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Global value chains in agriculture and food: A synthesis of OECD analysis

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GLOBAL VALUE CHAINS IN AGRICULTURE AND FOOD: A SYNTHESIS OF OECD ANALYSIS

This report synthesises the key findings and policy messages from recent OECD work on global value chains (GVCs) in agriculture and food. The food and agriculture sector is increasingly organised within GVC around a number of global hubs. Agro-food GVCs have broadened the gains from specialisation and trade through stronger sector and employment growth. Openness to trade, especially services trade, can positively influence domestic value added creation in agro-food GVCs. However, trade protection and distorting agricultural support policies can reduce the gains from GVC participation and impose costs along the value chain. Government policies need to focus on facilitating participation in GVCs and helping to manage any adjustments across the food and agriculture sector**Keywords**: Agro-food, value added, employment, policy reform, trade.

Keywords: Global value chains, agricultural trade, trade in value added, services, employment, policy reform

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Executive Summary

The food and agriculture sector is increasingly integrated into global value chains

The food and agriculture sector is increasingly organised within global value chains (GVCs), wherein different stages of the process of transforming raw materials into a final consumer product are located across different countries. The separation of production, transformation and delivery has been facilitated by falling barriers to trade and investment, and by developments in contracting, marketing and logistics. Agriculture is linked to GVCs generally as an upstream provider of food, fibre and fuel, with the food sector more of a downstream user of agricultural materials.

Two key indicators can be used to calculate the degree of engagement in GVCs: i) forward participation, which measures the share of exports that form an intermediate into other countries' exports; and ii) backward participation, which measures the share of imported intermediates embedded in a country's exports.

Forward participation in the primary agricultural sector is high when compared with most industrial sectors, with about 20% of exports re-exported by the first importing country. The food and agriculture sectors have slightly lower backward participation than most other industrial sectors, with shares of imported intermediates in exports of about 25% and 15% respectively.

Services are an increasingly important component of agro-food GVCs. They represent around 25% of the total value-added in agricultural exports, and 35% in food sector exports. In addition, service sector inputs account for 30% of the final value of agro-food products in high-income countries and 23% in developing countries. The most important services are trade, transport, financial and business services, mostly sourced from the domestic market, underscoring the importance of the quality of the domestic services market for agro-food production and competitiveness.

GVCs are becoming more global. The amount of agro-food value added used to produce foreign exports has more than doubled in nominal terms between 2004 and 2014, with the fastest growth in extra-regional trade. Emerging economies, especially from Latin America and increasingly from Asia, are key suppliers of agro-food intermediates, which are often processed and sold into regional networks.

Agricultural and food value chains are also increasingly centralised around hubs, notably the People's Republic of China (hereafter "China"), the United States, and Germany. China is both a central seller of intermediates for the production of agro-food products in other countries and a buyer of value added for production of its own exports and for its own final demand. Europe, and Germany in particular, is a key buyer of value added for use in exports and in final demand, underscoring the highly integrated nature of the food systems of EU Members. The United States is most central for purchases towards its own final demand.

Even so, most agro-food trade does not cross multiple borders, with exports of agricultural and food intermediates often used to produce final goods for the domestic market. Moreover, in many developing countries, food production and consumption remains largely local.

The development of agro-food GVCs broadens the gains from specialisation and trade

Countries with higher levels of participation in GVCs have experienced stronger sector and employment growth as a result of access to more efficient and higher quality inputs and services. They have also been able to reap productivity gains from new technologies and wider innovations.

GVC participation in agro-food activities has wider spill-overs in terms of productivity improvements, production growth, and livelihood improvement. In the wool, oilseeds and plant fibres sectors, GVCs account for between one third and one-half of employment. At the aggregate level, there is evidence that involvement in GVCs is a key driver of economic transformation and growth in non-agricultural sectors and for the sector as a whole, with evidence that jobs linked into GVCs have higher productivity levels. Greater service content has helped producers to differentiate and customise their products, improve product quality and build long-term relationships with customers.

The gains from GVC participation do not necessarily imply that countries should inevitably seek to expand vertically into downstream processing. In some cases, a country's comparative advantage may argue in favour of remaining specialised in primary production, but using the efficiency gains from GVC participation to maximise domestic value added by adding services to increase the quality of the primary product or diversify into other sectors.

GVC development has, through a more efficient allocation of resources, raised the availability of food, lowered prices and improved consumer choice. It has simultaneously supported income growth across the agro-food sector, with participation in agro-food GVCs accounting for about a quarter of agricultural work force returns globally. Total agricultural workforce returns vary significantly across countries, reaching a high of 73% in New Zealand. Furthermore, trade-related employment was responsible for the creation of about 2 million agricultural jobs in high-income major trading countries between 2004 and 2014. These trade jobs have helped to mitigate the decline in agricultural employment resulting from longer-term structural adjustment.

Trade protection imposes costs along the value chain

Just as GVC participation expands the gains from open trade, so trade protection along GVCs magnifies the losses. As goods cross borders multiple times, countries may re-import their own value added embodied in other countries' exports. Tariffs imposed on imported intermediates thus effectively act as a tax on exports. At the same time, countries' exports may be constrained not just by tariffs in the markets to which those exports are sent, but also by tariffs in the third markets to which exports containing their value added are sent. Tariffs also choke off the wider gains from GVC participation, by restricting competition, acting as a brake on productivity growth and slowing increases in employment. Openness to trade, especially services trade, can positively influence domestic value added creation in agro-food GVCs. Given the range of inputs that contribute to agro-food GVCs, and that countries can be affected by barriers on other countries' exports, comprehensive and collective action is key to help all countries gain from agro-food GVCs

Non-tariff measures (NTMs) tend to be higher for agricultural and food products than for many other sectors, and are often higher than tariffs. They can support or hinder trade, depending on their design. Safety and quality standards can increase consumer confidence, thereby raising demand. But unnecessarily high compliance costs can raise prices, and constrain participation by firms, especially SMEs. Fundamental principles of regulatory design can help ensure that NTMs facilitate trade and GVC participation, without impeding a country's right to regulate. Those principles include transparency and predictability, non-discrimination, and proportionality (i.e. regulations that are science-based and consistent with agreed international standards).

Government support policies need to facilitate participation in GVCs and manage associated adjustments across the food and agriculture sector

Domestic agricultural support policies need to be carefully designed. Distorting agricultural subsidies have a harmful effect on growth of agricultural value added, and particularly on export returns from participation in GVCs that involve domestic processing sectors. This reduces sector competitiveness and harms

downstream sectors over time. Subsidies linked to outputs and inputs create market distortions and have a negative impact on labour returns from GVC participation, and hence a longer run negative impact on the employment and wage growth opportunities from trade and GVC participation.

Domestic support to agriculture can be structured in a way that strengthens GVC participation. In particular, policies that support sustainable productivity growth, such as R&D, education and high quality physical infrastructure can increase labour returns and domestic value added.

While the spread of production and consumption across different markets can reduce risks, the concentration of agro-food trade around specific regional hubs can have important consequences for countries on the periphery of the network. In particular, the reliance on one or two markets for the sourcing of intermediates or the supply of agro-food products may increase risk exposure, implying a need for private and potentially public risk management strategies.

The development of GVCs magnifies the effects of open markets, bringing efficiency gains and accelerating economic transformation, but also creating winners and losers, requiring effective policies to help maximise the benefits and assist those facing adjustment.

1. Introduction

Trade in agriculture and food products plays a key role in providing consumers with the food we eat and the fibre we wear. Importantly, it plays a key role in providing consumers with greater choice and nutrition, lowering prices and production costs, and increasing supply. For producers, global markets send signals that drive efficient production decisions and generate substantial income and earning opportunities across the globe. The way the global food trade system is organised, and the policies that influence it, are thus of key interest and importance for policy makers.

OECD research has shown that agricultural trade, like that in other sectors, is increasingly organised within global value chains (GVCs), with the production of food occurring increasingly across countries and making use of inputs sourced from around the world. Simply defined, GVCs represent all the activities that take place in transforming raw materials into the product delivered at its end use. Transformation activities include the production, marketing and delivery of a product or service to the final consumer.

Understanding the new linkages and opportunities from agro-food GVCs is important as countries consider new paths to economic development, participation in regional trade initiatives and further reform of multilateral trade rules.

