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Agricultural Specific Trade Facilitation Indicators

AN OVERVIEW

Peter S. Liapis

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Abstract

AGRICULTURAL SPECIFIC TRADE FACILITATION INDICATORS: AN OVERVIEW

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Trade facilitation matters. Estimates of trade friction costs from border and custom procedures are relatively high. Trade facilitation to allow for the speedy movement of traded goods may be more important for agricultural, especially perishable, products than for other goods because of their time sensitivity, especially for developing countries. Data suggest that many countries across the geographic and income spectrum have improved their performance on several trade facilitation variables. Concurrently, agricultural trade has grown substantially, especially from low and lower middle income countries. The data suggest that further improvements to trade facilitation in many low and lower middle income countries are needed for them to catch up with best practices. Impediments to trade remain, as indicated by the relatively high tariff equivalent of trade costs, especially on agricultural products.

Key words: Agricultural trade, perishable products, trade facilitation, developing countries, sanitary and phytosanitary standards, trading time.

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Trade facilitation matters. Estimates of trade friction costs from border and custom procedures (direct trade transaction cost) amount to 2% to 15% of the value of traded goods (Moïsé and Le Bris (2013). As reported in Shephard and Wilson (2008), several studies show increased trade flows and benefits from trade facilitation improvements comparable to full liberalization of goods and services. Estimates from Hummels et al. (2007) suggest that the tariff equivalent of time delays involved in processing documents, transporting goods to the border, clearing customs and loading the cargo on to the vessel, are higher than applied tariffs faced by exporters in most regions. Trade facilitation may be more important for agricultural rather than manufacturing trade, especially from lower income countries. As reported by Moïsé and Le Bris (2013) trade transaction costs (for narrowly defined trade facilitation) are higher for agro-food products than manufactured goods due to more stringent and numerous border procedures, physical inspections and SPS requirements, and the perishable nature of many agricultural products which entail a higher sensitivity to delivery delays. Calculations of trade costs excluding tariffs by Duval et al. (2012) confirm that they are higher for agricultural products compared to industrial goods.

The purpose of the study is: to provide an extensive literature review of empirical studies on trade facilitation, including a specific analysis for agricultural goods; to give an overview of recent trends in agricultural and merchandise trade, including relevant policy lessons; to identify knowledge gaps and provide some guidance on information needs for developing trade facilitation variables for agricultural specific trade.

International trade in goods has evolved, especially in the last two decades from trading mostly goods destined for final consumption, to trading intermediate goods destined as inputs for further processing prior to final consumption either domestically or abroad. The fragmentation of production has been assembled into value chains either regional or global. A country's ability to connect to value chains and its location within the chain are partly determined by its ability to meet standards and efficiently move goods through its borders. Innovative work by Hummels and his various co-authors demonstrate that firms and consumers are willing to pay a premium to avoid delays to receive time-sensitive imported goods. Such goods include not only perishable agricultural products but manufactured intermediate inputs within GVCs. Trade facilitation measures which aim to speed the trading process, lower costs and improve the efficiency of procedures involved in moving goods between countries become more important in this context.

Time and motion data from the *Trading Across Borders* database suggest that many countries across the geographic and income spectrum have improved their performance on several trade facilitation variables. The number of documents needed to trade has been reduced and there have been improvements in the timeliness of clearing customs, as well as the time needed to transport the goods to the port and to get the shipment on-board a vessel for exported or imported goods. Although these variables as measured are more representative of manufacturing rather than agricultural trade, low income countries are diversifying their export basket and generating a larger proportion of their export earnings from manufactures and improvements in these metrics suggest an overall improvement in their trading environment.

At the same time, agricultural trade, including perishable products has grown substantially especially for low and lower middle income countries. In addition to improvements in trade facilitation, tariffs have fallen contributing to the trade expansion. Nonetheless, low income countries, despite high growth rates only supply about 2% of the world's agricultural exports and

less than 1% of the world's non-agricultural exports. Lower middle-income countries on the other hand, increased their market share especially of agricultural exports.

The specificities of trading agricultural products suggest that trade facilitation proxy variables as currently measured, may not be representative of the trade frictions associated with their trade. Better measurements of the conventional trade facilitation variables that single out agricultural products are needed. Additionally, there are behind the border procedures such as meeting SPS standards that are important for many agricultural products that need to be taken into account along with potential differences associated with different modes of transporting agricultural goods across international borders such as air transport or cold storage. The literature review identified several variables that are useful for generating agricultural specific trade facilitation indicators when they are measured with respect to trading agricultural particularly perishable products.

For perishable agricultural products whose trade is particularly time sensitive and where food safety and health standards may be more scrutinised, low income countries have increased the share of earnings as their agricultural export basket has shifted to exporting relatively more of these goods. The circumstantial evidence suggests that the capacity to meet food safety health and other standards as well as timely delivery in many low and lower middle income countries may not be binding constraints. This is not to imply that further improvements to trade facilitation are not warranted. The data suggest that many low and lower middle income countries have some ways to go to catch up with best practices. Impediments to trade remain as indicated by the relatively high tariff equivalent of trade costs, especially on agricultural products.

1. Introduction

Trade facilitation refers to policies and measures aimed at easing trade costs by improving efficiency at each stage of the international trade chain. According to the WTO definition, trade facilitation is the "simplification of trade procedures", understood as the "activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade." This is the definition also followed by OECD work on trade facilitation.

Taking a narrow approach, trade facilitation refers to policies and measures which address the logistics of moving goods across borders and efficiently processing customs documentation associated with cross-border trade (Wilson, Mann and Otsuki, 2005). Wider definitions often expand the focus on customs and transit to also include transport and telecommunications infrastructure, banking and insurance, business practices, and standards and regulations (Moïsé and Sorescu, 2013). In this wider sense, trade facilitation measures address both at-the-border and behind-the-border trade costs and bottlenecks throughout value chains. For example, measures concerning trade finance, conforming to standards and regulations and logistics and transport infrastructure can affect costs on either side of the border, while issues concerning customs administrative steps and efficiency present at-the-border direct and indirect costs in terms of time and procedural delays (Moïsé and Le Bris, 2013).

Whatever the definition and scope, existing economic analysis of trade facilitation usually draws on the notion of trade transaction costs and seeks to assess the benefits of (efficiency-enhancing) trade facilitating measures by estimating the costs of inefficiency in the various policy areas influencing the movement of goods. It is within this context that the OECD has developed a series of Trade Facilitation Indicators (TFIs) to evaluate the relative impact of trade facilitation measures and further help identify and address specific facilitation hurdles of given countries (Moïsé and Sorescu, 2013).

The purpose of the study is: to provide an extensive literature review of empirical studies on trade facilitation, including a specific analysis for agricultural goods; to give an overview of

recent trends in agricultural and merchandise trade, including relevant policy lessons; to identify knowledge gaps and provide some guidance on information needs for developing trade facilitation variables for agricultural specific trade.

The rest of the paper is structured as follows. Section 2 provides a brief summary of the recent WTO agreement on trade facilitation, sections 3 to 7 provide an extensive review of empirical literature that examined border and other impediments to trade.[1] First, the findings and limitations from the OECD TFIs for agricultural trade by income and geographical groups are outlined. Section 4 presents insights from studies using measures of customs performance, logistics, infrastructure, and time delays in exports. Section 5 briefly reports on evaluations which adopt more general indicators for trade restrictiveness and non-tariff measures. Section 6 explores the literature on regulatory environments, standards compliance capacity, and standards harmonisation. Section 7 concludes the literature review by summarising the main findings of the review, identifying gaps and limitations in the empirical literature and suggesting potential avenues for future research. For quick reference, Annex I provides a brief summary of the reviewed empirical studies. The subsequent section provides a summary of some key trade facilitation indicators often used in empirical analysis to document their progression. This is followed by background information on general agricultural trade patterns especially for low and lower middle income countries, emphasising trade in perishable goods. The last section summarises and concludes.

2. WTO agreement on trade facilitation

WTO Members reached an important agreement to facilitate trade at the Bali Ministerial in December 2013. The agreement is comprehensive covering the various border processes of importing or exporting. An extensive discussion of the agreement is beyond the scope of this paper. Suffice to say, the Agreement includes language on improving information flows, non-discrimination and impartiality, disciplining fees and charges imposed on importation or exportation among others, along with creating a Committee on Trade Facilitation so that Members can meet and consult regarding the operation of the agreement. The Committee was tasked to i) conduct a legal review of the Trade Facilitation Agreement, ii) receive notifications from members on the commitments they can undertake immediately (Category A commitments) and iii) draw up a Protocol of Amendments to insert the Agreement into Annex 1A of the WTO Agreement. The Agreement also includes Special and Differential Treatment for Developing and Least Developed Members. Developing and least developed Members have the option to place each provision of the Agreement into one of three categories, with each Developing and Least Developed Member self-selecting which provision is placed into which category.

- Category A contains provisions that are designated by the country for implementation upon entry into force of the Agreement, with least developed countries given up to one year to implement the provisions.
- Category B contains provisions that are designated for implementation on a date after a transitional period of time following the entry into force of the Agreement.
- Category C contains provisions that are designated for implementation on a date after the transitional period of time following the Agreement's entry into force and requiring technical assistance in order to implement the provisions

The legal review was completed by members in July 2014. Delegations have begun to submit their Category A notifications. Work on the Protocol started but the July 31 2014 deadline passed without members reaching consensus on the adoption of the Protocol. Countries bridged

1. The literature review sections were prepared mainly by Mr Jean-Louis Keene.

their differences and reached an agreement in late November, 2014, placing the proceedings back on track.

Of interest to this paper is the explicit signalling out perishable products under Article 7 paragraph 9 for their speedy release in order to prevent avoidable loss or deterioration given that all regulatory requirements are met. The Agreement stipulates to release perishable goods under normal circumstances within the shortest possible time; and provide for the release of perishable goods, in exceptional circumstances where it would be appropriate to do so, outside the business hours of customs and other relevant authorities. Furthermore, priority should be given to perishable goods when scheduling any examination, and arrange or allow the importer to arrange proper storage of perishable goods and where practical and consistent with domestic legislation, allow for release to take place at the storage facilities.

3. Applying the OECD trade facilitation indicators to agricultural trade data

The Trade Facilitation Indicators developed by the OECD form a broad set of 16 indicators (derived from 97 variables collected from publicly available data and verified by the authorities of concerned countries) on import, export and transit trade ranging from information availability, advance rulings and appeals, to formalities concerning documentation, time delays, automation and procedures.[2] Applying these indicators in a quantitative setting, Moïsé and Sorescu, (2013) estimate the impact of each TFI on bilateral trade flows of developing countries through a gravity trade model. Estimations are conducted for their entire sample of 106 non-OECD countries as well as for separate income and geographic country groupings. Sub-sample regressions also differentiate between aggregate trade and manufacturing and agricultural sector specific trade. Overall, the TFIs appear to perform quit well for estimations of aggregate trade and manufacturing sector trade flows, with the most statistically meaningful results found when all sectors are included. Results are however less consistent for agricultural trade where reported coefficients tend to be non-significant and less robust to changes in model specifications.[3] The authors suggest that this may be due to the limited number of agricultural sector specific variables included in the indicators' design.

Results also appear to vary greatly across income groups and regions regardless whether the sample included the country groupings only as importing - from or only as exporting - to other countries in the sample. Running agricultural sector trade estimations split by income level sub-samples finds that none of the TFIs are statistically significant and robust across all model specifications for either agricultural imports by, or exports from, low income countries. Three TFIs, namely information availability, formalities-documents and governance and impartiality, appear to be robust in the case of imports to lower middle income countries, however only the indicator for governance and impartiality is robust in the case of exports. For upper middle income countries, only one TFI – formalities-procedures – appears significant and robust for either imports or exports. In all these cases, robust TFIs show a positive relationship with agricultural trade flows; improving the indicator increases agricultural trade.

Estimations for regional country grouping sub-samples also reveal similarly limited results. None of the TFIs are significant and robust in the case of exports from Sub-Saharan Africa, while only the indicator for governance and impartiality is robust in the case of imports to the region. Only TFIs for formalities-documents and formalities-automation appear robust across all

2. A detailed presentation of the TFIs and their components and data sources are given in Moïsé, Orliac and Minor (2011) and Moïsé et al. (2013a).

3. The Significance levels of coefficients for TFIs appear to be quite sensitive to model specifications and are either not statistically significant across all regressions or reverse signs across the four models tested.

model specifications for imports to the Middle East and North Africa region. Again, none of the TFIs are robust across all specifications in the case of exports. Similar findings are reported for Asia where only formalities-documents and formalities-automation are robust for imports and no TFIs are robust in the case of exports. Focussing on Latin America and the Caribbean one TFI, for formalities-automation, appears robust in the case of imports, although indicators for advance rulings, formalities-documents, and formalities-procedures are all robust for exports. Finally, formalities-documents is the only significant and robust TFI in the case of imports to non-OECD Eastern Europe and Central Asia countries, while both formalities-procedures and governance and impartiality are robust in the case of exports. Again, coefficients for this limited set of robust indicators are positive throughout model specifications.

4. Trade facilitation: Customs, logistics, infrastructure and trade time

Aside from those focusing on measures of regulations, most empirical studies evaluating the impacts of trade facilitation on agricultural trade tend to focus on customs performance, infrastructure and logistics efficiency, and overall trade times. These evaluations tend to rely on more general indicators such as the number of days for export and import, the number of documents needed, infrastructure quality, and shipping connectivity and logistics performance indices as proxies for more specific aspects of trade facilitation.[4] Nearly all of the studies identified by this review use more general indicators taken from the World Bank Doing Business surveys, the World Bank Logistics Performance Index, World Trade Indicators, World Development Indicators or the World Economic Forum Global Competitiveness Report. While these indicators may be more representative of aggregate trade flows and stylised shipments than sector specific constraints, the absence of agriculture-specific measures suggests that accessible cross-country data on agricultural trade constraints may be limited. In an effort to discern wider trends in the literature, empirical findings are grouped by general categories of indicators and reported in the sub-sections below.

Border procedures: Time and documents

Import and export times and unreliable time delays can present important direct and indirect trade costs through repercussions on inventory holding and buffer stocks, slowdowns in production chains and just-in-time production, and deterioration of quality or value of perishable and time-sensitive goods (Nordås, Pinali, and Grosso, 2006; Moïsé and Le Bris, 2013). Trade time can be particularly important for agricultural products due to risks of spoilage, especially in the case of more sensitive products such as fresh produce, horticultural goods or meats and dairy products. While less specific than other proxies of trade facilitation, average measures of days to export and import, such as the ones developed by the World Bank Doing Business Database, do represent typically expected delays throughout the entire export or import process albeit not reflecting time-sensitive products.[5]

Studies evaluating the impact of more general trade times tend to report a significant and negative relationship between time delays and bilateral trade in most agricultural sectors, though the importance of these effects seem to vary across types of goods. Not surprisingly, evaluations generally find a stronger effect of time delays on more perishable and time-sensitive products.

4 Many of these are used as inputs in the construction of some of the 16 TFIs developed by the OECD discussed above.

5 Trade times reported by the World Bank Doing Business reports are estimated for a standard cargo of goods by sea transport, from the start of procedures until shipments leave the country. These include time obtaining documents, inland transport and handling, customs clearance and inspections, and port and terminal handling, but do not include ocean transport time. Note that the standard cargo does not require cold storage or special handling.

Looking at bilateral trade flows of aggregate and processed agricultural goods[6], Liapis (2011) finds a statistically significant and negative association between time delays[7] and agricultural trade, suggesting that a 10% reduction in export time is associated with a 9.6% increase in overall bilateral agricultural trade and a 17% increase in traded processed goods for the given country sample. A 10% improvement in import times, on the other hand, is associated with a 22% increase for overall agricultural trade, but does not have a statistically significant effect on processed products. Most of the impacts of export time on processed goods also appear to occur on the extensive rather than intensive margin, with time delays affecting the price and variety of products exported rather than volume. Using the number of days needed to export goods[8] as a proxy for trade transaction costs, Persson (2013) reports a negative and statistically significant effect of export time on the number of agricultural products exported from developing countries to the European Union (EU).

Looking at sector specific trade, effects appear to be stronger in the case of animal or vegetables fats, waxes and oils, and live animal and animal products than in the case of vegetable products. Export times are not statistically significant in the case of prepared foodstuffs, beverages, spirits and vinegar and tobacco, which may reflect the lower time sensitivity of these types of goods. Adopting a similar sectorial estimation approach, Martinez-Zarzoso and Marquez-Ramos (2008) find that both time for import and time for export (as measured by the World Bank Doing Business Database) are significant and negatively associated with trade volumes of coffee, tea, cocoa, spices and manufactures thereof, though export times seem to have a somewhat stronger effect than import times. Focusing on time-sensitive fruit and vegetable products[9] Djankov, Freund and Pham (2006, 2010) find a significant and negative effect of export times, estimating that a 10% increase in time delays is associated with a 3.5% reduction in the volume of such exports in their sample.

The impact of import and export times can vary across sectors depending on time sensitivity, while reductions in trade times can affect aggregate trade volumes. Preliminary World Bank research as reported in a presentation at Columbia University suggests that reducing time to export by one day could increase industrial good exports by 3.4% and agricultural exports by 4.5% (Wilson 2012). Trade time, is also likely to affect a country's composition of trade. Minor and Tsingas (2008) estimate average tariff equivalents of time savings per day for exports and use a computable general equilibrium model to simulate the impact of a reduction in export times on the trade composition of Sub-Saharan African countries. These simulations suggest that a 50% decrease in export time triggers reduction in the share of basic agriculture to total exports and an increase in the share of fresh and processed agriculture, most notably in the exports of vegetables, fruits and nuts.

Other customs procedures, regulations and administrative requirements can present important sources of trade frictions. These can involve significant direct costs in terms of supplying information and documents and complying with inspection and clearance procedures, as well as indirect costs linked to at-the-border slowdowns and time delays. The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) notes that bureaucratic

6. Processed goods are taken as goods that require extensive transformation and are closer to the consumer, such as chocolates, beverages and fresh or chilled meats.

7. Time delays, expressed as the number of days needed to export or import a good, are taken from the World Bank Trading Across Borders Database.

8. Numbers of days needed to export a good are taken from the World Bank Doing Business Database.

9. Agricultural goods with a minimum storage life of three weeks or less are classified as time-sensitive

procedures and documents needed for trade can be an important source of transaction delays and inefficiencies such as the duplication of information, while delays at the border caused by excessive controls and physical inspection procedures, lack of coordination among border agencies, and lengthy clearance procedures can pose significant bottlenecks to trade (UNESCAP, 2011). That administrative procedures can add to time delays was also found by Djankov, Freund and Pham (2010). In examining various components in export procedures they conclude that only about one-fourth of export time delays were caused by poor road or port infrastructure. The rest was from administrative hurdles including custom and tax procedures.

As UNESCAP suggests, agricultural products often face more complex border procedures such as sanitary and phytosanitary certificates, export quota clearance, quarantine measures and inspection controls which require additional documentation and clearance processes. An analysis of surveys[10] conducted by the OECD and the WTO under the aid-for-trade initiative reveals that close to 60% of responding lead firms identified customs delays as the main trade problem when dealing with agro-food suppliers from developing countries (OECD and WTO, 2013a). More than 30% of surveyed developing county private sector suppliers also identified customs paperwork and delays as important difficulties in connecting to value chains. While evaluating the capacity of customs and border services to handle and clear agro-food-products could provide a means to measure trade facilitation performance, most empirical studies rely on broad measures such as customs times or the number of documents needed to trade as proxies for the customs environment, suggesting a gap in the available information on customs efficiency and procedures which can be applied to cross-country analysis.

A few studies propose to evaluate the impacts of at-the-border delays using measures of the average number of days to clear customs and technical controls provided by the World Bank Doing Business reports. These evaluations, however, suggest a somewhat limited impact of customs times on agricultural trade, which may also be sensitive to country particularities and types of goods traded. Further highlighting the costs of trade delays on time-sensitive goods, Liu and Yue (2013) find that customs clearance times have different quality and price effects across agricultural exports. Taking exports in lettuce, apples and groundnuts to reflect three degrees of perishability, estimations report a statistically significant and negative effect of customs times on both quality and price of highly perishable goods (lettuce). Results further indicate a negative and statistically significant relationship with quality, but no significant effect on price in the case of moderately time-sensitive goods (apples), and no statistically significant effect on either quality or price in the case of less perishable goods (groundnuts). Freund and Rocha (2005) also evaluate the impact of customs and technical control clearance time on time-sensitive agricultural exports from African countries using a similar approach to that of Djankov, Freund and Pham (2006, 2010) but find no statistically significant relationship.

