

C. The theory and measurement of trade facilitation

This section first provides a conceptual framework for understanding the economic effects of trade facilitation – how improving trade procedures reduces trade costs, and how that in turn affects the pattern and volume of trade, the allocation of resources, and economic welfare. Given that trade facilitation can, in principle, be implemented unilaterally, this section examines the reasons why countries would want to include trade facilitation in a multilateral trade agreement. Finally, it examines the indicators – from narrower customs-related ones to broader regulatory and infrastructural areas – that have been developed to measure trade facilitation, and identifies what indicators can best be employed to estimate the economic benefits of implementing the WTO's Trade Facilitation Agreement.

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Some key facts and findings

- Existing models of international trade, including recent ones that take into account the ways in which trade costs are compounded and magnified along supply chains, can be used to better understand the trade and economic effects of the Trade Facilitation Agreement (TFA). For example, the “iceberg” model of trade cost draws an analogy between the way trade costs reduce the value of goods to both exporters and importers and the way an iceberg melts as it moves through the ocean.
- If a country improves its trade procedures so that trade costs are reduced, importers benefit from a lower price, while exporters receive a higher price for the traded good. Thus, trade facilitation benefits both exporting and importing countries.
- Incorporating trade facilitation in a multilateral agreement creates additional benefits compared to what can be achieved unilaterally. It provides greater legal certainty, helps reforming governments marshal support from domestic constituents, assists with the adoption of similar trade procedures and coordinates the provision of donor support for capacity-constrained developing countries.
- A wide range of trade facilitation indicators has been developed by international organizations and within academic literature. Among these, the Organisation for Economic Co-operation and Development’s (OECD) Trade Facilitation Indicators (TFIs) are well suited to analysing the trade and economic effects of implementing the TFA, as these indicators are mapped to the provisions of the Agreement.

1. Trade facilitation in models of international trade

Trade facilitation aims to reduce trade costs, which in their broadest definition include all costs, apart from the cost of production, incurred in getting a good from a producer to a final consumer (Anderson and van Wincoop, 2004). Among other constituents, they include the costs of transportation, tariffs, non-tariff measures and inefficient trade procedures. This section begins with a graphical analysis of the impact of trade facilitation using a partial equilibrium supply-and-demand model. However, because the effects of trade facilitation on a particular market may spill over to other markets, the analysis is extended to a general equilibrium setting using standard models of international trade, from the classical models to the most recent models of global value chains.

The early or classical trade models explain why trade emerges between dissimilar countries (inter-industry trade) based on differences in productivity (Ricardo, 1817) or endowment in factors of production (Heckscher, 1949; Ohlin, 1934). While these early trade models do not bring trade costs explicitly into the analysis, later trade models do. The new trade theory (Krugman, 1979; 1980) explains why trade between similar countries (intra-industry trade) takes place

because of demand for variety and increasing returns to scale in production. Finally, a branch of more recent models incorporates differences in the productivity of firms which result in only some of them being able to overcome the fixed trade cost of entering export markets (Melitz, 2003). A second branch focuses on fragmented production and value chains and tells us that trade costs are particularly pernicious because they are cumulated and magnified along the supply chain (Yi, 2010).

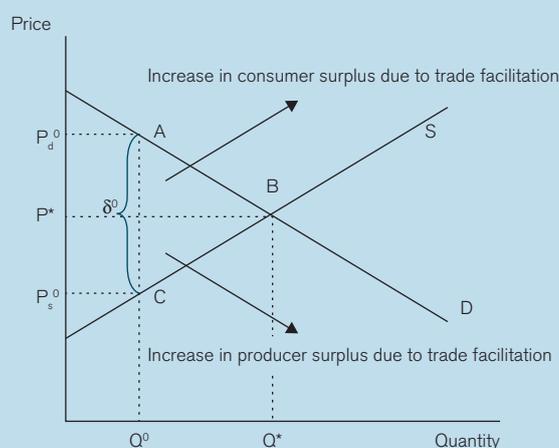
(a) A simple “iceberg” partial equilibrium model

The “iceberg” model by Samuelson (Samuelson, 1954) is a useful device for analysing the effect of trade costs, although it was originally designed to model transportation costs (see Box C.1). Inefficient trade procedures increase the cost of trade and drive a wedge between the price received by the producer of the good and the price paid by the consumer. This represents a pure loss (“deadweight loss”) akin to the part of the iceberg’s mass that is melted away as it moves through the ocean. In the iceberg model, trade costs are proportional to the value of goods shipped, but the main results will continue to hold even in cases where trade costs are additive instead.¹

Box C.1: The “iceberg” model

Figure C.1 gives a graphical illustration of the iceberg model for an imported good. For simplicity, it is assumed that the good is not produced domestically. Domestic demand is given by the line D while foreign supply is given by the line S. In the initial market equilibrium, trade costs are high, denoted by δ^0 . Domestic consumers pay a price of P_d^0 and foreign producers receive P_s^0 , which is lower by the trade cost δ^0 while the total quantity imported is equal to Q^0 .

Figure C.1: Iceberg partial equilibrium model



Box C.1: The “iceberg” model (continued)

Assume that the country improves its trade procedures so that trade cost is reduced to zero. The quantity of goods imported in equilibrium rises to Q^* , domestic prices fall to P^* and foreign prices rise to P^* as well. The price wedge caused by trade costs disappears. Both domestic consumer and foreign producer welfare increase by the amounts indicated by the trapezoidal areas $P_d^0ABP^*$ and $P_s^0CBP^*$ respectively. Observe that trade facilitation improves the terms of trade of both countries because it simultaneously reduces the price paid by domestic consumers for imports and increases the price received by foreign exporters. This terms-of-trade improvement in both countries (a “win-win” outcome) as a result of trade facilitation is taken up again in subsection C.3, which deals with the economic rationale for a multilateral agreement on trade facilitation. The gains from trade facilitation will be smaller than those shown in Figure C.1 if inefficient trade procedures create rents captured by some economic agents rather than pure deadweight losses (Dee, 2006). The analysis has also not taken the cost of implementing trade facilitation reform into account, which would reduce the gains shown in Figure C.1.