This paper sets out a series of key findings on the changes that have been occurring in world agriculture and food markets based on recent OECD research.[1] It draws out key messages for policy makers, both in terms of the policies that shape GVCs and the factors that policy makers should consider when looking to enable domestic agricultural sectors to benefit the most from participation in these value chains.

2. Agro-food trade has evolved, in line with global trends

The nature of trade has evolved considerably over time. The first unbundling separated the location of production and consumption and resulted in increased trade in final products. The second unbundling saw the fragmentation of production processes across countries, with an increase in trade in intermediates.

For agro-food sectors, the initial unbundling was primarily characterised by commodity trading and supported by the development of standards and grades. These developments allowed the mixing of products from different origins in bulk shipments, facilitating their transport and use for final consumption or in other production activities. The second stage corresponded to a de-commodification process, with increasing importance of information about the way food is produced, and supported by a range of developments in contracting and marketing arrangements that helped build trust among value chain participants (Rhodes, 1993; Royer, 1995; Drabenstott, 1995; Pasour, 1998; Unneveher, 2000; Kirsten and Sartorius, 2002). This resulted in the integration of various agro-food chains with marketing channels and led to an increase in the importance of services both upstream and downstream in the chain. This second unbundling was further driven by innovations in the agro-food sector and improvements in trade logistics.

Across countries, the development of GVCs means that a rising share of exports from one country is being re-exported by another, after having being used as intermediates for further processing (forward participation). In other words, agro-food production from one country can cross borders multiple times by being exported both directly and indirectly (when embedded in a processed good). In 2014, on average, 20% of all agro-food exports were re-exported by the first importing country.

That said, most agro-food production still only crosses borders once. Exports of agro-food products sold as intermediates are increasing in value, with an increasing amount of countries participating. However,

[1] See Greenville, Kawasaki and Beaujeu (2017a;b), Greenville, Kawasaki and Jouanjean (2019a;b;c) and Greenville et al. (2019).

trade in intermediates exceeds that of trade for final demand for the majority of sectors in value added terms. Furthermore, most of the intermediates traded are still used in the production of final goods destined for the domestic market in the importing region and are not re-exported.

The changing face of international trade in agro-food products has affected the structure and dynamics of the agro-food sector. Studies at the farm or individual value chain level have shown that GVC participation in agro-food activities has several spillovers in terms of productivity improvements, production growth, and livelihood improvement (Dedehouanou, Swinnen and Maertens, 2013; Colen, Maertens and Swinnen, 2012; Maertens and Swinnen, 2009; Jaffee and Masakure, 2005). Similarly, at the aggregate level, there is evidence suggesting that involvement in GVCs is a key driver of economic transformation and growth in non-agricultural sectors (Jouanjean, Gourdon and Korinek, 2017) and for the sector as a whole (Lopez-Gonzalez, 2016; OECD, 2015a), with evidence that jobs associated with GVCs have higher productivity levels (Lopez-Gonzalez, 2016).

Ultimately, the result of the increased linkages is a gradual movement away from a bilateral system of international agro-food trade to one that is more akin to a 'network' of trade. Bilateral trading relationships, while important, are often a gateway into the broader network. Similarly, imports of intermediates provide a key linkage, with some significant impacts on sector development.

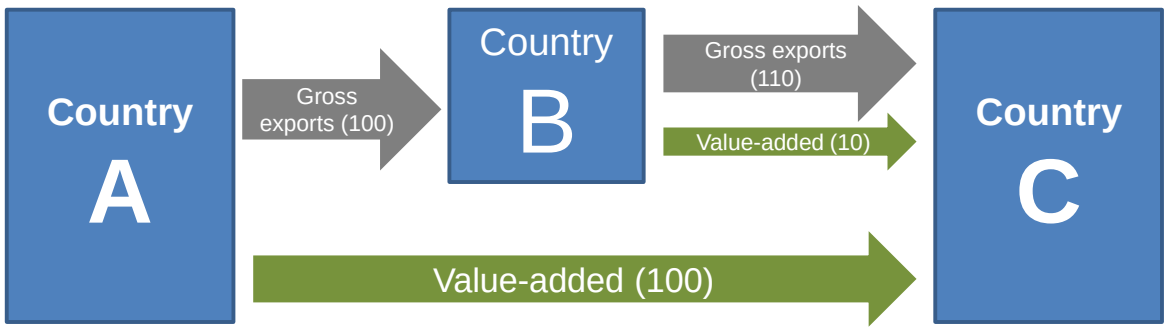
3. Mapping GVCs in agriculture and food

The value of a given product represents the combination of a number of inputs, some of which sourced locally (such as labour, capital and local products) and some imported (such as intermediate inputs and their embodied labour and capital). Gross trade values are made up of the sum of the value of all those inputs. 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. This approach allows estimation of trade in value added terms.

The difference between conventional gross 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. According to conventional measures, total global trade is of $210. However, the value created by Country A is accounted for twice. In other words, traditional measures are inflated by double-counting issues when value added is indirectly exported. In value added terms, global trade is only $110.

Figure 1. Measuring trade in value added

Unpacking trade flows



Similarly, according to conventional measures of trade, Country C has a trade deficit of $110 with Country B, and no trade at all with Country A. The analysis in value added terms, shows that Country A is in fact the chief beneficiary of Country C's consumption. 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.

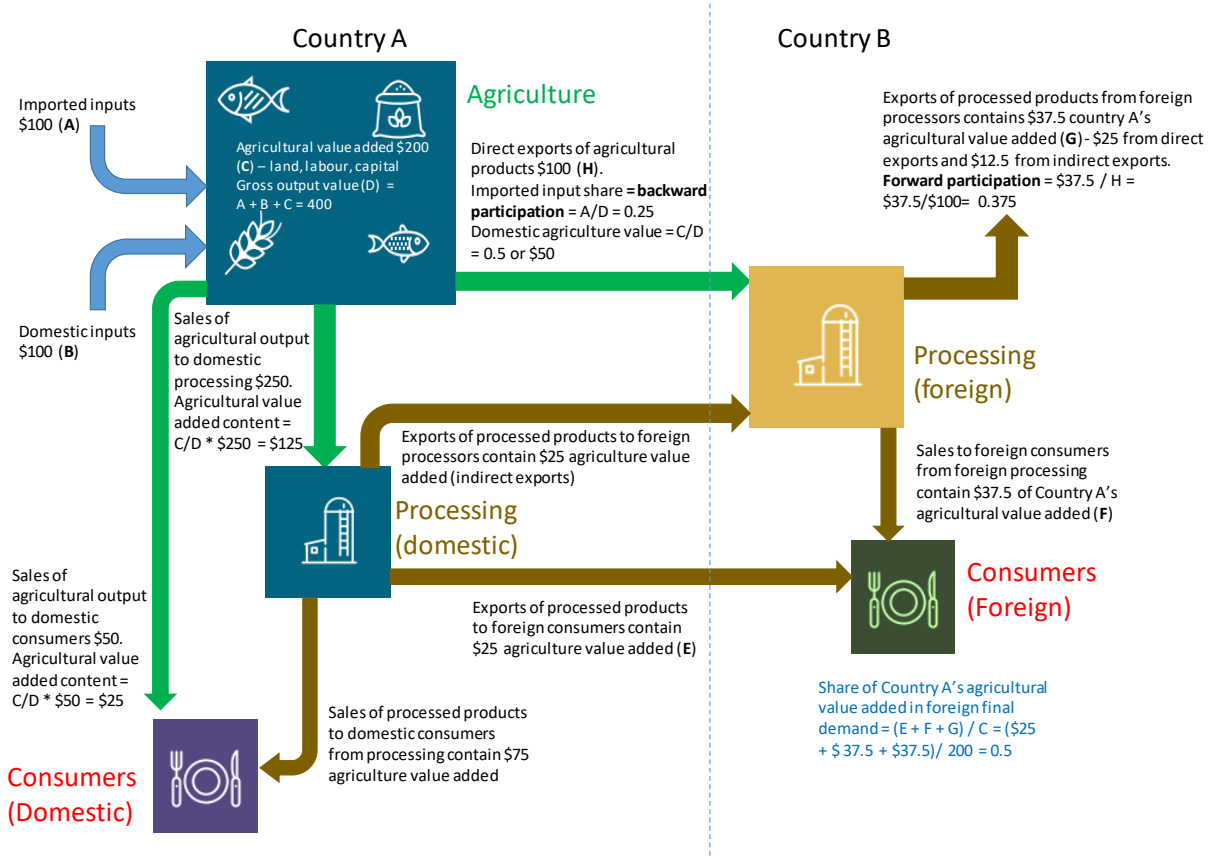
- Broadly, the backward participation index is measured as the share of foreign value added that is included in the total export value of a country. The forward GVC participation index is measured as the share of a country's value added arising from its own exports included in exports of other countries.[2] 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 provide a metric of engagement in the form of 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 is often different from 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 analyse agro-food trade and GVCs from the perspective of the amount of domestic value added that ends in foreign final demand.