Studies using World Bank Doing Business measures for the number of documents and time to obtain and complete documentation also seem to find similarly limited effects. Liapis (2011) finds no statistically significant effect of number of documents needed for export on trade flows of processed agricultural products. Freund and Rocha (2005) also report non-significant coefficients for documentation time on time-sensitive African exports. Estimations by Martinez-Zarzoso and Marquez-Ramos (2008), on the other hand, do present a significant and negative effect of number of documents for import on bilateral trade in the case of coffee, tea, cocoa, spices and manufactures thereof.

Taking an alternative approach, Hummels et al. (2007) using import data by mode of transport (air or ocean shipping) into the United States, calculate the premium that firms are willing

10. The survey was undertaken by the OECD and the WTO, in collaboration with Growth Africa, in preparation for the 4th Global Review on Aid for Trade, and recorded 257 responses from agrifood firms located in 78 countries or territories.

to pay to air ship rather than face an additional day's delay of ocean shipping. They find that the premium varies across products and it is higher for time sensitive goods. Their findings are discussed in more detail below.

A couple of studies further suggest using measures of irregular payments connected with import and export permits as an indicator for customs administration. Again, the significance of results varies by country or region studied. Examining trade flows in food products in Southeast Asia, Shepherd and Wilson (2008) find that irregularities in payments for permits are not statistically significant. Soloaga, Wilson and Mejía (2006) construct a measure of customs environment, composed of hidden import barriers other than published tariffs and quotas and irregular payments or bribes connected with import and export permits, which they apply in gravity model estimations for industrial sector trade flows in Mexico. Surprisingly, while their results indicate that improving the customs environment has a positive impact for Mexican exporters, they find a negative impact on food, beverage and tobacco product importers.

Trade logistics performance

Trade logistics play a fundamental role in facilitating the movement of goods and exchange of related information across borders. Trade logistics systems broadly encompass infrastructure, and transport procedures and services involved in the movement of goods throughout trade chains, covering multimodal transportation networks, vehicles, and port facilities as well as warehouses, storage and handling services, and information and communication technology (UNESCAP, 2011). Efficient trade logistics can be particularly important for agricultural products which may be sensitive to time and storage temperature. Illustrating this, the IFC (2011) reported that in 2010 as much as a third of India's fresh produce was lost as a result of poor transportation and storage facilities, representing a waste in fruit, meat, and dairy products of around USD 13 billion. Fernández et al. (2011) further estimated that logistics costs ranged from 36% to 40% of final price for wheat imports into Nicaragua and Honduras, and 45% to 48% for corn imports to the two countries. UNESCAP (2011) observed that producers and exporters of fresh fruits and vegetables in Thailand lost about USD 96.4 million a year due to spoilage and poor storage, partly caused by a lack of proper cold chain maintenance throughout supply chains.

A couple of studies identified in this review propose to use the World Bank Logistics Performance Index (LPI)[11] in order to capture multiples measures of trade facilitation throughout trade chains. Supporting the previously mentioned case studies, Arvis et al. (2013) analyse the determinant of bilateral trade costs for a group of 178 countries and report a statistically significant and negative effect of logistics performance on overall agricultural trade costs. Weerahewa (2009) conducts gravity model estimations for food and agricultural exports of SAARC countries[12] and finds that the LPI of exporters and importers have a significant and positive impact on the value of exports. Using a sub-component of the LPI, the infrastructure quality index[13], Moïsé et al. (2013) find that agricultural exports of developing countries are highly responsive to the quality of transport and trade related infrastructure, suggesting that a 10% improvement in infrastructure

11. The LPI is compiled based on ratings from individual country assessments by international freight forwarders and includes six components: (1) efficiency of clearance process by border control agencies; (2) quality of trade and transport related infrastructure; (3) ease of arranging competitively prices shipments; (4) competence and quality of logistics services including transport operators and customs brokers; (5) ability to track and trace consignments; (6) frequency of shipments arriving within scheduled or expected delivery time (Arvis et al.. 2012).

12. South Asian Association for Regional Cooperation countries includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

13. The index of infrastructure quality reflects the quality of a number of infrastructure elements including ports, railroads, roads and information technology.

quality has the potential of increasing developing countries' agricultural exports by around 30% for their country sample. More broadly, Portugal-Perez and Wilson (2012) find that improvements in hard infrastructure (ports, airports, road and rail and information and communication technology) bring greater benefits in terms of export growth compared to soft infrastructure (border and transport efficiency). They add however that such investments are expensive and net benefits and costs cannot be stated with certainty for a given country.

Most studies identified by this review tend to favour measures of particular aspects of transport infrastructure rather than broader logistics performance when evaluating the impacts of trade infrastructure on agricultural products. More particularly, these studies employ indicator of air and maritime connectivity, road networks and port efficiency, all of which form vital links in trade networks where inefficiencies can contribute substantially to trade costs.

The OECD and the WTO (2013b) note that while transport costs may be somewhat lower in the case of agro-food products, in part due to simpler supply chains, these can have a greater proportional impact on the price of agricultural products due to their low value-to-weight ratio. As such, transport performance can play an important role in ensuring effective participation in agro-food chains. The OECD and the WTO (2013a) observe that 56% of surveyed agro-food suppliers in developing countries identified transportation costs as a barrier to connect to value chains. Inadequate maritime transport was also identified by around one-quarter of firms. Inadequate airport capacity or links however, was identified by less than 10% of respondents.

Case studies on transportation and infrastructure costs often demonstrate significant impacts on agricultural exporters. Looking at the implicit taxation on Ugandan exports caused by land and sea transport in 1994, Milner, Morrisey and Rudaheranwa (2000) estimate that costs due to poor marine and land infrastructure together represented an implicit tax of 12% and 40% on coffee and food exports respectively. A case study of an agro-business firm in Brazil presented by the World Economic Forum (2013) identified inadequate transport infrastructure as an important source of delays and increased operational costs, with delays at ports costing as much as USD 25 000 per vessel per day. Case studies presented by Nordås, Pinali, and Grosso (2006) further highlighted trade impeding effects of poor quality in physical infrastructure and related services on dairy exports from the Kyrgyz Republic. The authors also underlined the importance of efficient air transport in allowing Kenya to exploit a comparative advantage in floriculture and expand exports of cut flowers.

Evaluations which include a measure of inland transport infrastructure tend to identify a significant effect on the composition of agricultural trade. Taking measures of inland transit times from the World Bank Doing Business Reports, Freund and Rocha (2010) find that increases in transit times reduce African exports of time-sensitive agricultural goods relatively more than time insensitive goods. This, they suggest, implies that more time delays affect the composition of trade and prevent countries from exporting higher-value time-sensitive products. Jongwanich (2009) finds that the density of road networks[14] does not have a significant effect on export volumes of processed foods. However, Jongwanich and Magtibay-Ramos (2009) do identify a statistically significant effect of road density on changes in the structure of agricultural exports implying that improvements in transportation and infrastructure would have larger benefits for processed food industries than for more traditional agricultural export sectors.

The efficiency of ports and maritime transport also appear to have an important effect on agricultural trade, though this impact may vary across regions. Employing an air connectivity index and a liner shipping connectivity index[15] Arvis et al. (2013) find that maritime connectivity

14. Density of domestic road networks is taken from the World Development Indicators.

15. Air connectivity index is taken from Arvis and Shepherd (2011), while the Liner Shipping Connectivity Index is computed by UNCTAD. This later index is composed of five components:

has a statistically significant and negative effect on trade costs of agricultural products. Air connectivity, on the other hand, is found to be non-significant. Duval et al. (2012) also report a negative and significant effect of shipping connectivity on agricultural trade costs, suggesting that a 10% improvement in the liner shipping connectivity index implies a reduction in trade costs of nearly 2%. The impact of port connectivity appears to be even greater for ASEAN-OECD trade flows. Shepherd and Wilson (2008) however find that the quality of sea and air transport[16] do not have a statistically significant effect on trade flows in food products between Southeast Asian countries. Merging indicators for both air and sea transport Soloaga, Wilson and Mejía (2006) compute a composite index of port efficiency[17] and observe a negative and significant effect of port facilities on Mexican trade flows in food, beverages and tobacco. Port efficiency in importing countries further appears to have a higher impact on food imports than exports.

Given the perishable and temperature sensitive nature of many agricultural products, several case studies and reports have signalled the importance of proper cold storage transport and handling infrastructure. Consultations with developing country suppliers conducted by the OECD and WTO identified cold storage and cold chain management as one of the most important constraints facing agro-food firms, with about one third of surveyed firms referring to it (OECD and WTO, 2013a). USAID (2011) reported that the nonexistence of cold chain infrastructure presented significant impediments to agricultural trade in West Africa where poor storage and poor quality product represented about 20% of market logistics costs. This review however, did not identify any empirical studies which included measures of cold chain infrastructure.

5. Trade facilitation: Non-tariff measures and trade restrictiveness

A few studies adopt a broader concept of trade facilitation, proposing to assess the impact of wider trade policy environments using measures of trade restrictiveness. Most of these studies tend to use an index of non-tariff measures (NTM) based on the tariff trade restrictiveness index (TTRI) and the overall trade restrictiveness index (OTRI)[18] which captures effects of quantitative restrictions, technical product regulations, anti-dumping and countervailing measures, and discretionary licensing as well as standards, licencing and similar regulatory environments (Hoekman and Nicita, 2008). Both the TTRI and the OTRI represent ad valorem tariff equivalent measures on a country's imports implied by observed trade policies. While these indices do present a much broader approach to quantifying the effects of non-tariff measures, Moïsé et al. (2013) suggest that these provide the best country coverage available to date for non-tariff measures and do give a realistic overview of constraints faced by countries in practice.

Evaluations quantifying the ad valorem tariff-equivalent of non-tariff measures tend to find a significant impact of NTMs on overall trade costs of agricultural products, reflecting higher trade barriers in agricultural sectors. Using the TTRI and OTRI to evaluate trade policy restrictiveness across sectors, Hoekman and Nicita (2008) show that agricultural trade is significantly more restricted than in manufacturing. Duvall et al. (2012) decomposed overall trade restrictiveness into tariff and non-tariff components for regional grouping and also conclude that

(1) number of ships; (2) their container-carrying capacity; (3) maximum vessel size; (4) number of services; and (5) number of companies that deploy container ships in a country's ports.

16. Quality of sea and air transport are taken from the World Economic forum Global Competitiveness Report

17. Soloaga, Wilson and Mejía (2006) compute port efficiency as the average of two indexed inputs for port facilities and inland waterways and air transport, both taken from the Global Competitiveness Report 2001-2002.

18. Such studies tend to follow the methodology proposed by Kee, Nicita and Olarreaga (2009) to calculate an overall trade restrictiveness index.

agricultural trade costs are much more costly than manufacturing and attribute it to the perishability and higher level of regulations for food safety or food security reasons. Including geometric averages of NTM indices for bilateral country pairs in estimations of an extended gravity model, Duval et al. (2012) find a significant and negative effect of non-tariff measures on trade costs. Preferred estimates suggest that a 10% reduction in nontariff measures is associated with a 3% reduction in agricultural comprehensive trade costs. Their findings also indicate however that natural barriers for example distance, substantially contribute to agricultural trade costs. Depending on the estimation method, they find that natural barriers contribute from 19% to 30% of trade costs. Following a similar approach to that of the OTRI, Moïsé et al. (2013) include an index of non-tariff measure restrictiveness[19] and a TTRI in gravity model estimations of agricultural trade flows of developing countries. Contrary to the authors' expectations, they find a positive and significant effect of the NTM restrictiveness index on agricultural exports from developing countries. While they do not rule out data and measurement issues, the authors suggest that NTMs, and particularly those concerning sanitary and phytosanitary standards, can potentially increase trade by diminishing information asymmetries. Similarly, Beghin, Disdier and Marette (2014) find that some NTMs, by addressing market imperfections such as asymmetric information, can be trade facilitating and welfare enhancing.

6. Trade facilitation: Regulations, standards and compliance capacity

A significantly large body of literature evaluates the impact of standards and regulations on trade flows of agricultural goods. Most recent empirical studies tend to focus on Sanitary and Phytosanitary (SPS) standards and Technical Barriers to Trade (TBT), either taking broader measures of the prevalence of SPS and TBTs or focusing on more specific standards such as maximum residue levels for specific toxins or pesticides.[20] Under the Agreement on Technical Barriers to Trade and the Agreement on the Application of Sanitary and Phytosanitary Measures included in the GATT 1994, countries have the right to implement health protection measures and regulations concerning human, animal, and plant health, as well as accompanying technical requirements, restrictions, and voluntary standards and procedures (WTO, 1994a, 1994b). While these agreements recommend that such regulations follow international standards and guidelines such as those developed by the Codex Alimentarius Commission, the World Organisation for Animal Health (OIE) or other organizations operating with the framework of the International Plant Protection Convention, members can implement their own regulations as long as these are not shown to be discriminatory and comply with the agreements. Notifications of all new SPS measures must also be submitted to the WTO.

SPS notifications have been used extensively since the ratification of the GATT 1994. Ferro, Wilson and Otsuki (2013) observe that 10 366 notifications, along with another 2 980 additions, alterations or corrections were filed with the WTO between January 1995 and October 2011. 1 436 of these were filed in 2010 alone. Nicita and Gourdon (2013) estimate that trade of more than 60% of food-related products are affected by at least one form of SPS measure. However, the expected impact of standards on agricultural trade is not necessarily clear. As Crivelli and Groschl (2012) propose, on the one hand compliance with standards may lead to increased production costs which reduce trade, while on the other, standards may also increase information on food safety and product quality which can lead to increased consumer confidence, reduce transaction costs and thus facilitate trade. This would suggest that the effects of standards

19. The non-tariff measure restrictiveness index is compiled as a weighted average of non-tariff measures tariff-equivalents which include, among others, price and quality control measures, technical regulations, standards, and monopolistic measures.

20. A more detailed literature review of earlier empirical evaluations and case studies is presented in OECD (2003) and OECD (2005).

likely depend on the capacity of a country's industries to comply with domestic and foreign standards. To this extent, Moïsé et al. (2013) suggest that the negative effects of complying with standards and regulations may be stronger for developing countries where relevant agencies often lack expertise and resources in standard setting and enforcement. Similarly, the OECD and the WTO (2013a) find that 60% of surveyed lead firms in global agro-food value chains point to the ability to meet quality and safety standards as one of the major difficulties in connecting with developing country suppliers when making sourcing and investment decisions.

Impacts of standards, sanitary and phytosanitary measures and technical barriers to trade

A variety of measures, each with varying implications for trade, including standards on finished products, standards on procedures, mutual recognition agreements, or embargos, among others, can be applied under the SPS and TBT banner. Empirical evaluations of the effects of SPS and TBT measures tend to find a negative effect on agricultural exports from developing countries to high income countries, but little effect on trade between developed countries, which seems to support the notion that the capacity of export industries to comply with standards play an important role in determining the impacts of SPS measures on trade flows. A review and meta-analysis conducted by Li and Beghin (2012) of 27 papers which employ gravity equations to estimate trade effects of standards and technical measures finds that technical measures are more likely to have a negative and significant effect on trade in agriculture and processed food products. SPS regulations on agro-products and food trade are also more likely to be trade impeding on exports from developing countries to high income importers than similar measures in North-North trade.

Reported impacts of standards, however, appear to vary significantly across agricultural sectors. Using a count measure of notified SPS/TBT standards, a frequency index of notifications and *ad valorem* equivalents of notifications as measures of standards, Disdier, Fontagné and Mimouni (2008) find that SPS and TBTs have a significant and negative effect on agricultural exports from developing countries to OECD countries, but do not have a significant impact on bilateral trade between OECD countries. Reported results also show significant variations across product sectors, indicating a negative effect in eight sectors, a positive effect in seven sectors, and no significant effect in a further ten sectors. Similar variations are also reported by Fontagné, Mimouni and Pasteels (2005) which find that environment related measures have a positive and significant effect on trade in four agricultural product groups, a negative and significant effect in six product groups, and a non-significant effect in nine product groups[21].

Evidence also suggests that standards can have different impacts at the extensive and intensive margins, often forming a barrier to entry into export markets rather than volume reducing constraints. Using data on concerns over SPS measures raised with the WTO by member countries[22], Crivelli and Gröschl (2012) find that SPS concerns have a negative impact on the likelihood that firms export to a country for which SPS concerns were raised. However, conditional on market entry, amounts of exports to markets with SPS measures in place also tend to be higher. The authors further note that conformity assessment related SPS measures have a negative effect on the likelihood of market entry while product characteristics related measures appear to have a positive impact on the amount of trade, suggesting that product characteristics measures might enhance consumer trust and increase trade for exporters who can overcome the fixed costs of complying with standards. Similar barrier to entry effects are also observed by Chen, Otsuki and Wilson (2006) who suggest that testing procedures and inspection times, as identified by firms'

21. SPS, TBTs and other non-tariff measures can be applied in a variety of ways and at varying stages of the production process which complicates the construction of tariff equivalents.

22. Concerns raised by member countries over notified SPS measures are reported in the SPS Information Management System of the WTO.

responses to World Bank Technical Barriers to Trade Surveys[23], have a negative impact on agricultural firms' propensity to export. Also using responses to Technical Barriers to Trade Surveys, Maskus, Otsuki and Wilson (2005) find that the costs of compliance with standards imposed by major importing countries do not have a statistically significant effect on variable costs of firms in the foods, drugs and liquors product category. Ferro, Wilson and Otsuki (2013), for their part, find that the number of regulated pesticides has a negative effect on the probability of trade and that the restrictiveness of standards in a destination market is associated with fewer firms exporting to the market. While tighter maximum residue levels (MRLs) have a negative and significant impact on both the probability and the intensity of trade, there appears to be no additional variable costs to comply with standards once fixed entry costs of compliance are covered.

As Li and Beghin (2012) observe, evaluations tend to find more trade impeding effects in the case of direct maximum residue limits (MRLs) than for other types of measures of standards. Indeed, Kim and Reiner (2009) find a positive and significant effect of MRLs for aflotoxin B1 on bilateral trade volumes of food and agricultural products, which suggest that more stringent regulations on maximum toxin levels (lower MRLs) have a negative effect on agricultural trade flows. Taking a more sector-specific approach, gravity model estimations by Otsuki, Wilson and Sewadeh (2001a, 2001b) indicate a negative effect of aflotoxin MRLs on African agricultural exports to European countries, suggesting that tightening maximum aflotoxin standards by 10% reduces exports in edible groundnuts by 11% while a 1% reduction in MRLs reduces exports by 1.1% for cereals and 0.43% for fruits, nuts and vegetables for their country sample. However, these findings are contradicted by Xiong and Beghin (2011) which take a similar dataset but find that aflotoxin MRLs do not have a statistically significant effect on African groundnut exports, which might suggest that findings can be sensitive to estimation approaches.

Standards coherence

Varying standards for the same product in different countries can increase trade costs. Mutual recognition or harmonising standards and regulations can present efficiency gains for trade procedures and facilitate the movement of goods across markets. UNESCAP (2011) suggests that harmonising food standards can deepen regional and international integration and expand trade. In addition to gains in customs efficiency, mutual recognition of conformity assessment or harmonized standards can also potentially lower entry barriers by reducing the compliance costs associated with multiple differing regulations and strengthen the trade enhancing effects of standards through better information and increased consumer confidence (OECD, 2003; van Tongeren, Beghin and Marette, 2009; ADB, 2013; Moïsé et al., 2013).

This review identified relatively few studies evaluating the impacts of standards harmonization on agricultural trade. All of these studies either focused on a particular regional grouping or single country exports, suggesting a gap in the country coverage of harmonization measures. Looking at bilateral trade flows between OECD countries, Moenius (2004) finds that shared standards, as well as importer country specific standards, appear to be negatively associated with trade in food and beverage products. Country specific standards of exporters, for their parts, have a positive relationship with trade in food products but a negative relationship in the case of beverages. Focusing on EU countries between 1990 and 2001, de Frahan and Vancauteren (2006) observe that standards harmonisation[24] has a significant and positive effect on imports in all agricultural sub-sectors, with the exception of condiments. Their estimates suggest that harmonization in food regulations has increased intra-EU imports over the 1990-2001 time period

23. Responses are given by firms in 17 developing countries, exporting to five OECD countries.

24. de Frahan and Vancauteren (2006) measure harmonization of food regulations by an export-weighted coverage ratio of relevant harmonization initiatives of technical regulations.

by about two-thirds for all food products, and around one-third for fruits and vegetables. Evaluating Chinese exports between 1992 and 2008, Mangelsdorf, Portugal-Perez and Wilson (2012) observe a generally positive and significant effect of mandatory domestic and international harmonized food standards. Voluntary standards, for their part, appear to have a smaller or non-significant effect. The authors note that the push effect of standards is larger when they are based on international standards such as Codex Alimentarius, suggesting that one additional internationally harmonised standard is associated with 0.38% to 0.64% increase in agricultural exports.

