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Influencing GVCs through Agro-Food Policy and Reform

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INFLUENCING GVCS THROUGH AGRO-FOOD POLICY AND REFORM

Jared Greenville, Kentaro Kawasaki,
Dorothee Flaig and Caitlyn Carrico (OECD)

Global value chains (GVCs) in agriculture and food sectors contribute to sector growth and development. However, agricultural trade is subject to significant distortions that limit trade which in turn impacts on its competitiveness world-wide. Using the OECD Metro model, this study analyses the impact of trade and domestic support policies on participation in agro-food GVCs and the benefits that flow from them. The results show that current market access barriers and distorting forms of domestic support have a negative effect not only on welfare, but also on the possible benefits from participation in agro-food GVCs. If barriers, i.e. tariffs and quotas, were removed this would offer the potential to increase welfare, increase exports of agro-food domestic value added from all countries, and promote trade by furthering GVC links through value added. This study also shows that regional trade agreements have the potential to deepen GVC linkages amongst members.

Key words: Global value chains, CGE modelling, agriculture, agricultural trade, regional trade agreements

JEL codes: Q17, F60, F14

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Executive summary

Global value chains (GVCs) are increasingly influencing agro-food trade. Past work has found that participation in GVCs is an important factor in growing total sector and growth of domestic value added. It is thus important to understand the policy impacts that help drive participation in GVCs and how these may influence the gains that may be created. Furthermore, while several studies have explored the effect of agricultural policies on production and welfare, this study explores the more complex impacts these policies have on GVCs and how countries link to GVCs through other domestic sectors.

This study extends past work by exploring the effects of current policies on GVC participation in a general equilibrium setting. It uses the OECD METRO model to explore a range of scenarios where current policies are removed. These "what if" trade and agricultural support scenarios provide new insights into the impact of policies on individual country and sector GVC participation and domestic value added creation. The results point to the negative effect that current market access barriers and distorting forms of domestic support have on welfare and the possible benefits from participation in agro-food GVCs. Removing these barriers has the potential to increase welfare, increase exports of agro-food domestic value added from all countries, promoting trade by furthering GVC links through value added. Market access barriers, through tariffs and quotas, dominate the effects on markets and trade from the full range of trade and domestic support. Globally, the gains from market access reforms are close to double those from reduction in distorting forms of domestic support. This results reflects that market access restrictions remain the main source of protection conferred to agricultural sectors worldwide.

When it comes to trade within GVCs, the results point to the significant effect that a country's own market access barriers have on its domestic value added creation. The use of foreign factors to help underpin trade and competitiveness mean that import tariffs act as a tax on its exports. For all countries, and all commodities, removing existing tariffs would grow the value of domestic value added created through trade.

This study finds that policies change the location of production around the globe without having much effect on overall production. In this way, these policies also alter the ways in which countries participate in GVCs. For *agricultural sectors* overall, current policies generally increase the average backward participation because they shift production through the trade barriers imposed away from larger producers who have larger backward participation. But policies can limit access to foreign markets, reducing forward participation for agricultural sectors. For *food*, current policies limit access to foreign inputs as they create a bias toward the use of domestic inputs, lowering backward participation. Limits are placed on food sector access to foreign final demand as tariffs are generally higher on more processed products. The results on the forward and backward indicators underscore the difficulties to interprete changes in participation indicators in isolation. Both increases and decreases in the estimated values are associated with lower returns from GVC participation and lower overall welfare (measured as final consumption), suggesting that these metrics need to be interpreted in a wider context when formulating policy advice on GVCs.

Market access barriers and distortive domestic support change the returns to labour in the agriculture and food sectors. The interplay in effect between changes in intermediate input costs and fixed asset prices mean that the relative returns from trade are altered when policies are reformed. The results from the model indicate removing trade barriers and distorting forms of domestic support has the largest impact on labour compared to other to labour and as such, with their removal, the share of labour in a growing total value of trade increases. These changes are also accompanied by a growth in agriculture's share of agro-food export values. In this way, improving access to foreign inputs and improving access to foreign consumers increases producer returns. Much of the growth in agro-food sector value added returns and the increasing share of export value for agriculture comes from decreases in the services value in agro-food exports. These results are largely driven by relative changes in the source of agro-food trade, with the greatest increases in participation by middle and low income countries that have more labour-intensive production. Nevertheless, the results suggest that the removal of distortions in international agro-food markets enhances the employment effects of agro-food GVCs either through higher wages or greater levels of employment in the sector.

The impact of regional integration – modelled as regional agreements (RTAs) – shows how policies can influence the location and extent of agro-food GVC linkages.

For members to an RTA, reducing tariff and non-tariff barriers has the potential to lead to greater integration of regional food systems. Indeed, the agreement is seen to lead to greater sector linkages with an increase in the GVC participation – both forward and backward – for most sectors. With differences in levels of applied tariffs, and greater opportunities for trade, regional integration by agricultural sectors is promoted to a greater extent through food sectors. The majority of increased agricultural trade in value added under the RTA occurs via indirect linkages through other domestic sectors to GVCs. Thus agro-food sectors are heavily reliant on other domestic sector linkages to GVCs as the pathway for their overall growth.

The agreements increase the amount of foreign value added of any given member's final demand. This is due to an increase in value added traded in GVCs within the membership group and is offset in part by decreases in value added that are sourced from outside the region – the trade diversion effect. However, while decreases do occur in non-member value added in RTA member final demand, this is partially offset by an increase in the flow of non-member value added that flow into the RTA group via other countries, as opposed to direct trade between member and non-member countries. As such, exploring only the bilateral effects may overstate the trade diversionary effects of RTAs. That said, for agro-food products the changes in flows via other countries are small.

Increased integration in global food systems promotes growth in re-imports of own domestic value added. For agro-food products these effects are small overall in total value; however, the creation of an RTA does cause an increase in the level of imports of own domestic value added. Much of the increase is from RTA members – showing how fostering a more competitive agro-food system regionally (or internationally) can promote own consumption of domestic value added.

1. Introduction

Agro-food global value chains (GVCs) appear to have a different structure compared with GVCs for industrial goods, particularly in that the former have a much higher proportion of intermediates bound for foreign processing before being consumed by final demand (the final consumer) (Greenville, Kawasaki and Beaujeu, 2017a; Greenville, Kawasaki and Jouanjean, 2018).[1] Past work has explored the policy influences on agro-food GVC participation and found that a country's trade and domestic agricultural policy settings can be an important influence on participation and the benefits obtained (Greenville, Kawasaki and Beaujeu, 2017a). Trade and domestic agricultural policies have the potential to have global effects on the distribution of agricultural activity and trade (OECD, 2016), but for individual countries, the impact will depend on their actions, those of other countries, and, importantly, on domestic factor markets.

Past work took an econometric approach using cross-sectional or time series data to draw out evidence of the impacts of different types of policies on GVC participation and benefits. This study takes a new approach to explore the effects of current policies on GVC participation using a general equilibrium modelling approach. Drawing on previous OECD work to estimate trade in value added for 22 agro-food sectors using the GTAP database (Greenville, Kawasaki and Beaujeu, 2017b), this study applies the OECD METRO model to explore a series of "what-if" policy questions to draw out specific policy effects on agro-food GVCs.[2] In particular, it explores various trade and agricultural support scenarios and their impact on GVC participation and domestic value added creation. By specifically taking into consideration the constraints on inputs and resources, and the effects of policies on global production mix and location, two questions are explored:

- What are the impacts of trade and agricultural support policies on GVC participation?
- What are the impacts of trade and agricultural support policies on the benefits obtained from GVC participation, measured through the lens of domestic value added creation?

The effects of regional trade agreements on the flow of value added in agro-food GVCs are also explored by looking at the creation of a hypothetical agreement centred around countries in Asia-Pacific. It explores the impacts of preferential market access and reductions in illustrative non-tariff measure-related trade costs between agreement participants.

The analysis presented makes use of the OECD METRO model (Box 1). METRO's database is the basis for the creation of the trade in value added data required to estimate indicators of GVC participation. Post-policy-change scenario simulation estimates of trade in value added are compared with those initially estimated from the database to test the effects of policy changes on agro-food GVCs. The base year for the analysis is 2011,

[1] The concept of an agro-food GVC used here is that trade occurs within global agriculture and food value chains. This occurs when the production of exports relies on foreign-sourced inputs (that is, the production system "buys" from GVCs) and/or exports are sold as intermediates either into ongoing production systems that mean the goods are re-exported, or ones where the good is processed before being delivered to final demand in a foreign market.

[2] In this study, agricultural products are those produced by GTAP sectors 1 to 14, and food products are those produced by sectors 19-26. Sector lists and definitions are provided in Annex A.

derived from GTAP database version 9.2. The approach requires estimating new inter-country input-output tables (ICIOs) after each scenario, and constructing an updated database of trade in value added following the approach set out in Greenville, Kawasaki and Beaujeu (2017b). This feature has been 'built into' the METRO model as part of the modelling work completed for this study and is documented in Flaig, Kawasaki and Greenville (2018). The METRO model is particularly apt for this type of analysis as it has a robust accounting of the trade structure of GVCs.

Box 1. The OECD METRO model

In 2015, the OECD launched a new global computable general equilibrium (CGE) trade model, known as METRO (ModElling TRade at the OECD) (OECD, 2015b). CGE models are computer simulation models that use data to explore the economic impact of changes in policy, technology and other factors. They show how different sectors inside one economy are linked and how multiple economies are connected to each other, and how resources such as labour, capital and natural resources are best allocated across all economic activities. The METRO model builds on the GLOBE model developed by Scott McDonald and Karen Thierfelder (2013).

The METRO database currently covers 61 economies across 57 economic sectors. It is based on the GTAP (Global Trade Analysis Project) database, and uniquely incorporates recent OECD statistical developments. METRO allows users to analyse global value chains (GVCs) by drawing on the OECD-WTO Trade in Value Added (TiVA) database, providing a platform to more fully integrate structural policy issues in the analysis of trade policy. METRO also features an extensive library of trade-related policies, including current border tariff rates and export restrictions, as well as domestic taxes and support. Using METRO, it is now possible to track trade flows by their use (that is, intermediate, household, government and investment) in addition to bilateral links between source and destination markets. This will greatly enhance the ability to model movements of goods and services, especially along global value chains

The remainder of this paper is structured as follows. In the following sub-section, the methods used to measure GVC participation are briefly set out. In Section 2, past findings of policy influences on agro-food GVC participation are summarised. Section 3 presents recent developments in agro-food trade and support policies to provide context for the scenarios explored. Section 4 sets out the scenarios for assessing the impacts of current policies on agro-food GVCs, with results presented in Section 5. The effects of a regional trade agreement which reduces tariffs and trade costs associated with non-tariff barriers is presented in Section 6. Conclusions and policy implications are discussed in Section 7.

Measuring trade within GVCs and GVC participation

Trade values are composed of a range of inputs. The value of a given product represents the combination of a number of inputs, some of which would have been sourced locally (such as labour, capital and local products) and some that would have been imported (such as intermediate inputs and their embodied labour and capital). Understanding GVCs requires unpacking these various elements so that for any given product traded, the amount of transformation that has occurred locally can be identified. That is, the approach allows the trade in value added to be estimated.

The difference between conventional trade flows and trade in value added is shown in Figure 1. In this simple example, Country A exports $100 worth of goods, produced entirely domestically, to Country B. Country B then further processes these goods before exporting them to Country C where they are consumed. In doing so, Country B adds value of $10 to the goods and so exports $110 worth of goods to Country C. Conventional

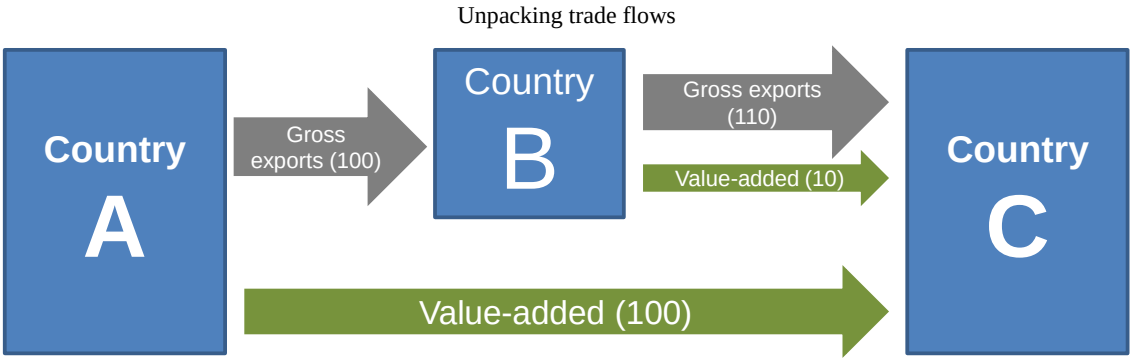
measures of trade show total global exports and imports of $210 but only $110 of value-added has been generated in their production. Conventional measures also show that Country C has a trade deficit of $110 with Country B, and no trade at all with Country A, despite the fact that Country A is the chief beneficiary of Country C's consumption.

Through tracking value added flows instead of absolute flows, it is possible to decompose trade into its value added components. In the example in Figure 1, Country C's trade deficit with Country B can be recalculated on the basis of the value-added it "purchases" from Country B by its final demand. Recalculating in this way reduces C's deficit with Country B to $10. This now means that Country C has a deficit of $100 with Country A. As such, Country C's overall trade deficit with the world remains at $110 but its composition changes.

Once estimates of trade in value added are known, information on how a country participates in a value chain can be estimated. The example above shows that Country B relies heavily on Country A for its exports as the source of most of its inputs. This reveals the GVC and shows there are two parts from any given country's perspective:

- a *forward* looking part that shows the extent to which a country's exports form part of a production process in another country, contributing to that other country's exports
- a *backward* looking part that shows the extent to which imports from other countries are used in the production of a country's exports.

Figure 1. Measuring trade in value added



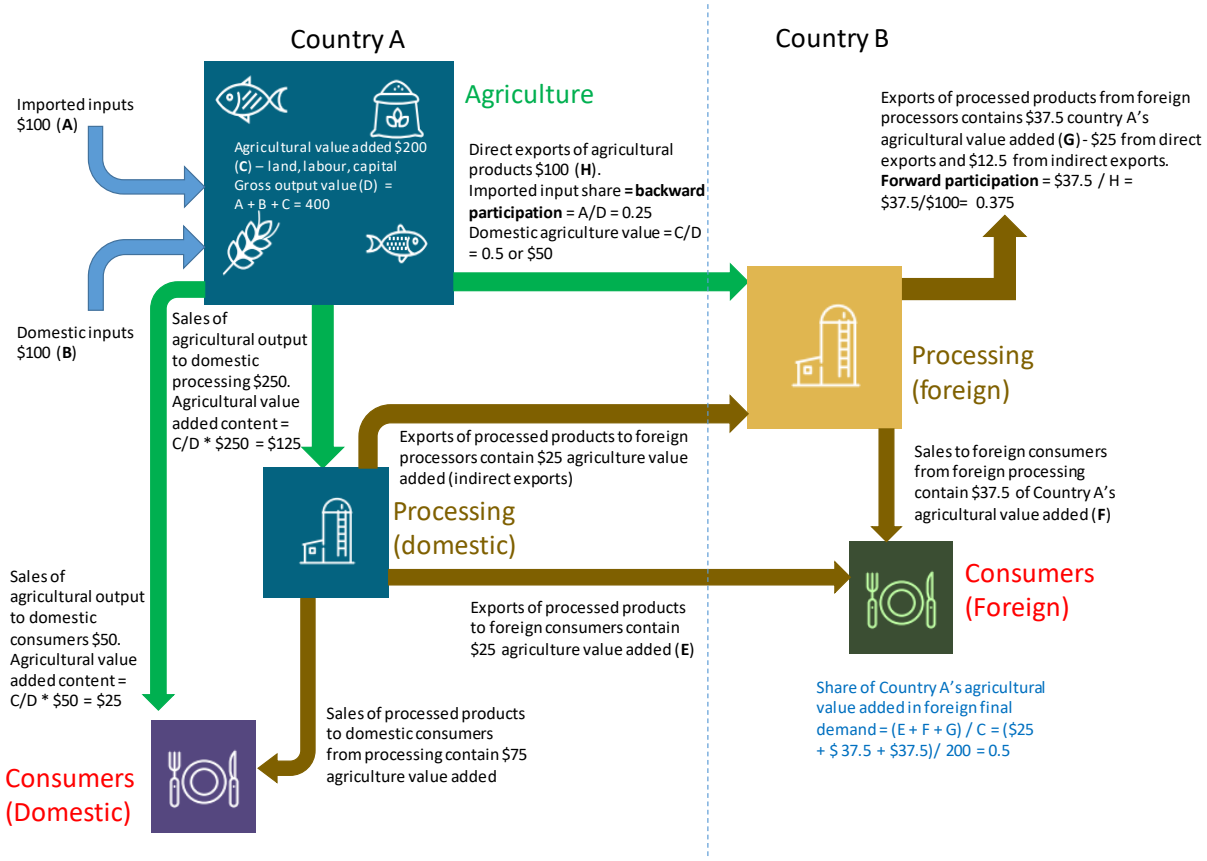
Source: OECD (2013a).