[2] The calculation of value added exported for a sector includes both that embodied in direct exports and that which is captured in the exports 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.

Figure 2. Concepts of GVC participation

Backward, forward and other key concepts



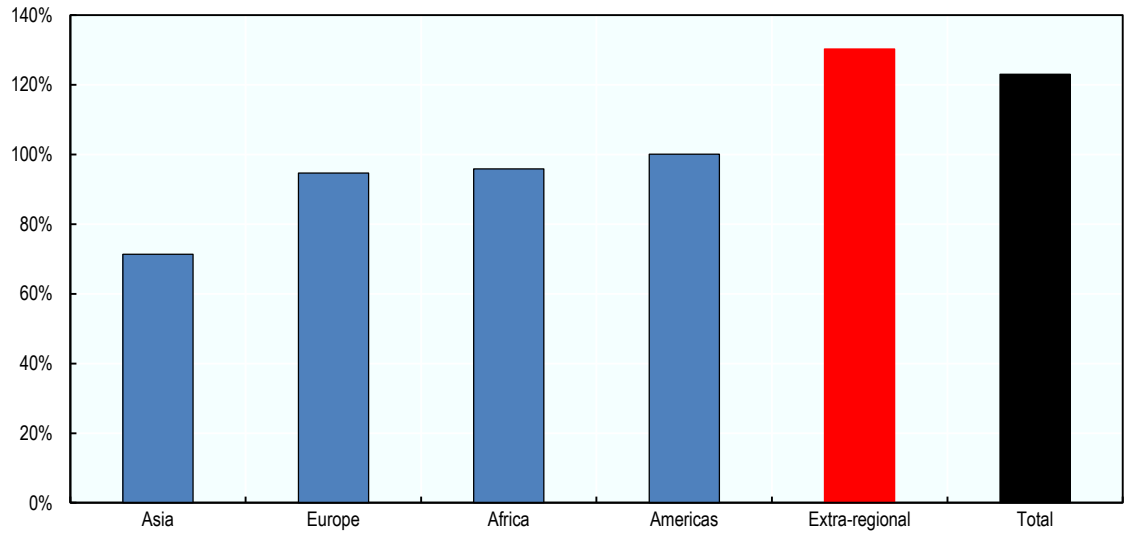
4. GVCs in agriculture and food are becoming more global

Agro-food GVCs are becoming more global as more countries participate, in particular developing and emerging economies, while many developed countries remain significant drivers of agro-food GVCs. However, countries have different patterns of engagement.

In total, agro-food value added used to produce foreign exports increased by 123% in nominal terms between 2004 and 2014, with the strongest increase seen in extra-regional linkages – those between countries located in different broad geographical regions – which grew at just over 130% (Figure 3). Within regions, intra-Asia linkages saw the lowest growth, while intra-Americas linkages experienced the highest (driven by Central and South America). Key drivers of the growth in extra-regional linkages were China and Europe, both of which source value added globally for use in their agro-food exports. For China, integration in GVCs is occurring alongside further development of its own agro-food sectors, which has allowed it to both export more and provide more domestically-produced inputs for the production of exports (resulting in a fall in China's backward participation measure). That said, in absolute value added terms, and in terms of linkages, China's role in agro-food GVCs grew between 2004 and 2014.

Figure 3. Growth in sourcing of value added from agro-food GVCs for use in exports, 2004-14

% change from 2004 to 2014 in nominal trade in value added



Note: Extra-regional trade is defined as those linkages that occur outside countries within each broad region shown.

Although extra regional linkages have increased, they have done so around a smaller number of key players. Looking at all flows of value added from inputs to final demand, agricultural and food value chains become increasingly centralised around specific hubs: China, the United States, and Germany. China, in particular, is both a central seller of intermediates for the production of agro-food products in other countries and a buyer of value added for the production of its agro-food exports and to serve its own final demand (largely through the rising volume of value added purchases even if the shares of Chinese exports have fallen). European countries, Germany in particular, engage globally in buying value added for use in the production of exports and final demand, but sell regionally. This result underscores the highly integrated nature of the food systems of EU members. The United States has a greater global engagement in selling into agro-food GVCs, but a much narrower and regionally focused buying pattern; with purchases targeted towards production for own final demand rather than any other form of engagement.

Other central sellers of value added are some of the world's major agricultural producers and these present a more varied picture by sector and according to countries' comparative advantage, notwithstanding the central role played by China. Despite the greater diversity, however, there has been a consolidation in centrality around several key players. Diverging trends are observed among some emerging economies. Large exporters of agro-food products in Latin America have maintained their role as central players in agro-food GVCs in various sectors, mainly as sellers of value added (either as intermediates or for final demand). These countries have been joined by several emerging Asian countries who have increased their importance in agro-food GVCs as sellers of intermediates. Few changes are seen for other emerging and developing countries.

The changes observed suggest that agro-food GVCs have developed in similar ways to those in manufacturing sectors. That is, there remains a strong intra-regional dimension, despite the growth in extra-regional trade; both ends of the value chains are concentrated around specific hubs; and emerging economies have become important players in the middle of the chain as suppliers of agro-food intermediates. The development of hubs in the agro-food GVC system has possible implications for the resilience of the value chain, with potential ripple effects on satellite countries from supply and demand shocks in the three major agro-food GVC hubs[3].

[3] This remains an area for further research.

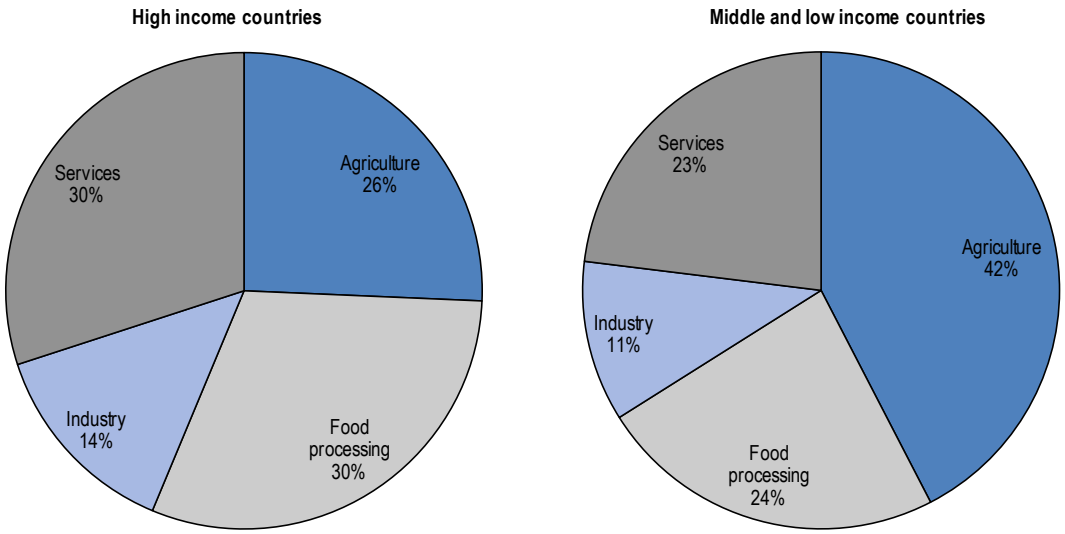
5. Agro-food GVCs are made up of more than just food and fibre – services also matter

A wide range of inputs goes into the food we eat and the fibre we wear. As such, agro-food GVCs extend well beyond these sectors, with linkages to a wide variety of other sectors. For example, even at the farm level, many sectors contribute to production. Production makes use of fertilisers, machinery, and advice from farm consultants such as agronomists, along with applications of new farming methods derived from research and development sectors. Farmers also seek advice from accountants, market analysts and climate specialists, and use information and data when making decisions. Once a product leaves the farm, the transport sector is involved and feeds into a wider production system that, in the case of cattle, may extend from the abattoir for meat to the car industry, which uses hides for leather seats and steering wheels.