Standards compliance capacity

As suggested in the previous sections, the capacity of firms in agricultural industries to comply with standards and regulations likely plays an important role in determining whether standards form barriers to trade. The United Nations Industrial Development Organization (UNIDO) (2011a, 2011b) observes that compliance is associated with a wide range of services including standard-setting, testing, system certification, inspection, traceability, packaging and labelling. These services, in turn, depend heavily on national conformity and quality infrastructure including national standard bodies and metrology institutes, product testing laboratories, certification services and national accreditation boards (UNIDO, 2011a).

Few studies have attempted to include measures of compliance capacity and national compliance infrastructure. Jongwanich (2009) uses data from the US Food and Drug Administration to calculate the incidence of border detention of shipments of processed food products[25] as a measure of exporters' capacity to meet food safety standards. The study reports a positive and significant effect of the ratio of export value to the number of detained shipments in the US market on the real value of process food exports which suggests that an increase in the number of detentions lead to a decline in export volumes of processed foods. Using border rejection data from 2002 to 2008 for the United States and the European Union, UNIDO (2011a, 2011b) conclude that there are significant differences in the patterns of rejections between the United States and the European Union reflecting different trade patterns and different food safety and other requirements. Focusing on four product groups (fruits and vegetables, fish, nuts and herbs), the data suggest that border rejections were a very small (less than 0.5%) share of total imports of these products and that a relatively small number of countries accounted for a large share of the rejections. Ten countries (not all the same) accounted for 69% and 60% of rejections in the European Union and United States, respectively. They were not all developing countries. The United States was among the top five countries whose products were most often rejected by the European Union while Canada and the United Kingdom were among the top six countries whose products were rejected in the United States. These data suggest that problems in complying with standards are not widespread and are not necessarily related to the exporting country's level of development, but more likely indicate problems with particular consignments. Kim and Reinert (2009) compute indices of informational capacity, conformity capacity, enforcement capacity and international standard-setting capacity as measures of institutional compliance capacity for a dataset of 52 countries. Informational and conformity capacity are found to have a statistically significant and positive effect on bilateral agricultural trade value between importing and exporting country pairs, but international standard-setting capacity is not significant. Enforcement capacity appears to have a negative and significant effect, though significance disappears in the case of developing-country exporters.

25. Jongwanich (2009) calculate the incidence of detention as the ratio of export value of food products to a number of detained shipments.

7. Summary of the literature review

The literature reporting empirical results for trade facilitation measures and agricultural trade was reviewed in order to advise future work on trade facilitation processes focused on more agriculture-specific constraints. While this exercise aims to identify evaluations using proxies of trade facilitation, it does not discuss measures such as governance and access to finance which fall outside of the scope of this paper but have been identified in the literature as potentially strong impediments to trade in agricultural products. Indeed, surveys conducted under the aid-for-trade initiative report that more than half of respondents from developing country agro-food suppliers listed access to finance as the main obstacle to their participation in value chains (OECD and WTO, 2013a). Similarly, Moïsé et al., (2013) point to issues of governance, and limited market information and access to financial services as significant bottlenecks to agricultural trade in developing countries. The studies identified in this review tend to focus predominantly on time delays, logistics and infrastructure, and customs efficiency or sanitary and phytosanitary (SPS) standards and technical barriers to trade (TBT), with very few studies overlapping into both categories. Table 1 summarises the range of results reported for several measures when estimated coefficients were significant in at least one study. This shows that results vary depending on commodity composition and country coverage.

Overall, evaluations which take indicators of trade times, logistics performance and infrastructure quality tend to find a significant relationship between trade facilitation proxies and trade flows or trade costs, though results vary significantly across product sectors and regions. These suggest that the length of export and import times and customs clearance delays can present important impediments to trade for time-sensitive agricultural products. Logistics performance and maritime connectivity also appear to have significant effects on trade costs. Nearly all of these studies rely on more general indicators such as the number of days needed to export or connectivity indices which may be more representative of aggregate trade flows and stylised shipments than sector specific constraints. This suggests that data on agriculture-specific measures may be limited. Whether or not these barriers have different implications for agricultural products than those captured by the standard indicators for overall trade is worth investigating.

Most empirical studies which attempt to evaluate the effects of customs performance on trade rely on broad measures such as customs times or the number of documents needed to trade as proxies for the customs environment, reporting somewhat limited results. This suggests a gap in available cross-country measures of customs efficiency pertaining not just to agricultural goods but to all trade flows. Here, initiatives to develop measures of customs and border efficiency, such as the OECD Trade Facilitation Indicators or ongoing efforts by the World Customs Organisation could present promising avenues to evaluate more targeted at-the-border trade facilitation measures.

Studies evaluating the impacts of sanitary and phytosanitary standards and technical barriers to trade tend to report a negative effect on agricultural exports from developing countries to high income countries, but little effect on trade between developed countries, though again significant variations are observed across sectors. These studies also tend to highlight the importance of compliance capacity in determining whether standards form impeding barriers to trade.

While numerous studies evaluate the impacts of SPS and TBT measures on agricultural trade flows, relatively few have assessed the impacts of standards harmonisation and compliance capacities largely because of data issues for quantitative assessments. The reviewed evaluations of standard harmonisation are limited to either country specific, intra-EU or intra-OECD trade. Analysing harmonisation measures in other regional groupings or the adoption of international standards across a wider sample of countries could provide valuable insight on the impacts of harmonising standards on agricultural trade, though limited information on national standards may be an issue. Expanding measures of institutional compliance capacity and infrastructure such as the

Relative Rejection Rate Indicator (UNIDO, 2011b), which summarises compliance performance and at the border rejections of countries, and the Standards Compliance Capacity Index (UNIDO, 2011a), which aims to provide a systemic and consistent framework to evaluate standards compliance capacity, could also present valuable openings to further assess the impact of compliance capacity and national compliance infrastructure.

Although gravity model type estimations such as the ones covered in this review do not directly identify the source of trade friction or trade costs at the country or country-pair level they can, as Arvis et al. (2013) suggest, form part of a comprehensive diagnosis and help advise policy packages, particularly when combined with country level assessments of trade facilitation, logistics and trade policy. Arvis et al. (2013) suggest that trade facilitation policy should pay special attention to improving transport and logistics performance, particularly in low income countries and in Sub-Saharan Africa where these could have highly significant impacts on trade costs. Improvements in such "hard" infrastructure have a greater impact on export growth compared to "soft" infrastructure, but they are expensive (Portugal-Perez and Wilson (2012). Similarly, Moïsé et al. (2013) propose that a significant expansion of agricultural trade in low income countries could be achieved by easing constraints related to infrastructure quality and efficiently upgrading standards implementation, monitoring and certification capacities. The OECD and the WTO (2013a) further identified the removal of obstacles to trade, the reduction of customs delays and border procedures, and the reduction of transport costs as key priorities for future aid-for-trade initiatives in the agro-food sector. Echoing these policy recommendations, the agricultural trade facilitation plan for the Greater Mekong Sub region outlined by the Asian Development Bank sets out short-term development strategies to develop and enhance the capacities of the region's quarantine agencies in improving permit insurance systems, product certification and inspection procedures through cooperation and information exchange (ADB, 2012). The plan further set out to examine and review regulatory frameworks and assess the adequacy of agricultural bureaucracies, in addition to a long-term strategy of liberalising trade and improving cooperation among customs, border agencies and the private sector. Building upon research and policy lessons from past empirical studies, future quantitative and qualitative evaluations of trade facilitation focused on more agriculture-specific constraints could provide valuable insights on agricultural trade constraints and help advise more targeted policy initiatives. Trade patterns are evolving with traded intermediate inputs increasing in importance as firms increasingly engage in global value chains and consumers demand more food variety including year-round supplies of seasonal products. Consequently, trade facilitation measures that efficiently and speedily enable goods to cross borders while assuring food safety become paramount.

Based on OECD's work on the relationship between trade facilitation indicators and agricultural trade, the initial purpose of this study was to compliment that information by collecting data on the various procedures, timeliness and cost required for agricultural goods to cross a border either to enter as imports or to leave as exports. Among the variables identified in the literature and are of interest for this study, number of documents, time and cost, come from the World Bank's Doing Business database. But, those metrics are mostly based on trading manufactured goods that do not reflect the peculiarities of agricultural trade. There is a need therefore to collect such metrics specifically for agricultural products, especially perishable goods as they require special handling, they need to pass SPS and other health and safety standards and they require clearance not only from customs but also health authorities. Information on how long it takes to get agricultural goods to the border (inland transport), because of the widely dispersed farms and in developing countries the relatively small scale of production from small holders implies greater time and possibly cost than merchandise goods that are produced in a few plants that are probably located near major cities and transport hubs. There may be additional time required to clear customs because inspections may occur more than once for the same consignment by customs and by health authorities, if the various agencies do not co-ordinate. In addition to special logistics to assure continued cold storage as goods transit to or depart the border, information on whether cold storage is available and the procedures for getting goods in and out of those facilities and where they are

located (within or outside the clearance and release zone) could affect time and cost. The number of documents required may also be different for agricultural products and all of these may necessitate longer time.

Timeliness has been identified in the literature as important to trade. Time in motion information as agricultural, especially perishable products move through the border would help identify bottlenecks and suggest procedures to speed the process without impeding countries abilities to provide the necessary food safety for their consumers or to protect their plants and animals from pests and other risks. Improvements in procedures that can speed up the process would facilitate trade. In general, to ascertain whether trade of agricultural goods, because of their particularities, is different from trade in general merchandise, needs agricultural specific metrics. The original intent was to contact relevant agencies in OECD Member and developing countries to collect such information. The International Finance Corporation of the World Bank is in the process of collecting such information in its "Benchmarking the Business of Agriculture" project, an undertaking comparable to its "Doing Business" endeavour. A pilot to test the project in ten countries was initiated in 2014 with plans to eventually cover some 80 countries. Among other information, this project will provide time and motion indicators for the procedures and costs associated with the process of complying with food safety and health standards, along with describing the process for cross-border trade for specific agricultural produce. The aim is to provide policy makers with laws and regulations affecting the business of agriculture that are comparable across countries. Once these data become available, one would be able to revisit the question of whether and to what extent, trade facilitation of agricultural; particularly perishable products, differs from other goods and how they influence agricultural trade. This approach looks more promising than the one whereby OECD would directly collect questionnaire based information, given the difficulty of establishing the necessary contacts, especially in a number of developing countries. For this study, the next section describes developments in a few trade facilitating indicators from the Trading Across Borders component of the Doing Business database and follows with a description of developments in agricultural trade since the beginning of the 21st century especially for low and lower middle income countries. An innovative approach by Hummels and his co-authors to estimate the premium firms and consumers are willing to pay for timely delivery of goods is also discussed.

Table 1. Summary of results reporting changes in trade or trade costs for different indicators of trade facilitation

Indicator	Study	Country set	Sector	Change in trade flows	Change in trade costs
Number of days to import	Liapis (2011)	214 countries and regions	-aggregate agri. -processed goods	10% reduction implies 22% increase in aggregate agri., but no effect in processed goods	
	Martinez-Zarzoso and Marquez-Ramos (2008)	13 exporters and 167 importers	- coffee, tea, cocoa, spices and manuf. thereof	10% reduction implies a 2.4% increase	
Number of days to export	Liapis (2011)	214 countries and regions	-aggregate agri. -processed goods	10% reduction implies increase of 9.6% for aggregate agri. And 17% for processed goods	
	Persson (2013)	Imports to 25 EU countries from 152 developing countries	-all agriculture, split by sectors	10% reduction implies increases in number of prod. traded between 0 and 5.6% depending on sector	
	Martinez-Zarzoso and Marquez-Ramos (2008)	13 exporters and 167 importers	- coffee, tea, cocoa, spices and manuf. thereof	10% reductions implies a 3.3% increase in bilateral trade	
	Djankov, Freund and Pham (2006, 2010)	146 countries	-time sensitive fruits and vegetables	10% decrease implies 3.5% increase in exports	
Number of documents	Liapis (2011)	214 countries and regions	-aggregate agri. -processed goods	non-significant	
	Martinez-Zarzoso and Marquez-Ramos (2008)	13 exporters and 167 importers	- coffee, tea, cocoa, spices and manuf. thereof	10% increase in number of doc. for imports implies a 1.1% increase	
	Freund and Rocha (2010)	Africa exports; 146 countries	- time sensitive agri. goods	non-significant	
	Weerahewa (2009)	SAARC countries	-aggregate agri.	1 point increase in LPI is associated with an increase in value of agricultural exports by 25.01%	
Infrastructure quality index	Moïsé et al. (2013b)	64 developing countries	-aggregate agri.	10% increase is associated with a 30% increase in exports	
Road density	Jongwanich (2009)	79 developing countries	-aggregate agri.	Non-significant	
	Jongwanich and Magtibay-Ramos (2009)	79 developing countries	-aggregate agri.	1% increase in the squared value increases share of processed goods by 0.01%	

Table 1. Summary of results reporting changes in trade or trade costs for different indicators of trade facilitation (*cont.*)

Indicator	Study	Country set	Sector	Change in trade flows	Change in trade costs
Liner shipping connectivity index	Arvis et al. (2013)	178 countries	-aggregate agri.		1 standard deviation increase implies a .04 standard deviations decrease in costs
	Duval et al. (2012)	108 countries	-aggregate agri.		LSCI contributes between 5 and more than 15% of costs
	Shepherd and Wilson (2008)	Southeast Asian countries	-aggregate agri.	non-significant	
Non-Tariff measures restrictiveness index	Duval et al. (2012)	108 countries	-aggregate agri.		10% reduction associated with 3% reduction in costs
	Moïsé et al. (2013b)	64 developing countries	-aggregate agri.	non-significant	

Note: Listed changes in trade flows are those implied by reported coefficients of statistically significant indicators in preferred estimation specifications. Non-significant indicators are not reported, unless when contradictory findings are suggested in the literature. Author constructed indices not generally comparable to those of other studies are not reported.

8. Evolution of selected trade facilitation measures

The literature review suggest that improvements in several trade facilitation variables including time delays or number of documents can reduce trade costs and expand trade. Although indicating that improvement in these variables lower trade costs and contribute to growing trade, the magnitude of these variables is not indicated nor how they changed over time. What is the average time delay to export or to import and how does it vary for countries in varying income groups? Table 2 reports the average and range of time delays, number of documents and cost to ship a standard 20 foot container for 2007 and 2014, and Table 3 reports the same information but for imports from Trading Across Borders component of Doing Business database.

Keeping a broad view, countries are classified into various income categories based on the 2012 World Bank's income classification designation. For our purposes, we group together all high income countries regardless of whether they are members of the OECD. The other income groupings are upper middle income, lower middle income and low income.[26] Information for 179 countries is available for 2007 and for 190 countries in 2014. The data suggest that on average, there has been considerable improvement in time delays, one of the important variables identified by the literature, with the average falling by around four days from 26 days in 2007 to 22 days in 2014. The improvement is even more dramatic for the longest duration, dropping 21 days from 102 to 81 in 2014.

26. Low income countries have per capita income less or equal to USD 1 005; for lower middle income the range is between USD 1 026-4 035; for upper middle income the range is USD 4 036-12 475 and high income countries have per capita income above USD 12 475

Table 2. Summary statistics for selected indicators of timeliness to export in 2007 and 2014

	2007									
	High income*		Upper middle income		Lower middle income		Low income		**World**	
	Average	range	Average	range	Average	range	Average	range	Average	range
Total number of documents	**4.35**	**2 to 7**	**6.24**	**3 to 11**	**7.37**	**4 to 14**	**8.70**	**6 to 15**	**6.55**	**2 to 15**
					Days					
Time to process documents	6.42	2 to 17	11.10	2 to 35	15.77	2 to 60	23.06	9 to 44	**13.49**	**2 to 60**
Time for customs clearance and inspections	1.66	1 to 10	2.86	1 to 14	3.37	1 to 13	4.09	1 to 11	**2.93**	**1 to 14**
time for port and terminal handling	2.22	11 to 8	3.98	1 to 12	4.87	1 to 17	5.58	2 to 11	**4.09**	**1 to 17**
Time for inland transport and handling	2.48	1 to 8	4.61	1 to 41	6.23	1 to 39	10.45	1 to 44	**5.62**	**1 to 44**
Total time to export	12.79	6 to 29	22.55	10 to 89	30.23	12 to 102	43.18	20 to 78	**26.13**	**6 to 102**
Number of countries	**45**		**49**		**52**		**33**		**179**	
					2014					
Total number of documents	**4.36**	**2 to 7**	**6.02**	**3 to 10**	**7.06**	**4 to 12**	**7.97**	**5 to 12**	**6.21**	**2 to 12**
					Days					
Time to process documents	5.52	2 to 14	8.90	3 to 34	13.11	3 to 50	19.29	8 to 44	**11.03**	**2 to 50**
Time for customs clearance and inspections	1.57	1 to 10	2.58	1 to 9	3.00	1 to 13	3.65	1 to 8	**2.61**	**1 to 13**
Time for port and terminal handling	2.31	1 to 5	3.54	1 to 12	4.35	1 to 12	4.62	2 to 11	**3.63**	**1 to 12**
Time for inland transport and handling	2.15	1 to 6	3.62	1 to 46	4.85	1 to 38	8.94	2 to 45	**4.52**	**1 to 46**
Total time to export	11.54	6 to 29	18.64	8 to 81	25.31	9 to 80	36.50	15 to 81	**21.79**	**6 to 81**
Number of countries	**52**		**50**		**54**		**34**		**190**	

* High income group includes OECD and non-OECD members.
Source: Author's calculations from World Bank, Trading Across Borders database.

There seems to be less variation in the number of documents to export between income groups as well as within each income category. The average number of documents required to export fell slightly as did the range. In 2014, in some high income countries, firms needed only two documents to export a consignment while firms in some low income countries needed as many as 12 documents. Nonetheless, this represents an improvement relative to 2007.

The Trading Across Borders database also provides information on the time duration to complete four unique steps: 1) time to process the documents, 2) time for custom clearance and inspection, 3) time for port and terminal handling, and 4) time for inland transport and handling), to get the consignment aboard a ship for its exportation. By far, the procedure that takes the most time is to process the various documents needed to complete the export procedures, and this is true across the income spectrum. In 2014, to process the average number of documents took a little more than 11 days representing half of all the time needed to get a shipment on a vessel. The variation of the time needed to process documents varied considerably across the income spectrum taking as little as two days for some high income countries (Hong Kong, Peoples Republic of China, Singapore and the United States) and as much as 50 days in Iraq.

As expected, the amount of time to clear customs is the quickest of the various steps during the export process On average the time required to clear customs worldwide is about two and a half days, but it can range to as long as 13 days in Iraq.

Whereas the duration to get cargo on board a vessel fell, the cost to do so did not. The average cost to prepare and put on board a vessel a standard 20-foot container in 2014 was USD 1 514, an increase of almost USD 300 relative to 2007 (Table 3). Higher costs were reflected across all income categories, with low income countries, with an average increase of more than USD 600, exhibiting the largest increase. The widespread phenomenon suggests that more systemic factors impacting all countries irrespective of their income level, other than time delays or number of documents needed to export, influenced the cost of preparing a shipment to board a vessel since each of the former variables declined.

Table 3. Summary statistics for selected indicators of cost to export in 2007 and 2014

	2007									
	High income*		Upper middle income		Lower middle income		Low income		World	
	Average	Range	Average	Range	Average	Range	Average	Range	**Average**	**Range**
	USD									
Cost to prepare documents	156.05	20 to 500	211.08	20 to 626	192.25	6 to 1400	308.79	25 to 1120	**209.78**	**6 to 1400**
Cost of custom clearance and inspections	78.56	25 to 243	149.23	38 to 550	120.87	10 to 530	258.30	85 to 556	**143.30**	**10 to 556**
Cost of port and terminal handling	243.83	18 to 660	263.21	25 to 1054	274.94	50 to 900	318.70	50 to 900	**272.03**	**18 to 1054**
Cost of inland transport and handling	403.81	100 to 959	499.15	50 to 2000	614.10	68 to 2800	959.09	112 to 3486	**593.90**	**50 to 3486**
Total cost to export 20-foot container	**882.25**	**400 to 1435**	**1 122.67**	**390 to 3155**	**1 202.15**	**468 to 3685**	**1 844.88**	**722 to 4867**	**1 219.00**	**390 to 4867**
Number of countries	**45**		**48**		**52**		**33**		**178**	
	2014									
	USD									
Cost to prepare documents	217.89	55 to 440	272.42	85 to 690	277.78	105 to 1050	369.26	125 to 1160	**276.35**	**55 to 1160**
Cost of custom clearance and inspections	90.74	0 to 275	184.70	30 to 550	176.11	0 to 700	288.71	80 to 660	**175.15**	**0 to 700**
Cost of port and terminal handling	263.65	25 to 660	310.80	65 to 800	277.81	50 to 800	350.47	100 to 805	**295.62**	**25 to 805**
Cost of inland transport and handling	453.24	100 to 1230	651.70	80 to 3800	750.02	90 to 4000	1,445.32	200 to 7200	**767.34**	**80 to 7200**
Total cost to export 20-foot container	**1 025.52**	**460 to 1900**	**1 419.62**	**450 4885**	**1 481.72**	**490 to 5355**	**2 453.77**	**670 to 8650**	**1 514.47**	**450 to 8650**
Number of countries	**52**		**50**		**54**		**34**		**190**	

* High income group includes OECD and non-OECD members; Observations for Russia in 2007 are excluded due to potential error on the cost to clear customs.
Source: Author's calculations from World Bank, Trading Across Borders database.

