffering extreme losses have, on average, lower landholdings and less use of fertilizers and pesticides, in almost all countries.

The amount of land available is also important, as shown in Figure 14. Here we graph the estimated welfare change from the staple food price increase over land ownership percentiles (for landowners only). We display the results for countries with three very different patterns of the welfare change variable: Vietnam, in which most landowners gain; Pakistan in which the shares of winners and losers are fairly equally distributed; and Malawi in which most households lose. In all cases there is a very clear positive and direct

relationship between the amount of land to which households have access and the magnitude of their gain or loss from increased food prices.

Figure 13. Characteristics of agriculture activity, by whether household suffers moderate or severe losses from price hikes

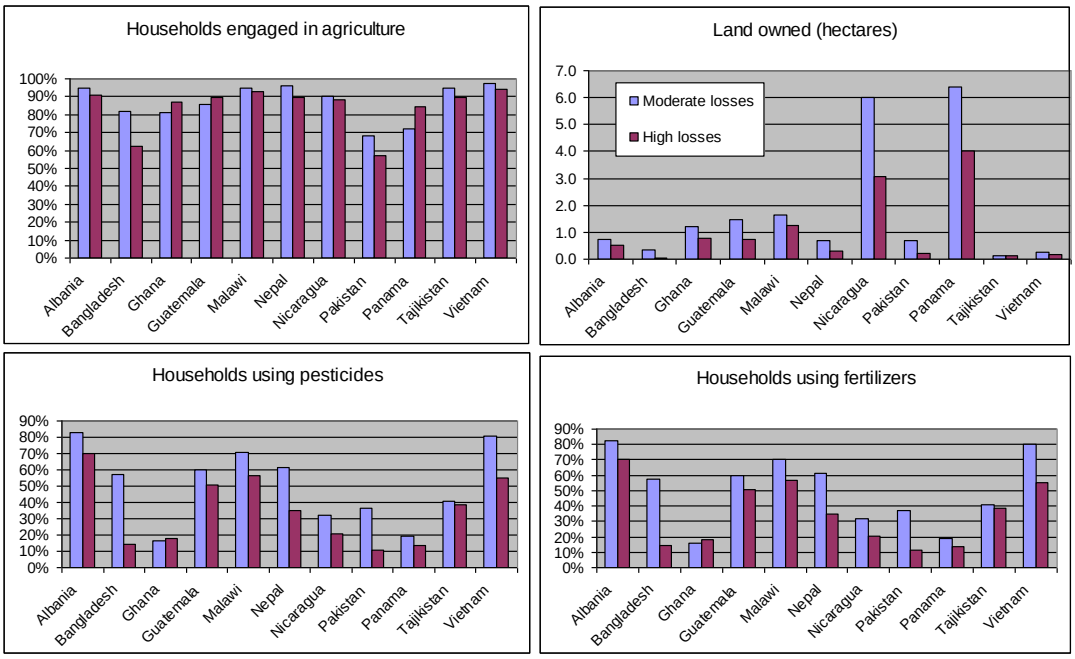
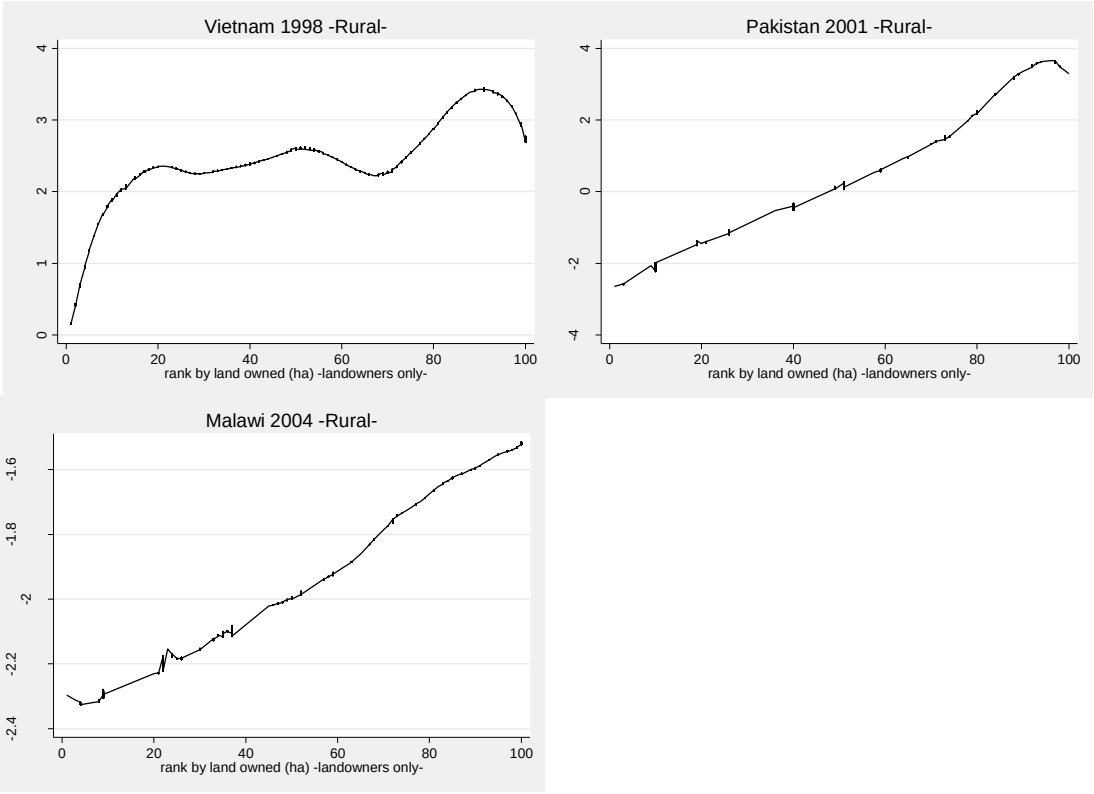
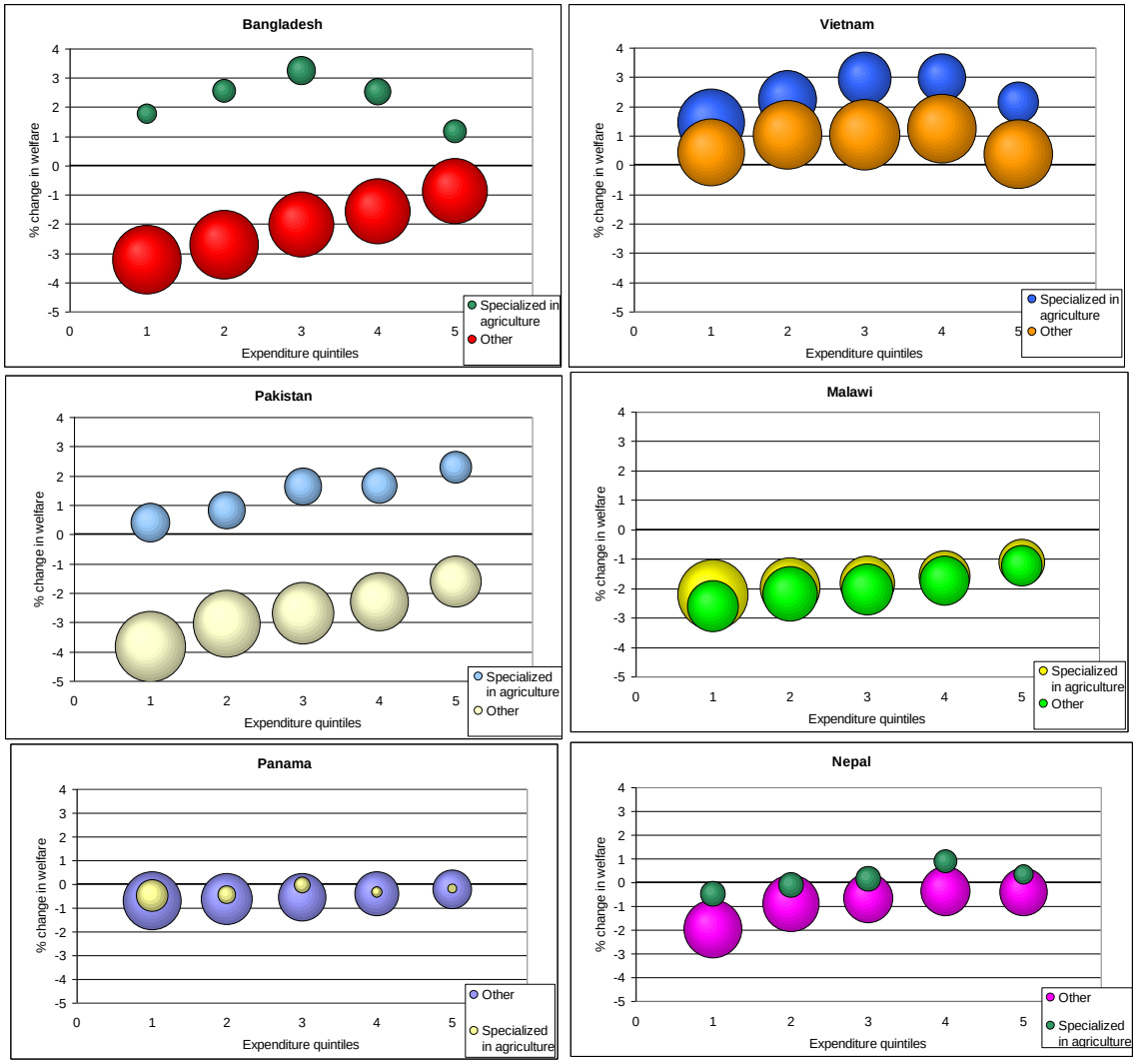