(b) Classical general equilibrium models of trade

The analysis has focused on a single market so far, and is therefore only partial in nature. It will be useful to know whether these results are modified or additional insights are obtained when the analysis is extended to a general equilibrium setting.

In classical models, gains from trade result because countries are assumed to possess either different relative productivities (Ricardo, 1817) or endowments of factors of production such as labour, capital and

land (Heckscher, 1949; Ohlin, 1934). In these models, countries specialize in goods in which they have a comparative technological advantage relative to other countries or in goods that use their abundant factors of production more intensively. They then import the other goods from their trade partners. These models provide a rationale for inter-industry trade (e.g. a country exporting automobiles and importing wheat) but not intra-industry trade (e.g. a country exporting sports cars and importing sports utility vehicles). Box C.2 provides a more detailed discussion on the effects of trade cost in classical models of trade.

Box C.2: The effects of trade costs in classical trade models

Classical trade theories explain trade in homogeneous goods under constant returns to scale and perfect competition. Factors of production are assumed mobile across sectors within one country, but immobile across countries. The basic versions of these models assume that two different final goods are produced.

The Ricardian model

The assumption motivating trade in the Ricardian model is that countries have different relative labour productivities. This implies that under autarky, i.e. when countries do not trade at all with one another, the relative price of one good expressed in terms of the other good differs between the countries.

In a hypothetical world without trade costs, this difference in relative prices opens up opportunities for welfare-enhancing international trade at a world price lying between the two autarky prices, which is determined by countries' consumption preferences and relative sizes (Markusen *et al.*, 1995). At least one country specializes completely in the production of the good in which it has a comparative advantage.

Inefficient trade procedures result in trade costs that drive a wedge between the relative prices faced by the two countries. They now face international prices closer to their respective autarky price. They may continue to remain specialized but there will be less consumption and trade and hence lower economic welfare. If trade costs become high enough, the international price faced by one country can become less favourable than its autarky price and trade ceases altogether, returning both countries to their autarky equilibria. Relative country sizes play a role in how likely this may happen. If one country is much larger, then the frictionless international price is already close to its autarky price and trade ceases for smaller transaction costs.

Box C.2: The effects of trade costs in classical trade models (continued)*The Heckscher-Ohlin model*

In contrast to Ricardo, the Heckscher-Ohlin model assumes the same productivity in both countries. There are two factors of production, capital and labour, and endowments of these factors of production vary across countries, making one country labour-abundant and the other country capital-abundant. There are two sectors producing two different goods; one sector, for instance automobiles, uses capital more intensively and the other sector, for example textiles, uses labour more intensively.

In autarky, relative prices in the two countries will differ because of differences in their factor endowments. The price of textiles relative to automobiles is lower in the labour-abundant country and higher in the capital-abundant country. If trade is opened up and in the absence of trade costs, both countries produce more of and export the commodity that uses their abundant factor intensively: i.e. the labour-abundant country exports textiles and the capital-abundant country exports automobiles. But, unlike in the Ricardian model, complete specialization is unlikely. They will trade at a world price lying between the two autarky prices, which means the world price of textiles relative to automobiles is higher than the autarky price in the labour-abundant country and lower than the autarky price in the capital-abundant country. Another important outcome of free trade is a convergence of factor prices in the two countries (factor price equalization).

Trade costs drive a wedge between the relative prices faced by the two countries, creating a situation where they both face international prices closer to their autarky price. Countries will be less specialized, and both trade and consumption will be lower compared to a frictionless world. Again, economic welfare suffers as a consequence. Furthermore, this wedge in the relative prices faced by the two countries also means a divergence in factor prices.

Irrespective of their differences, trade costs work through the same mechanism in these classical trade models. Inefficient trade procedures drive a wedge between the relative prices faced by the two trading countries. These relative prices move closer to the initial autarky price, reducing the scope for specialization and trade. As a result, consumption possibilities are lower, and so is economic welfare.

One interesting result from the Heckscher-Ohlin model concerns how trade facilitation improves the real income of the abundant factor of production. By reducing trade costs, it leads to greater specialization in the sector that uses the abundant factor more intensively. This increases the demand for the abundant factor and increases the real return to the factor. If one of the countries involved is a labour-abundant developing country, trade facilitation can make workers better off.

(c) The “New Trade Theory” – monopolistic competition

In contrast to the classical theories, the “New Trade Theory” (Krugman, 1979; 1980) explains why countries engage in intra-industry trade. This is a valuable result because the great bulk of global trade is intra-industry rather than inter-industry in nature. The ability of the theory to explain this feature of global trade is made

possible by a number of assumptions: consumers prefer variety in consumption, the market is populated by firms selling different varieties of a good and there are increasing (internal) returns to scale in production, meaning that a firm's average cost of production falls as its volume of production increases.

The theory predicts that trade costs can have a disproportionately adverse impact on small developing economies. Typically, small developing economies have large agricultural or natural resource sectors typified by constant returns to scale, and only a small manufacturing sector. In contrast, big developed economies have a large manufacturing sector operating under increasing returns to scale. In this setting, trade costs lead both to less trade and to a disproportionate relocation of manufacturing to the big developed countries (the “home market effect”). Meanwhile, small developing countries become concentrated in the agricultural or natural resource sector.

The key to explaining this result lies in the tension created between the consumer's love of variety and increasing returns to scale. With open trade and zero trade costs, consumers in the big developed country will purchase both foreign and domestic manufactured goods because of their preference for variety. All things being equal, love of variety leads to more trade. On the other hand, increasing returns to

scale gives a cost advantage to manufacturing firms in the developed country because of the size of the market and the larger scale of production that could be achieved by firms there. All things being the same, consumers in the developed country will prefer to purchase lower-cost domestic varieties than higher-cost foreign varieties.