To date, different approaches have been used to characterise the forward and backward participation of a country in GVCs. The most commonly applied approach is to calculate an indicator of "vertical specialisation". This indicator was first described by Hummels et al. (2001) and later refined by Koopman et al. (2011). This approach defines value chain participation in terms of the origin of the value added embodied in exports both looking backward and forward from a reference country: backward when it comes to foreign value added embodied in exports; and forward when relates to domestic value added used as inputs to produce exports in the destination country. Such indicators have been calculated by using harmonised systems of inter-country input-output tables (ICIOs) (as in Timmer et al. 2012; OECD 2013a; OECD 2013b; and UNCTAD 2013). The OECD TiVA database released in 2013 and updated in 2015 is based on this approach and provides, amongst other indicators, a decomposition of gross trade flows into various types of foreign and domestic value added. These indicators, however, have limitations. They represent average results

for industries with often very heterogeneous firm structures (or farm types) with some firms solely serving domestic markets and others specialising in exports.

Figure 2. Concepts of GVC participation

Backward, forward and other key concepts



Broadly, the backward participation index is measured as the share of foreign value added that is included in the total export value of a country. The forward GVC participation index is measured as the share of a country's value added arising from its own exports included in exports of other countries.[3] These concepts are depicted in Figure 2 and as shown the different indexes measure very different forms of engagement. For example, a country that is predominantly assembling products into final goods and subsequently exporting these will have a strong backward participation index but a small forward participation measure. Conversely, a country which predominantly supplies intermediates to an assembler will have a strong forward participation indicator but a small backward participation measure. These participation measures therefore give us a metric of engagement in the form of

[3] The calculation of value added exported for a sector includes both that embodied in direct exports and that which is captured in the export of other using domestic industries. For example, if the paddy rice industry exports directly into a production process in another country that exports to a third country, but also the processed rice industry exports rice that it sources domestically to that same foreign processing industry, the value added attributed to the domestically sourced paddy rice within processed rice exports is included in determining the forward participation of the paddy rice industry.

buying from (backward participation) and selling into (forward participation) GVCs – in other words, the demand and supply sides of the value chain activity. Differences across countries in forward and backward participation can then be analysed to explore the structural and policy determinants that underpin engagement in GVCs.

For agro-food sectors, the nature of GVCs are often different to other production activities with a much higher share of trade flowing from one country's agricultural sector, into foreign processing and then to final demand in that country. As such, it is also important to analysis agro-food GVCs from the perspective of the amount of domestic value added that end in foreign final demand.

2. What policy factors influence agro-food GVC participation and domestic value added creation

Past work on agro-food GVCs has identified a number of policy influences on GVC participation and domestic value added generation. In particular, less distorting trade policies have been associated with greater GVC participation and higher domestic returns from participation (Figure 3) (Greenville, Kawasaki and Beaujeu, 2017a). Tariffs on imports and those faced on exports reduce participation in GVCs. Similarly, non-tariff barriers also reduce participation. In particular, tariffs charged on imports and the frequency of non-tariff measures imposed by a country on imports (measured by the number of sanitary and phyto-sanity (SPS) concerns raised) have a negative influence on participation and the total domestic value added gained from exporting agro-food goods (those into GVCs and those which make use of inputs from GVCs).

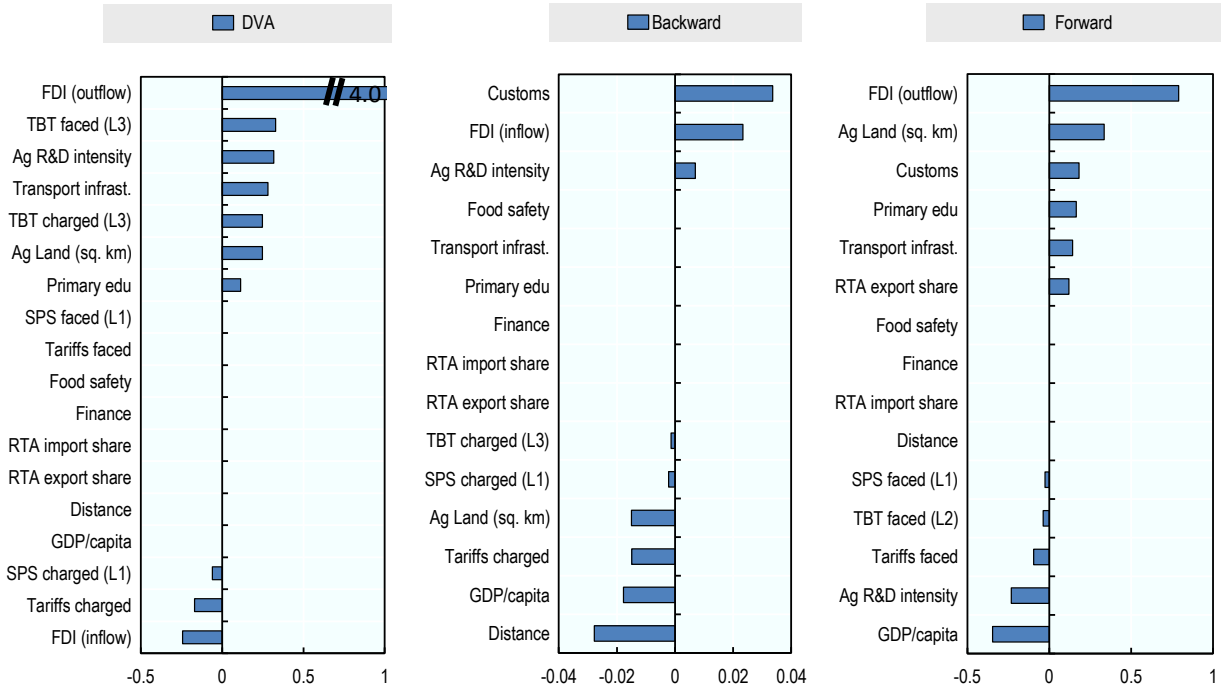
However, not all non-tariff measures are found to have the same effects, pointing to the mix of trade-creating and diverting effects of such policies. Complex domestic arrangements that create problems for international suppliers negatively affect the domestic value added generated from exports (Greenville, Kawasaki and Beaujeu, 2017a). On the other hand, some technical barriers to trade have a positive effect by creating the necessary rules and trust to underpin trade, creating confidence in markets and supply. Overall, less complex and more transparent and science-based arrangements, that avoid concerns being raised by trading partners, can increase the domestic value added generated in exports.

Policies that lead to productivity-enhancing investments in the agro-food sector are also found to contribute to greater levels of GVC participation and domestic returns from that participation (Figure 3). Transport infrastructure, education levels and agricultural R&D are all positively related to participation (backward for agricultural R&D) and domestic value added creation from GVC participation (Greenville, Kawasaki and Beaujeu, 2017a). Beyond these, other factors such as the ability to meet private standards are also important for a subset of countries.

In terms of support, non-distorting agricultural producer support policies are also found to be important for GVC participation and the domestic value added generated (Greenville, Kawasaki and Beaujeu, 2017a). Non-distorting support provided either directly to producers or to the sector as a whole has a positive influence on GVC participation and domestic value added generation. In contrast, the use of distorting support has a negative influence on the benefits from GVC participation, highlighting the potential value added losses from protection policies.

Figure 3. Factors influencing the returns from and participation in agro-food GVCs

Estimated standardised effects across determinants



Note: Standardised coefficients measure the impact of a one standard deviation increase in the variable. DVA is domestic value added.
Source: Greenville, Kawasaki and Beaujeu (2017a).

Other work on agriculture (broadly defined in one composite sector) has shown similar effects. This work shows that the tariffs charged on goods are important not just for domestic value added generation but, more broadly, for the use of all forms of foreign value added in the production of those exports (Lopez-Gonzalez, 2016). That is, it includes the full range of inputs ranging from services to other agricultural products. Thus policies in other areas of the economy also influence the outcomes for the agriculture sector.

3. Changes in agro-food policies affecting GVC participation

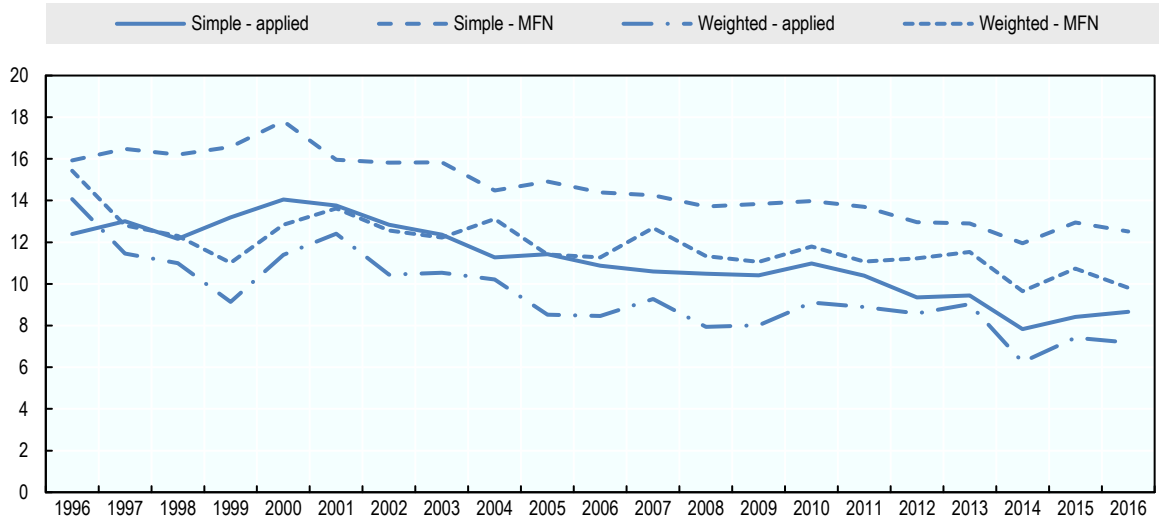
Changes in agro-food tariffs and other trade barriers

There have been notable changes in agro-food trade policies that provide important context for the results from policy scenarios. These relate to the levels and changes seen in trading patterns, as well as changes in tariff and non-tariff measures.

Agro-food markets remain relatively highly protected. Average tariffs on agro-food products are around three times higher than those on other traded goods. That said, there has been a gradual decrease in applied tariff levels (Figure 4). Starting with the implementation of the WTO Agreement on Agriculture (AoA) in 1995-96, and continuing with China's accession in 2001 along with further unilateral and preferential agreement-based changes, agro-food tariffs have continued to fall over time.

Figure 4. Average and applied agro-food tariffs, 1996-2016

% most favoured nation (MFN) and effectively applied (applied)



Source: WITS (2018), https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx.

Despite these falls, tariff and other market access barriers still have a significant impact on markets. OECD (2016) found that these, along with market-distorting domestic support, were negatively affecting trade. The greatest effects were found to be on trade in intermediates for developing countries and it was suggested that these policies are likely to be hampering the development of GVCs among developing countries.

Beyond tariffs and other formal barriers, significant non-tariff measures (NTMs) are applied to agro-food trade (Figure 5).[4] NTMs represent the range of laws, regulations and requirements that influence the flow of goods across borders. They include measures such as sanitary and phyto-sanitary (SPS) requirements, technical barriers to trade (TBT) along with customs procedures (TF) as well as trade requirements such as pre-shipment inspections. Most often NTMs are in place to achieve a number of legitimate regulatory goals, and indeed their effects have been found to be both trade enhancing and trade distorting (for example, see Disdier et al. 2008; Winchester, 2009; and Li and Beghin, 2012).

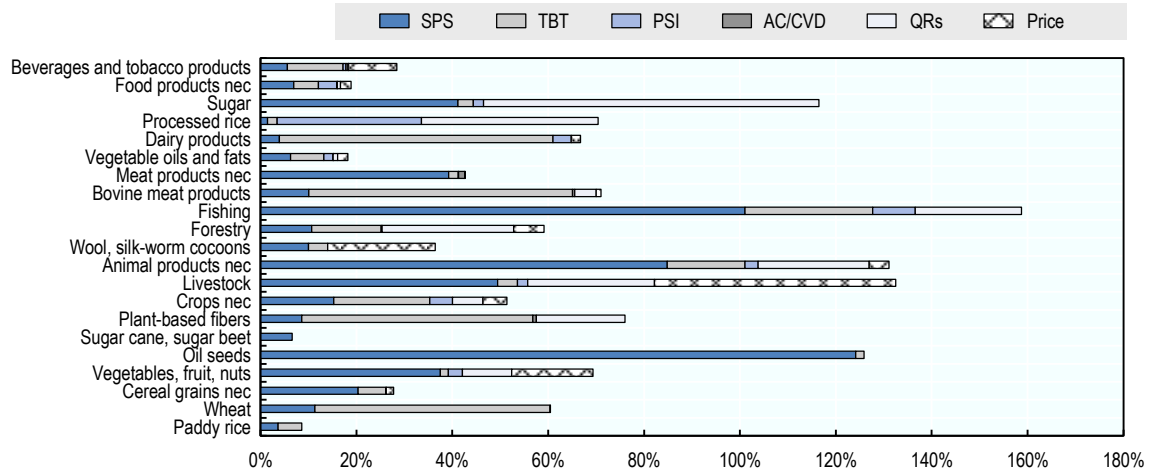
Despite the reasons for NTMs, recent estimates (Cadot, Gourdon and van Tongeren, 2018) suggest that they have significant impacts on agro-food trade. The ad valorem equivalents of NTMs are on average significantly greater than those of tariffs (Figure 5). For most agro-food sectors, SPS and TBT measures have the greatest impact on trade. Further, complaints over NTMs raised as specific trade concerns at the WTO suggest that these measures may be creating additional frictions in world markets over time – the number of new complaints lodged has been rising since 2000 (OECD, 2016). However, unlike tariffs, it is not feasible to think of reducing the observed estimated level to zero as this could actually be welfare decreasing (Cadot, Gourdon and van Tongeren, 2018). Instead, in

[4] *Ad valorem* equivalents represent the tariff rate equivalent of the NTM. That is, its effect on prices of exported goods in the imported market. It is estimated by collecting information on use of NTMs and then econometrically estimating their effect on price-gaps.

reforming non-tariff measures what is important are reductions in unnecessary costs that may arise from poorly designed or implemented measures.

Figure 5. NTMs in agro-food sectors

Ad valorem equivalents %



Note: SPS: sanitary and phyto-sanitary measures; TBT: technical barriers to trade; PSI: pre-shipment inspection; AC/CVD: anti-dumping and counter-vailing duties; QRs: quantitative restrictions; and Price: price controls.
Source: Cadot, Gourdon and van Tongeren (2018).

Changes in support to agriculture

The other notable feature of agro-food markets is the support provided to the agricultural sector. As measured by the OECD's Producer Support Estimate (PSE) – which includes the market price effects from tariffs and so goes beyond domestic support as covered by the WTO AoA –there has been a convergence over time in the level of support provided by OECD countries and several emerging economies (Figure 6).

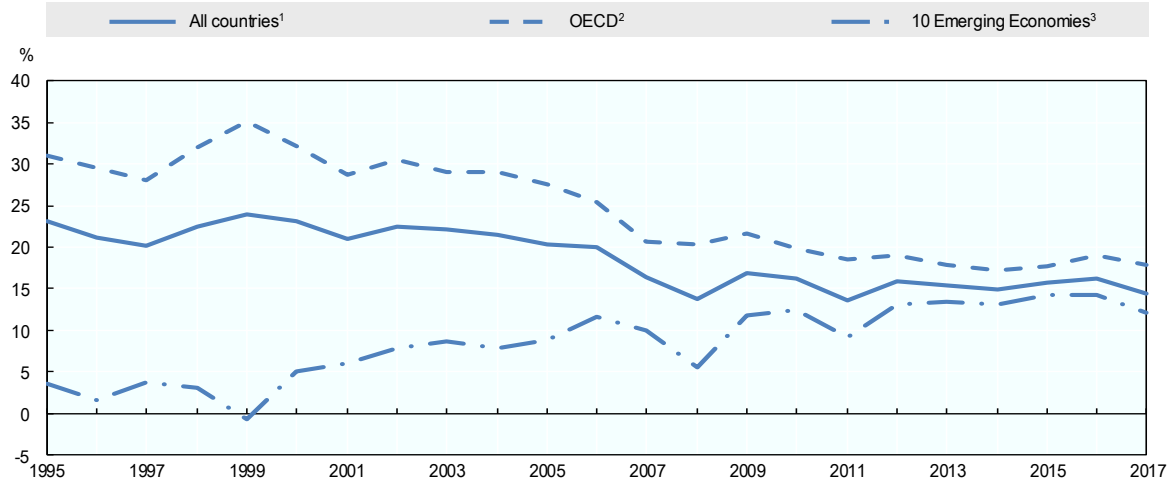
In 2015-17, government support monitored by the OECD provided an average of USD 620 billion per year to support agricultural producers (OECD, 2018). The majority of this support was comprised of market price support – that conferred by market access restrictions or through the use of floor and target prices. Beyond that, support is provided in the form of output and input subsidies, and through direct decoupled payments to producers (collectively with market price support, comprising the PSE). Support can also be provided in the form of general services provided to the sector as a whole (such as research and development). Over 2015-17, an additional USD 136 billion was spent on average on such support by government covered by the OECD's *Agricultural Policy Monitoring and Evaluation* report. The composition of this support varies by country (Figure 7). For some, support is mostly provided in the form of market distorting measures (captured by the PSE[5]), while for others, general support is more important.

[5] There are a range of methods used by governments to support individual producers which are captured in the PSE. These vary from those considered most production and trade distorting (market price support, output subsidies and input subsidies) to those considered less production and trade distorting (payments made on an area basis or historical production).