Figure 14. Median welfare change by land ownership percentile: Vietnam, Pakistan and Malawi



Focusing on household livelihood strategies permits identification of those agricultural producers that are most likely to benefit from the price hikes. Households that specialize in agriculture, which we define as those that derive more than 75 percent of their income from farming, stand to gain the most. In Bangladesh, Pakistan, Nepal, and Vietnam, agricultural 'specializers' gain substantially from higher food prices, with benefits accruing even to some of the poor households (Figure 15). Somewhat surprisingly, wealthier households specializing in agriculture may not always gain the most from staple food price increases, as they may be producing other commodities, the prices of which may not be necessarily increasing, such as high value crops, or livestock.

Figure 15. Median welfare effects by livelihood typology and expenditure quintiles (rural sample only; selected countries)



In Bangladesh these households, which form about one tenth of the rural sample, see their welfare improving by 2.4 percent on average (1.8 percent in the bottom quintile, 3.2 in the middle, 1.2 in the top one). In Vietnam as well the middle-income agricultural 'specializers' gain the most, at around 3 percent. But in the latter case this group represents a substantially larger share of the rural population, likely due to the more equal distribution of land.

8.3 Multivariate analysis

To test the robustness of these descriptive results to the simultaneous introduction of additional control variables, we run a regression of the simulated percentage welfare change on a number of household demographic, asset and socio-economic characteristics. As noted by Chen and Ravallion (2004), who apply a similar model to their estimates of welfare change in China following WTO accession, these coefficients are not straightforward to interpret as they subsume effects on both production and consumption decisions.