As indicated in Table 3, the average cost of each of the four processes was higher in 2014 compared to 2007, in each income group. By far the costliest component for countries in each income category is the cost of inland transport with a worldwide average of USD 767, ranging to as much as USD 7 200 in Tajikistan. And, except for high income countries, it is the largest contributor to higher cost, with average cost for low income countries increasing the most. For high income countries, the cost to prepare documents contributed most to overall cost.

The cost to clear customs remained the least expensive process across all income categories. And, it is the component with the lowest average increase between 2007 and 2014 for all countries other than lower middle income. For the latter group of countries, costs associated with terminal handling increased the least.

Turning to the import side, data in Table 4 reveal a similar story. There have been improvements in time delays with the average dropping from a little more than 30 days in 2007 to about 25 days in 2014 and number of documents needed to import falling slightly from around eight in 2007 to a little more than seven in 2014. In general, high income countries require fewer documents to allow a consignment into their borders while low income countries require the most. In 2014, importers in France and Ireland only needed two documents while as many as 17 were required in the Central African Republic (Table 4).

Table 4. Summary statistics for selected indicators of timeliness to import in 2007 and 2014

	2007									
	High income*		Upper middle income		Lower middle income		Low income		**World**	
	Average	Range	Average	Range	Average	Range	Average	Range	**Average**	**Range**
Total number of documents	**5.27**	**2 to 10**	**7.49**	3 to 13	**8.40**	**4 to 15**	**10.79**	**6 to 21**	**7.80**	**2 to 21**
					Days					
Time to process documents	6.51	1 to 17	13.65	2 to 49	18.46	2 to 60	26.70	5 to 50	**15.66**	**1 to 60**
Time for customs clearance and inspections	1.90	1 to 14	3.98	1 to 11	5.27	2 to 15	7.23	1 to 26	**4.43**	**1 to 26**
Time for port and terminal handling	2.47	1 to 10	4.96	1 to 19	6.87	1 to 28	7.14	2 to 17	**5.29**	**1 to 28**
Time for inland transport and handling	2.11	1 to 9	3.16	1 to 28	5.15	1 to 32	10.73	1 to 38	**4.87**	**1 to 38**
Total time to import	**12.99**	**4 to 42**	**25.76**	**9 to 76**	**35.75**	**14 to 104**	**51.79**	**23 to 102**	**30.25**	**4 to 104**
Number of countries	**45**		**49**		**52**		**33**		**179**	
	2014									
Total number of documents	**5.13**	**2 to 10**	**6.96**	**3 to 12**	**7.94**	**4 to 14**	**9.68**	**6 to 17**	**7.23**	**2 to 17**
					Days					
Time to process documents	5.34	1 to 20	10.7	3 to 54	15.54	2 to 100	21.94	8 to 49	**12.62**	**1 to 100**
Time for customs clearance and inspections	1.72	1 to 14	3.08	1 to 10	4.31	1 to 15	4.82	1 to 11	**3.37**	**1 to 15**
Time for port and terminal handling	2.21	1 to 8	4.32	1 to 18	5.70	2 to 15	5.91	2 to 10	**4.42**	**1 to 18**
Time for inland transport and handling	1.85	1 to 6	3.0	1 to 35	4.20	1 to 38	9.32	1 to 45	**4.16**	**1 to 45**
Total time to import	**11.12**	**4 to 44**	**21.10**	**8 to 82**	**29.76**	**10 to 130**	**42.00**	**21 to 98**	**24.57**	**4 to 130**
Number of countries	**52**		**50**		**54**		**34**		**190**	

* High income group includes OECD and non-OECD members.
Source: Author's calculations from World Bank, Trading Across Borders database.

Fewer documents potentially lower trade cost through speeding the import process. In 2014, importers in the average high income country needed a little more than 11 days to complete the import process. In contrast, the import process takes almost four times longer – 42 days – in the typical low income country. Nonetheless, countries have improved their performance and have reduced the duration to import a consignment by an average of about six days between 2007 and 2014.

However, there is considerable variation in time delays especially among countries within a given income group. Importing in 2014 can take as few as four days in Singapore to as many as 130 days in South Sudan. The reader is reminded that the literature indicates that time delays are the largest hindrance to trade and although the data suggest improvements, the typical developing and emerging country has considerable scope for further progress to speed-up the trading process.

The most time-consuming procedure when importing, across all income groups, is processing the necessary documents. Worldwide, this step, on average, takes almost 13 days, taking up almost as much time as the other three procedures combined. Total duration of importing goods seems to be positively correlated with the number of required documents, increasing as more documents are mandated, and is inversely related to income, taking longer time in low income countries.

The least time consuming process is to clear customs averaging a little more than three days for all countries irrespective of income. There are countries across all income categories where an importer can clear customs in a day. However, the process can take up to two weeks in some high and lower middle income countries (Table 4).

The timeliness of getting a consignment ready to cross a border is not just about physical infrastructure or logistics. The information in Tables 2 and 4 indicate that on average, the time for inland transport reflecting road conditions, and the time for terminal handling, a proxy for port infrastructure to get a consignment from the factory to the ship, combined, take less time than the bureaucratic hurdles of processing the required documents whether this is to move a product out of the country or to bring it into the country. As indicated in the literature review, studies have shown that trade is reduced and the composition of the trade basket is altered the longer it takes to complete the trading process. Streamlining and reducing the administrative hurdles, (the number of documents and the duration to process them) may provide a relatively inexpensive way to increase trade.

As in the case of exporting, the cost to import a standard 20-foot container increased relative to 2007 across all income groups once again suggesting factors outside cost associated with time delays at the border or the numbers of documents since both were lower in 2014 compared to 2007. In relative terms, costs increased the most in high income countries, almost tripling since 2007, but in absolute terms, costs increased the most in low income countries (Table 5). There is also considerable variation in the cost to bring a 20 foot container from the ship across the border to the warehouse both within and between the various income groups, ranging from as low as USD 440 in high income countries to more than USD 10 000 in low income countries.

The least expensive procedure across all income groups is customs clearance and inspections while inland transport and handling is the most expensive across all income groups. Perhaps not surprising, although bureaucratic hurdles are the most time consuming of the identified importing or exporting steps, they are less expensive than the physical moving and handling of the container. Since the literature has identified timeliness as more germane than cost to expanding trade, countries may want to consider ways to expedite and speed-up the trading process. More information on the value of time in international trade is provided below.

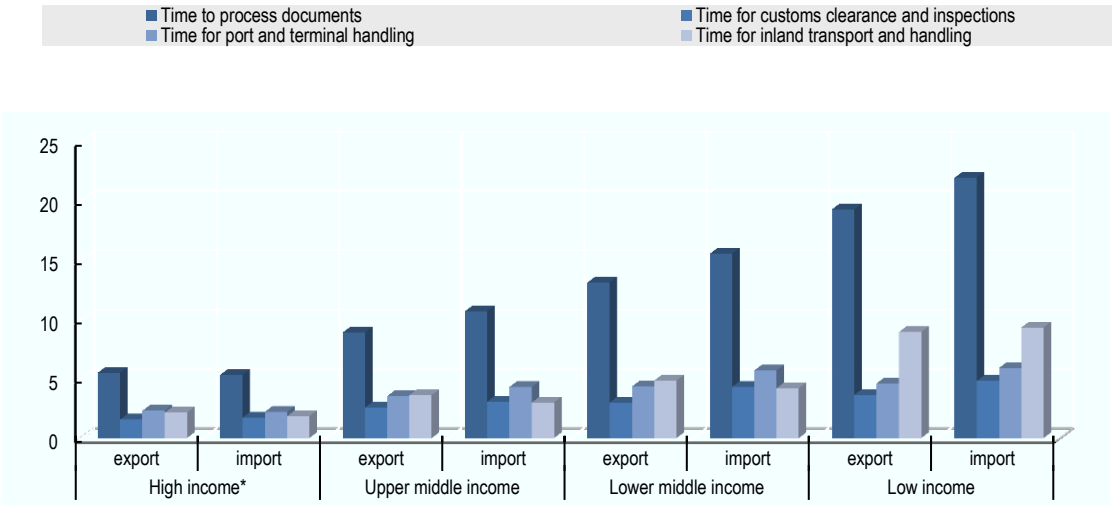
Table 5. Summary statistics for selected indicators for cost to import for 2007 and 2014

	2007									
	High income*		Upper middle income		Lower middle income		Low income		World	
	Average	Range	Average	Range	Average	Range	Average	Range	**Average**	**Range**
	USD									
Cost to prepare documents	109.74	20 to 500	249.67	40 to 750	242.08	30 to 1500	349.18	35 to 1500	242.89	**20 to 1400**
Cost of custom clearance and inspections	194.48	2 to 1300	238.37	30 to 1270	165.87	10 to 705	279.03	100 to 750	196.46	**2 to 556**
Cost of port and terminal handling	155.34	110 to 853	327.98	75 yo 1112	310.65	75 to 910	406.97	80 to 1150	325.04	**75 to 1054**
Cost of inland transport and handling	216.82	100 to 1042	536.76	50 to 2100	685.48	75 to 3415	1,218.97	112 to 3500	676.33	**50 to 3486**
Total cost to import 20-foot container	**379.72**	**367 to 2333**	**1352.78**	**385 to 2945**	**1,404.08**	**505 to 4050**	**2,254.15**	**852 to 5715**	**1,440.73**	**367 to 5715**
Number of countries	**45**		**49**		**52**		**33**		**179**	
	2014									
Cost to prepare documents	218.66	65 to 640	306.8	80 to 800	318.06	35 to 1250	466.18	190 to 1500	**314.40**	**35 to 1500**
Cost of custom clearance and inspections	140.55	0 to 1400	321.4	30 to 1400	222.96	25 to 700	327.97	80 to 665	**245.10**	**0 to 1400**
Cost of port and terminal handling	312.98	100 to 950	362.9	120 to 850	343.56	100 to 1000	442.68	125 to 1000	**358.02**	**100 to 1000**
Cost of inland transport and handling	456.40	100 to 1230	698.42	80 to 3800	928.00	90 to 7200	1,848.74	200 to 8950	**903.28**	**80 to 8950**
Total cost to import 20-foot container	**1,128.59**	**440 to 2615**	**1689.52**	**485 to 4865**	**1,812.57**	**490 to 9285**	**3,085.56**	**660 to 10250**	**1,820.79**	**440 to 10250**
Number of countries	**52**		**50**		**54**		**34**		**190**	

Comparing the import indicators discussed above to their exporting counterparts, for the average country, regardless of its income, import procedures require more documents, take longer and are more costly. Although improvements in timeliness and bureaucratic burdens have been recorded for both exporting and importing procedures and in most cases exporting countries do not undertake duty collection related controls, the discrepancy between the two suggests that countries are keen to facilitate their exports relatively more than their imports.

Figure 1 illustrates the differences in the average timeliness of various exporting and importing procedures in 2014 for countries with different levels of developments. This illustrates that the longest duration by far, regardless of whether one imports or exports or the level of development, is the time to process documents. The figure also illustrates that traders in high income countries face the shortest delays whether they are exporting or importing while those in low income countries face the longest delays.

Figure 1. Average time delays to import or export in 2014



* High income group includes OECD and non-OECD members
Source: Author's calculations from World Bank, Trading Across Borders database.

As indicated in the Trading Across Borders website, the variable presented in Tables 2-5 are measured for a standardised product that travels in a dry-cargo, in a full, 20-foot container. The product does not require refrigeration or any other special environment, and does not require any special phytosanitary or environmental safety standards other than accepted international standards. As such, the variables may not reflect the time sensitivity of many perishable agricultural products or the cost of port and terminal handling, especially for agricultural products requiring cold storage and/or special handling for quarantine or other considerations.

Another assumption in generating the data is that the business has at least 60 employees and is located in the economy's largest business city. The cost of inland transport and handling therefore reflects this assumption which probably results in lower cost compared to the cost of gathering most agricultural products from small-holder farms generally located far from the main business city and Bringing the produce to packing or warehouses and then to the border especially if cold storage along the chain is required. Furthermore, the levels of the different variables reflect a country's export basket as they are based on information for the leading export or import products. For high income countries this implies that the variables are biased toward exports of manufactured goods as these comprise the largest share of their export basket. For low income and many developing countries, the measures may be more skewed towards agricultural products albeit given the other assumptions, not products that require special handling or refrigeration thus probably not perishable. The relative higher value of the indicators for this group of countries may not only reflect their infrastructure and border constraints but also the relatively higher costs of trading agricultural products. As indicated by Duval et al., (2012) trade costs (at the border excluding tariffs and behind the border) are higher for agricultural compared to manufactured products. Measuring these trade facilitation indicators, taking into account the special handling, cold transport and storage and other requirements specific to agricultural especially perishable products, will better reflect the conditions for trading agricultural goods and better reveal the effect of these variables on agricultural trade. The World Bank's project to collect agricultural specific information in their Benchmarking the Business of Agriculture may provide this information in the near future.

9. How important is trade of perishable products?

The literature review highlights some of the important issues considered to hinder trade in agricultural products especially by developing and emerging economies. In this section, developments in agricultural trade since 2000 are factually examined. Given the hypothesis that the poor account of the perishability of certain agricultural products may be a reason for the poor performance of some trade facilitation measures in explaining agricultural trade, trends in the trade of a group of commodities classified as perishable are particularly highlighted.

A list identifying perishable agricultural products at the harmonized classification system level is not readily available. Even the WTO Agreement on Trade Facilitation at its Bali Ministerial in December 2013 which explicitly takes perishable goods into account defines them as "…perishable goods are goods that rapidly decay due to their natural characteristics, in particular in the absence of appropriate storage conditions" (WTO (2013) page 11). Given the lack of explicit listing of which products are perishable, a rather subjective approach (but includes searching the product description for the term "fresh" or "frozen") is taken to identify these products explicitly and provide a relative order of magnitude of their importance in trade. Annex II lists the products, at the HS4 digit level that are classified as perishable for the purposes of the paper. The product description is given at the HS4 digit level for convenience. The products were identified at the HS6 digit level which is also the basis of the trade data. A casual look at Annex II indicates that the listed products belong to fresh or frozen meat, most dairy products (excluding skim milk and whole milk powder), fresh fruit and vegetables and other products with the words fresh or frozen in the description.

Table 6 provides data for the years 2000 and 2012 breaking down agricultural trade into those products classified as "perishable" from all other. Data that includes intra-EU trade is provided along with data that excludes it to illustrate the magnitude of trade between EU Members. For other countries, this distinction does not matter, but the magnitude of intra EU trade skews world totals and market shares.

Agricultural trade in 2012, when it includes trade within the members of the European Union (top half of Table 6) totalled more than USD 1.3 trillion. Of the total; almost USD 411 billion or 30%, is trade of perishable products. The bottom half of the table excludes intra-EU trade. It seems that a fair amount of agricultural trade is between EU Member states. Eliminating this trade in 2012, shaved about USD 374 million or 28% from the world total. A good proportion of the trade between EU Members is in perishable goods. Excluding intra-EU trade lowers the share perishable goods to a little more than quarter of total agricultural trade compared to more than 30% when intra-EU trade is included. The dynamics of agricultural trade is altered somewhat when the data excludes intra-EU trade. Overall agricultural trade growth is little changed, but the growth in the trade of perishable products is diminished. The rest of the discussion is based on data that excludes intra-EU trade.

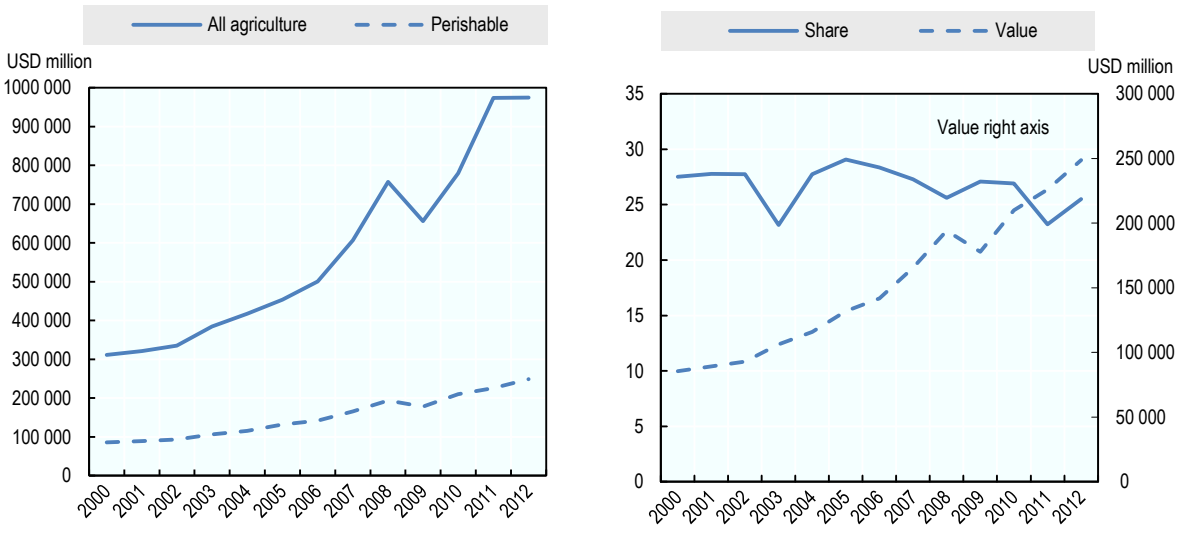
Table 6. Exports of perishable and other agricultural products 2000 and 2011 (USD million)

	Includes intra EU trade		
	2000	**2012**	**Average annual growth rate**
	USD million		
Perishable	123 805	410 589	10.51
Other	309 772	937 740	9.70
Total	**433 577**	**1 348 329**	**9.92**
Share perishable	28.55	30.45	

	Excludes intra EU trade		
	2000	**2012**	**Average annual growth rate**
Perishable	88 706	248 676	8.97
Other	222 328	726 027	10.36
Total	**311 034**	**974 703**	**9.99**
Share perishable	28.52	25.51	

Table 6 provides information for two points in time while Figure 2 shows the trend. The left panel of Figure 2 shows the developments in the trade of all agricultural and of perishable products from the beginning of the 21st century. Trade in both increased during this time but as evidenced in the right panel of Figure 2, the growth of perishable products lagged somewhat the growth of all agricultural goods resulting in slight decline in their share.

Figure 2. Trade of all agricultural and perishable goods and their share

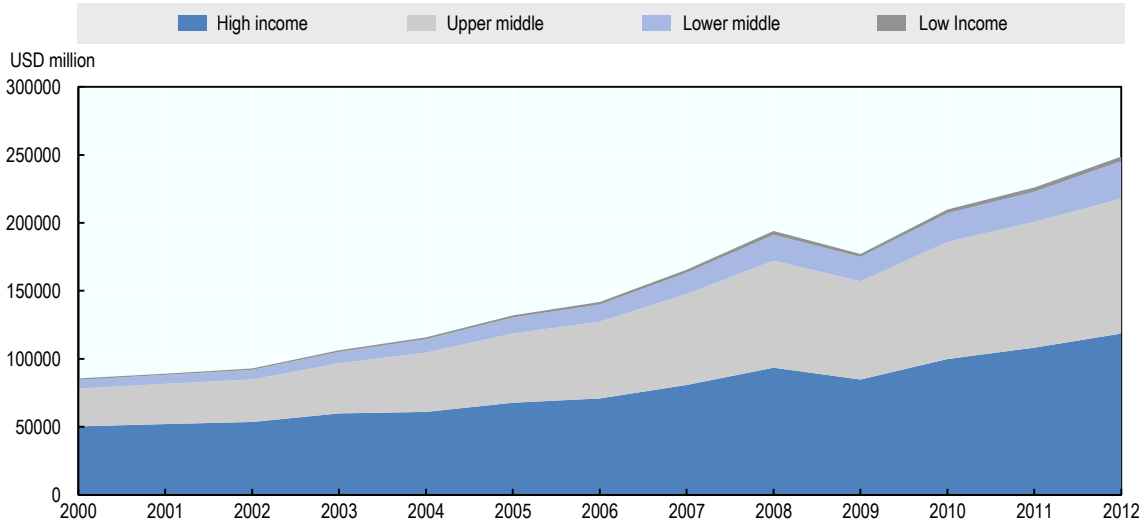


Source: Author's calculations from BACI data

Who is exporting perishable products?