In 2016, close to 62% of the PSE on average was made up of support targeted to individual commodities. Single commodity support is one of the most production- and trade-distorting forms of support as the measures employed are, by definition, targeted to the production of specific outputs or the use of specific inputs into the targeted sectors. The reasons for targeting specific commodities varies across countries; however, despite the individual nature of support decisions within countries, there appears to be a common set of production activities that attract government support (OECD, 2017b; Greenville, 2017). In 2014-16, rice, cotton and sugar were the most intensively supported sectors (Figure 8). In absolute terms, the size of the sector in conjunction with the intensity of support changes the ranking, with rice, maize, wheat, pig meat, beef and milk attracting the highest levels of support. Support to these commodities accounted for around 59% of total single commodity support between the years 2014-16 and 38% of total producer support measured by the PSE. For some commodities, in contrast, support is negative, e.g. palm oil. This negative support was driven through policies such as export taxes.

Figure 6. Evolution of the Producer Support Estimate, 1995 to 2017

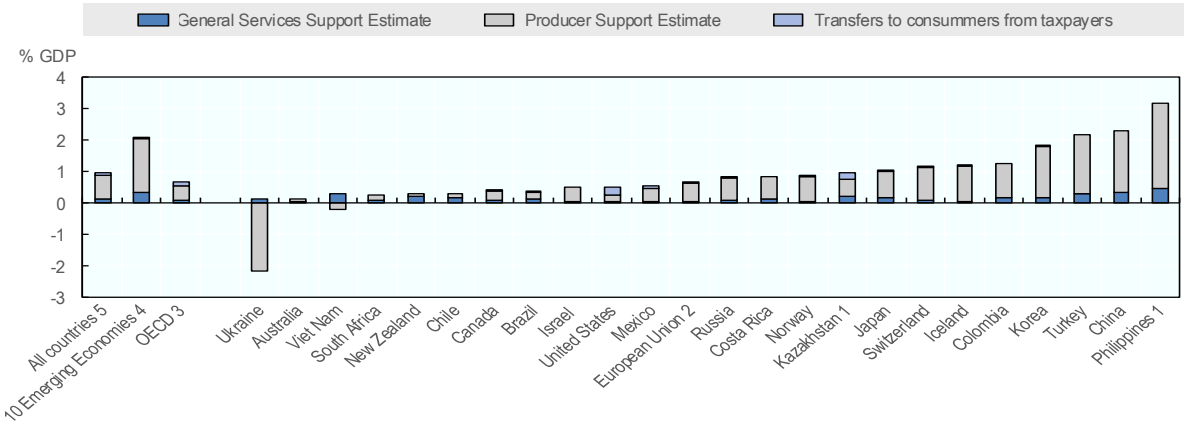
Evolution of the Producer Support Estimate, 1995 to 2017



Note: % PSE: Producer Support Estimate in percentage of gross farm receipts. 1. The All countries total includes all OECD countries, non-OECD EU Member States, and the 10 Emerging Economies. 2. The OECD total does not include the non-OECD EU Member States. Latvia is included only from 2004. 3. The 10 Emerging Economies are Brazil, China, Colombia, Costa Rica, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam. The Philippines and Viet Nam are included from 2000 onwards. Indonesia is not included in this report.
Source: OECD (2018), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

Figure 7. Total support provided to agriculture by country, 2015-17

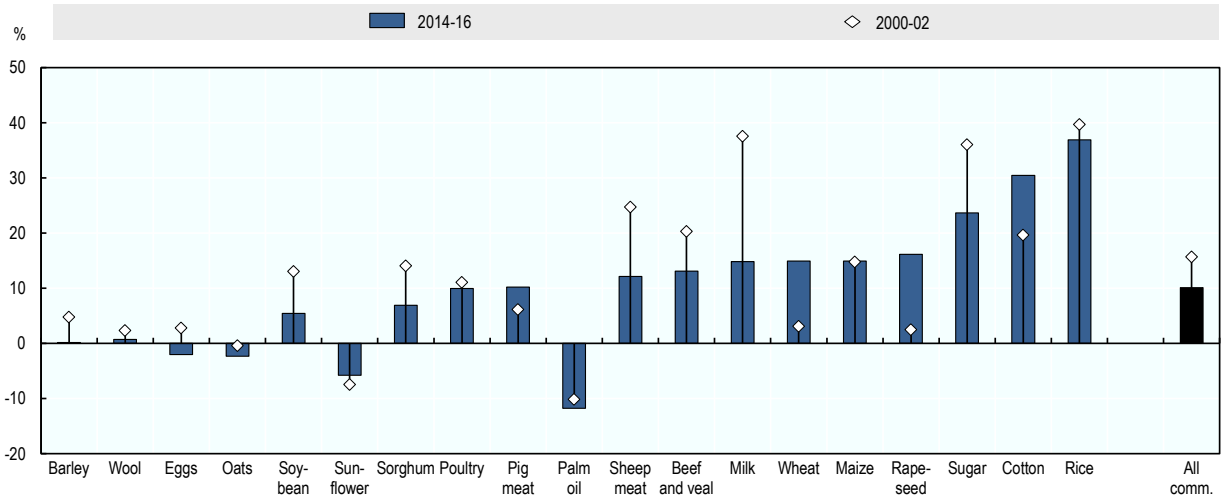
Percentage of GDP



Note: 1. For Kazakhstan and the Philippines, 2015-17 is replaced by 2015-16. 2. EU28. 3. The OECD total does not include the non-OECD EU Member States. 4. The 10 Emerging Economies are Brazil, China, Colombia, Costa Rica, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam. Indonesia is not included in this report. 5. The All countries total includes all OECD countries, non-OECD EU Member States, and the 10 Emerging Economies. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.
Source: OECD (2018), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

Figure 8. Single commodity transfers, all countries, 2000-02 and 2014-16

Percentage of Gross Farm Receipts



Note: Commodities are ranked according to the absolute value of % SCT in 2014-16.
Source: OECD (2017b), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database).
http://dx.doi.org/10.1787/agr-pcse-data-en.

4. The effects of policies on agro-food GVCs

Priority was given in this study to scenarios that shed light on the effects of different policies, so that the extent of the impact of existing policies could be measured. That is, the purpose was not to explore the impacts of feasible policy reforms, but to explore hypothetical scenarios that best illustrate impacts. The scenarios presented should not therefore be viewed as possible reform options that could be achieved within a multilateral framework, but rather a means to illustrate the impacts of current policies on GVC participation and benefits. In this way, these scenarios should provide one input to help inform policy makers when they are deciding on particular reform options.

The other complication in this type of analysis lies in deciding on an appropriate aggregation of countries over which the effects can be explored. Modelling time constraints renders estimating the scenarios with all 141 countries and regions that are present in the GTAP database unfeasible. As such, the choice of countries was made with a view to ensuring that: there was adequate OECD coverage; countries are significant in terms of agro-food trade or regional importance; a large diversity of countries are represented; and, where relevant, countries are grouped where there is a common approach to the policy reforms being considered (such as in the European Union). On this basis, a total of 34 countries and regions are explored (as set out in Annex B).

As the focus of this study is on agro-food GVCs, all 22 agro-food sectors are examined individually with the scenarios explored using the OECD METRO Model. The remaining sectors are grouped into like categories such that the model includes 31 different sectors (Annex A).

The scenarios explored focus on trade and agricultural policy settings with the aim of using these scenarios to highlight the impact of current policy settings and regional settings on agro-food GVCs. Specifically, four scenarios are explored:

- *Agro-food trade barriers*: all tariffs[6] on agro-food products are set to zero.
- *Market-distorting agricultural domestic support removal*: removing subsidies (and specific taxes) on agricultural outputs and inputs (both factors of production and intermediates) (Box 2).
- *All distorting forms of distorting agricultural policy removal*: combines 1 and 2.
- *Regional trade agreement creation*: where tariffs, along with non-tariff measures, are reduced for members of the agreement (and as such trade creation and diversion within a GVC context are explored).

In addition, a further scenario is undertaken to allow for the specific effect of a tariff increase to be explored. This is not included in the present discussion, although Box 3 presents the results of an exploration of a 10% point increase in tariff levels).

For this paper, the shocks in scenarios 1, 2 and 3 are applied to all countries in the chosen aggregation with no exceptions for carve outs for sensitive sectors.

[6] Tariffs include *ad valorem* tariffs, specific tariffs and ad valorem estimates of quotas and tariff-rate quotas.

5. The impacts of current policies on trade and GVC participation

Overall effects on production, trade, prices and welfare

The overall changes in production, gross trade, prices and welfare provide important context for the changes in GVC participation and exports of domestic value added discussed below. These results are briefly discussed in this section. The various effects of removing existing policies can be explored from the complete scenario (scenario 3) as it can be decomposed into the various parts that comprise the other scenarios. In this way, the changes attributable to the various policy instruments can be isolated.[7]

The removal of the various policies has a differentiated effect on production across regions (Figure 9). Similar to the results presented in OECD (2016), the current mix of market access barriers and distortive domestic support changes the location of production across the world. Of the policies explored, trade policy barriers have the largest impact on agro-food production globally, but domestic support policies are important in some countries and regions. Across countries, removal of the policies explored has the greatest impact on large agricultural traders (based on 2011 import and export levels) with significant increases in agro-food value added in Australia, New Zealand and Singapore (but off a low base and related to processed food production). For Australia and New Zealand, the increase is driven by greater agricultural exports along with increases in meat and dairy products (both from allied processing sectors). Korea also experiences strong growth in its food processing sector as a result of the removal of policy distortions, taking advantage of access to foreign inputs to grow its domestic value added.

Box 2. Agricultural support polices modelled

In the scenarios used in the study, the policy measures explicitly modelled include:

- domestic support to agriculture in the form of subsidies/taxes paid to land
- domestic support to agriculture in the form of subsidies/taxes paid to labour
- domestic support to agriculture in the form of subsidies/taxes paid to intermediate inputs into agricultural production
- domestic support to agriculture in the form of subsidies/taxes paid on outputs
- tariffs applied to, and *ad valorem* equivalents of all quota arrangements on, agricultural and processed food products
- export subsidies applied to agricultural products and selected processed agricultural products.

The data on agricultural domestic support included in the METRO database comes from the GTAP database. It is primarily derived from the OECD PSE database and for some countries where such data do not exist, it is taken from the country-specific input-output tables used to create the database. These subsidies include the payments that are considered market distorting and excludes payments are completely decoupled from production and support and provided as general services support to the sector. No market price support data is converted into domestic support estimates as these effects are captured by the ad valorem equivalent tariffs included in the database. While this data source provides comprehensive information on a range of countries and payment types, it does not cover a number of countries; as such, there is less information for some agricultural producers. For the aggregated regions, the data within the database on agricultural support on individual countries is included in the aggregates.

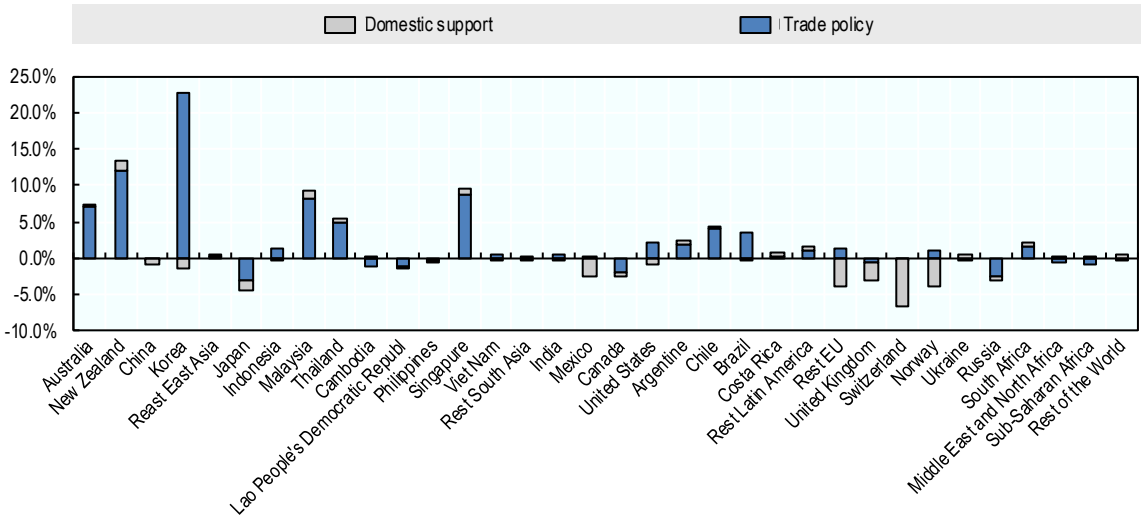
[7] The scenarios 1 and 2 are combined in scenario 3 with the effects mostly additive. There are some small variations between the simple sum of effects and that obtained in scenario 3 which represent the effects of policies when changes are made together rather than separately

For some countries, changes in policies result in falls in production – both in absolute and value added terms. The falls in production levels lead to total value added falls in these countries. For the EU (excluding the United Kingdom), removing distorting forms of domestic support causes production to fall (based on 2011 support levels), whereas liberalising tariffs leads to increases in production.

Tariffs and quotas have stronger trade effects than other policies. The significant impacts of these policies are seen for all 22 agro-food sectors (Figure 10). For almost all products, trade expands with the removal of current policies. Large increases are seen for wool and paddy rice; however, for paddy rice, these changes are small in absolute terms and the initial base values are very small (the changes for raw milk and sugar cane & beet are also off a very low base and represent overall very small changes). The relative increases in food trade are generally greater than those seen for agriculture trade on the back of both greater market access for processed food products and the availability of more competitively priced inputs from lower import duties.[8]

Figure 9. Changes in agro-food production from removing distorting agro-food trade and domestic support policies

% change in value added (quantity) by country compared to 2011 base

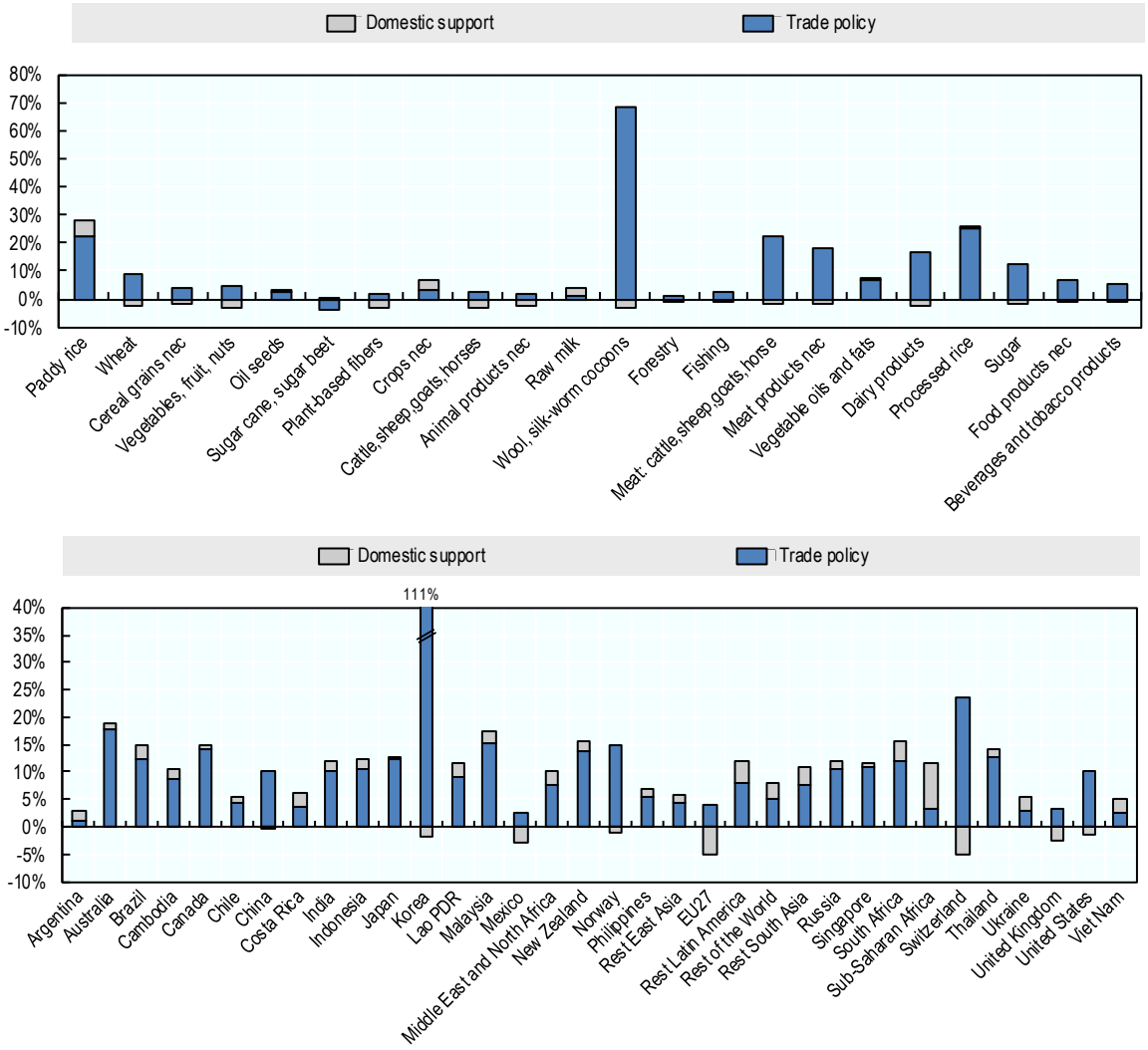


Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2.
Source: Author estimates.

[8] Greenville, Kawasaki and Beaujeu (2017) highlights the tariff escalation on agro-food products, with more transformed food products facing higher tariff barriers than less processed agricultural products.

Figure 10. Changes in agro-food exports from removing distorting agro-food trade and domestic support policies

% change in agro-food export quantity compared to 2011 base



Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2. For Korea, results should be treated with some caution, see footnote 10.
Source: Author estimates.

