

## Estimating the Benefits of Cross-Border Paperless Trade

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## Executive Summary

Cross-border paperless trade refers to “trade taking place on the basis of electronic communications, including exchange of trade-related data and documents in electronic form”.<sup>1</sup> It is an extension of the more general concept of paperless trade, which has been widely discussed in the trade facilitation literature. Paperless trade has been part of customs reforms efforts in a variety of countries over recent years.

Increased implementation of cross-border paperless trade is high on the trade facilitation agenda in the Asia-Pacific. UNESCAP (2013) provides a discussion of the possible scope of a regional arrangement on cross-border paperless trade, based on a thorough review of the various possibilities, as well as existing national practice. The impetus for this move comes from UNESCAP’s member states: Resolution 68/3, adopted in 2012, is entitled “*Enabling Paperless Trade and Cross-Border Recognition of Electronic Data and Documents for Inclusive and Sustainable Intraregional Trade Facilitation*”. It invites member states to work towards the development of regional arrangements on the facilitation of cross-border paperless trade. In addition, it sets out a number of concrete steps they can take along that path, and provides guidelines for the UNESCAP Secretariat to support the process. Although considerable efforts will be required—including capacity building, as the Resolution sets out—the recent WTO Trade Facilitation Agreement suggests that there may be sufficient momentum to move forward on this issue in the short- to medium-term. This point is all the truer for the Asia-Pacific, which is a region that has a history of significant and effective trade facilitation reforms in a wide range of areas.

Although the precise measures covered by cross-border paperless trade initiatives vary from country to country and from analysis to analysis, it is necessary to use a relatively precise definition in order to calculate an estimate of the possible benefits, which is the focus of this report. With that aim in mind, this report considers the following six measures as representative of cross-border paperless trade reforms, based on the structure of a survey administered by UNESCAP at its 2013 Asia-Pacific Trade Facilitation Forum:

1. Laws and regulations for electronic transactions.
2. Recognized certification authority.
3. Engagement of cross-border electronic data exchange.
4. Electronic exchange of Certificate of Origin.
5. Electronic exchange of Sanitary & Phyto-Sanitary certificates.
6. Banks and insurers retrieving letters of credit electronically without lodging paper-based documents.

This report estimates the possible economic benefits—export gains, and cost savings—from partial or full implementation of this set of measures. The approach of this report is to conduct counterfactual simulations: “what if” exercises based on the current reality of cross-border paperless trade implementation, and two ambitious but realistic reform scenarios.

Simulation results suggest that cross-border paperless trade has significant potential to reduce trade costs and boost trade in the Asia-Pacific region. Concretely, partial implementation of cross-border paperless trade measures would be associated with an export increase of \$36bn

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<sup>1</sup> <http://unnex.unescap.org/fcpt-igm-wp1e.pdf>.

annually. Under a more ambitious scenario of full region-wide implementation of cross border paperless trade, the export gain would be of the order of \$257bn annually. The time required to export would fall by 24% to 44%, and the cost by 17% to 31%, depending on the reform scenario considered. Total cost savings across all trade would be approximately \$1bn annually for partial reform, and \$7bn annually for full implementation. Moreover, there is every reason to believe that these are low-end estimates of the possible economic gains from reform, due to the way in which the simulations are set up on a technical level, and the fact that they focus on implementation of cross-border measures only. In reality, paperless trade is typically implemented on a broader basis, which would tend to increase the level of export gains and cost savings reported here.

One key policy message to emerge from this report is that “new generation” trade facilitation measures, like cross-border paperless trade, have just as much potential as more traditional measures to reduce trade costs and increase intra- and extra-regional trade. The gains from comprehensive trade facilitation reform have not yet been reaped: even strong performers have areas in which improvements can be made, and weaker performers need to make progress on a broad front to catch up with the rest of the region, and improve their trade integration.

For those countries with much to do in terms of implementing cross-border paperless trade, it is clear that the first policy priority should be on general paperless initiatives, such as customs automation, and an electronic Single Window. These systems need to be fully in place before the cross-border aspects as more narrowly understood can be properly dealt with. However, the two processes need to work together. For example, it is possible to build in capabilities into paperless trading systems so that cross-border expansion is more straightforward than if that possibility had not been allowed for. The two policy areas can therefore work in tandem. This point is particularly true for those countries that still have to make fundamental reforms to border processes: by getting involved in regional cooperation on cross-border paperless trade at an early stage, they can avoid having to re-engineer processes at a later point, and thereby enjoy considerable overall implementation cost savings.