We use these regressions mainly to isolate the correlates of the simulated welfare impacts. In our case, the interpretation is somewhat less complicated than in Chen and Ravallion as our simulations rely on a more limited set of price changes[10]. Since our aim in this paper is to ensure comparability in the cross-country analysis we have estimated the model, using OLS, on the same set of regressors for all the countries included in the analysis. Each country regression was run independently of each other, so we have a total of eleven country regressions, specified as follows:

$$w_i = \alpha + \beta X_i + \varepsilon_i \qquad (3)$$

where w_i is the estimated change in welfare expressed as a percentage of initial per capita consumption expenditure of household i, X_i is a vector of household characteristics (as detailed in the next few paragraphs) and ε is an independently and identically distributed error term.

The first set of variables used in the analysis – schooling, age, employment and marital status of the household head, family size and the share of household individuals of non-working age, the gender of the household head, the share of female working age adults – represent the human capital, own-labor assets and demographic composition of the household. In addition, we include a variable on one particular aspect of access to social capital: whether the household head belongs to the country's main religious group[11]. It is difficult to sign a priori most of these variables as they can in principle have different effects on household's staple production and consumption.

The next set of variables measures household access to natural and physical capital, as well as household wealth. Natural capital is measured by hectares of land owned, and quality is approximated by the share of owned land that is irrigated[12]. For both agricultural productive assets and household non-productive assets, constructing comparable measures is challenging given the range of assets used for production or held as stores of wealth across the countries being analyzed. In both cases, we created indices of wealth that would facilitate comparison across countries.

Following Filmer and Pritchett (2001), a principal components approach is used in which indices are based on a range of assets owned by households. The choice of assets depended on the country under study but included agriculture-specific assets (such as tractors, threshers, harvesters) for agricultural wealth and household durables (e.g. TV, VCR, stove, refrigerator) for non-agricultural wealth. By construction, the mean of these indices is zero. A measure of household livestock assets expressed in Tropical Livestock Units (TLUs) is also

[10] Chen and Ravallion (2004) simulate the impact of a full set of predicted price changes estimated using a GTAP model.

[11] In Guatemala a variable identifying whether the household head belongs to an indigenous group is used instead.

[12] This variable is not available for two countries, Bangladesh and Panama.

included, as well as two dummy variables indicating whether the household used any fertilizer or pesticides during the year preceding the survey.

We expect agricultural assets to be positively related to changes in welfare as they are likely to be correlated with the ability to produce a surplus in staples. As it has descriptively been shown earlier, however, the relationship may not be linear in the case of land, as larger landowners may diversify away from staple food crops. We therefore include a squared term for land owned in our regressions. We also expect the use of inputs like fertilizers and pesticides to be a good predictor of surplus production, as they have been shown elsewhere to be consistently positively correlated to successful performance in agricultural output markets (Rios et al., 2008b; Zezza et al., 2008a).

Finally, the set of regressors includes a measure of access to infrastructure and markets, created in a manner similar to the wealth indices, including both public goods (electricity, telephone, etc.) and distance to infrastructure (schools, health centers, towns, etc.). As with the other indices, the variables included in the index vary somewhat by country. Country specific geographic dummies are also included in each regression.

Table 8. Statistically significant coefficients for rural and urban OLS models. Dependent variable: percentage change in welfare

Variable	Rural Positive/Negative	Urban Positive/Negative	Total # of countries
HH size	0 / 10	0 / 9	11
Share of hh dependents	3 / 0	0 / 0	11
Share of females in hh labor	0 / 3	0 / 3	11
Female headed hh	0 / 5	1 / 3	11
Hh is single	1 / 1	2 / 0	11
Age of hh head	1 / 2	0 / 4	11
Age of hh head squared	1 / 1	2 / 0	11
Hh head wage labourer	0 / 7	1 / 4	10
Average hh education	4 / 1	7 / 0	11
Average hh education squared	2 / 2	0 / 4	11
Religion	2 / 0	0 / 0	9
Infrastructure index	4 / 0	8 / 1	11
Wealth index	4 / 1	11 / 0	11
Land owned	10 / 0	3 / 0	11
Land owned (squared)	0 / 9	0 / 3	11
Share of irrigated land	1 / 1	1 / 0	9
Livestock (TLU)	5 / 3	4 / 0	10
Agricultural wealth index	5 / 1		11
Fertilizers	9 / 0	7 / 0	11
Pesticides	7 / 0	6 / 0	10

Note: The dependent variable is the estimated percentage welfare change following a 10 percent increase in the price of the main tradable staples. The total number of cases refers to the country regression for which the specific dependent variable was included (variables were not included only when not available in the dataset).