Inefficient trade procedures that lead to higher trade costs upset this balance by making purchases (imports) of foreign varieties more costly. As a consequence, consumers in the developed country substitute away from foreign varieties towards domestic varieties. This shift in demand towards domestic manufactured goods gives greater scope for what are already powerful scale forces to operate. The manufacturing sector in the big developed country expands even more while it shrinks in the small developing country. This analysis suggests that small developing countries that want to diversify their economies have a strong interest in lowering trade costs, as this reduces incentives for manufacturing to concentrate in the biggest markets.

(d) The “New New Trade Theory” – heterogeneous firms

In the classical theories of trade, it is countries that are the objects of interest and analysis. In the last decade, new models of trade have emerged that have shifted this focus to firms – the so-called “heterogeneous firms” literature (Melitz, 2003). These models are motivated by empirical studies that reveal the striking diversity of firms in terms of size, productivity and participation in international trade (Bernard *et al.*, 2007a; 2007b).

The studies find that only a small number of firms export, and that the vast majority are only able to sell in the domestic market. The reason for this disparity is that firms differ in productivity: those with low productivity do not survive competition, more productive firms can compete but only in the domestic market, while only the most productive firms are able to enter and compete in the export market. There are two productivity thresholds: the minimum level needed for a firm to survive, and the level at which a firm starts exporting part of its production.

The main result of the heterogeneous firms literature is that any reduction in trade costs brings the two thresholds closer to each other, increasing the range of firms that are driven out by competition and the range of firms that enter the export market. This is beneficial to the economy, as resources (capital and labour) are released from the least productive firms and reallocated to the most productive firms.

While it might be obvious that a reduction in trade costs will increase a country’s exports, this literature shows the need to distinguish between the two ways in which trade costs can be reduced and the different ways exports can increase as a consequence (Chaney, 2006). Trade costs can be categorized as either variable or fixed. Variable trade costs are costs that have to be paid on every unit of export. Tariffs are a prominent example of variable trade costs, as an importer needs to pay duty on every unit he imports. Fixed trade costs are costs that have to be incurred independently of the volume of exports. A firm deciding on whether to enter a particular market might have to incur a cost to learn about the trade procedures in that country. These are costs incurred even before it ships a single product to the foreign market.

An increase in exports can take place along two dimensions or margins: the intensive and extensive margins. The intensive margin refers to existing exporters increasing the volume of their exports, while the extensive margin refers to an increase in exports achieved by new firms entering the export market.

A reduction in variable trade costs affects both the extensive and intensive margins of trade. It enables existing exporters to capture a larger share of the export market and firms with a lower level of productivity than incumbent exporters to enter the export market. A reduction in fixed trade costs only affects the extensive margin of trade. Trade facilitation will reduce both fixed and variable trade costs, making it possible for incumbent exporters to capture a larger share of the international market, and for firms that have never exported before to begin to do so.

If trade facilitation reduces both fixed and variable trade costs, this analysis implies that one should see trade expansion along both margins. Those enterprises that are currently engaged in international trade as exporters will most likely expand the volume of their exports. In addition, firms that were shut out of foreign markets will now find it possible to enter these markets and begin exporting. These new firms may be smaller and less productive than current incumbents but the reduction in trade cost now gives them an opportunity to participate in international trade.

(e) Supply chain models

Supply chain models of trade emerge at around the same time as the heterogeneous firms literature.² While traditional trade theory assumes that each final good is produced entirely within one country, supply chain models recognize that the parts and components that make up complex final goods such as electronic

products or motor vehicles are made in many different countries.

As a result of this way of organizing global production, trade costs become amplified (Yi, 2010). This occurs through “cumulation” and “magnification” effects. Trade costs are cumulated through the different stages of the value chain, as goods cross national borders multiple times while they are in process. They are magnified because the trade costs at any stage must be paid out of the share of value added in the cost of production.

The existence of the cumulation and magnification effects mean that trade costs have a far greater deterrent effect on global value chain-related trade than on trade involving only final goods. The higher the trade costs, the less scope there is for supply chain trade. In the extreme case where trade costs are very high, it is not worthwhile to divide up production between different countries, and only final goods are traded. This means that trade facilitation is crucial to the viability of global value chains, allowing for more specialization in those production stages in which countries have a comparative advantage. Any reduction in trade costs, such as what would be made possible by the TFA, also becomes amplified in the opposite direction. The cumulation and magnification effects explained above take effect, but in a positive way, thereby lowering barriers and allowing more developing countries to become involved in global value chains (GVCs).

More complicated production arrangements in GVCs have been analysed by Baldwin and Venables (2013). They distinguish between “snakes”, i.e. sequential production processes with each operation adding value in a predetermined order, and “spiders”, which combine different intermediate inputs in an assembly stage. Any GVC can be viewed as a combination of spiders and snakes.

Given these differences in structure, the impact of trade facilitation on GVCs and trade will be more complicated and vary depending on the structure of these chains. Firms face a trade-off between setting up manufacturing sites in different countries to reduce production costs and keeping production in one country to limit trade costs. In the case of snake-type GVCs, a fall in trade costs would lead to greater fragmentation and offshoring of production and expansion of trade, although the results are less straightforward in the case of spider-type GVCs.

2. The economic rationale for an international trade facilitation agreement

Given the widespread benefits of trade facilitation, every country should have an incentive to undertake reforms on its own. The questions, therefore, are: why is trade facilitation still on the agenda of many countries; and why have these countries decided to proceed with the reforms by signing the TFA?

Evidence reviewed in this report suggests that trade facilitation can stimulate trade, promote diversification and increase aggregate welfare. It also shows that trade facilitation benefits both the economy that takes facilitating measures and its trading partners. The discussion so far suggests that governments would not need to cooperate to derive the benefits from trade facilitation and that they could benefit from proceeding unilaterally with the reforms. Yet, the signature of the TFA suggests that there are reasons why incorporating trade facilitation in an international agreement creates additional benefits.

Economists have identified several rationales for trade agreements. The first one is that trade agreements may serve as a means to escape from a terms-of-trade-driven prisoners' dilemma.³ Countries with sufficient market power have an incentive to impose tariffs which raise their terms of trade, i.e. the (untaxed) price of their exports relative to the (untaxed) price of their imports, but lower the terms of trade of their trading partners. In the absence of cooperation, this may give rise to a trade war, that is, a prisoners' dilemma situation where countries set their tariffs too high, and the volume of trade is inefficiently low. A trade agreement, according to the terms of trade theory, allows countries to derive benefits from reciprocally reducing their tariffs, thereby escaping the prisoners' dilemma.