Total agro-food exports are also seen to increase for almost all countries (with virtually no change in the European Union and Mexico). The changes are brought about by compositional shifts in production within economies that are induced by removing distorting policies. For some, the percentage changes are large – such as Korea and Switzerland.[9] For Korea, the results are driven almost entirely by its food processing sector,

[9] For Switzerland, an investigation of inward processing tariff concessions was completed based on data provided by the Swiss Government. This data showed effective zero tariff rates applied to imports of wheat and oilseeds. Updating this information in the model reduced the percentage gain

where exports benefit considerably from changes in agro-food tariffs that alter the cost of inputs into the sector and provide it with greater access to foreign markets.[10] In particular, exports of food products nec account for 65% of the increase in value added exports compared to base levels seen. On the import side, the largest increases are seen in oilseeds, with increases also seen in wheat; cereal grains nec; vegetables, fruits and nuts; dairy products; and food products nec. Similarly, for Switzerland, processed food and beverages account for most of the changes observed – similar gains are seen for Japan but with a lower percentage change. The results for the sectors and countries mean that there are a number of changes in the sourcing composition of exports from each agro-food sectors.

Removing distorting policies also has price effects on world markets. Generally, trade distortions have been found to depress world prices both by suppressing world demand and through the effects on world markets of barriers imposed by large countries (which push down world prices through terms of trade effects). This result is found again here for all types of policies. As there is no single international price (exporting countries face different export prices due to transport costs along with differences in their trading relationships), world prices are explored by taking the weighted average of individual country export prices. Across the 22 agro-food sectors explored, the removal of current market access barriers and distorting forms of domestic support increases world export prices (Figure 10). The price effects are greater for agriculture products than for food products, with the livestock sector most affected. What is also evident is that trade policies disproportionally influence the price of food products, whereas domestic support policies have greater influence on agricultural products. The results, through the price effects estimated, continue to show that domestic policies can have adverse impacts on world markets and on producers in countries outside that where support is provided.

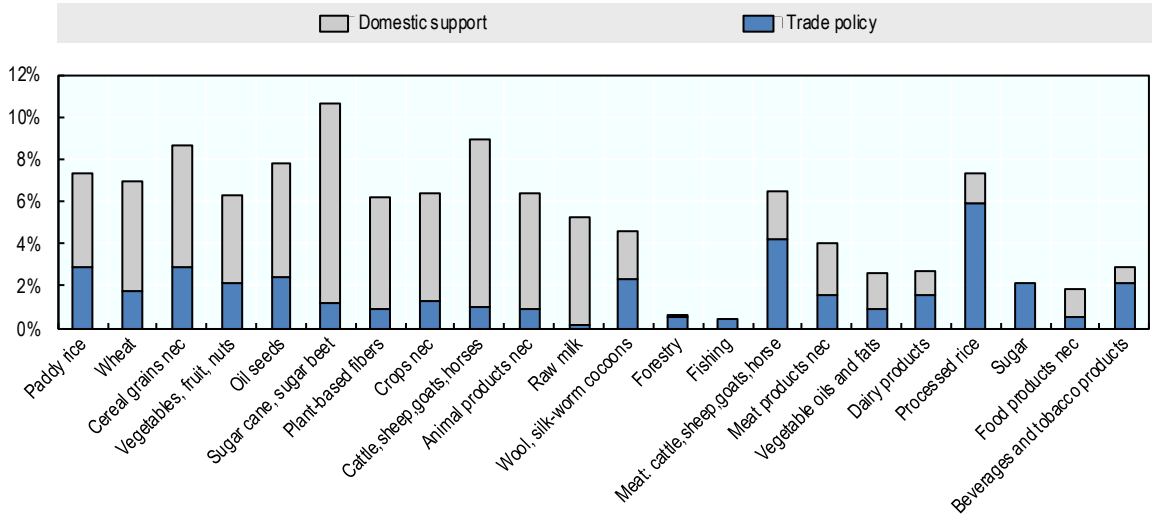
Changes in real final consumption serves as a proxy for the welfare effects of reforms. Market access barriers are found to have the largest welfare impacts of various policies analysed (Figure 12). Globally, the removal of current market access barriers and distorting forms of agricultural support are welfare increasing – they lead to a situation where households and governments can consume more given their budget constraints (consume more in real terms). Of these changes, the majority of that improvement is derived from reforms to trade policy and the removal of tariffs and quota barriers on agro-food trade.

in value added trade for Switzerland by 1 percentage point, with very small impacts on the other results obtained in this paper.

[10] The significant results seen for the Korean food sector result from the removal of tariff-rate-quotas on oilseeds. These policies are modelled in METRO as ad valorem tariff equivalents to capture both the direct price effect from the tariff and the indirect effect on prices from the quantity restrictions. The actual tariffs applied on oilseed imports are thus significantly less than the ad valorem equivalents included in the model, with applied rates for within quota of close to zero, and the weighted average total tariff (within and out of quota) around 11.5%. The results obtained will be very sensitive to the accuracy of the ad valorem equivalent included in the model and therefore should be treated with some caution.

Figure 11. Changes in export prices for agro-food products from removing distorting agro-food trade and domestic support policies

% change in agro-food weighted average export prices compared to 2011 base



Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2.
Source: Author estimates.

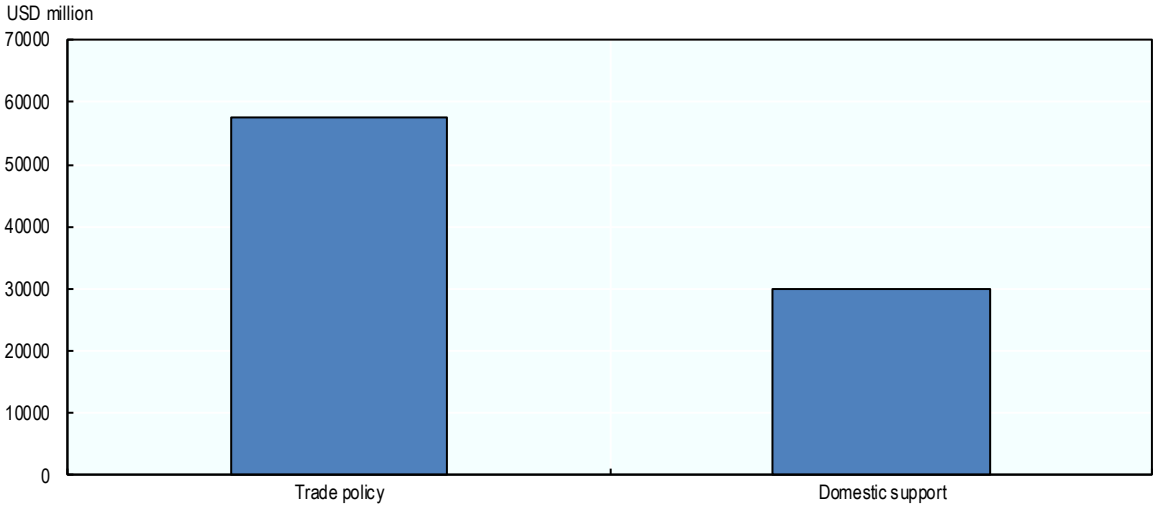
The welfare effects across countries again show the significance of tariff measures in influencing global outcomes. A number of countries and regions have positive welfare impacts if current policies are removed, but not all (Figure 13). In particular, welfare falls are seen in Cambodia, China, Sub-Saharan African countries, and the Russian Federation (Russian Federation). Welfare effects calculated are influenced by the assumptions made around government taxation and redistribution policies. The net impacts on households depend on the way in which changes in tax revenues and expenditure are redistributed between the government and households.[11] However, it should be noted that changes in these assumptions, and around flexible exchange rates versus fixed external balance, do not alter the production and trade flows seen that underpin changes in GVC participation which is the focus of this paper.

The impact of these policies has been highlighted in past OECD work assessing the impact of agricultural policies on markets and trade. OECD (2016) found that the trade and production effects of differing assumptions around post-reform exchange rate movements and government taxation and redistribution policies had minimal trade and production effects but had significant impacts on the welfare outcomes obtained (OECD, 2016). This result is observed once again. As such, the results indicate that changes in the macroeconomic environment and subsequent response are important in defining welfare outcomes of reforms.

[11] The closure assumptions used in this report assume flexible exchange rates and fixed regional savings rates.

Figure 12. Changes in total global consumption from removing distorting agro-food trade and domestic support policies

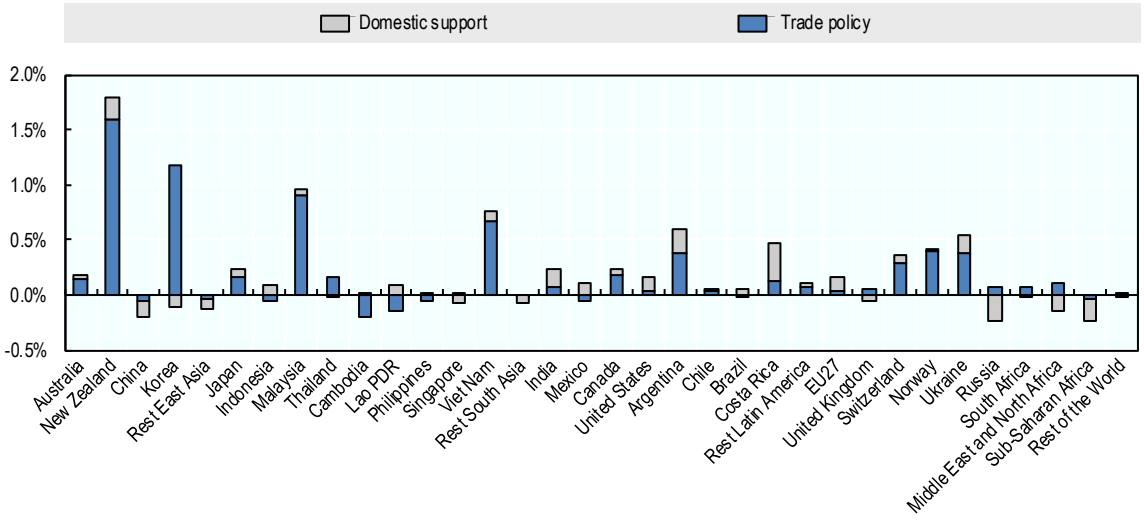
Changes in USD million compared to 2011 base



Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2.
Source: Author estimates.

Figure 13. Changes in total consumption by country from removing distorting agro-food trade and domestic support policies

Changes in USD million compared to 2011 base



Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2.
Source: Author estimates.

Overall effects on exports of domestic value added and GVC participation

The effects of the various policy changes in the scenarios on agro-food GVCs are explored in the context of the GVC participation indicators (forward and backward) and changes in domestic value added generated in exports to GVCs. For policy makers, changes in domestic value added reveal the benefits that are created directly from GVC participation,

with backward participation found to have longer run impacts on agro-food sector development (Greenville, Kawasaki and Jouanjean, 2018) – consistent with findings seen for other sectors where foreign inputs have been found to be an important source of productivity and sector transformation (Jouanjean, Gourdon and Korinek, 2017; Lopez-Gonzalez, 2016; OECD, 2015). The forward indicator has lesser links to sector development, and instead, provides more information about the nature of GVCs in the agro-food sector. For example, the nature of the product and the closeness of food processing sectors to final demand, mean that the forward indicator of GVC participation will remain structurally lower than that seen for agriculture. With increased competitiveness from better sourcing of inputs, sectors may therefore increase their links to domestic final demand rather than increase international linkages.

Trade in domestic value added

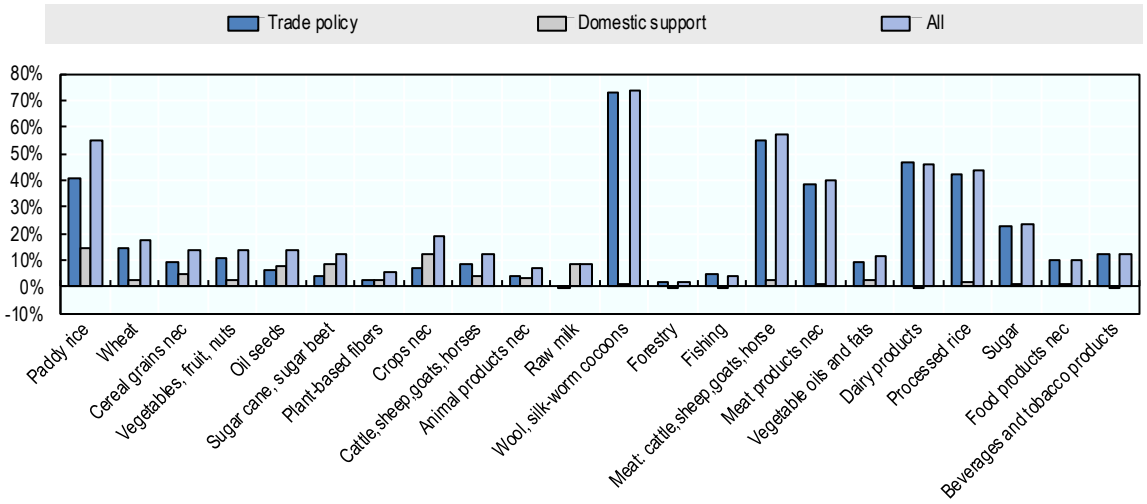
The impacts of removing market access barriers and distorting forms of domestic support on exports on domestic value added exports from the 22 agro-food sectors examined is almost uniformly positive (Figure 14). For each of the sectors, all policy change scenarios highlight how trade and distorting domestic support policies have negative impacts on trade in value added. Across both agricultural and food sectors, the combined scenario (removal of both market access barriers and domestic support) yields the most significant increases to trade in value added. For food sectors, the results are driven primarily by the removal of trade barriers whereas agricultural sectors are also impacted by changes in domestic support. Agricultural products represent the highest share of the intermediate inputs into food sector, and, as such, food sectors are also indirectly affected by domestic support, though at a much smaller scale. These small secondary effects of removal on the food sectors are mostly beneficial.

Comparing the effects of domestic support and market access policies indicates that market access barriers have the greatest impact on trade in value added. Indeed, isolating the impact of tariffs indicates the significant impact that tariffs have on trade in value added (Box 3). A 10 percentage point increase in tariffs is explored as it provides a means of avoiding bias in the results when percentage changes are applied to countries with different starting points – and thus mitigates regional and sectoral heterogeneity in tariff reductions. An increase was examined as, with low and zero tariffs in a number of countries, a set percentage point reduction globally was not feasible. For a 10 percentage point increase in tariffs, the average decrease in trade in value added across each of the sectors is around -1.01% (on a trade-weighted basis the impact is more proportional and stands at -0.99%).

Across countries an interesting pattern appears in terms of changes in exports of domestic value added from the agriculture and food sectors (Figure 16 and Annex C). What is observed is that for all countries and regions examined, the effects of removing both current market access barriers and distortive domestic support is to increase exports of domestic value added. For some countries, these changes are significant (in the case of Korea's food sector). This highlights the "taxing" effect of market access restrictions and distortive forms of domestic support. Linking to the changes seen in gross trade changes by country, much of the increase is driven by a redistribution of activity among the 22 agro-food sectors explored.

Figure 14. Changes in exports of domestic agro-food value added by sector from removing distorting agro-food trade and domestic support policies

% change compared to 2011 base



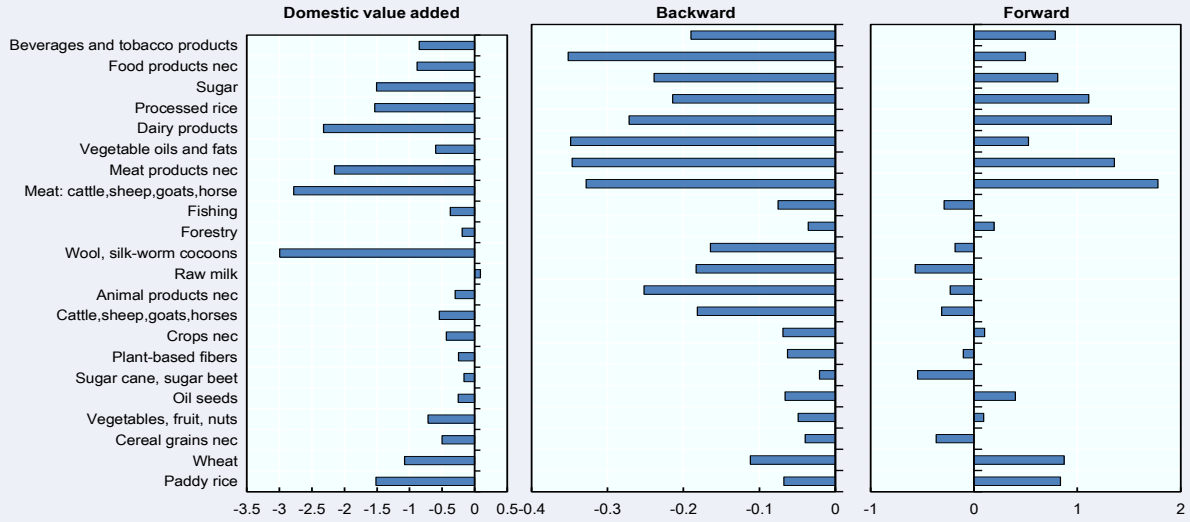
Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2. All represents the combined scenario of trade and domestic support policy removal.
Source: Author estimates.

Box 3. Isolating the impact of tariffs on GVC participation

A 10 percentage point increase in global agro-food tariffs was separately explored to isolate the impact of tariffs on GVC participation and benefits. The results from the simulation highlight the impact that tariffs have on exports of domestic value added. Across almost all sectors, the increase in tariffs decreases the amount of value added exported (Figure 15), with the exception of a small increase in the raw milk sector. This overall trend in decreasing exports of value-added is driven by two factors – first, reduced trade overall from the tariff increase (falls are seen in exports both for final demand and as intermediates), and second, the 'taxation' effect on industries that use imported goods as part of their export production process.