Figure 3 provides information on exports of perishable agricultural products for aggregate group of countries based on their income classification for the years 2000 to 2012. All income groups increased the volume of exports during the period with exports by the countries in the lower middle income category growing the fastest, averaging almost 13% per year. Agricultural exports from high income countries exhibited the slowest growth rate averaging a little more than 7% per year while low income countries, albeit starting from a very low level, averaged a growth rate of 11.6% per year. High income countries are the largest suppliers of these products. In 2000, high income countries supplied USD 50.4 billion capturing some 59% of the trade in perishable goods. Upper middle income countries supplied 32% of the total while lower middle and low income countries combined supplied about 9% of the world's total of those goods. The latter group of countries seems to be more competitive in trading other agricultural commodities capturing a slightly higher share of world total.

Figure 3. Exports of perishable goods by income category (USD million)



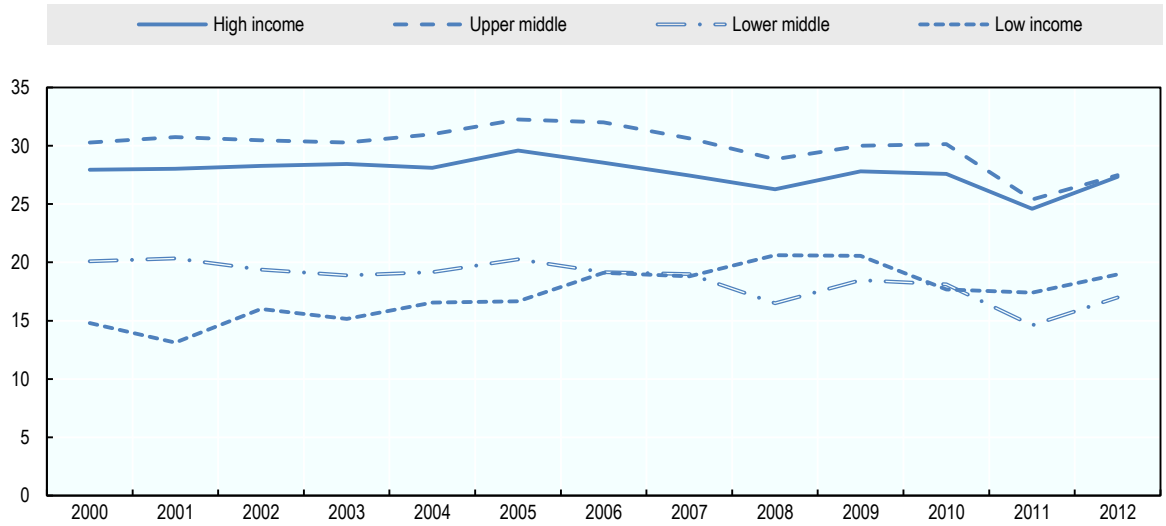
Source: Author's calculations from BACI data.

The relatively lower export growth rate in high income countries during this time resulted in lost market share, dropping 11 percentage points to 48% of the total in 2012. Most of this was captured by upper middle income countries, as they increased their share by eight percentage points to 40%. Lower middle income countries also expanded their market share of perishable goods, capturing 11% of the market while low income countries maintained their relatively miniscule 1% market share.

Interestingly, although agricultural exports increased for each income group, the composition of the export basket changed slightly. Whereas 28% of the agricultural export basked in high income countries consisted of perishable products in 2000, the share dropped slightly to 27% in 2012 (Figure 4). Perishable products constitute a larger share of the agricultural export basket of upper middle income countries. Even as the total exports of perishable products increased substantially for these countries as illustrated in Figure 3, their proportion in the export basket declined, falling some three percentage points. A similar decline in the share of perishable products occurred in lower middle income countries dropping three percentage points even as total perishable exports increased. Hence, even though upper and lower middle income countries captured a larger share of the perishable goods market, their exports of non-perishable goods expanded even more. In contrast, low income countries shifted their export basket towards

perishable goods increasing the share of perishable products in their agricultural export basket from 15% in 2000 to 19% (albeit a relatively small amount of USD 3.3 billion) in 2012.

Figure 4. Exports of perishable goods as a percent of total agricultural exports by income category



Source: Author's calculations from BACI data.

And which group of countries is importing them?

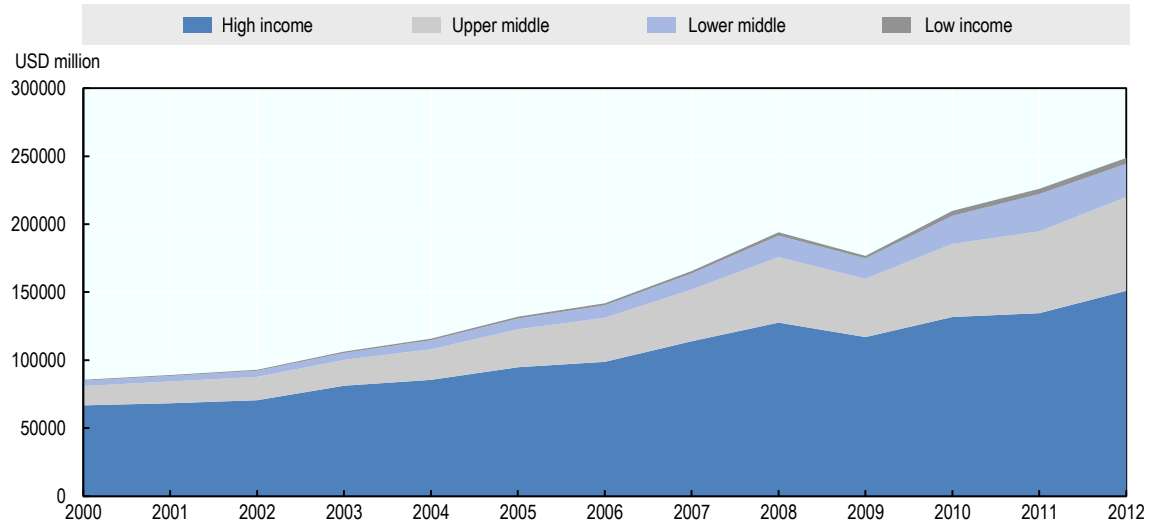
Looking at the flip side of the ledger, not surprising, high income countries are the biggest consumers of high-value perishable products (Figure 5). In 2000, high income countries imported more than three-quarters of all traded perishable products compared to importing 62% of other agricultural goods. At the other end of the income spectrum, perishable goods were less than 1% of the total agricultural import bill for low income countries compared to 2.5% share of imports of other agricultural goods.

Income and population growth during the 2000s resulted in higher demand and greater imports of agricultural products in countries of all income groups for all agricultural products, including perishable goods. Overall import demand for all agricultural products grew the fastest in lower middle income and low income countries while import demand in high income countries grew the slowest. The result of the varying growth rates in import demand was that developing and emerging economies increased their share of the world market.

Lower middle income and low income countries albeit from relatively low levels, exhibited an even greater import demand for perishable products with demand growing 17.5% and 16.5% per year respectively. Hence, developing and emerging economies accounted for a larger share of world imports of perishable products. Even low income countries increased their share of imports of both perishable (almost 2% of total) and other goods (almost 4% of total).

Interestingly, in 2000, only high income countries ran a trade deficit in perishable products importing about USD 16.4 billion more than they exported with the other income groups filling the shortfall. By 2012 however, low income countries also ran a trade deficit in perishable goods importing about USD 1 billion more than they exported while the deficit in high income countries almost doubled to USD 32.4 billion with upper middle income countries filling most of the gap running a surplus of USD 30.1 billion with a more modest contribution from lower middle income countries supplying an additional USD 3.3 billion. Low income countries however had an ever bigger trade deficit in other agricultural goods with their imports exceeding exports by some USD 14 billion.

Figure 5. Imports of perishable goods by income category (USD million)



Source: Author's calculations from BACI data.

Which direction is the trade flowing?

Trade facilitation should enable exporting and importing countries to trade equally with all partners. Can we glean anything from the direction of trade while still staying at a rather aggregate level? Defining trade among high income countries as north-north (NN) from high income countries to all countries other than high income as north-south (NS), trade from non-high income countries to high income countries as south-north (SN) and trade among non-high income countries as south-south (SS), what do the trade data tell us?

Given the information that high income countries are losing market share it is not surprising that the share of high income countries trading with each other has diminished during the last 13 years. In 2000, NN trade in perishable commodities was 45% of world trade in those goods with another 33% traveling from the south to the north (SN) (Table 7). As these goods are typically high-value products, the pattern of trade is consistent with the high consumer income in developed countries. In the same year, trade between developing and emerging countries (SS) was less than 8% of the total while 14% of the trade in perishable products moved from the north to the south (NS).

Although the absolute volume of NN trade by 2012 jumped almost 90% to USD 74.8 billion, it represented only 29% of the total trade in perishable produce, a drop in market share of some 16 percentage points. However, exports of perishable products from high income to the other countries (NS) almost quadrupled to USD 48.7 billion representing 19% of world trade reflecting increased demand resulting from higher income growth in emerging countries. At the same time, trade between developing countries (SS) in perishable products increased more than seven times representing 20% of the world trade in those products. Although exports to rich countries (SN) almost tripled, this trade pattern was relatively stable as a share of world trade (Table 7).

Table 7. Direction of trade in 2000 and 2012

	2000				
	USD million				
	NN	**NS**	**SN**	**SS**	**Total**
Perishable	39 708	12 624	29 488	6 886	88 706
Other	79 769	48 212	56 196	38 161	222 338
Share perishable	44.8	14.2	33.2	7.8	100
Share other agriculture	35.9	21.7	25.3	17.2	100

	2012				
	NN	**NS**	**SN**	**SS**	**Total**
	USD million				
Perishable	74 774	48 741	82 196	51 826	257 537
Other	153 369	156 882	175 975	230 941	717 167
Share perishable	29.0	18.9	31.9	20.1	100
Share other agriculture	21.4	21.9	24.5	32.2	100

Source: Author's calculations from BACI database.

Focusing on low and lower middle income countries, where did their agricultural especially perishable exports go? Defining exports from low income and lower middle income (L) to: a) other low income countries as L-L, b) upper middle income (L-LUM) and c) high income (L-H) countries, in 2000, 28% of low income country perishable exports went to other low income countries whereas upper middle income countries did not have large demand for the products from low income countries. In 2000, high income countries were by far the dominant destination for low income country perishable products with two-thirds travelling to those countries (Table 8).

It seems that low income countries have diversified their export destination relying less on rich markets for their goods. In 2012 slightly more than half of perishable products found markets in other low income and upper middle income countries. Although the share of exports to the rich world was some 16 percentage points lower, the demand from rich countries did not falter as the value of their imports more than doubled (Table 8).

Trade in perishable and other agricultural products by developing countries expanded significantly in the 2000s suggesting productive and trading capacity increased supplying higher import demand. But not all developing countries participated equally in the growing agricultural trade. Low income countries, although exhibiting trade growth and increasing market share, they represent a sliver of world trade. Whether trade could have expanded more significantly for this group of countries is unclear at this juncture as is whether the relatively low volumes reflect productive constraints or border and other policy and infrastructural bottlenecks that can be ameliorated through trade facilitation measures. Exports of perishable products from low income countries grew faster than exports of other agricultural goods averaging 10.5% and 8.1% per year respectively since 2000. Exports of non-agricultural products grew even faster for this group of countries going from about USD 22.5 billion to USD 84 billion, an average annual growth rate of 11.6%. Furthermore, imports of perishable products by low income countries grew 17.8% a year, much faster that imports of other agricultural products (14.4% p.a.) or non-agricultural products (13.2% p.a.). Such growth rates may indicate that improvements in the trade facilitation indicators discussed above may have contributed to growing trade but the relatively small traded volumes and market share may be indicative of income constraints on the import side and production constraints on the export side. Undoubtedly, there is room for low and lower middle income countries to improve their trade procedures as indicated by the Trading Across Borders data above. Such efforts will lower trade costs and spur export supply and import demand. Better measurements of trade

facilitation indicators reflecting specificities of agricultural products may illuminate further whether and by how much agricultural trade can expand via additional improvements in border processes and behind the border logistics and infrastructure constraints.

Table 8. Where agricultural exports from low income countries went in 2000 and 2012

	2000			
	USD million			
	LL	**LUM**	**LH**	**Total**
Perishable	289	64	677	1 031
Other	1 517	987	3 305	5 809
Share perishable	28	6	66	100
Share other agriculture	26	17	57	100
	2012			
	USD million			
	LL	**LUM**	**LH**	**Total**
Perishable	1 193	501	1 649	3 343
Other	4 920	3 785	3 785	12 490
Share perishable	36	15	49	100
Share other agriculture	39	30	30	100

Source: Author's calculations from BACI database.

10. Which low income countries are the major traders?

Exports from low income countries are substantially more agricultural than exports of other income groups. In 2000, the share of export receipts from agricultural goods was 23% of the total whereas it was 10% or less for the other income groups. For 14 of the 36 low income countries in the database, agricultural exports generated more than 50% of their total export earnings. However, of the ten top exporters of all goods, agricultural exports were more than 50% of export earnings for only two (Zimbabwe and Kenya) while the top 20 exporters include only two additional countries with agricultural exports more than half of the total. In contrast, agricultural exports generated less than 5% of total export earnings for five of the 10 leading exporting countries. Although low income countries are relatively more agricultural based than others, it is still the case that for most, especially the larger exporters, the majority of export earnings come from selling non-agricultural goods.

Many current low income countries are following the development path of current higher income countries and are further diversifying their economies, shifting away from agriculture and towards their non-agricultural sectors. The share of agricultural goods in the export basket of low income countries fell to 17% in 2012, even as their agricultural exports almost tripled. Among the top 10 low income exporters, agricultural exports were more than half of the value only in Kenya. Even countries outside the top 10 exporters, agricultural exports generated more than 50% of export earnings in only 10 of the 36 low income countries in 2012. Reliance on the agricultural sector to generate export earnings however remained very high in Ethiopia, (81%) Guinea-Bissau (87%), Malawi (85%) and Somalia (88%).

Table 9 lists the ten leading low income agricultural exporters in order of importance (the number in parenthesis is their position in total exports) for 2000, 2005 and 2012, along with each country's exports of perishable agricultural products, non-agricultural products along with the share of agricultural and non-agricultural exports in each country's total export earnings (for perishable products it is their share of agricultural export earnings) and the number of destinations. The rankings have changed somewhat but the list is fairly stable with only Burkina Faso and Benin dropping out of the top 10 replaced by Mozambique and Myanmar. Most of the agricultural exports from low income countries come from only a few countries. The top five exporting countries supply more than half of all agricultural exports with the top ten countries generating about three-fourths of all agricultural export earnings of low income countries.

It seems that the top exporters are agricultural specialists. Agricultural exports generated more than half of total earning in four countries. Although the leading 10 agricultural exporters generate three-quarters of the group's agricultural exports and includes five countries that are also among the ten leaders in total exports, their share of non-agricultural export earnings is considerably lower. The ten leading agricultural exporters generated about 29% of low income countries non-agricultural export earnings. Nonetheless, during the first 13 years of the new century agricultural exports have become less important to the export basket of even the largest agricultural exporters. Exports of agricultural goods from the ten leading low income countries generated 56% of their total export earnings 2000 but this fell to about 35% in the later years as these countries diversified their economies and expanded exports of their non-agricultural goods.

Exports of perishable agricultural products are not generating large earnings for most low income countries including the leaders. In 2000, perishable agricultural products among the 10 leading agricultural exporters generated about 14% of agricultural export earnings. But even though perishable products are not a large share of agricultural earnings for the ten agricultural leaders, these ten countries garner about 70% of low income countries total earnings from perishable products. Some low income countries however have shifted their export basket toward perishable goods. Noticeable among them is Kenya and Ethiopia. Ethiopia is especially notable in this regard increasing the perishable share of its agricultural exports from around 3% in 2000 to 26% in 2012. For some low income countries however, agricultural exports comprise mostly of perishable products providing more than half of their agricultural export revenues (Guinea-Bissau (99%), Gabon (73%) and Democratic Republic of Korea (52%) but each was a relatively small exporter in 2012.

Relating the export performance of the low income countries to the trade facilitation variables discussed above, of course, it's difficult to discern the level of additional exports these countries could have undertaken if their trade facilitation measures proxied in Table 2 had improved even more. But, the rapid rise in their exports (agricultural and perishable goods as well as non-agricultural goods) especially by the top ten exporters suggests that improvements in trade facilitation may have contributed to higher exports.

Another potential indication of a country's administrative and infrastructure's ability to reach export markets is the number of partners that it is able to service and the number of goods that it exports. As shown in Table 9, the number of countries that each of the top exporters is able to service is in the hundreds. In general the number of partners for non-agricultural goods is greater, even for these agricultural specialists, but there is not a great deal of difference between the number of partners for agricultural trade versus the number of partners for non-agricultural trade. The number (at the HS6 digit level) of agricultural products that the typical low income country exports have remained relatively flat. In 2012, the typical low income country exported 136 agricultural products (there are more than 600 HS6 digit products that make up the agricultural and food sector as defined in the WTO), ranging from a low of only 17 products (Comoros) to a high of 389 products (Kenya). The ten leading exporters not only ship higher volume, they ship more varieties, exporting on average 241 different goods.

Table 9. Ten leading low income agricultural exporting countries

Country	All agriculture	Perishable	Non-agriculture	All agriculture	Perishable	Non-agriculture	Agriculture	Non-agriculture	All goods
	Value (USD '000)			Share (%)			Number of partners		
				2000					
Zimbabwe (2)	1,303,049	194,085	1,055,149	55.26	14.89	44.74	110	129	143
Kenya (4)	1,174,114	314,738	773,839	60.27	26.81	39.73	125	126	138
Malawi (19)	464,238	4,805	64,365	87.82	1.04	12.18	109	78	118
Ethiopia (15)	461,298	12,848	126,672	78.46	2.79	21.54	84	84	103
Tanzania (10)	397,936	69,650	531,824	42.80	17.50	57.20	111	112	128
Uganda (17)	386,775	19,191	168,610	69.64	4.96	30.36	79	89	107
Madagascar (8)	295,129	52,126	747,961	28.29	17.66	71.71	91	109	121
Mali (14)	237,492	6,041	355,434	40.05	2.54	59.95	68	86	101
Burkina Faso (24)	212,772	9,467	91,589	69.91	4.45	30.09	67	74	86
Benin (25)	205,591	21,079	82,211	71.43	10.25	28.57	60	68	87
Total above	**5,138,393**	**704,030**	**3,997,654**	**75.13***	**68.31***	**17.78***	**N/A**	**N/A**	**N/A**
				2005					
Kenya (2)	1,754,724	652,195	1,943,912	47.44	37.17	52.56	150	170	176
Ethiopia (12)	1,134,597	59,915	191,578	85.55	5.28	14.45	116	95	131
Zimbabwe (6)	709,906	107,440	1,661,136	29.94	15.13	70.06	109	126	139
Tanzania (7)	705,198	107,591	1,589,372	30.73	15.26	69.27	113	133	139
Malawi (19)	636,233	16,813	127,606	83.29	2.64	16.71	113	85	123
Uganda (17)	571,089	75,954	479,424	54.36	13.30	45.64	107	122	134
Myanmar (3)	467,359	16,829	3,078,853	13.18	3.60	86.82	55	89	94
Mali (15)	331,221	7,860	774,346	29.96	2.37	70.04	87	110	122
Mozambique (5)	265,901	32,948	2,191,251	10.82	12.39	89.18	77	104	115
Benin (24)	255,046	34,720	240,005	51.52	13.61	48.48	58	96	103
Total above	**6,831,274**	**1,112,263**	**12,277,483**	**73.96***	**72.25***	**31.44***	**N/A**	**N/A**	**N/A**
				2012					
Kenya (6)	2,626,902	990,845	1,898,214	58.05	37.72	41.95	104	105	113
Ethiopia (11)	2,280,328	601,550	550,930	80.54	26.38	19.46	124	123	141
Tanzania (5)	1,768,049	273,252	3,798,771	31.76	15.46	68.24	110	135	142
Uganda (13)	1,276,720	125,425	860,859	59.73	9.82	40.27	104	122	135
Myanmar (3)	1,132,920	40,429	6,253,431	15.34	3.57	84.66	68	85	95
Zimbabwe (8)	1,057,786	73,078	2,495,532	29.77	6.91	70.23	84	89	107
Malawi (20)	831,846	18,268	152,200	84.53	2.20	15.47	82	44	85
Mali (10)	828,174	24,994	2,065,370	28.62	3.02	71.38	66	105	116
Mozambique (4)	732,820	73,605	5,258,796	12.23	10.04	87.77	81	93	112
Madagascar (15)	551,516	49,369	1,120,214	32.99	8.95	67.01	108	117	132
Total above	**13,087,061**	**2,270,816**	**24,454,316**	**75.83***	**69.34***	**29.11***	**N/A**	**N/A**	**N/A**

* Top ten total as a share of total for all low income countries. Numbers in parenthesis is the country's rank in total exports.
Source: Author's calculations from BACI database.