Unpacking these linkages provides a means to explore what goes into the products end consumers buy. Focusing just on the final consumption of food and fibre,[4] the average share (globally) of $1 of agro-food products consumed shows that, while agriculture is important, it does not represent the largest value addition to the food we eat or the clothing we wear. In developed countries, the value contributed by the agriculture sector is on average 26% of the final value, with the contribution of food processing sectors at around 30%. In developing countries, agriculture represents a larger share of the value of the final product – most likely associated with the lower level of product transformation that occurs, rather than differing market structures with, for example, a much higher share of production going straight from producers to consumers through local markets.

Figure 4. Distribution of returns from final demand along the value chain, 2014

For agro-food in aggregate, average share of $1 paid by consumers



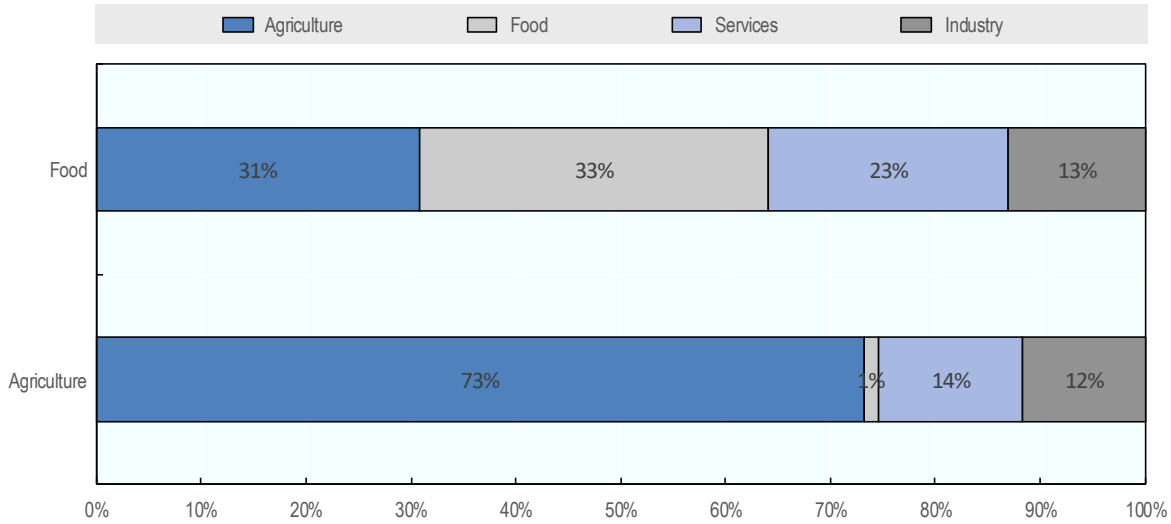
Note: Simple averages across country groups.

[4] That is, the final consumption of products sold to consumers from agriculture and food sectors directly and so not including links from agriculture through to manufacturing sectors.

In 2014, service sector inputs into the final value of agro-food products made up 30% of the final value in high-income countries and 23% in developing countries. In exports, the value contribution from services and industrial sectors is also large, accounting for an average of around one-third of agricultural export value (Figure 5). However, for services, the range of service sector contributions varies significantly across countries (Box 1).

Figure 5. Distribution of average gross export value

Share of USD of export value across broad sector groupings



Note: Shares are total agricultural value added, weighted average shares of the gross value of agricultural exports. Weighted averages taken for consistency with remaining paper. Unweighted averages differ, with higher service and lower agriculture shares seen due to the greater total value of exports from high-income countries.

Box 1. Services used in the production of agro-food exports

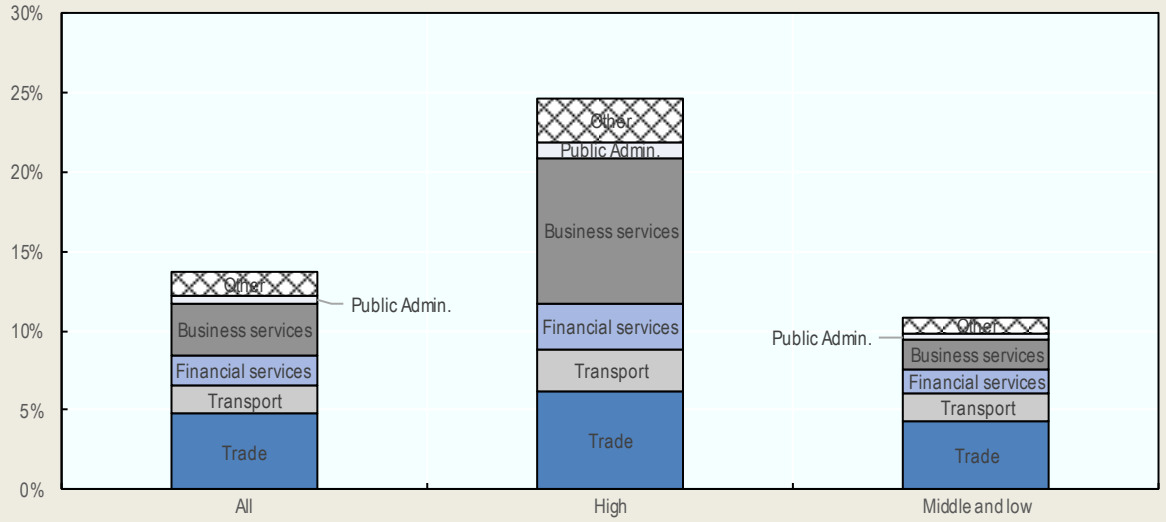
At the country level, the average contribution of services value added in 2014 (and in earlier years) was greater than that of industrial inputs. However, there is considerable variation in the use of services value added across sectors and countries. This variation suggests that it may be an important factor in explaining different exporting patterns across countries.

The major service inputs into agro-food exports are shown in Figure 6, expressed relative to gross export value. Globally, there are four major service sectors that provide inputs into agricultural production and therefore exports. These include trade (all retail sales; wholesale trade and commission trade; hotels and restaurants; repairs of motor vehicles and personal and household goods; retail sale of automotive fuel), transport, financial and business services. These four sectors accounted for over 86% of service provision to the world's agricultural exports in 2014 – a figure that has remained stable over time.

Most of these services are provided by the domestic market. In 2014, on average, 80% of the services provided to agriculture and 73% to food were sourced from the domestic market. This underscores the importance of the quality of the domestic services market for agro-food production, including for its international competitiveness

Figure 6. Major service inputs into agro-food exports by broad country groupings, 2014

Global weighted averages expressed as a share of total industry domestic value added



Note: Other refers to construction, communication; insurance; recreation and other services; and dwellings. Estimates weighted by industry total value added.

6. Agro-food GVCs contribute to sector growth – and services can increase producer returns

Agro-food GVCs shape outcomes for the agriculture and food sectors, with GVC participation a significant driver of sector development and growth. Using foreign inputs in the production of exports (and in production more generally) has a positive impact on domestic value added creation and sector growth. That is, countries with higher backward participation have experienced stronger aggregate domestic value added growth and stronger growth in domestic value added exports over time (between 2004 and 2014) compared with those with lower levels of participation (Figure 7). Similarly, having access to a more diverse set of imported intermediate inputs has promoted sector growth (implying falling input concentration). Furthermore, it is not only the use of foreign inputs in production that matters: agro-food sectors which sold higher amounts of domestic value added into GVCs, either directly or through other domestic and foreign processing sectors, were found to have greater levels of domestic value added growth over time.