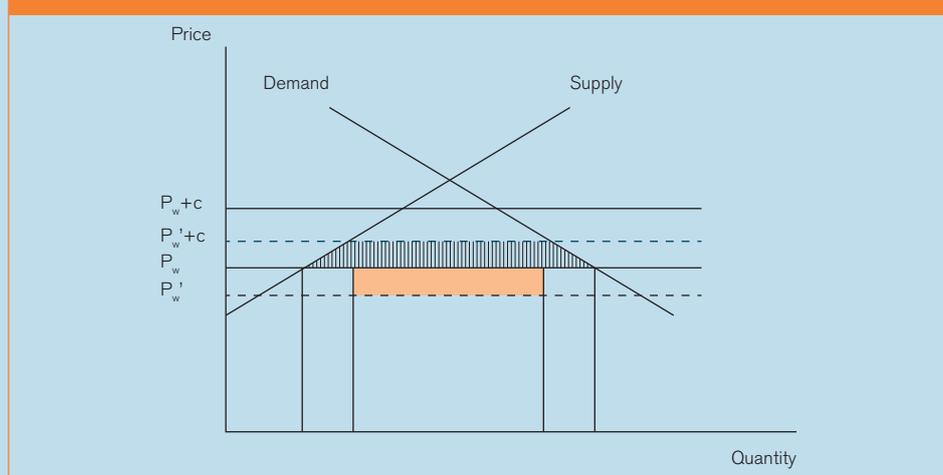
This rationale may also play a role in explaining an agreement on trade facilitation. First, if customs procedures and practices can be manipulated to generate rents and governments can be captured by private interests, countries may end up in a terms-of-trade-driven prisoners' dilemma similar to the one just described. However, more interestingly, even if inefficiencies at the border generate costs rather than rents, a slightly modified version of the terms of trade explanation may shed light on the rationale behind a trade facilitation agreement if the implementation of trade facilitation measures is costly (see Box C.3).

Box C.3: The effect of inefficient customs procedures on an economy

Consider first the effect of inefficient customs procedures. As shown in Figure C.2, such procedures raise a large country's trade costs and the price of its imports, lowering its terms of trade while at the same time they cause the partner's terms of trade to deteriorate.⁴ Inefficient procedures raise the domestic price in the importing country to $P_w + c$ and reduce the demand for imports which, if the country is large enough, may push down the world price – i.e. the price received by exporters – from P_w to P_w' . While in the case of a tariff, this reduction of the world price generates a terms of trade gain equal to the area of the orange rectangle, it generates a loss equal to the same area in the case of inefficient customs procedures. Overall, for the importing country, the welfare effect of the inefficiency is a large deadweight loss equal to the sum of the areas of the striped trapezoid and the orange rectangle.

Consider now the effect of trade facilitation. Trade facilitation, by eliminating cost-raising inefficiencies, generates a welfare gain for both the importing country and its supplier. At the same time, however, implementing trade facilitation measures is costly. The importing country has an incentive to invest in trade facilitation inasmuch as the gains exceed the implementation cost. However, as explained, eliminating inefficiencies also benefits the exporting country, as this imparts a positive externality on foreign exporters. This externality provides a rationale for international cooperation on trade facilitation. Without a trade facilitation agreement, (i.e., under unilateral decisions about making efficiency-enhancing investments in customs procedures) this positive externality will result in too little investment in improving customs procedures by large importing countries. A prisoners' dilemma type situation may arise where two large importing countries do not invest enough in trade facilitation, thereby imposing costs on each other. A trade facilitation agreement can help countries to internalize these positive (terms of trade) externalities and thereby lead to greater investments in efficient customs procedures.

Figure C.2: Impact of inefficient custom procedures on welfare



The second rationale identified by economists is that trade agreements can help governments address a credibility problem. The idea is that governments value trade agreements as a way to tie their hands against, and thus resist pressure from, lobbies.⁵ According to Hoekman (2014), this theory does not help much in understanding the rationale behind a trade facilitation agreement because trading partners would not be in a position to enforce an agreement by threatening to withdraw concessions. It would, indeed, be difficult for a government to selectively “unwind” trade facilitation measures to enforce a trade facilitation agreement. If, however, the agreement foresees the possibility of using other enforcement instruments, as is the case

for the WTO TFA, it may allow governments to tie their hands against anti-facilitation lobbies. In other words, commitment may be one of the rationales behind the TFA.

Another possible rationale is proposed by Hoekman (2014), who argues that the TFA reflects international coordination or collective action considerations. As already mentioned, implementing trade facilitation measures unilaterally yields significant economic gains as customs procedures become more transparent, predictable and efficient. However, if countries use different approaches and adopt different standards and procedures, there will be redundancy in documentary

requirement and control procedures at the borders. If procedures differ between countries, exporters and importers need to learn about multiple standards, which can create significant learning costs. The adoption of common procedures can reduce the time and costs required to become familiar with customs procedures in different countries as well as improve the efficiency and timeliness of the movement of goods through customs worldwide. Coordination among WTO members in the context of the TFA and the adoption of common approaches towards customs and related matters could further increase the gains from trade facilitation by harmonizing customs procedures worldwide. This international coordination problem has been conceptualized in a game theory framework by Snidal (1985) (see Box C.4).

A similar line of reasoning can be applied to the coordination problem related to asymmetries in implementation costs and capacity. Indeed, the TFA foresees that richer members will provide assistance and support for capacity-building to developing and least-developed countries to help them implement the agreement.⁶ Without the agreement, many countries might not have engaged in trade facilitation because they might have preferred to allocate scarce resources to other priorities, which would have resulted in a suboptimal situation for all members. Coordination benefits may thus explain international cooperation on trade facilitation. However, this explanation may not be sufficient in itself to explain the TFA. This is because if a trade facilitation agreement only serves a coordination purpose, it would not need to be enforced through dispute settlement procedures.