Turning to imports, Table 10 shows the ten leading low income agricultural importing countries (the number is parenthesis is their rank in imports of non-agricultural goods), along with imports of perishable and non-agricultural goods, the share for each country's import expenditures on agricultural (for perishable goods it is the share of agricultural expenditures) and non-agricultural goods and the number of partners supplying each country's import demand. The ten leading agricultural importers substantially increased their imports of both agricultural and non-agricultural goods but for each country, expenditures on agricultural goods are a relatively small part of their import bill. Together however, the agricultural import bill of the top ten was 61% of the total. The leading agricultural importers are also substantial importers of non-agricultural goods as their combined import bill for non-agricultural goods was 58% of total expenditures by all low income countries in 2012. Imports of perishable products are relatively small share of total agricultural imports among the leading importers. In 2012 imports of perishable goods was more than 20% of the agricultural import bill in only three of the leading importing countries while it was in single digits in four (Table 10). Nonetheless, the leading importers account for more than half of the import bill for perishables.

As for the number of partners, the leading importers seem to utilise fewer partners to satisfy their demand compared to the leading exporters which have vaster network. However, they import a relatively large variety of agricultural products. The typical low income country in 2012 imported 332 different agricultural products (HS6 digit level), ranging from a low of 111 in Eritrea to 514 in Mozambique. It is not clear whether the relatively few countries used as source of imports reflects bureaucratic and other problems with the importing procedures or that the relatively small market and low income of each of these countries is satiated by fewer suppliers. The relatively large number of imported agricultural products suggests that importing procedures allow a variety of agricultural goods to enter.

Table 10. Ten leading low income agriculture importing countries

Country	All agriculture	Perishable	Non-agriculture	All agriculture	Perishable	Non-agriculture	Agriculture	Non-agriculture	All goods
	Value (USD '000)			Share (%)			Number of partners		
				2000					
Bangladesh (1)	1,420,204	60,950	6,581,859	17.75	4.29	82.25	119	152	162
Kenya (3)	508,199	20,670	2,824,775	15.25	4.07	84.75	83	124	125
Haiti (19)	312,987	54,221	580,473	35.03	17.32	64.97	50	71	74
Myanmar (4)	297,536	28,008	2,218,170	11.83	9.41	88.17	34	60	64
Mozambique (11)	265,667	32,281	1,064,961	19.97	12.15	80.03	74	122	128
Tanzania (6)	255,229	26,312	1,430,566	15.14	10.31	84.86	80	136	139
Nepal (9)	245,156	31,166	1,326,754	15.60	12.71	84.40	49	74	77
Benin (12)	231,364	73,562	974,096	19.19	31.80	80.81	73	109	117
Democratic People's Republic of Korea (7)	228,222	10,388	1,364,008	14.33	4.55	85.67	49	78	85
Ethiopia (8)	191,797	12,575	1,331,031	12.59	6.56	87.41	80	127	128
Total above	**3,956,362**	**350,135**	**19,696,692**	**61.66***	**55.77***	**54.42***	**N/A**	**N/A**	**N/A**
				2005					
Bangladesh (1)	2,377,179	90,662	10,409,574	18.59	3.81	81.41	130	170	177
Afghanistan (7)	749,997	190,884	2,790,077	21.19	25.45	78.81	64	83	89
Kenya (2)	671,186	32,825	5,756,879	10.44	4.89	89.56	109	161	163
Ethiopia (4)	458,537	20,460	4,050,062	10.17	4.46	89.83	94	154	155
Myanmar (8)	458,116	36,738	2,579,357	15.08	8.02	84.92	38	63	68
Democratic People's Republic of Korea (11)	442,474	127,998	1,903,699	18.86	28.93	81.14	55	87	90
Benin (16)	409,969	80,558	1,471,803	21.79	19.65	78.21	71	117	125
Cambodia (6)	409,261	57,060	3,100,435	11.66	13.94	88.34	46	69	72
Haiti (24)	398,137	74,650	718,508	35.65	18.75	64.35	61	88	91
Mozambique (10)	393,754	38,871	1,930,828	16.94	9.87	83.06	77	140	144
Total above	**6,768,608**	**750,705**	**34,711,221**	**56.83***	**55.37***	**54.98***	**N/A**	**N/A**	**N/A**
				2012					
Bangladesh (1)	6,127,309	415,862	21,489,340	22.19	6.79	77.81	67	88	94
Myanmar (3)	1,856,494	229,412	11,493,949	13.91	12.36	86.09	44	63	69
Kenya (2)	1,777,058	142,421	12,191,468	12.72	8.01	87.28	80	94	100
Afghanistan (12)	1,743,829	448,059	5,553,528	23.90	25.69	76.10	52	73	78
Benin (14)	1,508,102	418,163	4,567,845	24.82	27.73	75.18	68	78	86
Cambodia (6)	1,472,376	161,628	9,628,770	13.26	10.98	86.74	57	96	100
Zimbabwe (9)	1,351,380	147,795	5,799,166	18.90	10.94	81.10	69	109	112
Tanzania (4)	1,132,693	59,181	10,418,547	9.81	5.22	90.19	80	143	144
Ethiopia (5)	1,115,407	39,703	10,270,697	9.80	3.56	90.20	93	133	142
Haiti (24)	1,002,674	235,261	1,669,675	37.52	23.46	62.48	55	77	80
Total above	**19,087,322**	**2,297,486**	**93,082,984**	**61.16***	**53.80***	**57.84***	**N/A**	**N/A**	**N/A**

* Top ten total as a share of total for all low income countries. Numbers in parenthesis is the country's rank in total imports.
Source: Author's calculations from BACI database.

Which lower middle income countries are the major traders?

Countries that fall within the lower middle income category are more numerous (49) than low income countries and export substantially more. The ten leading exporting lower middle income countries exported ten times more agricultural, including perishable goods and more than four times as much non-agricultural goods in 2012 compared to 2000. And, just as in the case of low income countries, the top exporters expanded their exports of all goods substantially during the period and garnered most of the group's export revenue.

Although the rankings changed somewhat, the leading agricultural exporting countries remained relatively constant. Two countries among the top ten in 2000, Uzbekistan and Honduras, dropped out in subsequent years replaced by Pakistan and Morocco in 2005 and Morocco was replaced by Nigeria in 2012. The ten leading exporters increased their agricultural exports from USD 23 billion in 2000 to almost USD 133 billion in 2012 (Table 11). This group of countries expanded their agricultural exports relatively more than other lower middle income countries, increasing their share of agricultural export earnings to more than 80% of the group's total in 2012. They also generated about three-fourths of the group's earnings from perishable products and they are also formidable exporters of non-agricultural products with more than 80% of export earnings of all lower middle income countries.

Unlike the developments in export earnings for low income countries, the importance of agricultural goods in generating export earnings in lower middle income countries increased over time with agricultural exports providing 14% of their export earnings in 2012, increasing from around 10% in 2000. In general, the ten leading lower middle income agricultural exporters generated more than 80% of all agricultural export revenues for the group, but agricultural export earnings for any one contributed a relatively small share to their total export earnings. The importance of the agricultural sector varies even among the ten leading exporters with Nigeria deriving only 4% of export earnings from agriculture while in Côte d'Ivoire almost half of export earnings in 2012 are agricultural based. Furthermore, the agricultural export basket of the leading exporting lower middle income countries shifted. Even though export earnings from perishable goods by the ten leaders were about three-fourths of the total receipts from perishable products by all lower middle income countries (Table 11), export earnings for the ten leaders from perishable goods fell from around 20% of their total agricultural exports in 2000 to around 16% in 2012 even as the total value of perishable exports increased from USD 4.7 billion to USD 20.7 billion.

Not surprisingly compared to low income countries, given the larger volumes exported by each of the lower middle income countries, they ship more varieties to more destinations. The average lower middle income country shipped 214 different products (HS6 digit) while among the ten leaders, the average number of products exported was 429.

In 2012, the two leading exporters shipped to all but two of the 195 reporting countries in the database. On average, the ten leading lower middle income exporters in 2012 shipped their agricultural products to 152 destinations with an average value of USD 873 million per partner. As a point of reference the leaders shipped their non-agricultural goods to165 partners collecting an average USD 4.9 billion per partner. Among the ten leading exporting low income countries in 2012 their agricultural goods were shipped to 93 different partners with an average shipment per market of USD 141 million while 102 partners were the destination on their non-agricultural goods with an average value per partner of USD 240 million.

Table 11. Ten leading lower middle income country agricultural exporters

Country	All agriculture	Perishable	Non-agriculture	All agriculture	Perishable	Non-agriculture	Agriculture	Non-agriculture	All goods
	Value (USD '000)			Share (%)			Number of partners		
				2000					
India (1)	5,807,733	1,223,358	43,871,808	11.69	21.06	88.31	174	184	184
Indonesia (2)	4,949,564	315,071	66,702,812	6.91	6.37	93.09	179	190	190
Côte d'Ivoire (18)	2,388,933	364,522	2,013,518	54.26	15.26	45.74	117	140	149
Philippines (5)	1,984,908	922,453	43,220,368	4.39	46.47	95.61	127	167	168
Guatemala (19)	1,843,446	549,507	2,294,952	44.54	29.81	55.46	109	99	121
Viet Nam (4)	1,609,541	209,715	11,387,242	12.38	13.03	87.62	107	126	130
Ukraine (7)	1,574,351	325,819	14,142,617	10.02	20.70	89.98	121	164	169
Uzbekistan (24)	1,079,579	113,194	980,094	52.42	10.49	47.58	59	66	71
Honduras (17)	900,962	366,332	3,273,187	21.58	40.66	78.42	83	104	118
Egypt (8)	895,897	296,814	5,417,276	14.19	33.13	85.81	126	160	162
Total above	**23,034,912**	**4,686,785**	**193,303,873**	**71.51***	**70.31***	**70.03***	**N/A**	**N/A**	**N/A**
				2005					
Indonesia (2)	9,603,577	521,759	93,831,736	9.28	5.43	90.72	186	191	191
India (1)	9,076,690	1,903,491	101,817,896	8.18	20.97	91.82	182	193	193
Ukraine (5)	4,618,405	765,929	33,052,974	12.26	16.58	87.74	147	170	171
Viet Nam (6)	4,015,249	832,714	32,973,906	10.86	20.74	89.14	167	187	187
Côte d'Ivoire 16)	3,472,206	523,244	4,504,888	43.53	15.07	56.47	124	138	150
Philippines (3)	2,972,821	1,277,639	56,195,984	5.02	42.98	94.98	159	179	183
Guatemala (18)	2,189,143	742,712	3,519,709	38.35	33.93	61.65	125	123	143
Egypt (9)	2,180,807	910,387	13,144,722	14.23	41.75	85.77	160	170	172
Pakistan (8)	2,032,584	232,720	13,278,210	13.28	11.45	86.72	161	192	192
Morocco (10)	1,878,097	1,260,481	11,887,701	13.64	67.11	86.36	129	158	161
Total above	**42,039,578**	**8,971,076**	**364,207,726**	**72.62***	**76.45***	**75.84***	**N/A**	**N/A**	**N/A**
				2012					
India (2)	37,099,808	5,509,207	237,321,008	13.52	14.85	86.48	185	193	193
Indonesia (1)	32,548,830	1,196,855	179,688,464	15.34	3.68	84.66	182	193	193
Ukraine (5)	18,575,608	1,355,444	53,722,492	25.69	7.30	74.31	159	175	176
Viet Nam (7)	12,303,476	2,826,118	99,343,600	11.02	22.97	88.98	158	156	162
Côte d'Ivoire (16)	5,919,549	742,402	6,076,004	49.35	12.54	50.65	111	139	147
Philippines (3)	5,796,176	2,386,251	66,376,260	8.03	41.17	91.97	156	181	183
Guatemala (15)	5,398,596	1,658,497	5,995,026	47.38	30.72	52.62	135	129	147
Pakistan (9)	5,385,559	895,779	19,284,356	21.83	16.63	78.17	161	179	182
Nigeria (4)	5,022,802	1,709,329	116,957,416	4.12	34.03	95.88	114	139	145
Egypt (10)	4,678,132	2,465,160	30,220,632	13.40	52.70	86.60	160	165	166
Total above	**132,728,535**	**20,745,041**	**814,985,257**	**81.44***	**74.94***	**81.92***	**N/A**	**N/A**	**N/A**

* Top ten total as a share of total for all lower middle income countries. Numbers in parenthesis is the country's rank in total exports.
Source: Author's calculations from BACI database.

The ten leading lower middle income agricultural importing countries materially expanded their imports of all products and in the process increased their share of the group's agricultural imports from 71% to 76%, imports of perishable agricultural products from 63% to 74% and non-agricultural imports from 79% to 85% (Table 12). Even as agricultural imports increased substantially, they represent a relatively small share of these countries expenditures. The agricultural import bill in 2012 for the ten largest agricultural importers was 8% of the total value of their import bill. However, within the agricultural import basket, the ten leading agricultural importing lower middle income countries increased imports of perishable goods relatively more raising the share of the basket to 17% in 2012 from 12% in 2000. Imports of perishable agricultural products for all lower middle income countries expanded relatively more than imports of all agricultural goods, raising their share to 17% of the total agricultural import bill in 2012 compared to 14% in 2000.

Table 12. Ten leading lower middle income country agricultural importers

Country	All agriculture	Perishable	Non-agriculture	All agriculture	Perishable	Non-agriculture	Agriculture	Non-agriculture	All goods
	Value (USD '000)			Share (%)			Number of partners		
				2000					
Egypt (4)	4,112,438	528,877	15,611,026	20.85	12.86	79.15	115	131	139
Indonesia (2)	4,023,556	404,693	32,246,180	11.09	10.06	88.91	141	170	176
India (1)	3,338,254	475,334	41,843,444	7.39	14.24	92.61	138	166	166
Philippines (3)	2,801,414	567,530	32,017,834	8.05	20.26	91.95	109	151	154
Morocco (7)	1,567,608	111,329	10,259,960	13.25	7.10	86.75	113	133	142
Nigeria (8)	1,310,244	86,419	7,290,305	15.23	6.60	84.77	121	166	167
Pakistan (9)	1,185,944	52,349	5,095,957	18.88	4.41	81.12	81	99	108
Viet Nam (6)	1,096,785	121,947	10,755,661	9.25	11.12	90.75	65	90	96
Ukraine (5)	1,016,760	160,482	13,200,392	7.15	15.78	92.85	116	135	149
Syrian Arab Republic (14)	708,987	53,380	2,906,009	19.61	7.53	80.39	73	79	87
Total above	**21,161,990**	**2,562,340**	**171,226,768**	**70.72***	**62.50***	**78.98***	**N/A**	**N/A**	**N/A**
				2005					
Indonesia (2)	5,527,305	766,066	58,169,124	8.68	13.86	91.32	124	173	177
India (1)	5,524,303	804,269	114,583,536	4.60	14.56	95.40	153	187	187
Egypt (6)	4,813,628	651,653	24,544,850	16.40	13.54	83.60	124	138	145
Philippines (3)	3,788,241	705,557	41,787,532	8.31	18.62	91.69	104	139	145
Pakistan 7)	3,212,107	185,855	23,288,104	12.12	5.79	87.88	149	185	187
Iraq (10)	2,704,215	426,207	9,229,365	22.66	15.76	77.34	63	85	87
Ukraine (4)	2,576,988	734,973	36,216,112	6.64	28.52	93.36	133	160	174
Viet Nam (5)	2,525,588	376,996	34,762,228	6.77	14.93	93.23	118	155	158
Morocco (8)	2,234,603	234,384	18,879,274	10.58	10.49	89.42	128	156	162
Nigeria (9)	2,127,887	115,862	16,169,359	11.63	5.44	88.37	81	113	114
Total above	**35,034,864**	**5,001,822**	**377,629,484**	**68.44***	**63.26***	**79.58***	**N/A**	**N/A**	**N/A**
				2012					
India (1)	19,145,190	2,056,295	428,200,672	4.28	10.74	95.72	154	185	185
Indonesia (2)	17,497,724	2,407,095	168,940,496	9.39	13.76	90.61	142	178	185
Egypt (6)	17,212,416	2,261,799	56,624,848	23.31	13.14	76.69	128	154	159
Viet Nam (3)	12,919,264	3,672,321	87,673,056	12.84	28.43	87.16	120	144	152
Philippines (5)	7,832,292	1,832,630	66,065,484	10.60	23.40	89.40	110	155	161
Iraq (10)	7,806,082	2,133,583	24,553,398	24.12	27.33	75.88	71	83	88
Nigeria (7)	7,027,818	287,759	39,758,668	15.02	4.09	84.98	112	153	157
Ukraine (4)	6,734,986	2,502,143	80,481,808	7.72	37.15	92.28	142	163	173
Pakistan (9)	5,623,336	415,248	37,350,268	13.09	7.38	86.91	130	175	178
Morocco (8)	5,232,333	545,741	38,289,620	12.02	10.43	87.98	129	148	160
Total above	**107,031,440**	**18,114,614**	**1,027,938,318**	**76.14***	**74.16***	**85.08***	**N/A**	**N/A**	**N/A**

* Top ten total as a share of total for all lower middle income countries. Numbers in parenthesis is the country's rank in total imports.
Source: Author's calculations from BACI database.

Not only did lower middle income countries spend more than low income countries they also imported a larger variety of agricultural goods. The average lower middle income country imported 403 different (HS6 digit) agricultural products in 2012. Moreover, for their imports, agricultural or otherwise, low income and lower middle income countries in general had access to many different partners. On average each low income country in 2012 sourced its agricultural imports from 62 partners ranging from 98 by Mauritania to 25 by Eritrea. For their non-agricultural needs, the average low income country sourced from 90 partners with Tanzania sourcing from as many as 143 countries while Eritrea sourced from the fewest partners (50). The average low income country spent about USD 507 million on agricultural goods and USD 1.8 billion on non-agricultural goods. Lower middle income countries with their relatively higher incomes have a larger choice of suppliers. In 2012, the average lower middle income country sourced its agricultural import needs from 77 partners spending an average of USD 1.8 billion per partner. For their non-agricultural imports, they sourced from 104 partners providing each partner about USD 4.6 billion. For both income groups, these statistics are substantially higher than their comparable 2000 levels, attesting to increased incomes over time and the capacity to expand trade - both imports and exports - over time.

The data suggest that trade, both imports and exports by low and lower middle income countries, expanded substantially and at the same time, there were improvements in their trade facilitation indicators reported in Trading Across Borders database. This suggests that developing countries capacity to trade improved. This is not to imply that further improvements in border procedures, logistics and other trade facilitating factors are not necessary. The data clearly suggest that most low and lower middle income countries have considerably catching-up to attain best practices. Perhaps the trade figures presented here would have been higher with additional improvements in trade facilitation as the literature suggests. But the data suggest, especially among the ten leading low and lower middle income exporters, that there have been improvements in custom clearance, logistics and infrastructure and productive capacity as reflected in the jump in trade since 2000.