We run the model separately for the rural and urban samples in each country. Given the large number of regressions, reporting the full set of results would be cumbersome. We therefore present in Table 8 a summary of the cases in which the coefficients for the key variables were significant at the 90 percent level in the country regressions[13]. In rural areas the first result that emerges is the consistency with which the agriculture-specific assets and inputs are a key element in drawing a profile of the households that are likely to gain from the

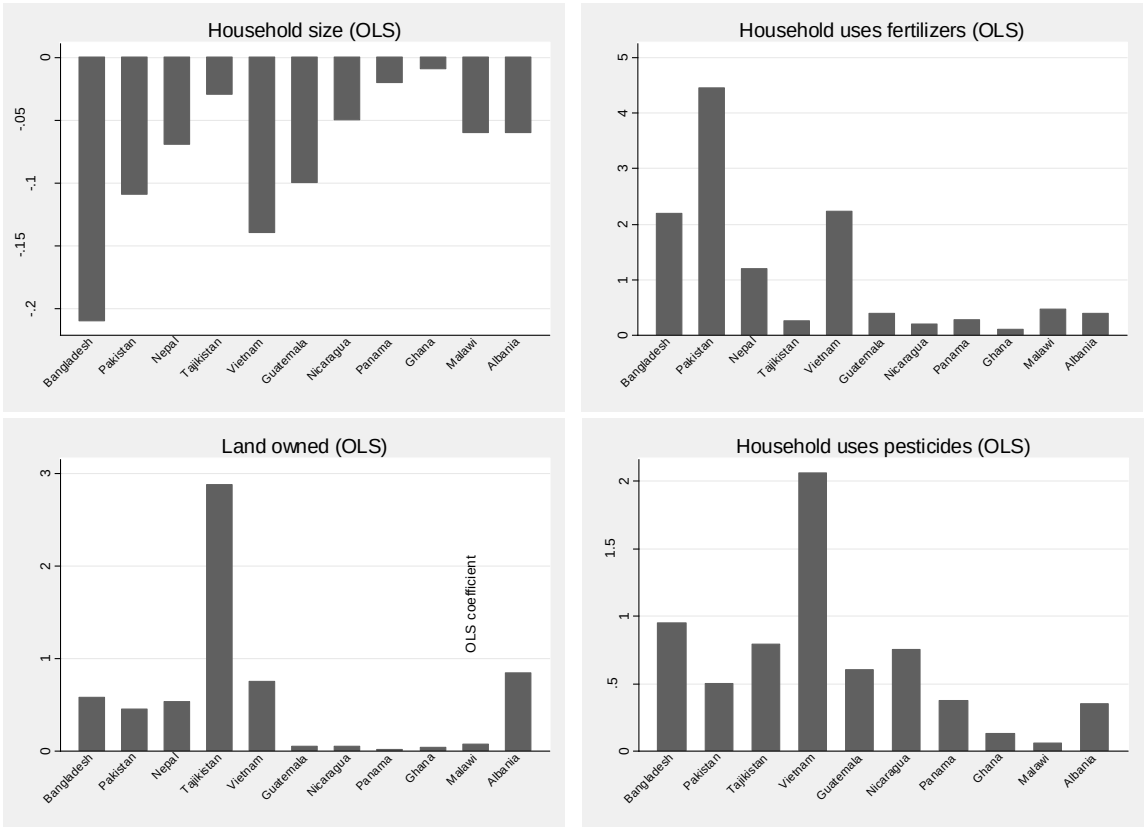
[13] Full regression results are available from the authors.

increase in staple food prices. Households with more land and that use fertilizers and pesticides are in fact more favorably affected by an upward movement in prices. The sign on the land coefficient is positive and significant in 10 out of 11 cases and those on the use of fertilizers and pesticides in 9 out of 11 and 7 out of 10 respectively. This is confirmed visually in Figure 16 which graphs the magnitude of the coefficients of those variables.