Box C.4: Coordination problems explained

Coordination problems are situations in which every individual gains from coordinating their actions with other individuals. We face coordination problems in our everyday life. For example, imagine that Mike and his wife Lucy both want to spend the night out. Mike would like to go to the cinema while Lucy wants to attend a play, but both would rather spend the night together than alone. Their levels of satisfaction, depending on their actions, are shown in Table C.1. In each cell of the table, the first number refers to Lucy's level of satisfaction and the second to Mike's. If they do not coordinate, they will end up with lower levels of satisfaction. For example, if Mike goes to the cinema and Lucy attends the play they will both get 1. This is lower than they would obtain if they went together to either the cinema or the play. If they both go to the cinema Lucy's satisfaction would be 3 and Mike's 4 as he prefers the cinema and vice versa if they both went to the play which is Lucy's preference. Therefore, coordination and negotiation can lead to an outcome in which both Mike and Lucy are better off than if they had not coordinated.

Table C.1: Coordination problem between Mike and Lucy

Evening Out		Mike	
		Cinema	Play
Lucy	Cinema	3 ; 4	0 ; 0
	Play	1 ; 1	4 ; 3

Snidal (1985) has conceptualized this coordination game in the context of international regimes. He underlines the difference between a collective action problem and a coordination problem. The terms-of-trade-driven prisoners' dilemma discussed previously in this subsection is a good example of the former. In this case, once a tariff agreement has been implemented, enforcement mechanisms will have to be put in place to prevent countries from raising their tariffs again, as doing so would serve their short-term interests. In contrast, in the case of a coordination problem both countries want to adopt the same behaviour and will have no incentive to deviate once they have selected a given behaviour. In other words, it requires no more than communication and common sense to achieve an outcome that is optimal both individually and collectively.

This coordination problem arises in the context of trade facilitation. Indeed, if Country 1 plans to implement trade facilitation measure X and Country 2 trade facilitation measure Y, they will both experience gains. However, if they manage to coordinate and both implement either X or Y, they will further the harmonization of customs procedures worldwide and increase their gains from trade facilitation. Consequently, the TFA, by providing a forum for negotiation and discussion on the best available approaches and standards, can help countries coordinate and maximize the benefits stemming from trade facilitation. Table C.2 displays such a scenario.

Box C.4: Coordination problems explained (continued)

Table C.2: Coordination problem between Country 1 and Country 2

Trade Facilitation Measures		Country 1	
		X	Y
Country 2	X	4 ; 4	1 ; 1
	Y	1 ; 1	4 ; 4

The only challenge comes from the fact that country 1 might prefer to standardize customs procedures with method X whereas country 2 might go for method Y. However, this can readily be solved through negotiations as both countries benefit from adopting common standards regardless of the method ultimately chosen.

3. Measuring trade facilitation

As discussed in Section A, there are varying definitions of trade facilitation which differ in whether they include soft or hard infrastructure and whether they are confined to border measures or also include behind the border measures. As a result, numerous indicators of trade facilitation exist which reflect this variation in the scope of what is involved in the definition of trade facilitation (see Box C.5 on what makes for a good indicator).

Subsection B.3 described how the activities of a number of international organizations in the trade facilitation area complement the role of the WTO. Subsection C.4(a) will go on to describe the main indicators that have been developed by international organizations to measure trade facilitation, and subsection C.4(b) will identify which indicator best reflects the provisions of the TFA and which has been used as the basis for the estimation and simulations undertaken in the rest of this report.

Box C.5: What is an indicator and what makes for a good indicator?

According to Walz (2000) and to Heink and Kowarik (2010), “[a]n indicator is a variable that describes the state of a system”. An indicator allows benchmarks to be established, comparisons to be made across countries, and monitoring of the state of a system by different agents. It can function as an early warning system and alert actors on the need to make improvements to the state of the system (Mainguet and Baye, 2006). A good indicator should be:

- Relevant from a policy point of view;
- Robust, that is, not sensitive to accidental fluctuations and suitable to be used in the long term;
- Connected with priorities and most significant issues;
- Coherent with other indicators on the same topic;
- Feasible, which requires the availability of its data sources;
- Accessible;
- Valid, which means that the indicator should be connected with the research question – this validity is measured by the strength of the association between the indicator and the concept to analyse (Pierce, 2008);
- Reliable, in that the measurement errors are reduced (Kimberlin and Winterstein, 2008);
- Accurately measured, in such a way that the indicator is close to the true value.

Indicators should be periodically updated, in order to incorporate new challenges, adapt to new issues and improvements in the measurement techniques and data availability (Brown, 2009).

(a) Measures of trade facilitation

According to Orliac (2012), there are more than twelve indicators of trade facilitation testifying to the importance of trade facilitation, as well as to its complexity. It will not be possible in this report to review all of these indicators. Instead, the focus will be on those that have been used frequently in the economic literature to determine the economic impact of trade facilitation reform. They include the World Bank Group's "Doing Business" (DB) indicators, particularly those related to trading across borders; the World Bank's Logistics Performance Index (LPI); the Organisation for Economic Co-operation and Development's (OECD) Trade Facilitation Indicators (TFIs); and the World Economic Forum's Enabling Trade Index (ETI).

It may be useful to distinguish between indicators that measure policy inputs and those that track the outcomes of policy. Policy-makers should obviously be interested in both since they are complementary, and should also be interested in understanding the outcomes of trade facilitation, as well as in identifying policies that can achieve the desired outcomes. While this is not a perfect categorization, the DB indicators measure outcomes, the OECD TFIs focus on policy inputs and the LPI and ETI are a mixture of both.