11. Use characteristics of traded agricultural products

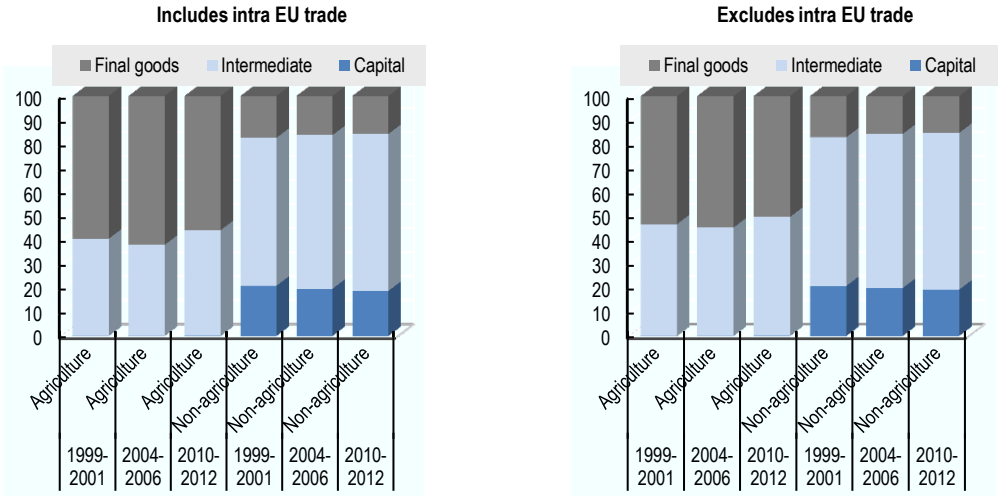
One of the big developments in international trade has been the "slicing and dicing" of production into various tasks that are performed in multiple countries prior to their assembly for sale to consumers. Improvements in communications, logistics, reductions in transport costs, among other technological improvements have enabled firms to locate production in multiple countries to improve profitability. A country's ability to connect to value chains and its location within the chain are partly determined by its ability to meet standards and efficiently move goods through its borders. Trade facilitation measures which aim to lower costs and improve the efficiency and reduce the timeliness of the procedures involved in moving goods between countries become more important in this context. The speed by which goods clear borders is not only relevant for perishable agricultural goods but also for other goods such as parts and components that are part of value chains in different countries. Delays in their availability can be quite costly as multiple plants in various countries can lie idle. Timeliness is also important for high tech goods that may experience rapid technological obsolescence or fashion merchandise that can quickly go out of fashion before firms can get their goods to the market. This phenomenon has increased the value of co-ordination and timeliness in moving the various parts where they are needed in timely manner. Thus, speedy movement of goods through borders has become more important as are efforts that help expedite the timely movement of goods.

International merchandise trade reflects this trend in the way enterprises organise their production and the prevalence of global value chains. Only a small portion of merchandise trade is destined for final consumers. Agricultural markets have also been characterised by global chains as agricultural goods move to deficit regions from surplus areas or seasonal and perishable produce move to fulfil consumer year-round demand.

Figure 6 illustrates the phenomenon using the Broad Economic Classification nomenclature to allocate traded agricultural and non-agricultural products into three broad groups of capital, intermediate and final goods. The data are based on three years centred around 2000 (1999 to 2001), 2005 (2004-2006) and 2011 (2010-2012). The left hand panel excludes intra-EU trade and the right hand panel includes it to illustrate that the relative magnitude of trade in intermediate agricultural goods is affected by the choice. The rest of the section, as in previous sections is based on data that excludes intra-EU trade.

It is apparent from Figure 6 that trade of agricultural products is different from non-agriculture with a much larger proportion of traded agricultural goods destined for final consumption, especially when intra EU trade is considered. Interestingly, the allocation of traded non-agricultural goods is little affected whether or not data include intra-EU trade. For agricultural goods however, the relative importance of traded intermediate goods diminishes when the figures reflect trade among the EU members. Nonetheless, in the more recent period, trade in agricultural products that are used as inputs by other countries (intermediate goods) have increased in importance.

Figure 6. End use of traded agricultural and non-agricultural products



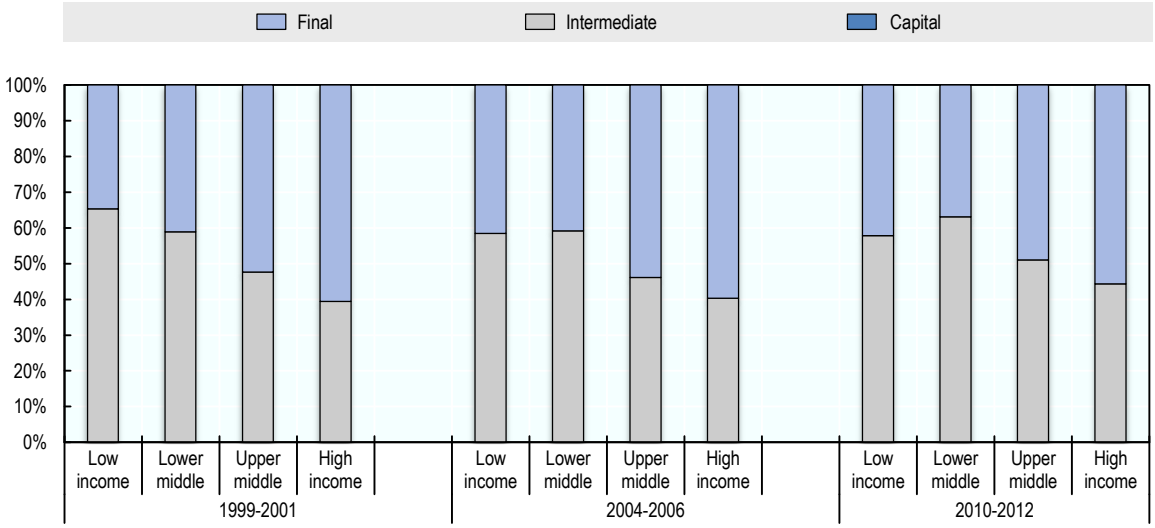
Source: Authors calculations applying BEC classification to BACI data.

Is a country's export structure, whether its goods are mostly used by its partner for final or intermediate consumption, depend on its income level? Do low or lower middle income countries export goods that are further upstream, i.e. provide inputs or further downstream exporting goods for final consumption? Has this changed over time?

In the early period (1999-2001), more than half of low income (65%) and lower middle income countries (59%) agricultural exports were intermediate inputs, used by their trading partners for further processing. This suggests that developing countries were fairly integrated into agricultural global value chains and were mostly upstream providing material for further processing. In contrast, upper middle (52%) and high income (61%) agricultural exports were goods destined primarily for final consumption (Figure 7) implying that these countries were further downstream exporting mostly for final consumption.

Trade expansion in subsequent years documented above, also brought about a modest transformation in the export basket of low and lower middle income countries. In the 2010 to 2012 period, agricultural exports from low income countries were still primarily destined for further processing elsewhere but exports for final consumption increased their share averaging 42% of their exports compared to 35% in the early period. In contrast, lower middle income countries continued to emphasise exporting primarily intermediate goods with 63% of their exports going overseas for further processing. The export basket of high income countries shifted somewhat upstream with 44% of their exports destined for further processing compared to 39% in the earlier period. The export basket of upper middle income countries was somewhat more balanced between exporting final and intermediate goods, but it also shifted somewhat moving from an export basket that contained slightly more goods destined for final consumption in the early period to a basket with slightly more intermediate goods. Thus, agricultural exports although lagging manufactures, are following a similar path trading more intermediate goods. This suggests an increasing emphasis in global value chains and the data suggest that low and lower middle income countries are participants.

Figure 7. Agricultural exports by income category and intended use by partners

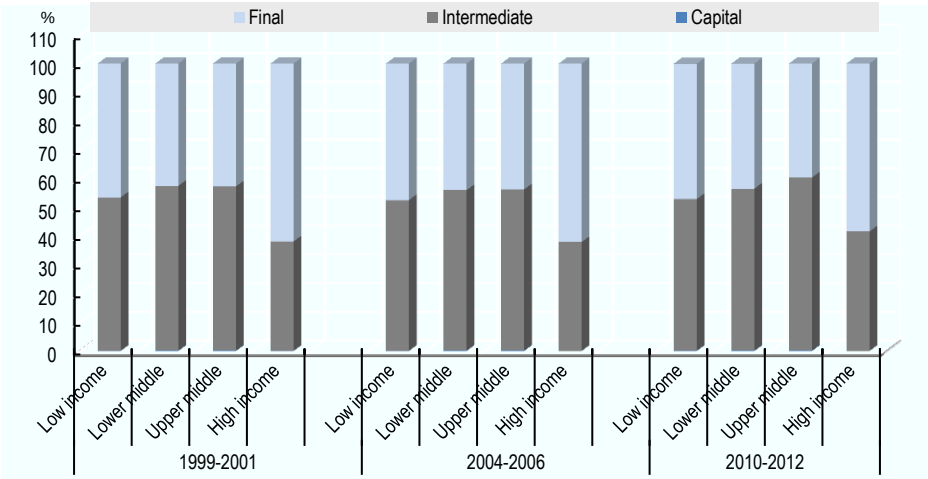


Source: Authors calculations applying BEC classification to BACI data.

On the import side, which set of countries are importing goods primarily for further processing and which are primarily importing final goods? High income countries are not only exporting agricultural goods that are mostly for final consumption, they are also importing them (Figure 8). Low and lower middle income countries have a relatively balanced import basket which remained relatively stable over time with a preference for importing intermediate goods.

Implications of these developments for developing countries' as they participate in global value chains is beyond the scope of this analysis but is being examined elsewhere in the Directorate. However, the back of the envelope calculations provided here suggest that developing countries participate in these chains and have expanded the amount they trade implying that their infrastructure at or behind the border and other trade facilitation factors for many of them, have evolved and improved allowing agricultural exports from low and lower middle income countries' to meet safety, traceability, quality and other criteria for participating in value chains.

Figure 8. Agricultural imports by income category and intended use



Source: Authors calculations applying BEC classification to BACI data.

12. Value of saving time

Timeliness is important in trading perishable products for obvious reasons. Timeliness; speedy delivery or speedy clearance of goods is important also for goods that are part of global value chains even if they do not physically deteriorate. Intermediate goods that arrive late or not at all, slow down or shut down assembly or processing plants in other countries, disrupting supplies along the value chain and increasing costs. Using data on US imports that distinguish mode of transport (air or ocean); Hummels and Schaur (2013) calculate the value of a day saved in transit and convert it to tariff equivalent for a large number of goods. They find that for all US imports, the median ad valorem air premium is 5% which they suggest implies that ocean shipping costs are equivalent to a 3% tariff and air shipping costs are equivalent to an 8% tariff (Hummels and Schaur 2013) indicating that firms are willing to incur higher costs for air shipment to save time. This finding confirms previous results that time delays in trade are costly. Hummels asserts that many goods, previously considered standardised, are becoming perishable due to technical or market obsolesces, and their value often depends importantly on timely delivery.

Using the same data and methodology[27] but segregating agricultural and food (as defined at the WTO) from other products, the air premium for agricultural goods was calculated for this exercise. The results indicate that the median *ad valorem* air premium for all agricultural products is 9% compared to 5% for non-agricultural goods. Segregating the agricultural goods further into perishable and all other agricultural goods using the concordance described in the Annex, the median ad valorem air premium for perishable products rises to 17% compared to 8% for other agricultural goods and 5% for non-agricultural goods. These results suggest that consumers that value saving time, trade higher cost of air shipping against the higher implicit quality of a good that arrives several days earlier and this time saving effect is higher for perishable agricultural products.

Hummels and Schaur (2013) also estimate the consumer's valuation of timeliness as the ratio of ocean transport time (in days) divided by relative freight prices. For all goods their estimate ranges from .003 to .021 depending on the specification. At the high end, it means that one additional day in transit is equivalent to a 2.1% tariff. They also estimate the value of time for broad commodity groups. They find that *Automotive Goods* are the most time sensitive products with a tariff equivalent of 4.3% per day's delay reflecting the sensitivity of these goods in global value chains. For *Food and Beverages*, they find the second highest time sensitivity with each day's delay equivalent to a 3.1% ad valorem tariff.

Hummels and Schaur (2013) innovative results suggest that speedy movement of goods through borders is not important just for countries exporting perishable agricultural products. Countries that want to participate in global value chains are also obliged to improve bureaucratic procedures, logistics port facilities and other infrastructure, that is, improve trade facilitation measures to reduce time and encourage firms to expand trade. Timeliness is not only important for perishable goods that can quickly deteriorate and spoil losing most if not all their value, but also for high tech goods that may experience rapid technological obsolescence or fashion merchandise that can quickly go out of fashion before firms can get their goods to the market. Streamlining customs procedures, improving port and terminal handling and inland transport and handling generate benefits measured in days saved. Coupled with estimates of the value of time saved, a monetary value of the benefits from these endeavours can be compared with their cost (Hummels and Schaur (2013).

Different types of costs in terms of customs and port procedures or clearing processes raise prices for exporters, especially when inputs are traded many times in the context of GVCs. Logistical and administrative procedures both at the point of departure and in the destination country slow down the workings of the global supply chains. Hence, trade facilitation measures

27. Provided on-line with the Hummels and Schaur (2013) paper.

that expedite border crossings become even more important for intermediate inputs that are part of GVCs.

A study for the USAID by Hummels et al., (2007) using data on imports to the United States via air and ocean transport (as above), calculated the tariff equivalent of a day's saving for various products. For example, they report that the tariff equivalent for the value of time saving per day is 0.9% for *Vegetables and fruit*, 0.8% for *Cereals and cereal preparations*, and 1.1% for *Coffee, tea, cocoa, spices and manufactures thereof*. They combined this type of information for all products with data form Trading Across Borders and each country's trade basket (imports or exports) to calculate the tariff equivalent of time delays in: i) inland transport, ii) port handling and iii) custom procedures for each country's imports or exports.[28] Aggregating the country information into various regions, the study concludes that for imports, the tariff equivalent of time delays is greater than the applied tariff in each region supporting other studies that find that non-tariff measures are a greater hindrance to trade. For exports, the tariff equivalent of time delays exceeds tariffs faced by exporters in all regions except high income OECD countries and countries in East Asia and the Pacific. Delays at customs were the largest contributor to the tariff equivalent of time delays only in East Asia and the Pacific. But, it was the second leading contributor to tariff equivalent of time delays in Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa and Sub Saharan Africa. Inland transport and handling was the leading contributor to the tariff equivalent of time delays in Europe and Central Asia and in South Asia, while port and terminal handling delays contributed the most to the tariff equivalent of time delays in High Income OECD, Latin America and the Caribbean, Middle East and North Africa and Sub-Saharan Africa. Given that countries have improved their performance in reducing time delays across the spectrum since 2007, the magnitude of the tariff equivalent of time delays may have declined. However, applied tariffs have mostly fallen during this period. It may still be the case that improvements in border procedures that reduce time delays may have a larger impact on trade than tariff reduction.

For the low income countries in his sample, the overall tariff equivalent of time delays to export averaged 19.7% ranging from 59% in Burundi to 3.5% in Cambodia. In contrast, the applied tariff faced by exporters from low income countries averaged 6.1% ranging from 17.1% for Nepal and 0.5% for Chad. The largest contributor to the cost of time delays for 18 of the 27 low income countries in his sample was delays in inland transportation while port handling or customs clearance each represented the largest share to time delay cost in seven countries.

The difference between the ad valorem equivalent of time delays and the applied tariff faced by exporters from lower middle income countries was less dramatic. The ad valorem equivalent of time cost to export averaged 9.9% ranging from a low of 2.5% in Syria to a high of 32% in Uzbekistan. The applied tariff faced by exporters from lower middle income countries averaged 7% ranging from a low of 0.3% in Iraq to a high of 38.1% in Fiji. Inland transportation was the highest contributor to the tariff equivalent of time cost to export for 25 of the 45 lower middle income countries in the sample while the tariff equivalent of time delays to clear customs was the largest contributor in 15 countries and port handling contributed the most in 14 countries.[29] The findings from Hummel et al., (2007) confirm results of others that trade delays are costly. They also indicate that the steps low income countries need to take to speed delivery of their exports may involve relatively high-cost infrastructural investments in roads and logistics to improve their inland transportation system along with improvements in handling the merchandise while in the port. Customs clearance, although also slowing trade, for low (lower middle) income

28. The *ad valorem* equivalent of a day saved is product but not country specific and the time value is based on US import data and are assumed to apply to all countries.

29. The number of countries is greater than 45 because in some cases there was a tie between the different procedures for the largest contributor to the tariff equivalent.

countries provided about 25% (29%) of the overall cost of time delays. The results from Hummel et al., (2007) although derived only from US import data, may be indicative of agricultural trade for other countries as they are based on the value traders place on speedy delivery of specific products including agricultural goods, which are then applied to an individual country's export basket to calculate the tariff equivalent of time delays for that country. With information on the cost to improve the timeliness of clearance at customs or to speed-up inland transport or port handling, one could conduct cost benefit analysis on the desirability of a country to undertake such projects.

13. Summary and conclusions

The literature reporting empirical results for trade facilitation measures and agricultural trade was reviewed in order to advise future work on trade facilitation processes focused on agriculture-specific constraints. The studies identified in this review tend to focus predominantly on time delays, logistics and infrastructure, and customs efficiency or sanitary and phytosanitary (SPS) standards and technical barriers to trade (TBT), with very few studies overlapping into both categories. The results vary depending on commodity composition and country coverage.

Overall, evaluations which take indicators of trade times, logistics performance and infrastructure quality tend to find a significant relationship between trade facilitation proxies and trade flows or trade costs, though results vary significantly across product sectors and regions. These suggest that the length of export and import times and customs clearance delays can present important impediments to trade for time-sensitive agricultural products. Results suggest that firms are willing to pay a premium for air shipment in order to avoid an extra day delay from ocean freight and this premium is higher for perishable agricultural products than for other goods. Logistics performance and maritime connectivity also appear to have significant effects on trade costs. Nearly all of these studies rely on more general indicators such as the number of days needed to export or connectivity indices which may be more representative of aggregate trade flows and stylised shipments than sector specific constraints. This suggests that data on agriculture-specific measures may be limited. Whether or not these barriers have different implications for agricultural products than those captured by the standard indicators for overall trade is worth investigating.

Summary statistics of key facilitation metrics such as the time to get the goods to the border, to clear customs, and to load a consignment onto a vessel from the World Bank's Doing Business database were also provided. The data indicate the measures have improved for most countries across the various income groupings suggesting that countries have taken steps to improve their performance.

Trade facilitation matters. Estimates of trade friction costs from border and custom procedures (direct trade transaction cost) amount to 2% to 15% of the value of traded goods (Moïsé and Le Bris (2013). As reported in Shephard and Wilson (2008), several studies show increased trade flows and benefits from trade facilitation improvements comparable to full liberalisation of goods and services. Results from Hummels et al. (2007) suggest that the tariff equivalent of time delays involved in processing documents, transporting goods to the border, clearing customs and loading the cargo on to the vessel, are higher than applied tariffs faced by exporters in most regions. Trade facilitation may be more important for agricultural rather than manufacturing trade especially from lower income countries. As reported by Moïsé and Le Bris (2013) trade transaction costs (for narrowly defined trade facilitation) are higher for agro-food products than manufactured goods due to more stringent and numerous border procedures, physical inspections and SPS requirements and the perishable nature of many agricultural products which entail a higher sensitivity to delivery delays. Calculations of trade costs excluding tariffs by Duval et al. (2012) confirm that they are higher for agricultural products compared to industrial goods.

The specificities of trading agricultural products may imply that trade facilitation variables discussed above, as currently measured, are not representative of the trade frictions associated with

their trade. Better measurements of the conventional trade facilitation variables that single out agricultural products are needed. Additionally, there are behind the border procedures such as meeting SPS standards that are important for many agricultural products and any additional time delays and documents (if any) required prior to importing or to exporting these goods needs to be taken into account. Additional specificity in trading some agricultural products is the potential differences associated with different modes such as air transport or cold storage of transporting these goods across international borders.

Specifically for any country exporting and importing a particular set of agricultural products perishable and others, a questionnaire distributed to custom officials, health and sanitary certificate providers, logistic operators and traders designed to collect time and motion information on the following set of variables, among others, would be helpful:

- Total number of documents to import or export identifying documents needed specifically to meet sanitary and phytosanitary standards (SPS).
- Total time to process the documents explicitly identifying time needed to receive SPS approval.
- Availability and capacity of cold storage facilities at the border.
- Collaboration or not, between different agencies at the border.
- Coordination or not, of consignment inspections.
- Time to clear customs.
- Time to load cargo on vessel from the time good arrived at customs (port handling).
- Time to collect goods and ship to warehouse or packing facility (inland transport).
- Time to transport goods from warehouse or packing facility to border.
- Choice of specific mode of trading agricultural products, which mode for which product for which market.

The World Bank's International Finance Corporation has started a project to Benchmark the Business of Agriculture which includes collecting indicators on doing business in agriculture behind, at and beyond the border. The project started in 2014 with a pilot test in ten countries with plans to eventually include some 80 countries by 2016[30]. Undoubtedly, food safety and health standards along with cold storage throughout the chain of many agricultural goods, sets their trade somewhat apart from trading general merchandise. But, agricultural products are not the only ones where speedy delivery and quick processing through border is important. Products involved in sequential multi-stage processing in various countries also benefit from speedy delivery and quick passage through borders.