Figure 15. Changes in GVC participation and benefits created from increasing tariffs

% change compared to 2011 base



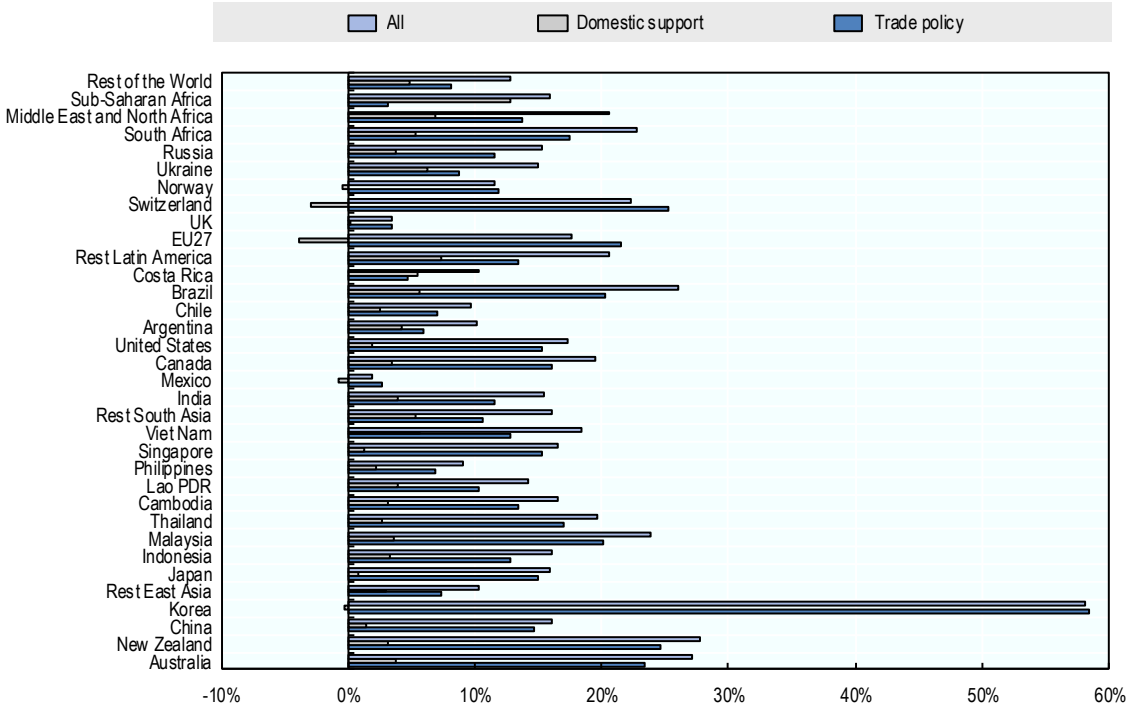
Source: Author estimates.

These falls in value added exports are seen in every country and region examined in this study – there is a universal fall. However, not all countries are proportionally affected by the shock, with some experiencing lesser falls (in relative terms) than others. Similarly, the impacts are not uniform across sectors and depend to a large extent on the share of imported goods in the input bundle and the ability to substitute competitively away from imported agro-food inputs to those produced domestically and in other sectors (this substitution is assumed to be imperfect).

The changes in participation indicators also vary. Across countries and sectors, backward participation falls with mixed results seen in forward participation. In fact, across food sectors, the impact of tariffs is most often an increase in forward participation, meaning that the lower volume (and value) of exports gets used to a greater extent in the exports of other countries. This in part is driven by the mechanical association between the two indicators – as foreign input value share in exports falls, domestic rises, leading to the potential increase in the forward estimate.

Figure 16. Changes in exports of domestic agro-food value added by country from removing distorting agro-food trade and domestic support policies

% change compared to base



Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2. All represents the combined scenario of trade and domestic support policy removal. Percentage changes for small are off small base.

Source: Author estimates.

Box 4. Taxing imports of own domestic value added through tariffs

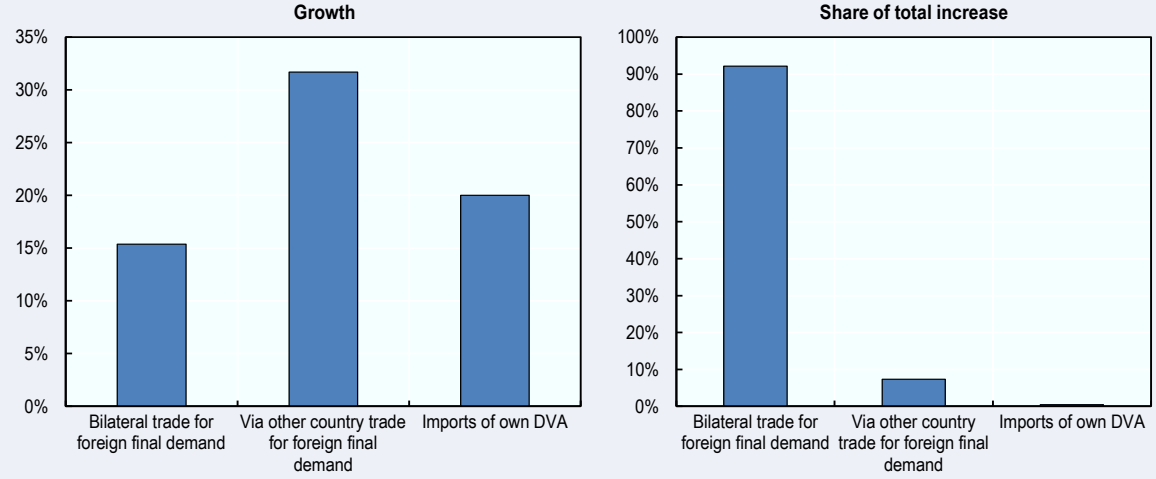
Trade policies can alter the way that value chains are organised due to differing levels of tariffs applied on different policies and the mix of preferential and MFN tariffs applied to different countries (the impact of regional trade agreements are explored in Section 6). Part of these effects is to tax imports of own domestic value added that is embodied in agro-food imports from other countries. Looking at the source of value added in final demand allows a breakdown in the different paths to final demand created by GVCs. These include:

- *bilateral path*: GVCs that cross two countries and link producers in one to final consumers in the other
- *via other country path* – GVCs that cross three or more countries and link producers in one country to final demand in another via processing that occurs in a third (or fourth or so on) country
- *import own domestic value added path* – GVCs that link producers in a country to domestic final demand via a third (or fourth or so on) country.

The largest path, or most common GVC path, is the first – the bilateral path. This accounts for 96% of all domestic value added that ends in foreign final demand (in 2011) compared to 93% for non agro-food products. However, tariff barriers appear to have the greatest relative impact on the second and third paths – that is those which result in multiple linkages between producers to final demand. When tariff barriers on agro-food products are removed, trade in these linkages grow by 32% and 20% respectively, compared to 15% in the bilateral path. Imports of own value added are relatively small across the world however, suggesting little feedback of agro-food intermediate exports to domestic consumers.

Figure 17. Changes in domestic value added traded in final demand from removing distorting agro-food trade policies

% change compared to 2011 base



Source: Author estimates.

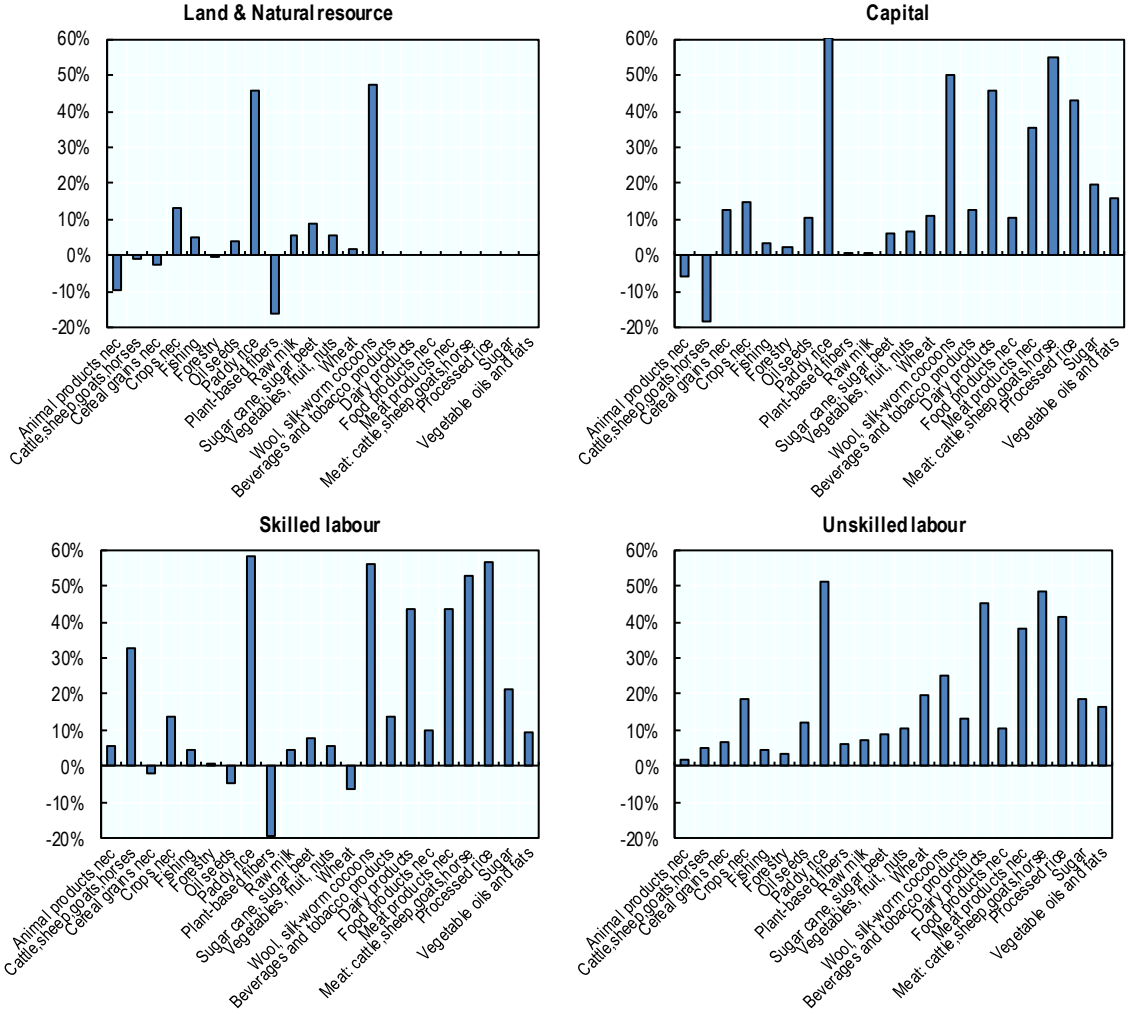
Beyond the use of domestic value added in other countries, and in foreign final demand, changes in tariffs can also influence the way that value added is traded and the consumption of own domestic value added that may be processed in foreign countries and form part of a country's imports (Box 4). Trade can flow directly between two countries (bilateral flows), or indirectly, passing through a third (or so on) country first. Overall, direct trade between two countries represents the highest share of agro-food GVC linkages. However, what is seen is that tariffs have a stronger impact on the GVC networks across the globe, with their removal increasing the linkages that occur between two countries that flow through a third (or fourth) country. Thus tariffs influence both the amounts traded and the network structure of agro-food GVCs themselves.

Returns to land, labour and capital from GVC participation

The changes in exports of domestic value added have flow-on effects on the returns to land, labour and capital used in production. Overall, the effects of removing market access barriers and distortive domestic support has mostly positive impacts on the returns to all factors across the globe. Labour, both skilled and unskilled, captures the highest amount of the increased value added in agro-food exports (Figure 18). This result is partly driven by the relative changes in trade values that are greatest in non-high income countries that use relatively high shares of labour in agricultural production and in particular unskilled labour. The results suggest that the removal of distortions to international agro-food markets enhances the employment effects of agro-food GVCs, either through higher wages or through greater levels of employment in the sector.

Figure 18. Changes in returns to factors of production from direct agro-food exports from removing distorting agro-food trade and domestic support policies

% change compared to 2011 base



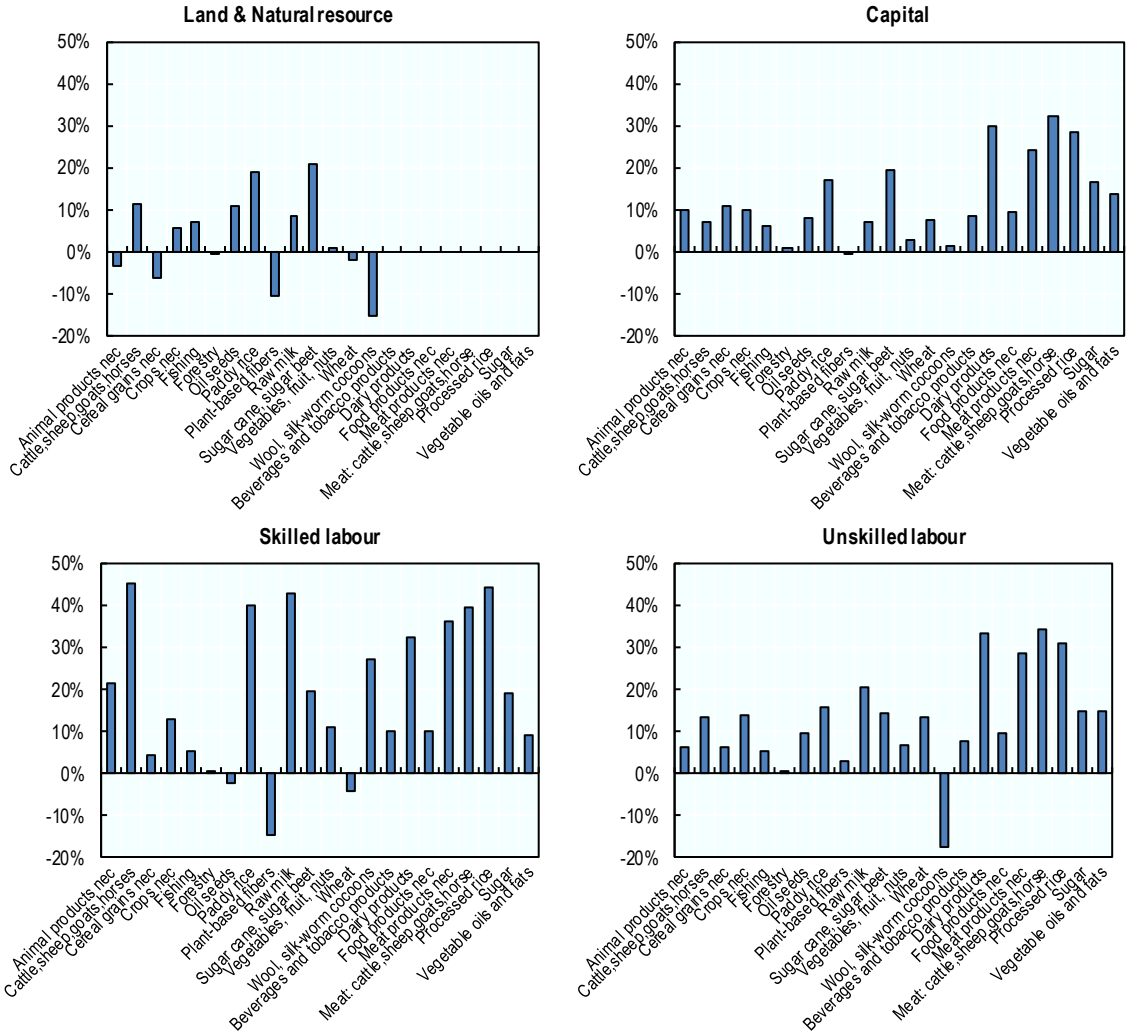
Note: Combined effects of both trade and domestic support policy removal – scenario 3. Land is only used in agricultural production activities, with natural resources used in forestry, fishing and mining activities.
Source: Author estimates.

The returns to land (or natural capital in the case of fisheries and forestry) and capital are lower and, in some cases, are negative. For land, the lower value added contribution is primarily driven by the effects on factor markets from the removal of domestic support, which often bids up the returns to land as support gets capitalised into this fixed asset.

However, it is not only the changes directly in the sector that have an influence on the returns from GVC participation by agro-food sectors. In some countries, changes are seen in using industries, shifting the way that sectors participate in GVCs. The differences can be seen when looking at the total domestic value added exported by different agro-food sectors – that exported directly and indirectly (Figure 19).

Figure 19. Changes in returns to factors of production from direct and indirect agro-food exports from removing distorting agro-food trade and domestic support policies

% changed compared to 2011 base



Note: Combined effects of both trade and domestic support policy removal – scenario 3. Land is only used in agricultural production activities, with natural resources used in forestry, fishing and mining activities.
Source: Author estimates.

Differences can be seen for all factors, but are largest with respect to livestock (animal products nec; cattle, sheep goats, horses), plant-based fibres and wool. For livestock and plant-based fibres, reforms see a shift towards greater returns from GVCs from indirect participation by these sectors – more domestic processing before export, but with the reverse seen for wool due to the shift in production from China to Australia. For plant-based fibres changes in labour returns in aggregate associated with GVC participation go from negative when only looking at direct exports to positive when indirect are considered. For wool, the result is reversed.