(i) *The World Bank Group's "Doing Business" (DB) indicators*

The "Doing Business" indicators measure the effect of business regulation and the protection of property rights on businesses, especially small and medium-sized domestic firms (World Bank, 2014). They are based on surveys of "local experts", including lawyers, business consultants, accountants, freight forwarders, government officials and other professionals routinely administering or advising on legal and regulatory requirements. The surveys have been conducted annually since 2004 and now cover 189 economies. For most of these, the collected data refer to businesses in the largest business city. The latest DB report contains 11 indicators which measure the complexity of the regulatory process and in particular, through the indicator "trading across borders", the costs related to standardized import and export activities. Table C.3 lists the indicators included in the DB, which are then summarized by two indices:

- (i) "Ease of Doing Business", which ranks countries according to their relative performance (World Bank, 2014);
- (ii) The "Distance to Frontier" score, which refers to how distant, on average, an economy is at a given time from the best practice, i.e. the best performing economy.

Table C.3: List of indicators and indexes

	Indicators	Index
Doing Business (DB)	1) Starting a business; 2) Dealing with construction permits; 3) Getting electricity; 4) Registering property; 5) Paying taxes; 6) Trading across borders; 7) Getting credit; 8) Protecting minority investors; 9) Enforcing contracts; 10) Resolving insolvency; 11) Labour market regulation.	Two main indexes: 1) Distance to the Frontier. 2) Ease of Doing Business.
Logistics Performance Index (LPI)	1) Customs; 2) Infrastructure; 3) Ease of arranging shipments; 4) Quality of logistics services; 5) Tracking and tracing; 6) Timeliness.	The LPI is constructed from the six indicators using a Principal Component Analysis (PCA). The scores obtained are a weighted average of the six measures, with the weights being the components loading.

Table C.3: List of indicators and indexes (continued)

	Indicators	Index
Trade Facilitation Indicators (TFIs)	<ol style="list-style-type: none"> 1) Information availability (a); 2) Involvement of the trade community (b); 3) Advance rulings (c); 4) Appeal procedures (d); 5) Fees and charges (e); 6) Formalities – Documents (f); 7) Formalities – Automation (g); 8) Formalities – Procedures (h); 9) Cooperation – Internal (i); 10) Cooperation – External (j); 11) Consularization (k); 12) Governance and impartiality (l); 13) Transit fees and charges (m); 14) Transit formalities (n); 15) Transit guarantees (o); 16) Transit agreements and cooperation (p). 	There are 16 indicators based on 97 variables. The variables have been normalized using a “multiple binary” scoring system (see Moisé <i>et al.</i> (2011) and Moisé and Sorescu (2013)).
Enabling Trading Index (ETI)	<p>Fifty-six indicators classified into seven pillars:</p> <ol style="list-style-type: none"> 1) Domestic market access; 2) Foreign market access; 3) Efficiency and transparency of border administration; 4) Availability and quality of transport infrastructure; 5) Availability and quality of transport services; 6) Availability and use of ICTs; 7) Operating environment. <p>The seven pillars are then grouped into four areas or subindexes:</p> <ol style="list-style-type: none"> 1) Market areas; 2) Border administration; 3) Infrastructure; 4) Operating environment. 	ETI is computed as the unweighted average of the various indicators.

(ii) *The World Bank Logistics Performance Index (LPI)*

The LPI focuses on the logistics friendliness of a country and ranks countries according to six dimensions: customs; infrastructure; ease of arranging shipments; quality of logistics services; tracking and tracing; and timeliness. The LPI indicators can be grouped according to whether they refer to inputs to the supply chain (customs, infrastructure and services quality) or to the outcomes (timeliness, international shipments and tracking and tracing).⁷

Data are collected through an online survey of operators in charge of moving and trading goods (Gogoneata, 2008). The survey has been conducted every two years

since 2007. In 2014, the data covered 160 countries. The survey is divided in two parts, an international one and a domestic one. In the international part, respondents assess the logistics friendliness of a country in eight selected overseas markets. In the domestic part, respondents provide qualitative and quantitative data on the logistics environment of the country in which they operate (Arvis *et al.*, 2014).

The six indicators are summarized into the LPI index by using a Principal Component Analysis (PCA), which is a statistical technique used to reduce the dimensionality of a dataset. The LPI is, then, a weighted average of the scores assigned to each indicator with the weights determined by the PCA. The index goes from 1 (worst score) to 5 (best score).

(iii) The OECD Trade Facilitation Indicators

The OECD TFIs correspond to the main policy areas under negotiation at the WTO, enabling the indicators (there are about 97 variables grouped into 16 indicators) to be mapped to relevant provisions of the TFA (see Table C.4). The OECD database, launched in 2012 and updated in 2015, contains information on 152 countries. The information used for the TFIs is collected from questionnaires to governments and the private sector.

The variables seek not only to reflect the regulatory framework in the concerned countries, but to delve, to the extent possible, into the state of implementation of various trade facilitation measures. Each of the variables follows a “multiple binary” scoring system, in which a score of 2 corresponds to the best performance, 0 corresponds to the worst performance and a score of 1 to performance that lies in-between.⁸

(iv) The World Economic Forum Enabling Trade Index (ETI)

The ETI assess the extent to which economies have in place institutions, policies, infrastructure and services facilitating the flow of goods over borders

and their destinations (WEF, 2014). It contains data on 79 indicators from 2010 to 2014 annually for 138 countries.⁹ Data on 56 of the indicators are collected through information provided by different international organizations, while data for the remaining indicators are collected from the WEF Executive Opinion Survey, which survey CEOs and top business leaders. The seventy-nine variables are scored from 1 to 7, with 7 indicating the best possible outcome. These are grouped into seven pillars which are then further consolidated into four areas: market access; border administration; infrastructure; and operating environment (see Table C.3). The ETI score is computed as the arithmetic mean of the 79 indicators and therefore also ranges from 1 to 7.

(b) Choice of the trade facilitation indicator

As the subject of this report is the TFA, and the OECD TFIs were designed on the basis of that agreement, the TFIs will be used as a measure of trade facilitation and country performance. In particular, the OECD indicators will be employed in Section D to estimate and simulate the economic impact of implementing the WTO TFA.¹⁰

Based on the criteria discussed in Box C.5, the TFIs satisfy many of the requirements for a good indicator.