Trade developments during the last 13 years suggest that developing countries as a group have materially expanded their ability to trade, both as exporters and as importers. Even low income countries have demonstrated very high growth rates in agricultural trade, including for products classified as perishable. Although the grouping of products is subjective, it is probably safe to say that the general pattern will not change significantly with a more refined list of relevant products given that the general trade pattern for all agricultural trade is very similar. Furthermore,

30. Information will be collected on the time needed and fees assessed for all required procedures such as necessary public and commercial documents including sanitary and phytosanitary certificates, certificate of origin, customs export declaration and bill of lading other conformity related procedures such as testing and certification, terminal handling and any other procedures before and at the border post.

trade in non-agricultural products for low and lower middle income countries expanded even faster. Data on border rejections, although limited to the United States and the European Union, suggest that rejections are a very small share of imports of affected products and that a relatively small number of countries, spanning all income levels, account for a large part of the rejections. Coupled with the findings that timeliness in trade is not unique to perishable agricultural products, it may be the case that trade frictions at the border may not have impeded trade of agricultural products any more than trade of industrial goods. Data from Benchmarking the Business of Agriculture will help shed light on the uniqueness or not of trade facilitating measures in trading agricultural products.

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Annex 1.

Summary of Reviewed Empirical Studies

Empirical studies with a component on agricultural products				
Study	**Country set**	**TF indicator(s) used**	**Data source for indicator(s)**	**Key findings**
Arvis et al. (2013)	178 countries for the period 1995-2010	-Air Connectivity Index -Logistics Performance Index -Liner Shipping Connectivity Index	World Bank UNCTAD	Liner shipping connectivity and logistics performance have a statistically significant and negative effect on trade costs of agricultural products. Costs on starting a business have a positive and significant effect, while air connectivity appears to be non-significant. Trade costs in agriculture are found to be less sensitive to marine transport connectivity and logistics performance than those for manufacturing products.
Chen, Otsuki and Wilson (2006)	17 developing countries (exporting to 5 OECD countries)	Survey response flagging as barriers: -Testing Procedures -Inspection time	World Bank Technical Barriers to Trade Survey	Evidence suggests that testing procedures and inspection times, as identified by firms' responses, have a negative impact on agricultural firms export propensity. Testing procedures and inspection times, on the other hand, are not significant in the sub-sample of manufacturing firms.
Crivelli and Gröschl (2012)	164 importing and 150 exporting countries in 1995-2010	- Dummy for reported concern for an SPS - Normalized frequency measure (of SPS in product sector)	WTO SPS Information Management System	Concerns over SPS measures raised by countries with the WTO pose a negative impact on the likelihood that firms export to a concerned market although, conditional on market entry, the amount of exports to markets with SPS measures in place tends to be higher. Most of the negative effect on the likelihood of market entry is due to conformity assessment-related SPS measures, while measures related to SPS product characteristics explain most of the positive impact on the amount of trade. This indicates that SPS product characteristic measures enhance consumer trust in imported products and by this increase trade for those exporters that manage to overcome the fixed cost of entering a market.
Disdier, Fontagné and Mimouni (2008)	154 importing, and 183 exporting countries in 2004	-Notified SPS/TBT measure -Frequency of notified measures index -Ad valorem of notified measures	UNCTAD	Results suggest that SPS and TBTs do not significantly affect bilateral trade between OECD members but have a significant and negative effect on developing countries' and LDCs' exports to OECD countries. Separately testing product sectors, coefficients estimates are negative and significant in 8 sectors, not significant for 10 sectors and positive and significant for 7 sectors.
Djankov, Freund and Pham (2010)	146 countries in 2005	-Export time (to move goods from the factory to the ship)	World Bank Doing Business Survey	Export times have a significant and negative effect on time sensitive agricultural goods (sensitivity based on storage life). A 10% increase in export time reduces exports of time-sensitive agricultural products by about 3.5%.

Study	Country set	TF indicator(s) used	Data source for indicator(s)	Key findings
Duval *et al.* (2012)	108 countries from 2001 to 2009	-Internet users per 100 -Liner Shipping Connectivity Index -Overall Trade Restrictiveness Index (OTRI)	UNCTAD World Trade Indicator Database	Non-tariff measures have a positive and significant effect on trade costs of agricultural products, while liner shipping connectivity has a negative and significant effect on costs. Reductions in non-tariff measures by 10% are associated with reductions in agricultural comprehensive trade costs by 3%, while the LSCI variable contributes between 5 and more than 15% of total trade costs. Internet connectivity is not statistically significant. The impact of port connectivity and non-tariff measures are even greater for ASEAN-OECD trade.
Ferro, Wilson, and Otsuki (2013)	61 countries	-Number of regulated pesticides -average maximum residue levels -restrictiveness measure	Agrobase Logigram Homologa database	Each additional pesticide regulated by the importer, on average, is associated with a 0.1% lower probability of trade. Using Average MRLs, results show that higher MRLs (less restrictive standards) are on average associated to higher probability and intensity of trade. Using the restrictiveness index, more restrictive standards in a destination market result, on average in fewer firms exporting into this market. However, once the fixed costs to comply with standards are covered there appears there are no additional variable costs to comply with standards that affect the intensity of trade.
Fontagné, Mimouni and Pasteels (2005)	114 exporting and 61 importing countries in 2000-2001	- Multilateral environment related measures	UNCTAD database on trade barriers	Different country groups (LDC, DC, OECD) are similarly affected by ERM. ERM have a positive and significant effect on agricultural imports in four product groups, a negative and significant effect in six product groups, and a non-significant effect in nine product groups.
Freund and Rocha (2010)	146 countries in 2007	-Time to complete documentation -Inland transit time -Customs and ports times	World Bank Doing Business	Increases in inland transit times reduce African exports of time-sensitive agricultural goods relatively more than time insensitive goods. In contrast, documents and customs and ports times are not significant. More transit delays affect the composition of trade, preventing countries from exporting time-sensitive agricultural goods.
de Frahan and Vancauteren (2006)	EU countries in 1990-2001	-Harmonization of regulations	Brenton *et al.* (2002) CEC (1998)	With the exception of condiments harmonisation has a significant and positive effect on EU imports in all agricultural sub-sectors. Harmonisation in food regulations has increased intra-EU imports in all food products by around two-thirds, and in fruits and vegetables by around one third in1990- 2001.
Jongwanich (2009)	79 developing countries in 1990-2006	- Incidence of detention (export value of food prods to the US to number of detained shipments) -road density	US Food and Drug Administration World Development Indicators	The ratio of export value to number of detained shipments in the US market has a positive and significant effect on the real value of processed food exports (used as a proxy for export performance). An increase in the number of detentions would lead to a decline in export volumes of processed foods. Road density appears to be non-significant. The statistical non-significance of road density may emerge from the relatively high correlations among density, GDP per capita, and resource endowments.

Study	Country set	TF indicator(s) used	Data source for indicator(s)	Key findings
Jongwanich and Magtibay-Ramos (2009)	79 developing countries in 1990-2006	-Road density	World Development Indicators	Road density has a statistically significant effect on changes to the structure of agricultural exports. This implies that improvements in infrastructure and transportation would benefit the processed food industry more than traditional agricultural products (benefit to supply chain links of processed goods).
Kim and Reinert (2009)	52 countries (30 developing countries) in 2001	-Maximum-level, Aflatoxin B1 standard -Information, Conformity, Enforcement, and Intl standards setting capacity	ITU UNDP UNPAN ISO WTO IIPC	Informational capacity has a positive and statistically significant effect on trade value between exporting and importing pairs. Enforcement capacity variable displays the trade suppressive effects, although this is not statistically significant in the case of developing-country exporters. International standard-setting capacity is not statistically significant. Conformity capacity has a small, but positive and significant effect. MRLs for alfotoxin B1 have a positive and significant effect.
Li and Beghin (2012)	27 papers evaluating technical measure effects on trade flows			Agriculture and food industries tend to be more impeded or less enhanced by SPSs and TBTs than other sectors. SPS regulations on agricultural and food trade flows from developing exporters to high-income importers are more likely to be trade impeding than similar barriers in North–North trade. Studies using direct maximum residue limits tend to find more trade impeding effects than other measures. Other technical measures proxies tend to find less significant trade effects; either they forego variations in actual policies and/or because they aggregate many NTMs into an index.
Liapis (2011)	214 countries and regions	-Number of Documents for export -Time to export	World Bank Trading Across Borders database	Time delays in exporting countries have a significant negative effect on bilateral trade, while time delays in importing countries do not have a significant effect. Number of documents is not statistically significant. Results suggest that time delays reduce exports, mostly at the extensive margin, reducing the variety of goods exported. At the intensive margin, time delays result in lower prices perhaps reflecting quality deterioration, without affecting export volume.
Liu and Yue (2013)	96 countries In 1991-2007	-average time of customs clearance and technical control	World Bank Doing Business Report	For highly perishable produce time delays' quality effect and price effect are both significant, implying that the time delays significantly decrease product quality and price. For medium perishable product time delays have significant quality effect but no significant price effect. For less perishable products, find neither significant quality effect nor price effect.

Study	Country set	TF indicator(s) used	Data source for indicator(s)	Key findings
Mangelsdorf, Portugal-Perez and Wilson (2012)	Chinese exports in 1992-2008	-Mandatory domestic standards -Mandatory Intl harmonised standards -Voluntary domestic standards -Voluntary Intl harmonized standards	Standards Administration of the Peoples' Republic of China (SAC)	Mandatory standards are generally positive and statistically significant for both purely domestic and international harmonized standards. The Push effect of standards is larger when they are based on international standards such as Codex Alimentarius. One additional internationally harmonized standard is associated with an increase in agricultural exports between 0.38% and 0.64%. Although voluntary domestic standards have a positive impact on exports in most specifications, the impact is either smaller or not significant compared to mandatory standards.
Martinez-Zarzoso and Marquez-Ramos (2008)	13 exporters and 167 importers in 2000	-Cost to export -Cost to import -Time to export -Time to import -Number of documents to export	World Bank Doing Business Database	Cost to export, cost to import, time for export, time for import and number of documents for import all have a negative and statistically significant effects on bilateral trade in agricultural products in coffee, tea, cocoa, spices and manufactures thereof. Time to exports appears to have a stronger effect than time to imports.
Maskus, Otsuki and Wilson (2005)	17 developing countries in 2002	-cost of compliance with foreign standards and technical regulations	World Bank Technical Barriers to Trade Survey	Compliance costs appear to have no statistically significant effect on variable costs in processed foods, drugs and liquors product category. Do observe some positive and significant effect on variable costs for raw foods, but findings are statistically significant in only 1 of 4 estimation models.
Minor and Tsigas (2008)	105 country/regions	-Time to trade	MacMap 2004 database	Average tariff-equivalent time cost range from 0–0.2% ad valorem per day for basic agriculture (bulk commodities) to 1.1% per day for fresh agricultural products. A 50% reduction in time to export in SSA would decrease the export composition share of basic agricultural products by about 9%, but increase the share of vegetables, fruits and nuts by 13%.
Moenius (2004)	12 OECD countries in 1980-1995	-shared and country-specific standards	PERINORM database	Shared standards and importer country specific standards appear to be negatively associated with bilateral trade flows of food and beverages products. Coefficients for country specific standards of exporters are positive for food products but negative for beverages.
Moïsé, E. et al. (2013a)	106 non-OECD countries	-Trade facilitation indicators	OECD	Results are less consistent for agriculture products than manufactured goods. Model does however fit rather well for agricultural sector in lower and middle income countries where information availability, advance rulings, formalities-documents, formalities-automation, formalities-procedures and governance and impartiality are positive and significant.
Moïsé, E. et al. (2013b)	64 developing countries in 2003-2008	-Index of infrastructure quality -Index of NTM restrictiveness (NTMRI)	World Bank Logistics Performance Index Kee, Nicita and Olarreaga (2009)	Developing countries 'agricultural exports are highly responsive to the quality of transport and trade-related infrastructure. A 10% improvement in the transport and trade related infrastructure quality has the potential of increasing developing countries agricultural exports by 30%. Contrary to expectations, the effect of the NTMRI term is found to be positive and significant.

Study	Country set	TF indicator(s) used	Data source for indicator(s)	Key findings
Nordas, Grosso and Pinali (2008)	Varying by estimation	-Supermarket penetration -Supermarket private labels	Deloitte Mintel ACNielsen	The commercial presence of a retailer from country I in country j is associated with about 20% higher imports of food and beverages. Do not, however, find any significant evidence that the presence of international retailers has an effect on the extensive margin. Thus, it appears that retailers enhance existing trade flows rather than creating new ones. Market concentration has and private labels are negative associated with imports in food and beverages.
Otsuki, Wilson and Sewadeh (2001a)	14 EU importers plus Switzerland, and 9 African exporters	-Maximum aflotoxin level imposed on groundnut products	FAO Survey of Mycotoxin Standards on Food and Feed Stuffs 1995	Simulations suggest that a 10% tighter aflatoxin standard in European countries reduces African edible groundnut imports by 11%. A new European Union regulation on aflatoxins could result in a trade flow that is 63% lower than when the Codex Alimentarius international standards are followed.
Otsuki, Wilson and Sewadeh (2001b)	15 EU countries and 9 African exporters	-Maximum aflotoxin B1 level imposed food product	FAO Survey of Mycotoxin Standards on Food and Feed Stuffs 1995	MRLs have a positive and significant effect on EU imports in cereals, dried fruits, nuts and vegetables. Estimations suggest that a 1% lower maximum allowable level of contamination reduces trade flows by 1.1% for cereals, and 0.435 for fruits nuts and vegetables. Groundnuts are found to be highly sensitive to the aflatoxin standards, a 1.3% reduction for a 1% change in the standard.
Persson (2013)	Imports to 25 EU countries from 152 developing countries	-Number days needed to export	World Bank Doing Business Database	The number of days needed for export has a negative and significant impact on the number of products exported in on most agricultural trade sectors (estimated coefficients of -.0411 for live animals and animal products, -.0164 for vegetable products, and -.0556 for animal and vegetables fats and waxes). Time for export is not significant in the case of exports in foodstuffs, beverages, spirits and tobacco.
Shepherd and Wilson (2008)	Southeast Asian countries in 2000-2005	-Quality of sea, air transport -Irregular payments for export/import permits -Competition in internet sector	World Economic Forum Global Competitiveness Report	Quality of air and sea infrastructure, irregular payments for import and export permits and internet sector competition are not statistically significant in the case of trade flows in food products between Southeast Asian countries.
Soloaga, Wilson and Mejía (2006)	Mexican imports and exports In 2000-2004	-Port efficiency -Customs environment -Perception of corruption -E-commerce use	Wilson, Mann and Otsuki (2003)	Port efficiency has a positive and significant impact on trade in food, beverages and tobacco. Port Efficiency in importing countries has a higher impact on food imports than exports. Perceived corruption, used as a proxy for regulatory environment, has a positive effect on food imports and exports, while customs environment appears to have a negative effect. E-commerce use is positively associated with food exports but negatively associated with imports.

Study	Country set	TF indicator(s) used	Data source for indicator(s)	Key findings
Weerahewa (2009)	SAARC member countries, top 5 export destinations and import sources and countries engaged in trade agreements with SAARC countries	-Logistics Performance Index -import/export cost	World Bank	LPI of exporters and importers have a significant and large effect on the value of exports. An increase in exporters and importers LPI by one point are associated with an increase in value of agricultural exports by 25.01%, by 63.32% for live animals, 38.63% for vegetables, and 40.49% for prepared foodstuffs. A one unit increase in LPI can increase exports of live animals, vegetables and prepared foods by 48%, 18% and 22% respectively. Cost of export/imports are also significant
Xiong and Beghin (2011)	13 EU countries, plus Switzerland, and 9 African countries	-Maximum residue levels on aflotoxin B1	FAO Survey of Mycotoxin Standards on Food and Feed Stuffs 1995	MRLs on aflatoxin turn out to have no significant restricting effects on African exports of all three groundnut exports included in the estimations, which contradicts the previous finding by Otsuki et al. (2001).The only significant estimate, for edible groundnut in the pooled regression, suggests that the MRL actually promotes trade.

Annex II.

List of perishable products

Product code	Product description
"0201"	Meat of bovine animals, fresh or chilled
"0202"	Meat of bovine animals, frozen
"0203"	Meat of swine, fresh, chilled or frozen
"0204"	Meat of sheep or goats, fresh, chilled or frozen
"0205"	Meat of horses, asses, mules or hinnies, fresh, chilled or frozen
"0206"	Edible offal of bovine animals, swine, sheep, goats, horses, asses, mules or hinnies, fresh, chilled or frozen
"0207"	Meat of edible offal, of the poultry of heading 01.05, fresh, chilled or frozen
"0208"	Other meat and edible meat offal, fresh, chilled or frozen
"0209"	Pig-fat, free of lean meat and poultry fat, not rendered or otherwise extracted, fresh, chilled frozen, salted in brine, dried or smoked
"0401"	Milk and cream, not concentrated nor containing added sugar or other sweeting matter
"0403"	Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit, nuts or cocoa.
"0404"	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included.
"0405"	Butter and other fats and oils derived from milk; dairy spreads.
"0406"	Cheese and curd.
"0407"	Birds' eggs, in shell, fresh, preserved or cooked.
"0408"	Birds' eggs, not in shell, and egg yolks, fresh, dried, cooked by steaming or by boiling in water, moulded, frozen or otherwise preserved, whether or not containing added sugar or other sweetening matter.
"0504"	Guts, bladders and stomachs of animals (other than fish), whole and pieces thereof, fresh, chilled, frozen, salted, in brine, dried or smoked.
"0510"	Ambergris, castoreum, civet and musk; cantharides; bile, whether or not dried; glands and other animal products used in the preparation of pharmaceutical products, fresh, chilled, frozen or otherwise provisionally preserved.
"0602"	Other live plants (including their roots), cuttings and slips; mushroom spawn.
"0603"	Cut flowers and flower buds of a kind suitable for bouquets or for ornamental purposes, fresh, dried, dyed, bleached, impregnated or otherwise prepared.
"070190"	Other potatoes, fresh or chilled
"0702"	Tomatoes, fresh or chilled.
"0703"	Onions, shallots, garlic, leeks and other alliaceous vegetables, fresh or chilled.
"0704"	Cabbages, cauliflowers, kohlrabi, kale and similar edible brassicas, fresh or chilled.

"0705"	Lettuce (Lactuca sativa) and chicory (Cichorium spp.), fresh or chilled.
"0706"	Carrots, turnips, salad beetroot, salsify, celeriac, radishes and similar edible roots, fresh or chilled.
"0707"	Cucumbers and gherkins, fresh or chilled.
"0708"	Other vegetables, fresh or chilled.

Product code	**Product description**
"0709"	Other vegetables, fresh or chilled.
"0710"	Vegetables (uncooked or cooked by steaming or boiling in water), frozen.
"0714"	Manioc, arrowroot, salep, Jerusalem artichokes, sweet potatoes and similar roots and tubers with high starch or inulin content, fresh, chilled, frozen or dried, whether or not sliced or in the form of pellets; sago pith.
“0801”	Coconuts, Brazil nuts and cashew nuts, fresh or dried, whether or not shelled or peeled.
“0802”	Other nuts, fresh or dried, whether or not shelled or peeled.
“0803”	Bananas, including plantains, fresh or dried.
"0804"	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried.
"0805"	Citrus fruit, fresh or dried.
"0806"	Grapes, fresh or dried.
"0807"	Melons (including watermelons) and papaws (papayas), fresh.
"0808"	Apples, pears and quinces, fresh.
"0809"	Apricots, cherries, peaches (including nectarines), plums and sloes, fresh.
"0810"	Other fruit, fresh.
"0811"	Fruit and nuts, uncooked or cooked by steaming or boiling in water, frozen, whether or not containing added sugar or other sweetening matter.
“0814”	Peel of citrus fruit or melons (including watermelons), fresh, frozen, dried or provisionally preserved in brine, in sulphur water or in other preservative solutions.
“1212”	Locust beans, seaweeds and other algae, sugar beet and sugar cane, fresh, chilled, frozen or dried, whether or not ground; fruit stones and kernels and other vegetable products (including unroasted chicory roots of the variety Cichorium intybus sativum)
"1601"	Sausages and similar products, of meat, meat offal or blood; food preparations based on these products.
"1602"	Other prepared or preserved meat, meat offal or blood.
"1902"	Pasta, whether or not cooked or stuffed (with meat or other substances) or otherwise prepared, such as spaghetti, macaroni, noodles, lasagne, gnocchi, ravioli, cannelloni; couscous, whether or not prepared.
“2004”	Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, frozen, other than products of heading 20.06.
"2009"	Fruit juices (including grape must) and vegetable juices, unfermented and not containing added spirit, whether or not containing added sugar or other sweetening matter.
"2104"	Soups and broths and preparations therefor; homogenised composite food preparations.
"2105"	Ice cream and other edible ice, whether or not containing cocoa.
"2106"	Food preparations not elsewhere specified or included.
"220190"	Other unsweetened waters; ice and snow.