It is well-known that the economic gains from trade facilitation reforms are very large: in realistic scenarios, they usually dwarf the gains from additional tariff liberalization, given the already generally low level of the latter. Trade facilitation—understood broadly as policy measures that reduce all types of trade costs—is a vital area for analysts and policymakers going forward. As the recent WTO Trade Facilitation Agreement makes clear, the costs of implementing trade facilitation can sometimes be significant. That is also the case implementation of paperless trade. As a result, Aid for Trade and capacity building to support the reform process, have to be an integral part of ongoing discussions. The key for policymakers going forward will be to combine reformist will with adequate human, technical, and financial resources. A strong regional arrangement on cross-border paperless trade facilitation would certainly help in this regard.

# 1 Introduction

Cross-border paperless trade refers to “trade taking place on the basis of electronic communications, including exchange of trade-related data and documents in electronic form”.<sup>2</sup> The more general concept of paperless trade has been widely discussed in the trade facilitation literature, where it has been part of customs reforms efforts in a variety of countries over recent years. This report focuses specifically on cross-border aspects, as opposed to those related to issues within each country, and provides a simple estimate of the possible trade gains and cost savings from partial or full implementation of cross-border paperless trade in the Asia-Pacific.

Although the precise measures covered by cross-border paperless trade initiatives vary from country to country and from analysis to analysis, it is necessary to use a relatively precise definition in order to calculate an estimate of the possible benefits. With that aim in mind, this report considers the following six measures as representative of cross-border paperless trade reforms, based on the structure of a survey administered by UNESCAP at its 2013 Asia-Pacific Trade Facilitation Forum:

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The report estimates the possible economic benefits—export gains, and cost savings—from partial or full implementation of this set of measures. Of course, these measures cannot be implemented in a vacuum: cross-border paperless trade may be seen as the culmination of a step-by-step process involving implementation of various other trade facilitation measures, with reforms frequently taking place in a number of areas simultaneously. Although it is possible to take account of these factors to some extent, it is not possible to forecast in detail the path of reform within the region, nor the economic circumstances under which it might take place. The approach of this report is therefore to conduct counterfactual simulations: “what if” exercises based on the current reality of cross-border paperless trade implementation, and two ambitious but realistic reform scenarios.

Increased implementation of cross-border paperless trade is high on the trade facilitation agenda in the Asia-Pacific. UNESCAP (2013) provides a discussion of the possible scope of a regional arrangement on cross-border paperless trade, based on a thorough review of the various possibilities, as well as existing national practice. The impetus for this move comes from UNESCAP’s member states: Resolution 68/3, adopted in 2012, is entitled “*Enabling Paperless Trade and Cross-Border Recognition of Electronic Data and Documents for Inclusive and Sustainable Intraregional Trade Facilitation*”. It invites member states to work towards the development of regional arrangements on the facilitation of cross-border paperless trade. In addition, it sets out a number of concrete steps they can take along that path, and provides

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<sup>2</sup> <http://unnexnext.unescap.org/fcpt-igm-wp1e.pdf>.

guidelines for the UNESCAP Secretariat to support the process. Although considerable efforts will be required—including capacity building, as the Resolution sets out—the recent WTO Trade Facilitation Agreement suggests that there may be sufficient momentum to move forward on this issue in the short- to medium-term. This point is all the truer for the Asia-Pacific, which is a region that has a history of significant and effective trade facilitation reforms in a wide range of areas.

Against that background, it is important for policymakers to have an idea of the sorts of economic benefits that could come from increased implementation of cross-border paperless trade. Although there are studies addressing the benefits that have accrued from such initiatives in particular national contexts, they deal with only a small number of countries. There is no cross-country, or region-level, evaluation of the possible benefits of cross-border paperless trade. This report is designed to fill that void, by covering as many Asia-Pacific countries as possible. It provides a region-level view of the possible implications of cross-border paperless trade for trade costs and exports. This information should help policymakers prioritize these measures in their broader trade facilitation reform agendas.