Backward and forward measures of GVC participation

The impact of the various policy changes on backward and forward participation for each of the 22 agro-food sectors examined are shown in Figure 20. The impact on backward participation varies mostly around the split between different types of sectors.

The effect of removing distorting trade policies across most agricultural and all food sectors is positive – that is removing tariffs increases backward participation. The only exceptions seen are those in other cereals and sugarcane and beet where small falls are seen. For most sectors, lower costs on inputs heavily sourced from other agriculture sectors increases their sourcing from international markets – creating an increase in backward participation. For those where increases are seen, changes in domestic production (driven by the reallocation of resources with tariff falls), helps to increase domestic sourcing and thus lowers backward participation.

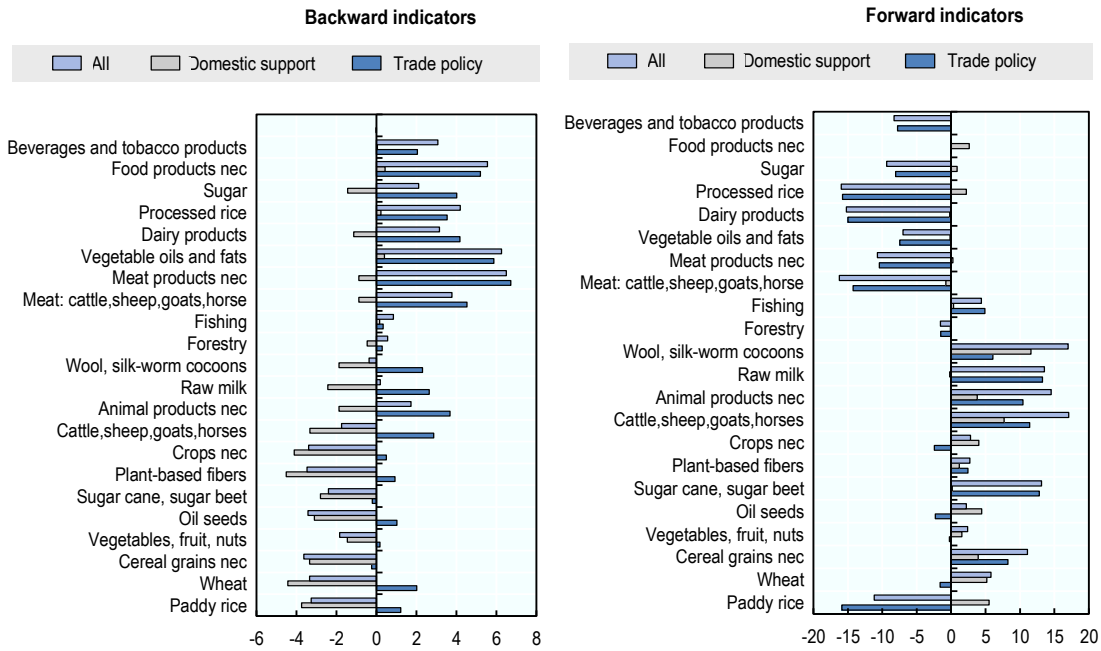
In the case of domestic support removal, however, the effects are mostly reversed. This effect is driven by two factors. The first relates to the reduction in input subsidies directed at some sectors that creates a fall in the derived demand for imported inputs. This means that backward participation across almost all agricultural sectors falls (exceptions being raw milk, forestry and fishing). The second impact relates to the reallocation of production to countries which have more established sectors and thus a larger domestic sector that provide inputs into these countries. The change in the composition of agricultural trade to regions with a comparative advantage in producing agricultural products results in a fall in the weighted average results for each sector. The second effect dominates the results seen and despite falls in the costs of imported inputs due to trade reforms, leads to lower observed backward participation globally.

The results for forward participation are reversed compared to those seen for backward participation. Overall, the removal of current policies sees an increase in forward participation in the agriculture sectors and a fall in the food sectors. With lower barriers faced on agricultural exports, the food sector sources more inputs internationally, with then a rise in the use of imported agriculture value added embodied in exports of a second country. Paddy rice is the exception due to the compositional shift of exports towards larger producers who have lower forward participation by virtue of the size of their exports.

Reforms to remove distorting trade and domestic support policies also change the value added composition of agro-food exports (Figure 21). Across all sectors, on a trade weighted basis, the largest effects are seen for agricultural value added – which increases its share by 0.5%. Following agricultural value added used in exports, imported and own sector value added also show growth in their share of agro-food export values. Much of the change is offset by falls in services value in agro-food exports – a result that is largely driven by the shift in agro-food production away from a number of developed regions towards developing countries.

Figure 20. Changes in GVC participation from removing distorting agro-food trade and domestic support policies

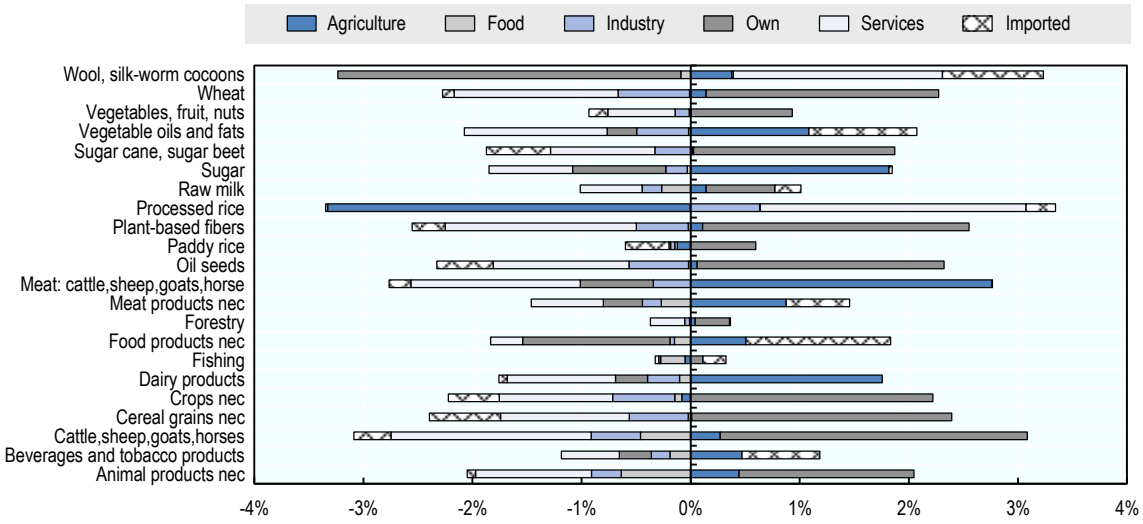
% change compared to base



Note: Trade policy represents results from scenario 1 and Domestic support represent results from scenario 2. All represents the combined scenario of trade and domestic support policy removal.
Source: Author estimates.

Figure 21. Changes in the sectoral value added composition of agro-food exports from removing distorting agro-food trade and domestic support policies

% point change in contribution to export values compared to 2011 base

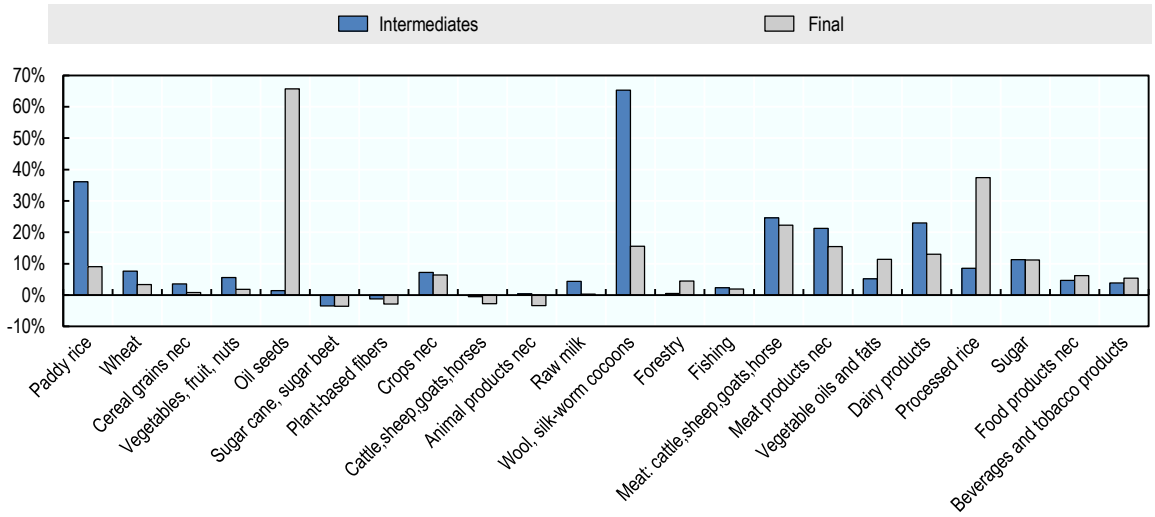


Note: Figure depicts the changing shares of agro-food export value that result from policy reforms to remove all tariff barriers and distorting forms of domestic support.
Source: Author estimates.

Policies also have differing effects on trade in intermediates versus trade in final goods across sectors (Figure 22). For food sectors, the falling barriers make it easier to access foreign final demand more directly, leading to a greater or at least significant increase in exports of final goods. Despite this, the impact on intermediates trade remains significant. For agriculture, there is a bias towards intermediates trade due to the nature of the good.

Figure 22. Changes in exports of intermediates and final goods from removing distorting agro-food trade and domestic support policies

% change compared to 2011 base



Note: Combined effects of both trade and domestic support policy removal – scenario 3.
Source: Author estimates.

6. The impacts of regional trade agreements on agro-food GVCs

Trade and domestic support policies can have a significant influence on the gains from GVC participation. The section above explores these changes in a global setting – where all countries reduce agro-food trade barriers and market distortions. In recent years, however, there has been a significant increase in regional trade agreements suggesting that much reform is being conducted on a preferential basis. To explore these effects, this section examines the outcomes for agro-food GVC participation and domestic value added returns from an illustrative regional trade agreement.

This section does not intend to examine a current or proposed agreement and instead presents an illustrative regional trade agreement taking in a number of large agro-food traders. Specifically, the illustration explores the implementation of a regional trade agreement covering several countries in the Asia-Pacific region. Two configurations have been examined:

- An agreement between a number of high-income countries, as defined by the World Bank (2018), in the Asia-Pacific region, including Australia, New Zealand, Korea, Japan, Singapore, Canada and Chile.
- An agreement between high and some middle income countries in the Asia-Pacific, including those in 1) along with Thailand, Viet Nam and Mexico.

The illustrative regional trade agreement is assumed to include liberalisations that achieve:

- A reduction in tariffs (which include ad valorem equivalents of quotas, specific tariffs and tariff-rate quotas) for less sensitive agro-food products by 50% – this includes cuts in manufacturing and services sectors.
- A reduction in tariffs and export taxes (where relevant) for more sensitive agricultural products – those of paddy rice, processed rice, raw milk, dairy and beef of 20%.
- A reduction in non-tariff measure trade costs (measured as iceberg costs) of 10% on trade between regional trade agreement members.

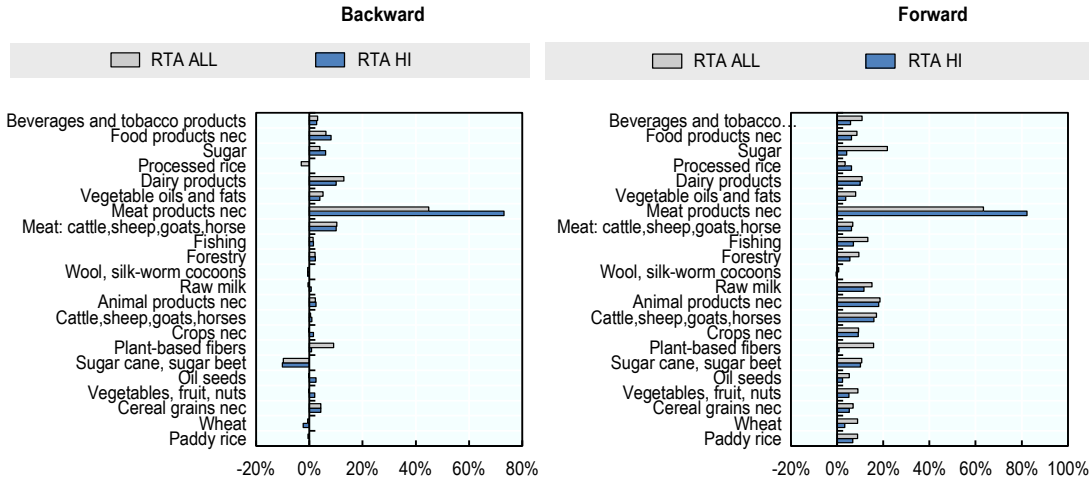
The analysis focuses on the impacts seen on GVC participation and domestic value added creation. Further, attention is given to any changes in the bilateral flows of domestic value added between countries – that is, whether RTAs change overall flows of domestic value added and the path these take across countries, be it directly between countries or that which occurs indirectly passing through production processes in third (for fourth or so on) countries.

Changes in GVC participation

The improvements in market access and reductions in trade costs associated with NTMs increases GVC linkages for member countries. Across most agro-food sectors, backward and forward participation increases, however, the changes are relatively small (Figure 23). For backward participation in the agriculture sector, small increases are likely because there is a shift in trade to larger producers who tend, due to domestic sector size and specialisation, to have lower initial backward participation. For the food sector, increases are on average larger because of the greater sourcing possibilities afforded by the RTA.

Figure 23. Changes in GVC participation from RTA creation by sector in member countries

% change compared to 2011 base



Note: RTA all includes Australia, New Zealand, Korea, Japan, Singapore, Canada, Chile, Mexico, Thailand and Viet Nam. RTA High income includes Australia, New Zealand, Korea, Japan, Singapore, Canada and Chile.
Source: Author estimates.

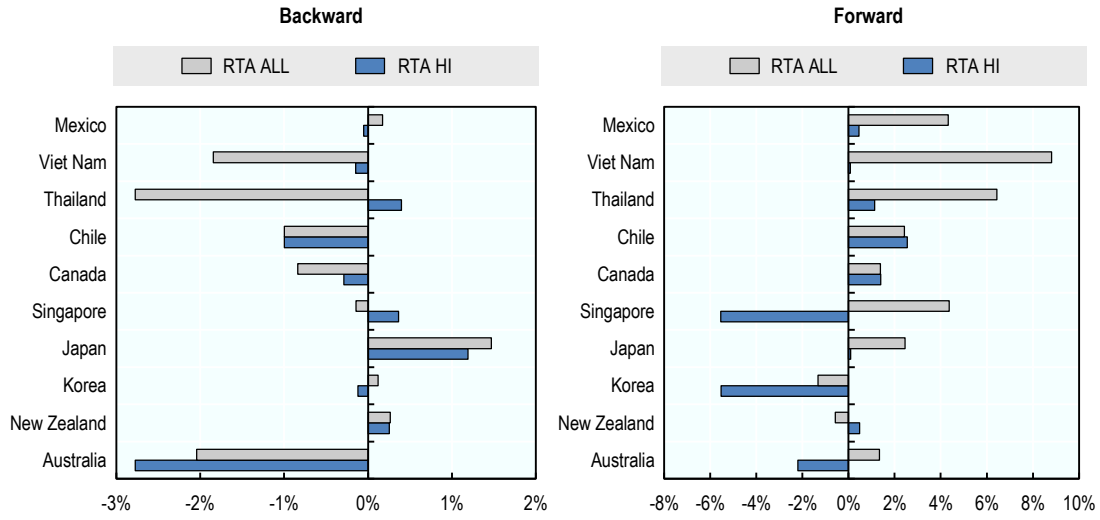
The changes in forward participation are larger and are positive for almost all agro-food sectors. The regional trade agreement increases the integration of the food system for member countries, with value added generated in one country increasingly being exported by another. In contrast, those countries outside the regional trade agreement see very little changes in participation outcomes.

At the country level, the creation of a regional trade agreement alters agro-food GVC participation (Figure 24). In terms of backward participation, the shift in exports towards larger producers generally sees a fall in country-level participation in these countries. This is driven by different effects across the countries. In Thailand and Viet Nam, under the wider RTA, there is a strong increase in food product exports which are underpinned by changes in domestic agriculture as a result of protection changes, increasing domestic competitiveness and domestic sourcing. In Australia (along with Canada and Chile), on the other hand, the falls are due to deepening exports in areas where there is large domestic industry (meat exports) which has lower than average backward participation due to significant domestic sourcing of inputs – they export more of what they are currently fairly advanced at producing which tends to have lower backward participation.

Forward participation across countries generally increases, with increases more likely when the emerging countries are part of the RTA. For Korea, which sees falls under all RTA configurations, the cause is a shift towards greater exports from the food product sector – a sector with lower than average forward participation for Korea. Thus, the RTA configuration is creating greater trade linkages to foreign final demand.

Figure 24. Changes in GVC participation from RTA creation by country for agro-food products

% change compared to 2011 base



Note: RTA all includes Australia, New Zealand, Korea, Japan, Singapore, Canada, Chile, Mexico, Thailand and Viet Nam. RTA High income includes Australia, New Zealand, Korea, Japan, Singapore, Canada and Chile.
Source: Author estimates.

Changes in domestic value added in exports

The changes in GVC participation at the country level are largely dependent on changes in export mix. Thus while it can be seen at the sector level that RTAs have the potential to deepen regional integration in GVCs, the gains for countries are not evident. Changes in domestic value added provide a better metric to assess the effects at the country level.