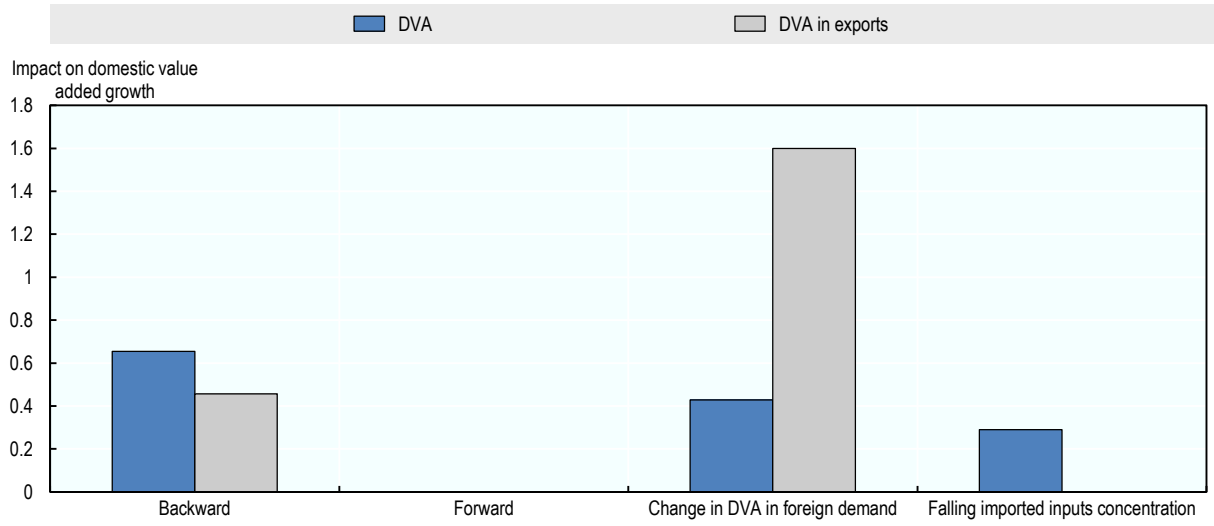
While participation in GVCs is beneficial to sector development, how sectors engage in GVCs is also important. In particular, use of services along the value chain is seen to be an important driver of domestic value added growth. Increasing service use along the value chain, as represented by an increase in the service share of exports, is beneficial for domestic value added growth. This highlights that the development of GVCs in the agriculture and food sectors is not just about mechanisation and investments to promote efficiency. The “de-commodification” of output means that it is not only about what is produced, but *how* it is produced and *how* it gets delivered to export markets or final consumers wherever they may be.

This *how* is the service element of the value chain and increasing service shares in export value were found to be beneficial for sector growth. This result is important when thinking in terms of sector

development and when considering changes in the share of the agro-food sector in the final value of a product. Adding services value means that the share of the agro-food sector in the final value will ultimately fall. Thus, policies that create the conditions where service value is added may mean that the *share* of the final dollar captured by producers will actually be less, but it can nonetheless *increase producer returns in aggregate*.

Figure 7. Changes in growth in domestic value added from GVC participation

Estimated impacts in growth in domestic value added



Note: The result for concentration on imported intermediate inputs depicted has been multiplied by -1 so that it illustrates falls in concentration.

7. Agro-food GVCs create jobs

The range of inputs that go into transforming of agricultural products into food and fibre suggest that the employment effects for the entire economy from agro-food GVC participation may be larger than initially expected.

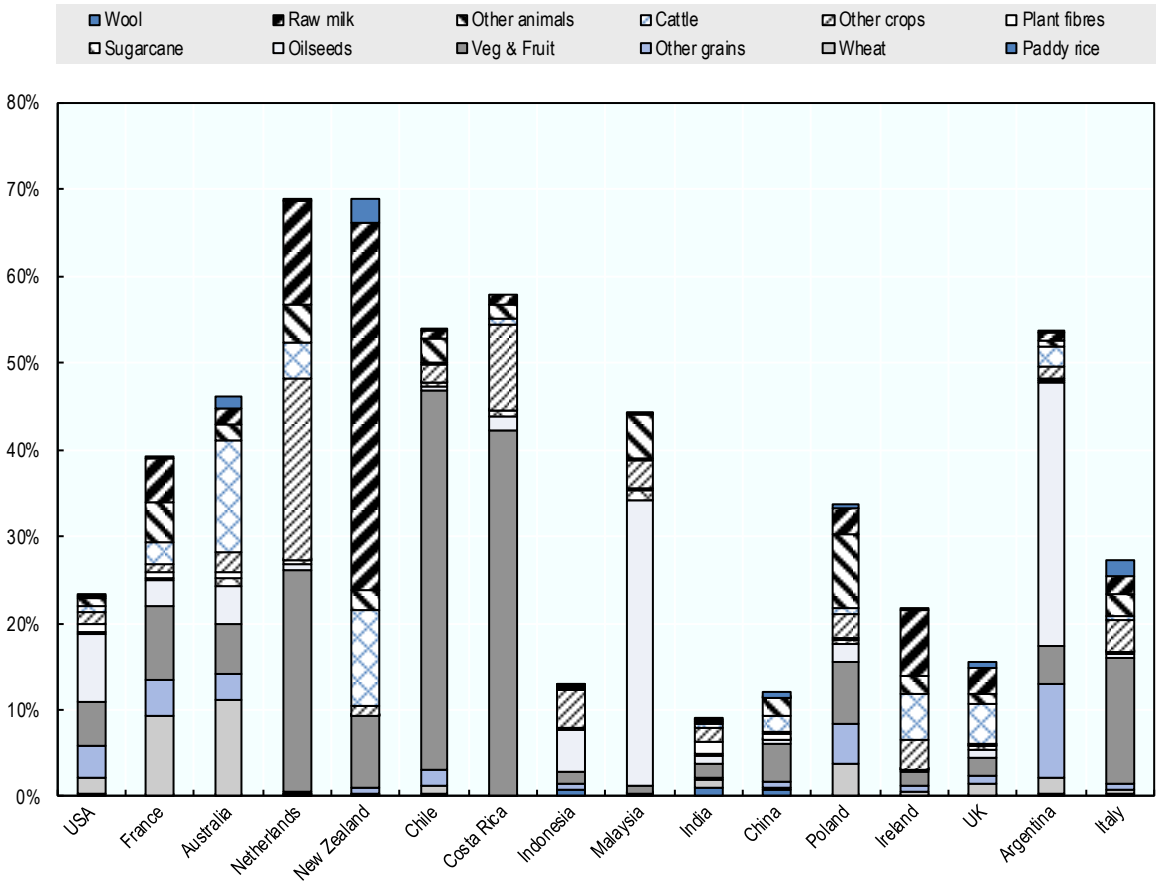
At the global level, trade and GVC participation is a significant driver of labour returns to the agriculture sector. Trade and agro-food GVCs generated an average of between 20-26% of total agricultural workforce returns. Across countries, national agricultural workforces are reliant to varying degrees on GVC participation. At one extreme, in New Zealand, close to 73% of agricultural workforce value is generated by trade in GVCs, while Japan is at the other extreme with around 3%.

Similarly, employment reliance on trade and GVCs varies across agricultural sectors. Trade and GVC reliance is greatest in the wool, oilseeds and plant-based fibres sectors, which have 48%, 39% and 38% of sector employment respectively reliant on agro food GVCs (global averages). These sectors feed most into other production activities, both food, in the case of oilseeds, and manufacturing.

For major agricultural trading countries, both employment reliance and how labour returns are generated from trade and GVC participation also varies considerably (Figure 8). For some, employment from GVC engagement is driven by one or two main sectors, such as oilseeds for Malaysia and fruits and vegetables for Chile and Costa Rica. For other countries, such as France, Australia, Poland, and Ireland, GVC participation is more widespread, with a greater number of sectors benefiting from GVC related employment.

Figure 8. Employment in agriculture generated from GVC participation by sector, selected countries 2014

% of total agricultural employment from total exports to GVCs by sector



Beyond the agriculture sector itself, trade and GVC participation creates employment in other sectors. In terms of exports, the employment spillovers appear to be greatest for sectors providing supporting services. Of the total returns to labour generated by agro-food exports, an average of 21% flows to service sectors. More specifically, this share is of 19% for the production of primary products and of 26% for processed products. The share of the industrial sector is relatively small and approximately the same for both agriculture and food exports, at around 6%.

For several high-income countries, labour demand in agricultural sectors has fallen over time due to rising productivity. This is to be expected: with smaller population growth and relatively saturated domestic demand (due to sufficiently high incomes), over time, the demand for labour to feed domestic demand will fall. While the price rises that occurred in 2007-08 saw employment levels increase in the sector, real prices have subsequently continued to fall, meaning past trends are likely to reappear.