The report proceeds as follows. The next section provides a review of the previous empirical literature on the benefits of cross-border paperless trade. Section 3 presents the report's three stage methodology for estimating possible benefits. Section 4 presents and discusses results, focusing on trade outcomes (exports) and trade cost savings. The final section concludes, and provides some policy implications.

## 2 Literature Review

This section provides an overview of previous studies that estimate the economic benefits from paperless trade, or particular elements of it. The reports summarized here adopt various methodologies, but typically rely on small amounts of survey data to estimate the benefits from paperless trade based on user experience. The survey results are then sometimes extrapolated to a wider range of countries, based on the assumption that similar benefits would be apparent there should they adopt the same system. As will be seen, results vary considerably from one study to another, depending on the survey data, assumptions, and baselines used, as well as the methodology adopted.

The section proceeds in two subsections. The first one addresses estimates of impact at the micro-level, namely evidence on the number of documents, amount of time, or cost saved by moving to paperless trading in a per transaction sense. These studies do not include any estimates of macro-level impacts, that is to say total costs saved or resulting trade impacts. That second group of studies is addressed in the following subsection.

### 2.1 Estimates of Micro-Level Impacts

A variety of countries in the Asia-Pacific and elsewhere have implemented elements of a paperless environment for cross-border trade transactions. UNNeXT (2009) reports a number of summary figures from single country studies. In Singapore, introduction of a Single Window reduced processing times from four days to 15 minutes or less. Thailand has implemented various trade facilitation measures as preparation for a move to a Single Window, and the time taken for export fell from 24 days to 14 days between 2006 and 2009. Some of the studies cited by the report have also provided quantifications of these benefits. For instance, UNNeXT (2009) cites a study of automation in Hong Kong, China, which finds estimated savings of \$167.5 million. The same source indicates that the business savings from automation in Korea amount to \$1.8 billion. Finally, the benefits of Thailand's Single Window are stated to be \$1.5 billion, for an initial investment of \$31 million, according to the national government.

UNNeXT (2010) examines the case of Singapore in more detail. It reports data showing that implementation of the country's electronic Single Window reduced the number of trade documents from between three and 35 to just one, lowered the submission cost per document from \$6.25 to \$1.80, and decreased processing time per permit to 10 minutes from between four hours and seven days. Studies have found that the Singaporean system reduced document processing costs by 20% or more. According to freight forwarders, there have been savings of 25%-35% in handling trade documentation.

UNNeXT (2011) reports on the paperless trade experience of Japan. As part of its border clearance automation process, Japan introduced a Single Window. To make the Single Window work most effectively, it was necessary to simplify documentary processes to allow for streamlined processing. Japan reduced its documentary requirements by 50%, from 16 to 8, as a result of this process. An independent report cited in the UNNeXT (2011) indicates that the benefits to the Japanese economy were of the order of \$532.9 million annually, for a cost of \$93.6 million. Overall lead time for imports by sea fell from 7 days to 2.6 days between 1991 and 2009.

Thailand's Single Window experience is examined by UNNeXT (2012). According to the World Bank's Doing Business data, Thailand has seen significant improvements in import and export



performance between 2007 and 2011, with the Single Window beginning operation in 2008. The numbers of documents required for import and export have fallen by 75% and 56% respectively. Time has been reduced by 41% on the import side, and by 42% on the export side. Corresponding cost reductions are 24% and 26% respectively.

## 2.2 Estimates of Macro-Level Impacts

DFAT and FTEC (2001) provide an estimate of the direct and indirect economic benefits from paperless trade among APEC economies. It focuses on the removal of mandatory requirements for paper-based documents in international trade. In terms of methodology, the report uses an APEC survey of the requirements for paper-based documents for 1999, combined with information from users on the percentage savings from the implementation of paperless systems in particular sectors. Depending on the product in question, the report finds that cost savings could amount to 1.5% to 15% of the landed price of goods, although the 15% figure is arguably an outlier; 4.4% seems a more reasonable upper bound based on the information presented. To provide a quantitative impact assessment, the report takes the figure of a 3% reduction in cost, and applies it to the baseline of all intra-APEC trade, to produce a total cost saving of around \$60bn annually. However, the 13-year old report notes that adoption costs for paperless trade technologies are also significant, perhaps amounting to 25% of the total gains. In terms of per-transaction costs, the data collected by the DFAT and FTEC (2001) report finds that paperwork adds around \$75-\$125 to each trade transaction. This number is an estimate provided by traders.