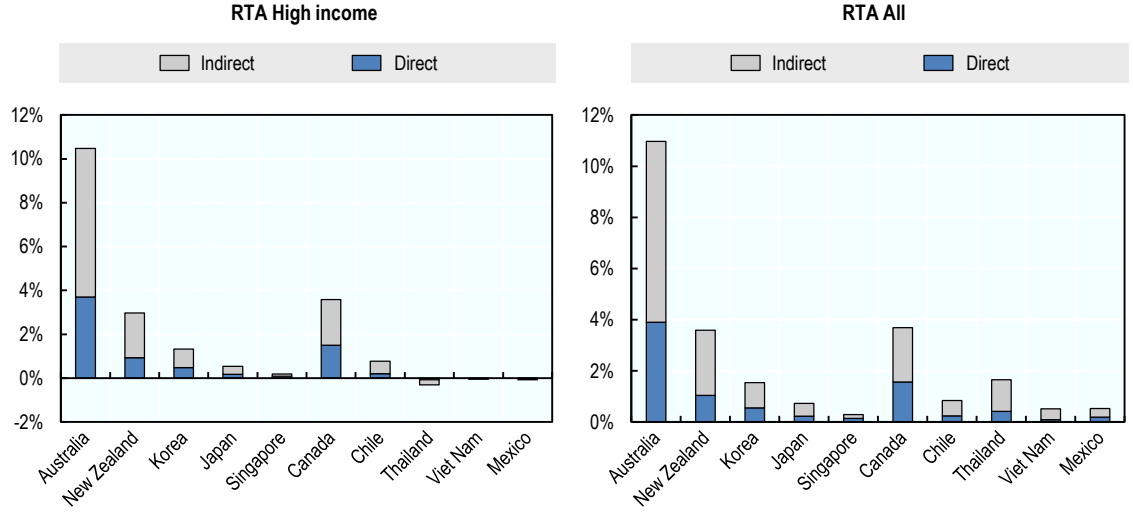
RTAs have the potential to increase trade within GVCs for agro-food sectors in all participating countries (Figure 25). For the illustrative agreement, there is clear benefits for the emerging countries to be involved – all see positive domestic value added creation from joining the RTA (comparing the results between the RTA All and RTA High income charts).

What stands out from the impacts of value added exports is that the majority of increased trade in value added occurs via indirect linkages to GVCs – that is, those that flow through other domestic sectors. Under the wider membership RTA, roughly 67% of the total increase comes from growth in agro-food trade through indirect linkages. Thus agro-food sectors are heavily reliant on other domestic sector linkages to GVCs as the pathway for their overall growth. This result was seen for large primary exporters as well as those which predominately export more processed goods.

Part of the reason for the greater indirect trade linkages related to the higher tariffs are that, on average, observed for food sector products. The greater relative falls induced greater trade and thus increase the domestic derived demand of agricultural and food sector inputs. Overall, food sector exports of domestic value added share of the total increase was 53%. The greater increase is seen across the various food sectors, with one of the strongest increases seen in meat exports (Figure 26).

Figure 25. Changes in exports of domestic value added for RTA members

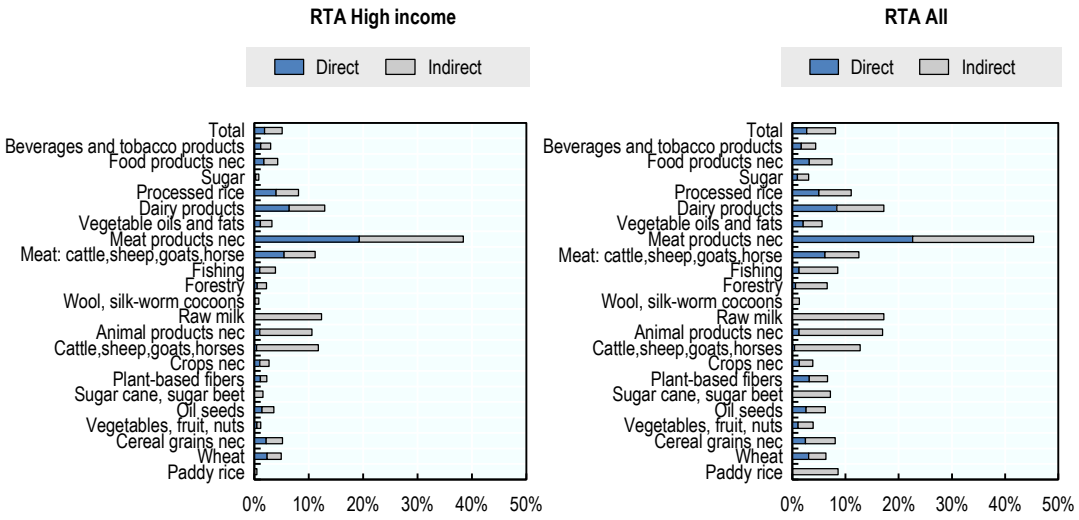
% change compared to 2011 base



Note: Direct exports into GVCs of value added are those generated through exports directly from the sector, indirect are those where trade from agro-food sectors goes through other domestic sectors before export. RTA all includes Australia, New Zealand, Korea, Japan, Singapore, Canada, Chile, Mexico, Thailand and Viet Nam. RTA High income includes Australia, New Zealand, Korea, Japan, Singapore, Canada and Chile.
Source: Author estimates.

Figure 26. Changes of exports of domestic value added for RTA members by product

% change compared to 2011 base



Note: Direct exports into GVCs of value added are those generated through exports directly from the sector, indirect are those where trade from agro-food sectors goes through other domestic sectors before export. RTA all includes Australia, New Zealand, Korea, Japan, Singapore, Canada, Chile, Mexico, Thailand and Viet Nam. RTA High income includes Australia, New Zealand, Korea, Japan, Singapore, Canada and Chile.
Source: Author estimates.

Changes in the flows of domestic value added to foreign final demand within and outside RTA members

The selling of domestic value added into GVCs provides one means to explore the impacts and benefits from RTA creation; however, it does not capture all the various linkages that occur through value chains before products are delivered to the end consumer. Furthermore, while RTA creation increases agro-food domestic value added created from trade for all members, it might change the make-up of where value added comes from and where it ends up more broadly.

An alternative way to explore RTA impacts is through the source and final destination of agro-food value added (Figure 27). Domestic value added can end up in foreign final demand through a number of pathways. It can flow directly from one country to the next – a bilateral flow – or it can flow through a third (or fourth and so on) country – via other country.

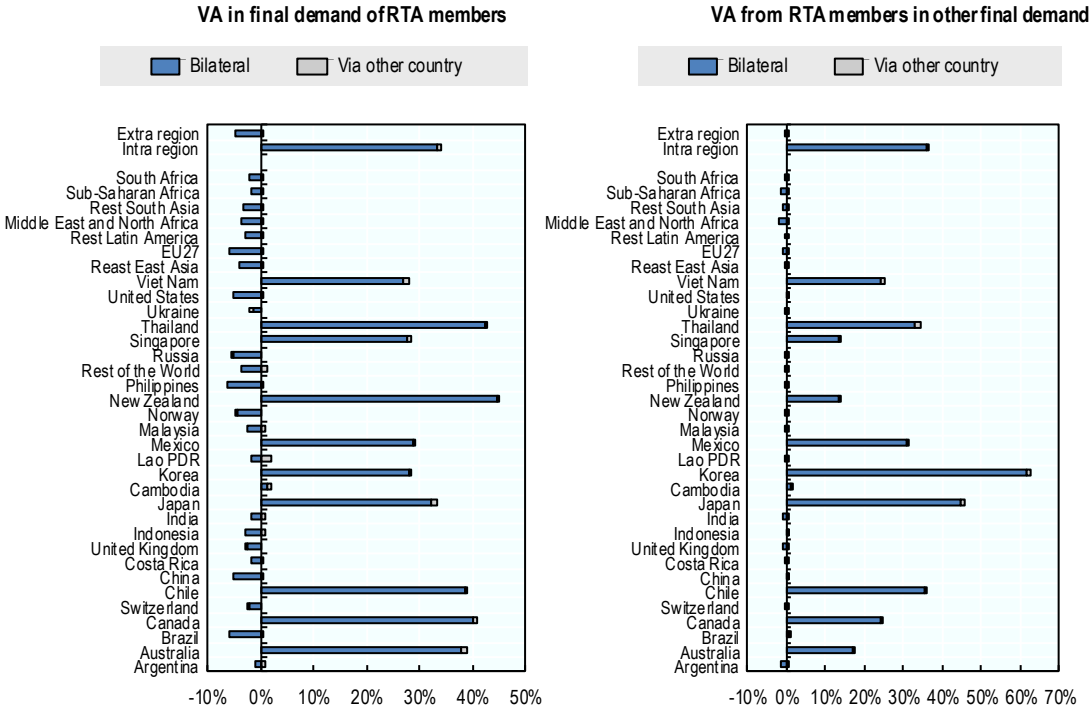
The flows of domestic value added to foreign final demand show the increased integration of the food system within RTA members. For all members, there is an increase in domestic value added that ends with other members' final demand – by around 34%. The vast majority of this occurs through direct linkages between members – 33.4% – with only 0.7% occurring through flows that go through other countries. Furthermore, of this 0.7%, most goes through other RTA members, with little domestic value added leaving the region and returning through non-member nations.

For non-members, there is a universal fall in value added that ends in the final demand of RTA members – by 4.6% in terms of bilateral flows (in aggregate, however, the amount of foreign value added in RTA member final demand in increases). This effect shows how the creation of a RTA changes the value chain structure in favour of RTA members over

non-members. The fall, however, is partially offset by an increase in the use of non-RTA member value added that comes into RTA members via other countries (0.3%) – both other members or other non-members – indicating that there is some displacement in the pathway of foreign value added. The changes in pathways indicate that changes bilateral flows may overstate the overall trade diversion impacts of RTAs.

Figure 27. Source and destination of value added consumed in foreign final demand

Flows to RTA members and from RTA members, RTA All

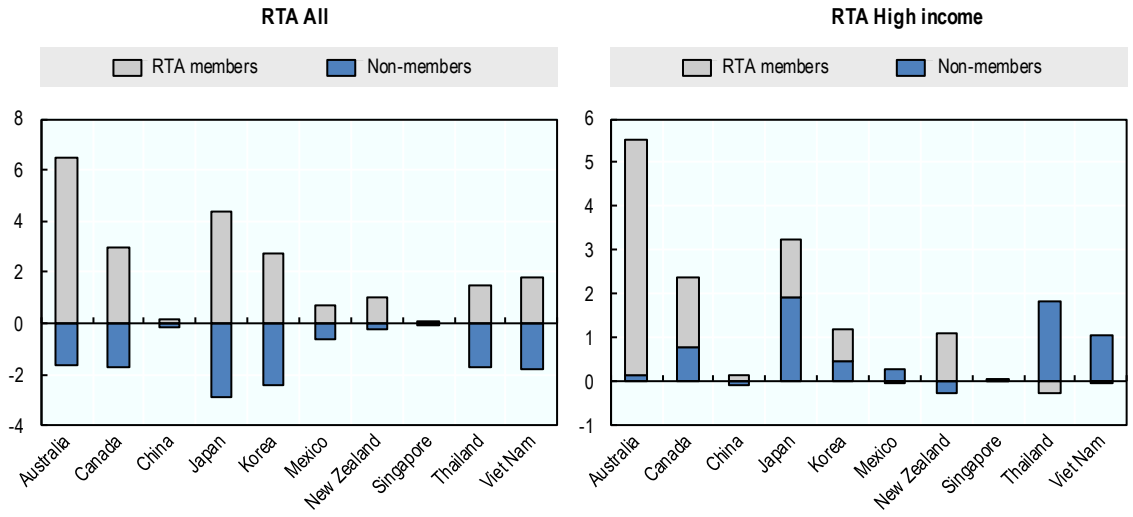


Note: Bilateral represent direct flows between two countries – in this case, from the source country to one of the RTA members. Via other countries represent flows of value added to final demand that pass through another country first. RTA all includes Australia, New Zealand, Korea, Japan, Singapore, Canada, Chile, Mexico, Thailand and Viet Nam.
Source: Author estimates.

The increasing integration of the food system for RTA members also has feedback effects in terms of changes in the amount of a country's own domestic value added that is embodied in imports (Figure 28). For agro-food products these effects are overall small in total value, however, creation of an RTA does cause an increase in the level of imports of own domestic value added. Much of the increase in this is from RTA members themselves – showing how fostering a more competitive agro-food system regionally (or internationally) can promote own consumption of domestic value added. Interestingly, there is a difference between the effects seen for the High income RTA and the wider RTA (RTA All). This shows that for the emerging countries, the gains from reducing their own protections when joining the RTA group can link their sectors more significantly to the GVCs of high income members – an effect that displaces non-members.

Figure 28. Changes in imports of own domestic value added

Absolute changes



Note: RTA all includes Australia, New Zealand, Korea, Japan, Singapore, Canada, Chile, Mexico, Thailand and Viet Nam. RTA High income includes Australia, New Zealand, Korea, Japan, Singapore, Canada and Chile.
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7. Conclusions and policy implications

The results in this paper point to the negative effect that current market access barriers and distortive forms of domestic support have on the benefits from participation in agro-food GVCs. Removing these barriers has the potential to increase agro-food domestic value added exports from all countries, promoting trade by furthering GVC links. In particular, the results points to the significant effect that a country's own market access barriers have on its domestic value added creation – that is import tariffs act as a tax on its exports.

In terms of participation, the results point to the difficulties in directly interpreting changes in backward and forward participation from reforms. Overall, the effects on the backward and forward indicators show mixed results. For food sectors, where a country lowers barriers and distortions, this generally increases backward participation (greater access to more competitive imported inputs), but reduces forward participation (greater direct access to foreign final demand due to the relatively higher tariff levels imposed on final goods). For agriculture, along with changes in the location of production, lower backward participation is driven by a shift in production to larger producers who have lower initial backward participation due to the domestic availability of inputs and the more advanced nature of production. At the same time forward participation increases as barriers to imports of agricultural products fall. However, both increases and decreases in these estimated values are associated with higher benefits from GVC participation as measured by domestic value added, suggesting that these metrics need to be interpreted in a wider context when formulating policy advice on GVCs.

Going beyond GVC indicators, the effects of removing market access barriers and distortive domestic support changes the returns to the factors used in the production of exports in agro-food sectors. Labour, both skilled and unskilled, represents the largest share of the increased value added in agro-food exports globally. Driven partly through changes

in the location of production, the results nevertheless suggests that the removal of distortions to international agro-food markets enhances the employment effects of agro-food GVCs, either through higher wages or through greater levels of employment in the sector.

The impact of regional integration – through regional agreements – shows how policies can influence the location and end extent of GVC linkages. For members to an agreement, reducing tariff and non-tariff barriers has the potential to lead to greater integration of regional food systems. The agreement leads to greater sector linkages with an increase in the GVC participation – both forward and backward – but most sectors overall. At the country level, the results are less obvious as shifts in product mix have an impact on the overall agro-food GVC participation indicators.

The regional trade agreement (and trade and domestic support barriers in general) can also influence the way that agro-food sectors access GVCs. Accessing GVCs for a sector can be direct – exports from the sector itself – or indirect – through other domestic sectors. What stands out from the impacts of value added exports is that for the majority of increased trade in value added occurs from the indirect linkages to GVCs – that is, those that flow through other domestic sectors. Thus agro-food sectors were heavily reliant on other domestic sector linkages to GVCs as the pathway for their overall growth.

The agreements also increase the amount of foreign value added that ends in member final demand. This increase is due to an increase in value added traded in GVCs within the membership group and is offset in part by falls in value added that is sourced from outside the region – the trade diversion effect. However, while falls do occur in non-member value added that ends in RTA member final demand, it is offset partially through an increase in the flow of non-member value added via other countries – as opposed to direct trade between member and non-member countries. As such, exploring only the bilateral effects may overstate the trade diversionary effects of RTAs. That said, for agro-food products the changes in flows via other countries are only small.

Increased integration in global food systems also promotes growth in imports of own domestic value added. For agro-food products these effects are overall small in total value, however, creation of an RTA does cause an increase the level of imports of own domestic value added. Much of the increase in this is from RTA members themselves – showing how fostering a more competitive agro-food system regionally (or internationally) can promote own consumption of domestic value added.

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Annex A. Sectors list

Table A.1. Sectors in the model

No.	Code	Description	Comprising
1	pdr	Paddy rice.	Paddy rice.
2	wht	Wheat.	Wheat.
3	gro	Cereal grains nec.	Cereal grains nec.
4	v_f	Vegetables, fruit, nuts.	Vegetables, fruit, nuts.
5	osd	Oil seeds.	Oil seeds.
6	c_b	Sugar cane, sugar beet.	Sugar cane, sugar beet.
7	pfb	Plant-based fibres.	Plant-based fibres.
8	ocr	Crops nec.	Crops nec.
9	ctl	Cattle, sheep, goats, horses.	Cattle, sheep, goats, horses.
10	oap	Animal products nec.	Animal products nec.
11	rmk	Raw milk.	Raw milk.
12	wol	Wool, silk-worm cocoons.	Wool, silk-worm cocoons.
13	frs	Forestry.	Forestry.
14	fsh	Fishing.	Fishing.
15	cmt	Meat: cattle, sheep, goats, horse.	Meat: cattle, sheep, goats, horses
16	omt	Meat products nec.	Meat products nec.
17	vol	Vegetable oils and fats.	Vegetable oils and fats.
18	mil	Dairy products.	Dairy products.
19	pcr	Processed rice.	Processed rice.
20	sgr	Sugar.	Sugar.
21	ofd	Food products nec.	Food products nec.
22	b_t	Beverages and tobacco products.	Beverages and tobacco products.
23	ext	Mining and Extraction	Coal; Oil; Gas; Minerals nec.
24	tex	Textiles and Clothing	Textiles; Wearing apparel.
25	lmc	Light Manufacturing	Leather products; Wood products; Paper products, publishing; Metal products; Motor vehicles and parts; Transport equipment nec; Manufactures nec.
26	hmc	Heavy Manufacturing	Petroleum, coal products; Chemical, rubber, plastic prods; Mineral products nec; Ferrous metals; Metals nec; Electronic equipment; Machinery and equipment nec.
27	utc	Utilities and Construction	Electricity; Gas manufacture, distribution; Water; Construction.
28	trd		Trade.
29	trn	Transport	Transport nec; Sea transport; Air transport.
30	bus	Business Services	Communication; Financial services nec; Insurance; Business services nec.
31	ots	Other	Recreation and other services; PubAdmin/Defence/Health/Educat; Dwellings.