Amongst high-income major trading countries, total employment in agriculture increased between 2004 and 2014.[5] In 2004, total labour returns in the agriculture sector of 14 high-income major trading countries

[5] Major high income trading countries include Australia, Belgium, Canada, Chile, Germany, Denmark, Spain, France, United Kingdom, Italy, Netherlands, New Zealand, Poland, and the United States.

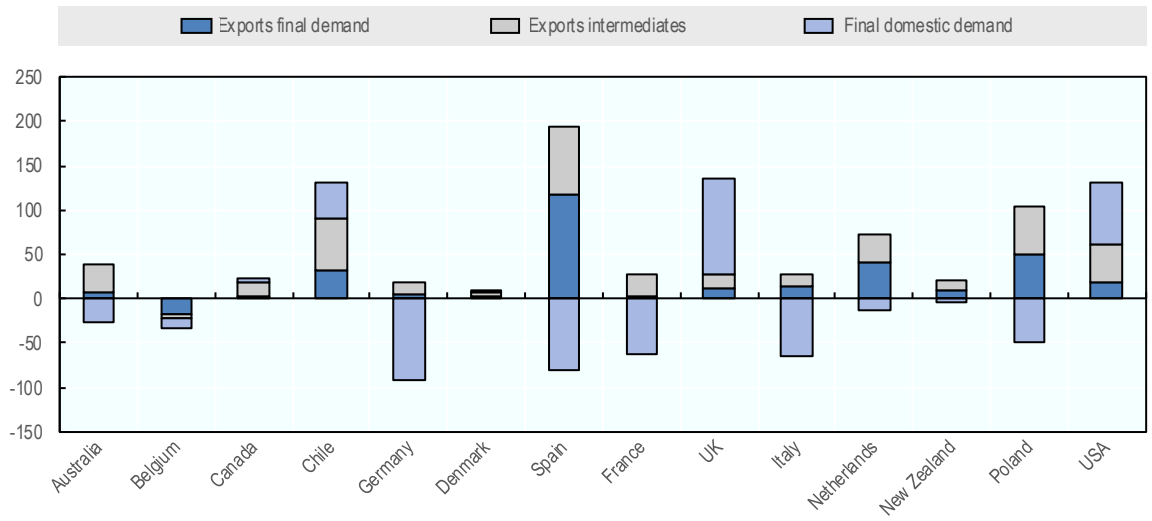
were equivalent to the incomes of an estimated 5.6 million "average" workers[6], a figure that rose to 7.1 million in 2014. This increase occurred despite the continued productivity gains over the period.

This increase in employment has followed differing trends and has been driven by different sources of growth. Agricultural jobs associated with domestic final demand experienced a net fall post-2007; that is, the agricultural sector required fewer jobs to service its own domestic demand. However, trade-related employment – or the number of average workers associated with the production of intermediate products feeding into foreign processing – increased, rising most strongly between 2007 and 2014. This, combined with the increase in employment associated with exports of final goods destined for foreign final demand, offset the falls related to domestic final demand. In other words, trade jobs have driven job creation in agricultural sectors in high-income major trading countries, helping to offset the effects on rural communities of longer-term structural adjustment pressures created through continued productivity improvements in the sector.

Across the high-income countries examined, the counterbalancing effects of trade on labour shedding associated with domestic final demand is particularly strong in Australia, Spain, France, and Poland (Figure 9). For all but France, the growth in trade jobs was greater than the reduction in jobs associated with serving the domestic market, having a net positive impact on the total number of jobs in the sector. In Australia, for example, the average number of jobs associated with selling to domestic final demand fell by around 27 000 between 2007 and 2014; trade-related jobs, however, increased by around 39 000, predominately from trade in intermediate inputs.

Figure 9. Changes in employment associated with trade and final demand, 2007-14

Number of "average" workers, thousands



Note: Average workers refers to the number of workers derived by apply the average economy wide wage for skilled and unskilled workers to skilled and unskilled labour returns across each agricultural sector. Differences in part-time work, under employment, and potential industry specific (non-occupational) wage differences across sectors cannot be taken into account and thus total actual is likely to differ from the estimates depicted.

[6] Average workers refers to the number of workers derived by applying the average economy wide wage for skilled and unskilled workers to skilled and unskilled labour returns across each agricultural sector.

While GVCs are a significant source of employment, and growth in trade has contributed to employment opportunities, participation in GVCs has other impacts at the farm level. GVC participation changes the share of returns captured by labour and other farm (and processor) factors of production. Access to competitive foreign inputs and the spillovers from using those inputs increases the share of value added captured by the producing industry itself. That is, higher returns flow to farmers and domestic food processors themselves and not to other input suppliers. The strongest effects are seen for capital, land, and unskilled labour, although skilled labour also benefits. The impacts on labour returns have been both in the form of higher wages and through increased employment; however, the mix varies considerably across countries.

8. Gains from participating in agro-food GVCs can come from exporting primary products as well as from downstream processing

Increasing trade in agro-food sectors within GVCs has the potential to offer new – and enhance existing – opportunities to add value to agricultural production. GVCs allow for the various stages of the production of the food we eat and the clothing we wear to be distributed across different countries. Combined with the shift in trade from raw commodities to products with specific attributes, these developments have potentially given rise to (or reinforced) a range of value adding opportunities for the agriculture sector.

Broadly speaking, there are two possible value-adding pathways related to exports of agriculture value added and GVC engagement. The first is a processing pathway, where domestic value addition to agriculture and links to trade and GVCs occur through downstream domestic processing sectors. The second is a primary pathway, where domestic value addition occurs on the primary or raw product, and the agricultural sector's engagement in trade and GVCs is direct through exports of these primary products to either foreign processing or foreign final demand.

Agricultural exporters worldwide present differences in specialisation in relation to the balance of the agricultural value added generated by direct trade in primary products and indirect trade embodied in processed products. While all countries export agricultural value added both in primary and processed forms, many have a clear bias towards one versus the other. Underlying these differences is a mix of production activities, but also a range of other factors that may provide a country with an advantage in primary exports but not processed, or the other way around.

Over time, increasing trade in GVCs may also see greater opportunities for direct exports of primary products from the agricultural sector. The break-up of tasks is likely to apply more to processing than production given primary production's reliance on land and climate. There might thus be greater total returns created from primary production by taking advantage of the competitive advantages of foreign processing rather than by moving into downstream processing sectors domestically. For most countries between 2004 and 2014, direct exports of domestic value added from agriculture grew faster than indirect exports of agricultural value added embodied in downstream products. This growth was seen for a number of major agricultural traders and for developed and developing countries alike – a total of 86 of 141 countries and regions experienced stronger growth in primary exports. Furthermore, of these, 72% of those with stronger primary export growth also experienced positive overall export value added growth, while only 60% of those with growth driven by indirect domestic value added saw growth in total exports of agricultural domestic value added.

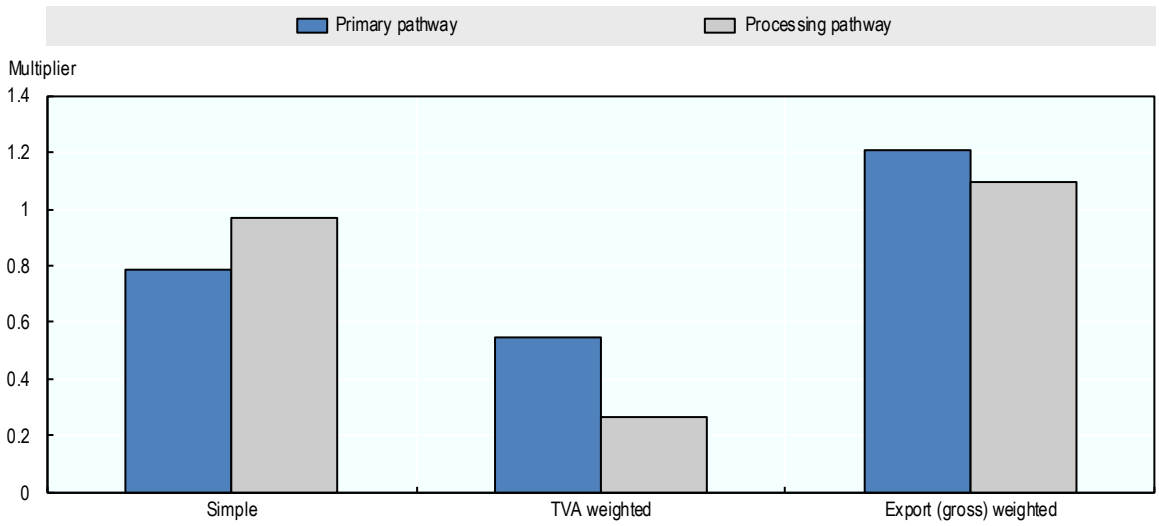
Arguments for moving into downstream value adding are often based on the idea that there are higher returns from domestic processing versus exports of primary products. But if greater export opportunities for primary products exist within GVCs, and selling into these GVCs also requires adding other domestic inputs such as services, the balance of total returns may not necessarily be higher for downstream processing.