Hyundai Research Institute (2006) uses results from a survey answered by 81 firms on the costs and benefits of adopting paperless trade in Korea. Overall, it finds that businesses gained by 2.6 trillion Won (\$2.4 billion) from the introduction of trade automation, at an adaptation and maintenance cost of 91.1 billion Won (\$85.2 million). The gains measured in the survey include reductions in the cost of labor, printing, and document delivery, as well as incidental expenses such as costs related to cargo custody and inventory management. It is not clear from the report whether the figures presented are for the firms surveyed or for the economy as a whole, but it is assumed here that they have been scaled up from the survey sample to the whole economy, and therefore represent macro-level impacts.

APEC PSU (2011) studies one specific aspect of cross-border paperless trade, namely electronic certificates of origin. The report is based on a small survey of Korean and Taiwanese traders, who as of writing benefitted from a new electronic certificate of origin program. The traders assessed the per transaction cost savings based on the new procedure, in terms of cost reductions related to document preparation and border clearance. As a counterfactual exercise simulating the uptake by other APEC economies of electronic certificates of origin for intra-regional trade, the report extrapolates these results (in percentage of baseline terms) to other APEC economies using the corresponding figures for per shipment document preparation and border clearance costs in the World Bank's Doing Business database.<sup>3</sup> The report finds that such region-wide

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<sup>3</sup> Based on the survey results, the report applies reductions of 87% and 52% respectively to the cost of document preparation and customs clearance and technical control on the export side, and reductions of 49% and 88% respectively on the import side.

adoption of electronic certificates of origin would result in cost savings of 6.79% of the baseline, or over \$7.5bn annually based on 2010 data.<sup>4</sup> .

### 2.3 Summary

This section has reviewed the available literature on the economic effects of various paperless trade initiatives. Three conclusions are apparent, and relevant from the point of view of the methodology to be adopted in the remainder of this report.

First, it is difficult to untangle the effects of cross-border paperless trade initiatives from other initiatives such as documentary simplification, automation of national procedures, and moving to a national Single Window. Indeed, in practice these activities are typically undertaken with some degree of overlap. In terms of establishing causality, therefore, it is very difficult to assign particular numbers to particular steps. Estimating the possible economic impacts of cross-border paperless trade will therefore inevitably also capture elements of companion initiatives.

Second, many of the contributions reviewed here are highly country specific. Context matters to the assessment of costs and benefits, and more importantly to the way that paperless trade initiatives are implemented on the ground. National context is also important because it establishes the baseline against which progress is measured. The exercise of estimating possible regional benefits therefore needs to confront the difficulty that national starting points are different. There needs to be a baseline measurement that is comparable across the region.

Third, only two of the reviewed studies are based on counterfactuals, i.e. an assessment of possible benefits from the implementation of a system that is not currently in place. The remaining studies measure actual benefits and costs based on historical implementation. The methodologies in these two cases are necessarily very different. It is not possible to directly apply the historical measurement examples to calculate counterfactuals without making strong assumptions as to similarity of national circumstances and implementation patterns.

As a result of these points, the estimates discussed in the previous subsections and summarized in Table 1 vary widely. For example, estimates of cost reductions per transaction associated with the implementation of certain paperless trade initiatives range from 20% to 87%, considering only estimates that apply the same baseline. Reported time reductions range from 41% to 99%, although baselines may differ in some cases, which makes direct comparison difficult. This large variance in findings is due in part to the application of different methodologies and the use of

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<sup>4</sup> The dollar equivalent figure is not quoted in the report, but can be calculated using the data and results reported in Appendix 12. Cost saving figures are calculated using the per shipment savings estimated using the Korean and Taiwanese data combined with Doing Business data, along with data on port container traffic that provides the total number of shipments (containers) leaving and entering each economy. The report uses total container movements and total trade values to estimate approximate values per container. Intra- and extra-APEC trade values are then used to estimate the approximate number of containers used for intra-APEC trade, which is the focus of the report's counterfactual. As the report makes clear, it excludes air freight, because no comparable data on movements of container equivalents are available across economies. The cost reductions reported in the text are only applied to the estimated number of containers subject to certificate of origin requirements, typically assumed to be 25%.

small survey samples to establish baseline information, as well as differences in national starting and ending points.