Table C.4: TFIs and TFA articles

Trade Facilitation Indicator	Trade Facilitation Agreement article
(a) Information availability	Article 1: Publication and availability of information
(b) Involvement of the trade community	Article 2: Opportunity to comment, information before the entry into force, and consultations
(c) Advance rulings	Article 3: Advance rulings
(d) Appeal procedures	Article 4: Procedures for appeal and review
(e) Fees and charges	Article 6: Disciplines on fees and charges imposed on or in connection with importation and exportations and penalties
(f) Formalities – documents	Article 10: Formalities connected with importation, exportation and transit
(g) Formalities – automation	Article 7: Release and clearance of goods Article 10: Formalities connected with importation, exportation and transit
(h) Formalities – procedures	Article 7: Release and clearance of goods Article 10: Formalities connected with importation, exportation and transit
(i) Cooperation- Internal	Article 8: Border agency cooperation
(j) Cooperation – external	Article 8: Border agency cooperation
(l) Governance and impartiality	Article 5: Other measures to enhance impartiality, non-discrimination and transparency
(m) Transit fees and charges	Article 11: Freedom of transit
(n) Transit formalities	Article 11: Freedom of transit
(o) Transit guarantees	Article 11: Freedom of transit
(p) Transit agreements and cooperation	Article 11: Freedom of transit

Note: The OECD TFI indicators include an item “(k) Consularization” which has no corresponding provision in the TFA.

II. SPEEDING UP TRADE: BENEFITS AND CHALLENGES OF IMPLEMENTING THE WTO TRADE FACILITATION AGREEMENT

The indicators are relevant from a policy point of view precisely because they are based on the TFA, which members have committed to implement. This also makes it a useful indicator to monitor the implementation of the TFA. The statistical robustness of the TFIs has been improved through the study of the underlying links of the dataset and tested with traditional indicators (Moisé *et al.*, 2011). The TFIs are also robust with regard to temporary fluctuations in economic activity as the indicators would only change as result of the implementation efforts of each country. Furthermore, the TFIs are consistent and correlated with the other widely used indicators of trade facilitation (despite some indicators being measures of outcomes rather than policy inputs). Table C.5 shows the correlation between the TFIs, the DB trading across borders components, LPI and ETI for the latest available year. The TFI average score is positively correlated with the LPI and the ETI measures. As expected, the TFI average is negatively correlated with the DB cost of export/import and number of days to export/import indicators. The correlation coefficients are all significant at the 5 per cent level.

Table C.5: Correlation between Doing Business Indicators, the Logistics Performance Index, the Enabling Trade Index and the Trade Facilitation Indicators

Indicator	TFI Average
DB: Trading across borders – costs to export	-0.25*
DB: Trading across borders – costs to import	-0.29*
DB: Trading across borders – number of days to export	-0.42*
DB: Trading across borders – number of days to import	-0.47*
DB: Trading across borders – number of documents required to export	-0.47*
DB: Trading across borders – number of documents required to import	-0.45*
LPI Score	0.43*
LPI Customs	0.41*
LPI Timeliness	0.42*
Enabling Trading Index	0.59*
ETI Efficiency and transparency of border administration	0.51*
ETI Customs transparency index	0.43*
ETI Efficiency of the clearance process	0.36*
ETI Irregular payments in import/export	0.47*
ETI Time predictability of import procedures	0.41*

*Significant at the 5 per cent level.

One can also compare how the different indexes score the trade facilitation performance of countries to see if major discrepancies emerge. Figure C.3 compares three trade facilitation indexes: the TFIs average, LPI and ETI scores.¹¹ It classifies countries according to the WTO region classification, the level of development and whether they are landlocked developing countries or not. It should be noted that, when accounting for the level of development and distinguishing between landlocked/non-landlocked countries, the three indexes score countries in the same general way. Groups performing best on the TFI average also perform best on the ETI and on the LPI. Among the WTO regions, North America and Europe are the best performers in all the indexes.

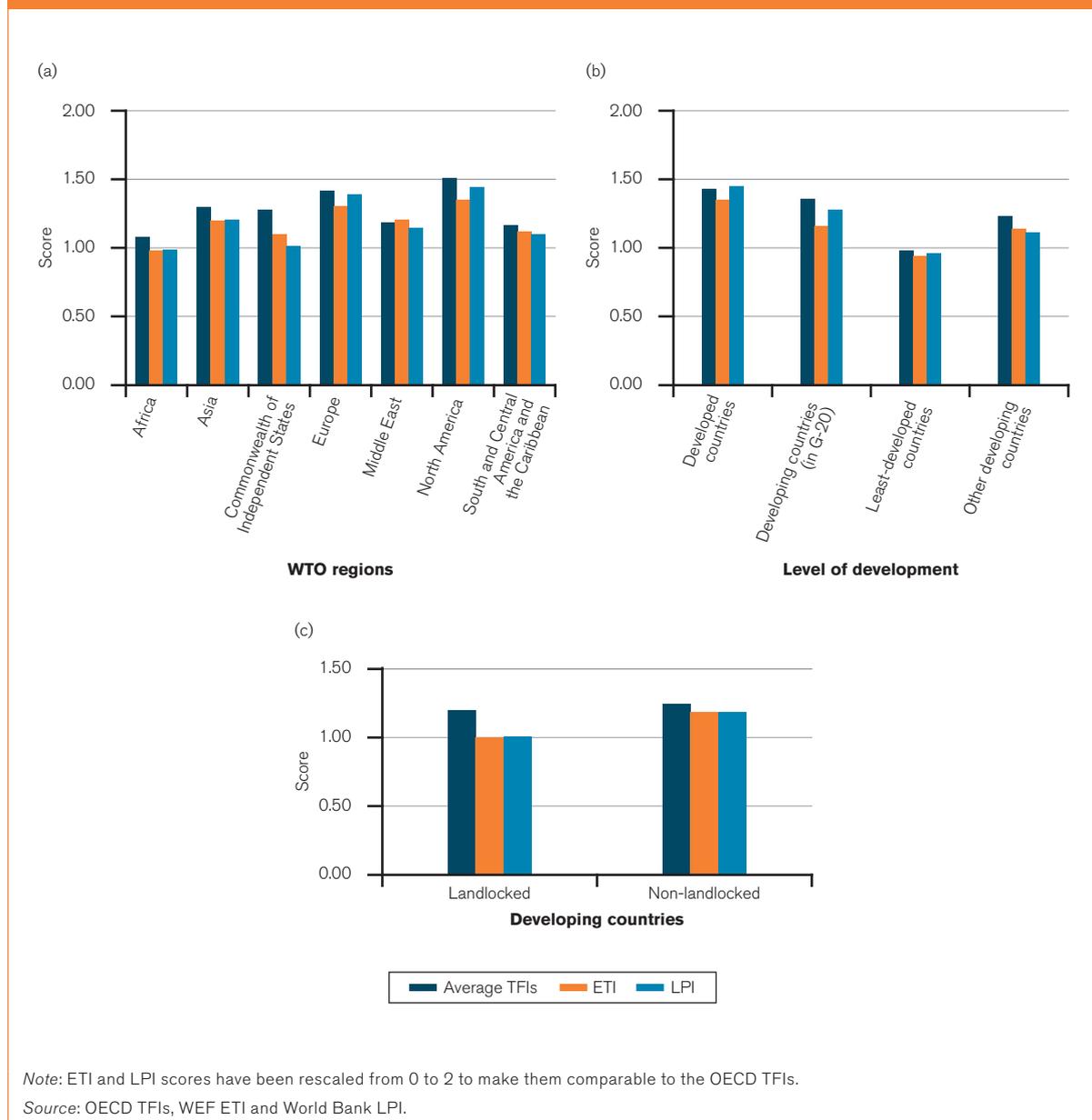
When considering the level of development, developed countries register the highest scores. Among developing countries, those that are not landlocked obtain higher scores compared to landlocked developing countries, although the differences between them are smaller if measured with the TFIs and larger if measured with the other indicators (DB, LPI or ETI). This result suggests a double burden for landlocked developing countries: apart from being isolated from global markets by having no access to the sea, they also have in place inefficient trade procedures that further hinder their trade.