To explore this possibility of two different value adding pathways, countries were split into two groups, based on the majority share of their agricultural exports (in value added terms) as either primary products (primary pathway) or processed products (processing pathway).[7] Countries in both pathways still export both primary and processed products, but have a bias towards one over the other.

For countries grouped into the two pathways, in terms of aggregate domestic value added from all sectors related to agricultural exporting activities, the specialisation in one over the other does not alter the total returns created (Figure 10). In other words, the two pathways appear to offer similar overall economic benefits from trade. Countries exporting predominately primary products generated similar aggregate domestic value added returns to those which exported primarily processed products. This result held for the average and at the extremes of specialisation.

Figure 10. Overall pathway contributions to domestic value added, 2014

Global average agriculture total value added multiplier in primary and processing pathways



Note: The primary and processing pathways are identified at the country level based on the total amounts of value added exported as primary versus food products. The multiplier represents the total domestic value added generated in exports on average in the pathways across countries.

This suggests that a relevant alternative pathway for increasing domestic value added – beyond moving into downstream processing – exists. Understanding the differences between the pathways can shed light on how countries can gain from the adding value to primary products and what the impacts of doing this are over time. This may be particularly important for developing countries to better understand policies that could aid in sector transformation and development.

[7] Agricultural value added measured in the processing pathway represents that embodied in downstream sector exports.

9. Policies matter in enabling agriculture to get the most from participation in GVCs

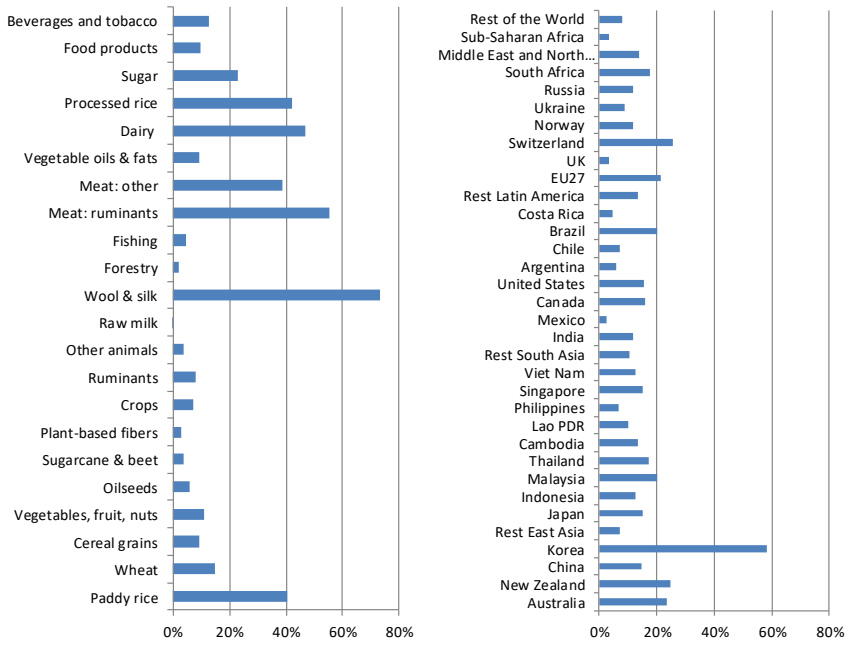
Free, fair and open markets lower costs and increase returns for participants in GVCs

Barriers at the border can have a number of impacts on both GVC participation and the value created by participation.

Tariffs limit both GVC participation and the domestic value added generated by exports. Backward participation in GVCs (that is, sourcing inputs from other countries) is negatively affected by higher tariffs – both overall, across a wide range of goods and services, and in terms of tariffs applied on imports of agriculture and food sectors. For example, participation by a country's dairy sector in GVCs will be limited if tariffs on the import of dairy products are high. Similarly, if that dairy sector was also then to export, the value created by those exports would be lower than if the tariffs on dairy products were to be removed.

Beyond participation, tariffs directly reduce the benefits in terms of the domestic value added of agro-food exports within GVCs. In this sense, tariffs act as a tax on exports. Globally, for all sectors and all countries, reforms to eliminate agro-food tariffs would increase the domestic value added component of agro-food exports (Figure 11).

Figure 11. Growth in exports of domestic value added from global agro-food tariff elimination



Furthermore, with trade in agricultural and food products increasingly taking place within a production network rather than a series of bilateral relationships, the effect of tariffs is compounded along the value chain as the first export market is often not the last. In the case of Australia, for example, 21% of its agricultural exports are re-exported by other countries as part their own agro-food exports – with China alone accounting for 4% of the 21%. Thus, ultimately for Australia, it is not only Australia's own tariffs and China's tariffs on Australian exports that matter, but also all tariffs faced by China on its exports. Given the relationships within GVCs, where a country may be re-importing its own value added embodied in the exports of other countries, tariffs also have the potential to tax a country's own value added – thus also thereby taxing the sector (Box 2).

Box 2. 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 products and the mix of preferential and MFN tariffs applied to different countries. One part of these effects is to tax imports of own domestic value added that is embodied in agro-food imports from other countries.

The source of value added in final demand can be broken down into the different paths to final demand created by GVCs. These include:

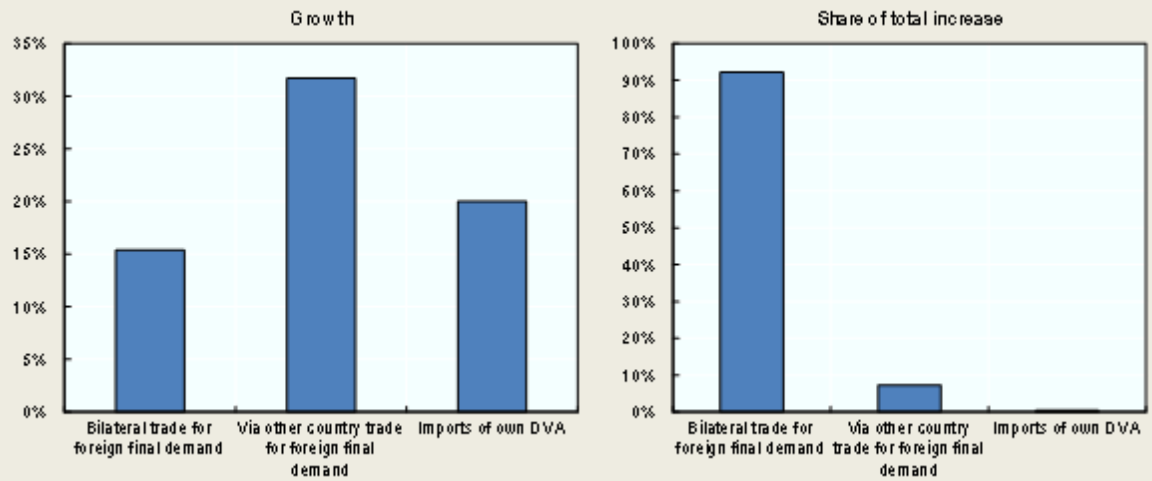
- bilateral path – GVCs that cross two countries and link producers in one country to final consumers in the other
- other country path – GVCs that cross three or more countries and link producers in one country to final demand in another country via processing that occurs in a third (or fourth or so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

The 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. Imports of own value added, the third path, are relatively small across the world.

However, tariff barriers appear to have the greatest relative impact on the second and third paths – that is, paths involving multiple linkages or steps between producers and final demand. When tariff barriers on agro-food products are removed, trade in these two paths grows by 32% and 20% respectively, compared to 15% in the bilateral path.

Figure 12. Changes in domestic value added traded in final demand from removing distorting agro-food trade policies

% change compared to 2011 base



Source: Author estimates.