For livestock the results are more mixed, as the coefficient is in fact negative in the three models of the Central American countries. This is likely due to the fact that in these countries households with large numbers of livestock are in fact specialized in relatively large scale meat and dairy production and purchase most of the food staples for their consumption.

Demographic characteristics are also important, with larger households consistently losing more from the price increase than smaller households (Figure 16). Female-headed households are also found to be on the losing side in 5 of 11 country regressions. Households whose head is employed in wage labor are also more likely to lose, as they are less likely to be earning a significant proportion of their livelihood from own production of agriculture.

Figure 16. OLS Coefficients on land and fertilizer variables, rural sample



In urban areas the results are quite different and wealthier households (as measured by the asset index) are consistently less adversely affected by the increases in food prices. This result squares with the analysis by expenditure quintiles discussed earlier, and it is due to the fact that staple food consumption constitutes a relatively less important expenditure item in the budget of richer households. A similar explanation holds for the consistently positive coefficients on education and the infrastructure index.

Interestingly, the use of agricultural inputs turns out to be a significant correlate of more favorable impact of staple food price increases in urban areas as well. In more than half of the country regressions, households that use fertilizers or pesticides, and that are therefore engaged in urban agriculture, manage to at least shield some of the negative impacts of the higher food prices by producing some food staples themselves.

9. Conclusions

This paper set out to characterise the heterogeneity of rural households with respect to their asset position, their access to basic assets and agrarian institutions in a sample of developing and transition countries in four continents. The paper showed how this heterogeneity is closely related to important outcome variables, such as success in farming (as measured by the degree of commercialization) and the way households are impacted by an increase in staple food prices.

From the results of the descriptive analysis in the first part of t the paper, a clear picture emerges of a rural space in which small land and livestock holders lack access to key assets, inputs, markets and basic services—the very instruments that are necessary for rural households engaged in farming to achieve an agricultural-led path out of poverty. The overall results also point to a large degree of heterogeneity both within and across countries in terms of access by rural households to essential assets and services.

Taken together these two conclusions point to the necessity of including such structural features of the rural economy of developing countries into any modelling exercise aimed at gauging the distributional and poverty impacts of agricultural policies on rural households.

Our results complement the findings of two studies which use the same dataset to look at sources of rural income (Davis et al., 2008; Winters et al., 2008). In those studies one main finding was that poorer rural households lack access to those sources of non-farm income which would enable them to escape poverty. In the second part of this paper the focus has been explicitly on assessing the extent to which rural households access to the assets, inputs, services correlates to (a) the ability to engage successfully in agricultural production, and (b) the way households are impacted by higher staple food prices.

We first looked at how market orientation is associated with greater access to agricultural specific inputs and services, after controlling for land ownership and access to non-agricultural wealth. Although it is difficult to make definite causal statements based on this analysis, we do think that our results are indeed suggestive of the fact that limited access to assets, basic agricultural inputs and services is still a major constraining factor undermining the potential of smallholders to successfully engage in agricultural output markets.

We also showed that in order to understand the real impact of the price increase on developing country households, it is essential not to lose sight of the heterogeneity at the household level. Looking into how households differ in term of their asset endowment and livelihood strategy yields important nuances that can be extremely useful for designing better informed policy responses.

One obvious avenue for future work is to utilize the wealth of information contained in the RIGA dataset (of which this paper presented just one part) to inform more sophisticated modeling exercises of the type outlined in Brooks et al. (2008), which have the potential to be much more informative than the simple bivariate and multivariate correlations presented in this paper.

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