4. Conclusions

This section has shown that trade models of all generations can be adapted to draw interesting and complementary conclusions regarding the impact of trade facilitation. Yet, with the increased academic and policy focus on trade facilitation, researchers should be encouraged to develop more specific economic models of trade facilitation that incorporate salient features of how today's international trade is conducted. For instance, none of the models discussed above specifically consider the role of time in trade costs, but recent work suggests lengthy shipping times impose significant costs on firms engaged in trade (Hummels and Schaur, 2013).

Aside from the time question, there is also empirical work on global value chains that indicates traders are concerned with the overall reliability of the supply chain and that hedging against uncertainty of delivery time makes up a significant part of logistics costs in many developing countries (Arvis *et al.*, 2007a; 2007b). Work by the WTO and the OECD on global value chains and trade in value added has made researchers much more aware of the role of trade in services. Might anything be said about the relationship between trade facilitation and trade in services? One hypothesis is that trade facilitation should also increase services trade since

Figure C.3: Average TFIs, Enabling Trade Index and Logistics Performance Index (latest available year)



logistics and transport activity are likely to expand along with merchandise goods trade. Alternatively, one can imagine border delays increasing service trade through more costly shipping and other transport costs. If so, trade facilitation will, in part, reduce service trade even as it expands trade in merchandise goods.

Future research could also distinguish between the impacts of different types of trade facilitation measures, consider the role of country circumstances along the lines of Duval (2007), and examine the contribution of complementary policies in achieving success in trade facilitation reform (Borchert *et al.*, 2012; Iwanow and Kirkpatrick, 2007; Francois and Hoekman, 2010).

This section has also examined four major trade facilitation indicators: the World Bank's Doing Business indicators, the World Bank's Logistics Performance Index, World Economic Forum's Enabling Trade Index and the OECD's Trade Facilitation Indicators. The main difference between them is the scope of trade facilitation they take into account. This report will use the OECD TFIs as the indicator for the TFA because they were constructed on the basis of the TFA, satisfy the criteria of a good indicator, are correlated with the other major indicators and, when accounting for the development and geographical characteristics of countries, they are consistent in their ranking with the other indicators.

Endnotes

- 1 The reader is nevertheless encouraged to read Hummels and Skiba (2004) and Hummels (2007), who examine in great detail how additive or non-proportional trade costs affect the pattern of trade.
- 2 Some recent contributions include Yi (2003; 2010) and Baldwin and Venables (2013).
- 3 See Bagwell and Staiger (1999; 2002) and WTO (2012).
- 4 See also the discussion in subsection C.1.
- 5 See Maggi and Rodriguez-Clare (1998; 2007), Matsuyama (1990), Staiger and Tabellini (1987), and WTO (2012).
- 6 See subsection E.4.
- 7 Arvis *et al.* (2014).
- 8 A scoring system that assigns discrete numerical values according to some metric of performance requires determining thresholds for what is best, worst or in between. Sometimes there are “natural” thresholds, as for example for the variable “Establishment of a national Customs website”. Thus, a country without a customs website will be assigned a score of 0; a country with a customs website will be assigned 1; and a country with a customs website which makes available a minimal set of information related to import or export procedures in one of the official WTO languages will be assigned a 2. In other cases, no natural thresholds can be identified. In these cases, if the variable is numerical in nature, the score could be determined by deviation from the sample mean or by its percentile rank. See Orliac (2012).
- 9 The country coverage has been increased in 2014. Before 2014, it covered 132 countries.
- 10 For the analysis in this subsection and the simulations in Section D, we use the 2009 OECD TFI database, which has information on 133 countries, 26 of which are OECD members, and 107 non-OECD members. Since previous studies on the economic effects of trade facilitation that have used the OECD TFIs have relied on the 2009 data, using the same data makes the analysis in this report comparable to those previous studies. All 26 OECD members are also WTO members. Of the 107 non-OECD countries, 96 are WTO members and 11 are WTO observers.
- 11 The “Ease of Doing Business” and/or the “Trading Across Borders” indicators have not been taken into account because they simply rank countries.