Countries with a greater diversity in imports into their agriculture and food sectors also gain more from GVC participation compared to those with a narrow scope of imports.

Beyond the immediate impact of tariffs on GVC participation and value creation are more pervasive effects with longer run consequences for agricultural sectors. The effect of tariffs on backward participation also results in a longer-run depressing impact on growth in the domestic agriculture and food sectors. By limiting GVC participation, tariffs also limit the possible productivity growth enabled by the use of foreign inputs, thereby reducing sector competitiveness and thus growth over the longer run. Limits on food trade from tariffs also reduce the competitive pressures faced by domestic sectors and the ensuing incentives for innovation

Tariffs can also have an indirect impact on competitive supply options for domestic agricultural sectors, potentially creating competition issues along the supply chain. With GVCs, open trade markets open each step of the value chain to competition, limiting the scope of market power within domestic markets.

Lastly, reducing sector competitiveness by limiting access to competitive inputs can in turn affect the ability of those domestic agriculture sectors to access global production networks, as they become less attractive as a source of inputs for countries whose own food sectors are a competitive choice of supply. Given that the total gains for an economy from agricultural production are on average the same with primary exports as they are for processed food exports (see Section 8), this represents the loss of an important opportunity for greater total value adding opportunities from agricultural production.

Indeed, maximising the overall economic returns from the agricultural sector does not necessarily mean moving into downstream processing. Facilitating access to international processors and value chains may offer the same or greater overall economic returns. Thus when considering policies for agricultural sector development and transformation, or for increasing employment opportunities and promoting growth in rural areas, open trade policies can be an important part of the policy framework.

In sum, countries with open markets are best placed to enable their agricultural and food sector to benefit from GVCs. Given the range of inputs that contribute to value addition in agricultural and food GVCs (see Section 4), open markets need to have a wide scope – covering all agricultural and food imports and those from other sectors to help drive domestic value added growth in both the short and the longer term. Moreover, given that GVC linkages mean that countries can be affected by barriers on other countries' exports, comprehensive and collective action under the multilateral trading system is of key importance in providing opportunities for all countries to gain from agro-food GVCs.

Beyond tariffs, domestic policies matter: NTMs can support or hinder GVC trade, depending on their design

Beyond tariffs, domestic regulations and the costs of complying with them also affect GVC participation and international trade. The design of these non-tariff measures (NTMs) matters: they can facilitate the free flow of goods and services by giving consumers confidence in quality or standards, or, conversely, they can generate unnecessarily high compliance costs for firms, especially SMEs.

There are fundamental principles of regulatory design that can help ensure that NTMs facilitate trade and GVC participation rather than constrain it, without impeding a country's right to regulate. These principles include transparency and predictability, non-discrimination, and proportionality (i.e. regulations that are science-based and consistent with agreed international standards).

NTMs are common in agricultural and food products, notably in relation to sanitary and phytosanitary (SPS) measures and other, technical measures such as standards (technical barriers to trade, or TBT measures), both of which tend to be higher for agricultural and food products than for many other sectors.

Not all NTMs have the same effects, pointing to the mix of trade-creating and diverting effects of such policies.

NTMs can constrain value creation and increase costs for businesses, with the potential to act in a similar way on domestic value added creation as tariffs. Complex domestic arrangements that create problems for international suppliers negatively affect the domestic value added generated from exports. OECD work to measure these effects found that the frequency of disputes in the World Trade Organisation regarding SPS and TBT measures imposed by a country had a negative influence on the total domestic value added gained from exporting agro-food goods (those into GVCs and those which make use of inputs from GVCs). In contrast, reducing trade costs associated with agro-food related NTMs can grow both participation and domestic value added.

On the other hand, some technical barriers to trade have a positive effect by creating the necessary rules to underpin trade, creating confidence in markets and supply. Robust and science-based measures can create opportunities for exporters to capture trade and value creation. SPS/TBT regulations and standards in export markets encourage the adoption of better production practices and the use of technology. Producers that can satisfy these requirements can access new, high-value markets. NTMs can also facilitate trade and GVC participation by reassuring consumers of the quality and the safety of the product they are purchasing.

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. The growing GVCs in agriculture and food thus underscore the importance of the design of domestic regulations.

How domestic support to agriculture is provided also matters: Support needs to target productivity and sustainability without distorting global markets

While measures affecting market access have direct impact on the economic relationship among actors in the value chain, domestic policies also play an important role in creating the enabling environment and determining agricultural competitiveness.

Governments provide support to agro-food sectors in a wide variety of ways, and domestic agricultural support policies also need to be carefully designed to avoid negative effects on domestic value-addition in global value chains. Recent evidence has found that market-distorting forms of domestic support can destroy value creation in a GVC context. Distorting agricultural subsidies were found to have a harmful effect on growth of agricultural value added, and in particular, to have the greatest impact on the growth in export returns derived from participation in GVCs that involve domestic processing sectors. Such policies reduced agricultural sector competitiveness and can thus harm downstream sectors over time.

For the agricultural sector and for farmers themselves, distorting agricultural subsidies – that is, subsidies linked to outputs and inputs – were found to have a negative impact on labour returns derived from GVC participation. This suggests that subsidies have a longer run negative impact on the employment and wage growth opportunities that arise from trade and GVC participation.

In contrast, non-distorting support provided either directly to producers or to the sector as a whole is seen to have a positive influence domestic value added generation. This has important implications for policy makers when considering reforms to improve the domestic value added generated from agro-food GVCs. Removing distorting forms of domestic can both promote domestic value added from GVC participation and, if coupled with shifts towards non-distorting forms of support, can help improve labour returns and sector competitiveness over the longer run.

So, while the majority of current domestic support is market-distorting, policy makers have other options in providing support – options that will contribute to creating an environment conducive for the creation of domestic value added and boosting agricultural competitiveness. The WTO Agreement on Agriculture provides space for governments to invest in the agro-food sector through non-trade distorting interventions, to support domestic value added and competitiveness. These include support for agricultural research and

development, sharing of knowledge and innovation, building new skill sets in marketing and promotion, information and infrastructure support (Dixit 2014). For instance, WTO rules do not limit investments in extension and advisory services that facilitate the transfer of information and results of research to producers and improve coordination, and physical and digital connectivity to local, regional and international markets. Infrastructure services including electricity reticulation, water supply facilities, and infrastructure associated with environmental programmes also support the development of capacity for domestic value addition. Government investments in these types of facilities are not subject to limit under WTO rules provided the expenditure is directed at the provision or construction of capital works only and excludes the subsidized provision of on-farm facilities other than for the reticulation of generally available public utilities.

Agricultural policies that distort economic incentives lead to friction, inhibit value creation in GVCs and limit opportunities from different value adding pathways. Policies to support the creation of domestic value added in the agro-food sector, therefore, need to be targeted at diverse elements of the agro-food system with a view to supporting the development and sustainability of connections along the value chain. For example, investments in R&D and education are all positively related to domestic value added creation from GVC participation.

The enabling environment for agriculture is key, especially widespread access to better services

The enabling environment to support agricultural production is likely to be a key determinant of the economy wide gains from agricultural and food GVCs. Physical infrastructure, such as quality ports, roads, railways and airports, plays a key role overall and particularly for economic actors in marginal areas – indeed quality physical infrastructure has been found to have a positive influence on domestic value added creation from GVC participation by agro-food sectors.

Telecommunications technology and Information technology (IT) infrastructure that enable consistent access to digital information also support the co-ordination of complex and dispersed production processes (WTO 2017). Services, such as transport, telecommunications, finance, and insurance, are essential inputs for economic activities and knowledge-based services contribute to value addition by helping differentiate products for specific markets and consumers (Roy 2017). Services represent around 25% of the total value-added in traded agricultural products and around 35% of food sector exports, with restrictions to services trade negatively influencing domestic value added creation in agro-food GVCs.

Furthermore, services sector input into agricultural exports are the key differentiating and driving aspect of growing primary sector exports of agricultural value added. Thus, for the agricultural sector to have greater options for value addition from exports and GVC participation, access to competitive service inputs are critical.

Thus to maximise participation in GVCs, and the benefits from that participation, policies need to go beyond the agriculture and foods sectors themselves: policies in other sectors – and notably service sectors – affect the development of agro-food GVCs and domestic value addition.

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