Annex B. Region list

Table B.1. Countries and regions in the model

No.	Code	Description	Comprising
1	AUS	Australia	Australia.
2	NZL	New Zealand	New Zealand.
3	CHN	China	China.
4	KOR	Korea	Korea, Republic of
5	XEA	Rest of East Asia	Hong Kong; Mongolia; Chinese Taipei; Rest of East Asia; Brunei Darussalam.
6	JPN	Japan	Japan.
7	IDN	Indonesia	Indonesia.
8	MYS	Malaysia	Malaysia.
9	THA	Thailand	Thailand.
10	KHM	Cambodia	Cambodia.
11	LAO	Lao PDR	Lao People's Democratic Republic
12	PHL	Philippines	Philippines.
13	SGP	Singapore	Singapore.
14	VNM	Viet Nam	Viet Nam.
15	XSA	Rest of South Asia	Bangladesh; Nepal; Pakistan; Sri Lanka; Rest of South Asia.
16	IND	India	India.
17	MEX	Mexico	Mexico.
18	CAN	Canada	Canada.
19	USA	USA	United States of America.
20	ARG	Argentina	Argentina.
21	CHL	Chile	Chile.
22	BRA	Brazil	Brazil.
23	CRI	Costa Rica	Costa Rica.
24	XLA	Rest of Latin America	Bolivia; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela; Rest of South America; Guatemala; Honduras; Nicaragua; Panama; El Salvador; Rest of Central America; Dominican Republic; Jamaica; Puerto Rico; Trinidad and Tobago; Caribbean.
25	XEU	EU27	Austria; Belgium; Cyprus[1,2]; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Slovakia; Slovenia; Spain; Sweden; Bulgaria; Croatia; Romania.
26	GBR	UK	United Kingdom.
27	CHE	Switzerland	Switzerland.
28	NOR	Norway	Norway.
29	UKR	Ukraine	Ukraine.
30	RUS	Russia	Russian Federation.
31	ZAF	South Africa	South Africa.
32	XMN	Middle East and North Africa	Bahrain; Iran Islamic Republic of; Israel; Jordan; Kuwait; Oman; Qatar; Saudi Arabia; Turkey; United Arab Emirates; Rest of Western Asia; Egypt; Morocco; Tunisia; Rest of North Africa.
33	XSS	Sub-Saharan Africa	Benin; Burkina Faso; Cameroon; Cote d'Ivoire; Ghana; Guinea; Nigeria; Senegal; Togo; Rest of Western Africa; Central Africa; South Central Africa; Ethiopia; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Rwanda; Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; Namibia; Rest of South African Customs .
34	XRW	ROW	Rest of Oceania; Rest of Southeast Asia; Rest of North America; Rest of EFTA; Albania; Belarus; Rest of Eastern Europe; Rest of Europe; Kazakhstan; Kyrgyzstan; Tajikistan; Rest of Former Soviet Union; Armenia; Azerbaijan; Georgia; Rest of the World.

Notes: 1. Note by Turkey: The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue.” 2. Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Annex C. Detailed results

Figure C.1. Change in flows of domestic value added export by country-sector: Trade policy removal

	AUS	NZL	CHN	KOR	XEA	JPN	IDN	MYS	THA	KHM	LAO	PHL	SGP	VNM	XSA	IND	MEX	CAN	USA	ARG	CHL	BRA	CRI	XLA	EU27	GBR	CHE	NOR	UKR	RUS	ZAF	MENA	SSA	ROW
Paddy rice	0	0	184	1	0	0	0	0	-5	1	0	0	0	21	12	35	0	0	541	-8	0	5	0	8	37	0	0	0	0	23	0	4	-3	23
Wheat	-271	0	1	0	0	0	0	0	0	0	0	0	0	0	-37	10	-33	2383	289	124	0	178	0	113	264	-11	198	0	893	1346	-5	-8	1	546
Cereal grains nec	18	1	0	0	0	0	1	0	2	1	13	0	0	0	5	88	15	43	1520	186	3	282	0	43	295	3	144	0	142	87	182	1	1	8
Vegetables, fruit, nuts	129	3	1709	26	22	67	527	3	213	32	14	-19	0	1057	64	136	56	1216	692	212	11	47	198	706	1278	6	5	-2	51	59	146	1005	-17	106
Oil seeds	7	0	860	2	0	0	2	4	1	2	2	2	0	0	4	396	14	-273	919	-137	1	787	2	229	167	17	10	0	-15	23	217	33	105	32
Sugar cane, sugar beet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Plant-based fibers	21	0	0	1	1	0	0	-4	0	0	0	0	0	0	12	161	11	0	202	-5	0	-20	0	3	8	2	3	0	0	0	1	26	105	47
Crops nec	-28	-35	891	15	0	188	-85	-95	-31	10	7	174	-3	-242	290	296	0	-39	701	83	-29	473	-32	-39	754	16	12	0	106	0	42	575	649	-20
Cattle,sheep,goats,horses	78	11	0	0	-3	0	0	0	0	0	0	0	0	0	0	2	43	21	-40	2	0	47	0	179	344	-6	-1	-1	0	0	-1	0	-52	0
Animal products nec	29	-20	67	10	2	-7	4	2	1	-1	0	0	2	-3	1	8	7	37	219	37	5	17	0	12	216	9	-6	3	2	1	2	1	-1	-2
Raw milk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	1	0	0
Wool, silk-worm cocoons	2516	-157	-58	2	-36	0	0	0	0	0	0	0	0	0	2	-3	0	2	7	13	7	-3	0	26	174	47	0	0	0	1	109	3	1	-2
Forestry	2	-142	15	1	1	2	12	19	4	1	8	0	3	2	22	20	0	15	24	0	2	-1	4	9	40	0	0	2	-4	18	1	7	68	151
Fishing	10	-1	123	16	6	27	10	3	5	4	0	2	2	2	6	10	9	27	56	0	8	1	0	9	17	-5	0	201	0	27	8	10	4	17
Meat: cattle,sheep,goats,horse	2748	2154	-7	2	1	-2	4	1	21	1	1	3	2	1	-20	272	160	398	1903	2608	120	2429	12	2369	3902	-267	4	3	-6	-10	6	0	254	7
Meat products nec	95	-46	-593	22	-9	-1	15	32	-262	2	1	-15	3	-4	5	24	319	1430	4101	241	739	5101	-1	39	6362	-28	286	27	-39	-15	-1	70	3	-31
Vegetable oils and fats	24	6	6	197	19	-5	2816	4064	-10	12	0	2	4	-8	-7	514	0	127	734	-1557	1	-483	3	16	520	14	43	42	-271	73	44	440	-7	42
Dairy products	743	3065	52	179	1	11	11	42	21	0	0	24	29	-1	4	19	8	85	2761	368	134	7	-6	167	8045	280	592	214	20	1	40	177	4	124
Processed rice	372	0	241	0	2	7	-2	-1	1829	-6	1	-4	1	656	310	524	0	0	2822	8	0	31	0	130	19	-1	1	0	0	31	0	20	-2	29
Sugar	115	0	3	71	0	1	-1	30	586	-4	4	87	5	1	4	229	-101	13	-6	33	1	4508	13	740	-33	-81	175	0	-3	4	130	316	-177	-2
Food products nec	252	-20	3692	1746	45	224	97	180	2026	3	2	120	28	49	82	405	41	539	3568	185	-133	977	7	990	5716	128	453	434	-56	60	131	432	-70	123
Beverages and tobacco products	674	27	199	333	219	188	34	23	73	1	2	29	181	60	69	319	18	111	797	-10	38	727	-1	171	3836	622	515	3	-27	23	224	103	-4	45

Source: Author estimates.

Figure C.2. Change in flows of domestic value added export by country-sector: Distorting forms of domestic support policy removal

	AUS	NZL	CHN	KOR	XEA	JPN	IDN	MYS	THA	KHM	LAO	PHL	SGP	VNM	XSA	IND	MEX	CAN	USA	ARG	CHL	BRA	CRI	XLA	EU27	GBR	CHE	NOR	UKR	RUS	ZAF	MENA	SSA	ROW
Paddy rice	0	0	35	0	0	-1	0	0	48	1	1	0	0	1	54	55	0	0	41	16	0	14	0	51	-28	10	0	0	0	1	1	8	7	1
Wheat	588	0	1	0	2	0	0	0	0	0	0	0	0	0	65	-2	-232	749	-67	207	0	-40	0	79	-913	38	-35	0	132	439	6	43	1	58
Cereal grains nec	80	2	7	0	0	0	0	0	4	1	2	0	0	0	1	22	-3	77	703	217	19	69	0	26	0	14	-18	0	124	27	56	12	17	12
Vegetables, fruit, nuts	-10	52	152	4	1	3	21	0	48	2	0	31	0	-22	28	92	126	-39	255	94	152	71	153	370	-487	-80	1	-2	8	5	166	723	130	79
Oil seeds	126	0	-43	0	1	1	1	9	1	0	0	0	0	0	2	114	0	390	866	532	3	1522	1	483	-120	34	-41	0	197	26	3	46	87	40
Sugar cane, sugar beet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0
Plant-based fibers	176	0	3	0	4	0	4	3	1	0	0	0	0	0	57	120	14	1	-263	25	0	110	0	8	-247	-22	-2	0	0	0	8	145	228	125
Crops nec	7	26	123	15	23	35	185	12	43	2	19	7	4	658	121	364	39	-182	333	65	33	2005	79	1772	-1251	16	-22	0	-3	0	38	329	2781	151
Cattle,sheep,goats,horses	39	11	1	0	21	0	0	0	1	0	0	0	0	0	0	0	-26	54	69	1	0	17	0	17	-20	38	-1	0	0	0	1	8	57	12
Animal products nec	20	29	158	1	11	3	13	3	7	0	0	0	2	6	6	8	0	6	118	19	4	20	0	17	8	-16	-1	-3	5	8	10	43	13	18
Raw milk	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	0	0	0	1	-3	-1	0	0	1	2	0	5	1	2
Wool, silk-worm cocoons	-17	8	76	0	35	0	0	0	0	0	0	0	0	0	0	-2	0	0	-6	3	-1	1	0	2	-124	-18	0	0	0	0	39	11	1	4
Forestry	-1	-24	4	0	0	0	0	-4	0	0	-3	0	0	0	0	2	0	7	11	0	0	0	0	-1	8	-2	0	0	0	-5	0	0	-26	-6
Fishing	-1	-1	-4	0	-1	0	-1	-1	0	0	0	-1	0	0	0	0	-1	0	-1	0	1	0	0	-1	-9	-6	0	-33	0	-1	0	-2	-1	-4
Meat: cattle,sheep,goats,horse	55	341	11	0	10	-1	0	0	1	0	0	0	0	0	6	89	-34	26	117	78	8	43	1	115	-201	36	0	1	2	6	1	3	30	10
Meat products nec	15	31	126	0	2	0	6	1	195	0	0	2	0	0	0	-2	-25	-11	335	19	17	253	0	32	-364	-19	-6	-52	0	2	5	26	1	23
Vegetable oils and fats	8	0	-49	0	-1	-2	599	752	2	1	0	73	3	0	2	196	-2	153	-80	332	1	201	2	51	-357	6	-14	4	90	28	3	48	20	55
Dairy products	40	112	9	1	1	0	2	5	5	0	0	2	5	1	0	8	1	5	-12	13	4	0	0	18	-408	-17	-88	-4	11	3	5	15	1	29
Processed rice	7	0	9	-1	1	-4	0	-3	113	7	1	1	0	28	35	45	0	0	66	1	0	2	0	3	-28	1	-1	0	0	-1	0	3	1	3
Sugar	13	0	1	3	0	0	0	-3	77	0	0	0	0	0	0	24	11	-3	4	0	0	-124	1	46	-22	-5	-12	0	1	0	7	25	32	16
Food products nec	32	17	69	-43	-2	3	52	-4	144	0	0	20	6	35	37	10	-57	89	229	34	73	23	-3	118	-804	32	-66	56	7	20	26	117	65	99
Beverages and tobacco products	18	5	4	2	4	3	1	0	5	0	0	0	2	1	2	3	18	7	66	5	15	7	0	15	-351	-12	25	1	-3	4	13	5	2	7

Source: Author estimates.

Figure C.3. Change in flows of domestic value added export by country-sector: Both trade policy and distorting forms of domestic support policy removal

	AUS	NZL	CHN	KOR	XEA	JPN	IDN	MYS	THA	KHM	LAO	PHL	SGP	VNM	XSA	IND	MEX	CAN	USA	ARG	CHL	BRA	CRI	XLA	EU27	GBR	CHE	NOR	UKR	RUS	ZAF	MENA	SSA	ROW
Paddy rice	0	0	219	1	1	-1	0	0	43	3	1	0	0	22	66	90	0	0	582	8	0	19	0	59	9	10	0	0	0	24	1	12	4	24
Wheat	317	0	1	0	2	0	0	0	0	0	0	0	0	0	28	7	-265	3132	222	331	0	138	0	192	-649	27	164	0	1024	1785	1	34	1	604
Cereal grains nec	98	3	8	0	0	0	1	0	6	2	14	0	0	0	6	110	12	120	2224	403	22	351	0	68	294	18	126	0	266	113	238	13	18	20
Vegetables, fruit, nuts	118	56	1861	30	22	69	548	3	261	34	14	12	0	1035	92	228	182	1177	948	306	163	118	352	1077	791	-73	6	-4	60	65	312	1728	114	185
Oil seeds	134	0	817	2	1	1	3	13	2	2	2	2	0	0	6	510	14	117	1785	395	4	2309	2	711	46	51	-31	0	182	49	220	79	192	72
Sugar cane, sugar beet	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	2	1	0
Plant-based fibers	197	0	3	2	5	0	4	-1	0	0	0	0	0	0	69	281	25	1	-61	20	0	90	0	11	-239	-21	0	0	0	0	8	171	333	173
Crops nec	-20	-8	1014	30	23	223	100	-83	12	12	26	181	1	417	410	660	39	-221	1034	148	4	2478	47	1734	-497	33	-11	0	103	0	80	904	3430	131
Cattle,sheep,goats,horses	117	22	1	1	17	1	0	0	1	0	0	0	0	0	0	2	17	75	29	3	1	64	0	196	324	32	-2	-1	0	0	0	8	4	12
Animal products nec	49	9	224	11	12	-4	17	5	8	0	0	0	4	3	7	16	6	43	337	57	9	37	0	29	224	-7	-7	-1	8	9	12	44	12	16
Raw milk	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	0	0	0	0	-4	-1	0	0	0	2	0	5	1	2
Wool, silk-worm cocoons	2499	-149	18	2	-1	0	0	0	0	0	0	0	0	0	3	-4	0	2	1	16	6	-2	0	29	50	29	0	0	0	1	149	13	2	3
Forestry	1	-166	19	1	1	2	13	15	4	0	4	0	4	2	22	22	0	22	35	0	3	-1	4	8	48	-2	0	2	-4	13	1	7	41	146
Fishing	9	-2	119	16	5	27	9	2	5	4	0	1	2	2	5	10	8	27	54	0	9	1	0	8	8	-10	0	168	0	26	8	9	4	14
Meat: cattle,sheep,goats,horse	2804	2494	4	2	11	-2	4	1	22	1	1	3	2	1	-14	361	126	424	2021	2686	128	2472	13	2484	3701	-231	4	4	-4	-4	8	3	285	17
Meat products nec	110	-15	-467	22	-6	-1	21	33	-67	2	1	-13	3	-4	6	23	293	1419	4436	260	756	5354	-1	70	5998	-47	280	-25	-39	-14	4	96	4	-8
Vegetable oils and fats	31	6	-43	197	18	-7	3415	4816	-8	13	0	75	7	-8	-5	710	-2	280	654	-1225	2	-281	5	68	163	19	29	46	-181	102	48	488	14	97
Dairy products	783	3177	61	180	2	11	12	47	26	0	0	26	33	0	5	27	9	90	2749	381	138	8	-6	185	7637	263	504	210	31	5	45	193	6	153
Processed rice	380	0	250	-1	4	2	-2	-3	1942	1	2	-3	1	684	345	569	0	0	2888	10	0	33	0	133	-9	0	1	0	0	29	0	23	-1	33
Sugar	128	0	4	75	1	1	-1	27	663	-3	4	86	5	1	4	253	-90	10	-2	33	1	4384	14	786	-55	-86	162	0	-2	4	136	341	-145	14
Food products nec	284	-3	3761	1703	43	227	148	176	2170	3	2	140	34	84	120	414	-16	628	3798	218	-60	999	4	1108	4912	160	388	490	-49	81	156	549	-5	222
Beverages and tobacco products	692	32	202	335	223	191	35	24	78	1	1	29	183	62	71	323	37	118	862	-5	53	734	-1	186	3485	610	541	4	-30	27	237	108	-2	52

Source: Author estimates.