The next section builds on these contributions and recent work by UNESCAP to propose a new methodology that can be applied in a cross-country setting. The findings in Table 1 will be used as a check on final results, to ensure that the alternative methodology produces results that accord with historical experience.

*Table 1: Savings due to implementation of various paperless trade initiatives, percent and USD.*

Country	Reduction in No. of Documents	Time savings	Cost savings per Transaction	Total Cost savings	Source
APEC economies	NA	NA	1.5%-15% <sup>5</sup>	\$60bn	DFAT and FTEC (2001)
APEC economies	NA	NA	87% for exports subject to certificate of origin; 49% for imports subject to certificate of origin	6.8% or \$7.5bn	APEC PSU (2011)
Hong Kong, China	NA	NA	NA	\$167.5m	UNNeXT (2009)
Japan	50%	62.9%	NA	\$0.53bn	UNNeXT (2011)
Korea	NA	NA	NA	\$1.8bn-\$2.4bn	Hyundai Research Institute (2006); UNNeXT (2009)
Singapore	97%	99%	20%-35%	NA	UNNeXT (2010)
Thailand	75% for imports; 56% for exports	41% for imports; 42% for exports	24% for imports; 26% for exports	\$1.5bn	UNNeXT, (2009); UNNeXT (2012)

*Source: As indicated in table.*

<sup>5</sup> Expressed relative to the landed cost of goods. All other cost reductions are expressed relative to the initial cost baseline.

### 3 Methodology

The literature review shows that analysts have applied a wide variety of methodologies, and come to significantly different results, in examining the impact of paperless trade and related measures. Most of the methodologies are highly specific, in the sense of applying to a single country only. They use data that cannot be easily gathered for the Asia-Pacific as a whole, and assumptions that are likely to vary substantially from one country to another.

We therefore develop an alternative methodology to assess the benefits of cross-border paperless trade in the Asia-Pacific as a whole. The methodology needs to rely on commonly available data that cover as many Asia-Pacific countries as possible. It needs to take account of different baselines in different countries, in the sense that the level of implementation of paperless trade, and trade facilitation measures more generally, differs substantially across countries. In terms of results, the methodology should be able to provide information in terms of time, cost, and trade outcomes. Any methodology should also be as simple and transparent as possible, so that it can be easily replicated and extended by other analysts.

With these objectives in mind, this section develops a methodology for estimating the benefits of cross-border paperless trade in the Asia-Pacific. The methodology consists of three stages:

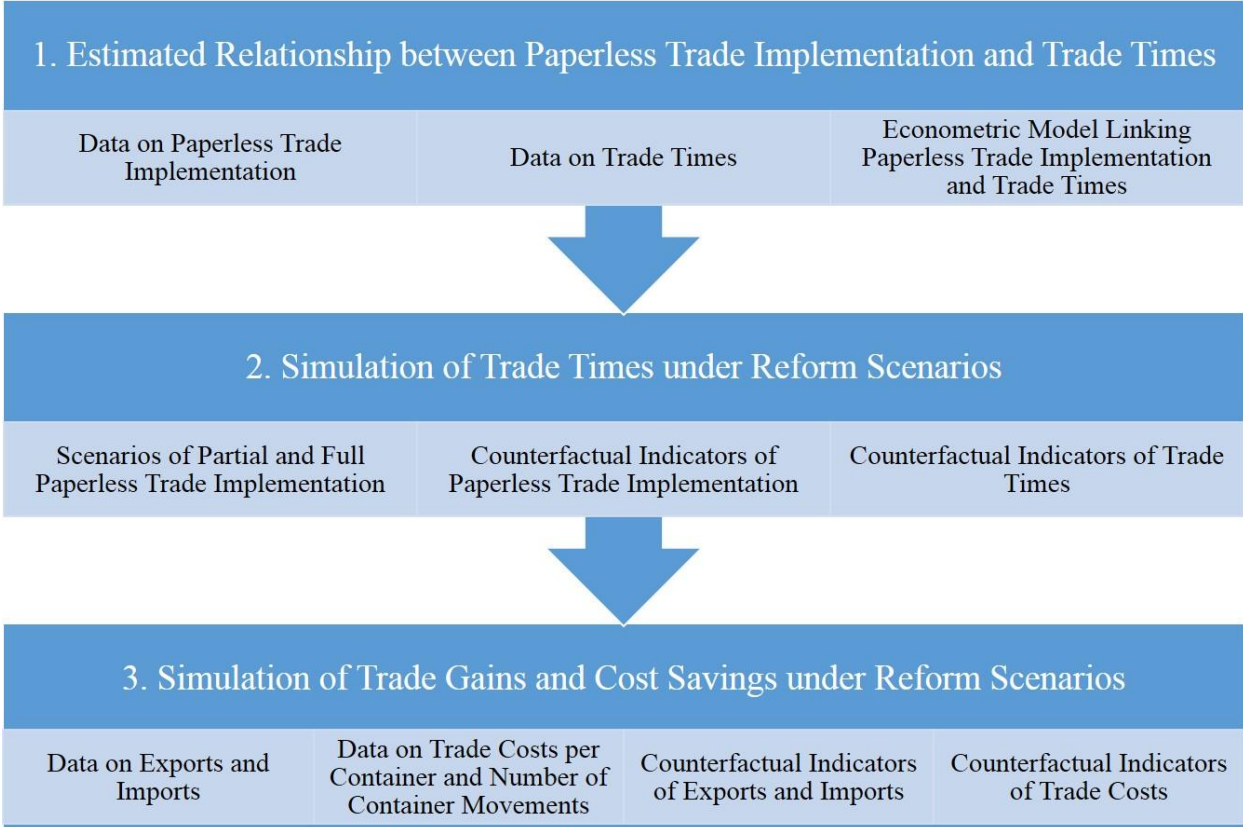
1. Estimation of the relationship between cross-border paperless trade reforms on the one hand, and import and export times on the other.
2. Simulation of export and import times under different scenarios of paperless trade reform across the region.
3. Simulation of export and import gains, as well as cost savings, corresponding to the scenarios from stage 2.

The reason for proceeding in this way is that there is no direct, cross-country estimate of the general relationship between cross-border paperless trade reforms and either trade costs or trade outcomes. However, there is good evidence on the relationship between trade times and trade outcomes, and it is straightforward to estimate a relationship between time and cost. The most innovative part of the methodology is therefore the first stage, which estimates a relationship between time and paperless trade reforms. The outputs from that stage will feed into all other stages, and provide the basis for estimating the impacts on trade costs and trade outcomes of different reform scenarios within the region.

It is important to highlight that the approach taken here is likely to produce low-end estimates of the possible economic impacts of cross-border paperless trade in the Asia-Pacific. One reason for believing this is the case is that the model is based on unilateral reform by each country. To keep it technically simple and transparent, it does not take account of the dynamic gains that accrue when trade partners reform reciprocally or multilaterally. Indeed, such reform is necessary in some cases, such as electronic certificates of origin. A second reason for believing these estimates are towards the low end of what is reasonable is that in terms of implementation on the ground, cross-border paperless trade typically requires improvement of general trade facilitation and paperless trade procedures. Reforms are therefore grouped together, and do not occur entirely independently. In reality, therefore, countries that pursue cross-border paperless trade from a current low baseline of implementation are likely to benefit more than is estimated here due to the additional, positive effects of more basic reforms. The simultaneity of reform paths is again excluded from the model to keep it simple, and as transparent as possible.

Each of the three stages of the estimation process is now discussed in detail. The explanation is presented in as non-technical a manner as possible, but necessarily involves a certain level of analytical detail. To assist with presentation, Figure 1 gives a graphical overview of the report’s methodology.

Figure 1: Methodology for calculating trade gains and cost savings from paperless trade reforms.



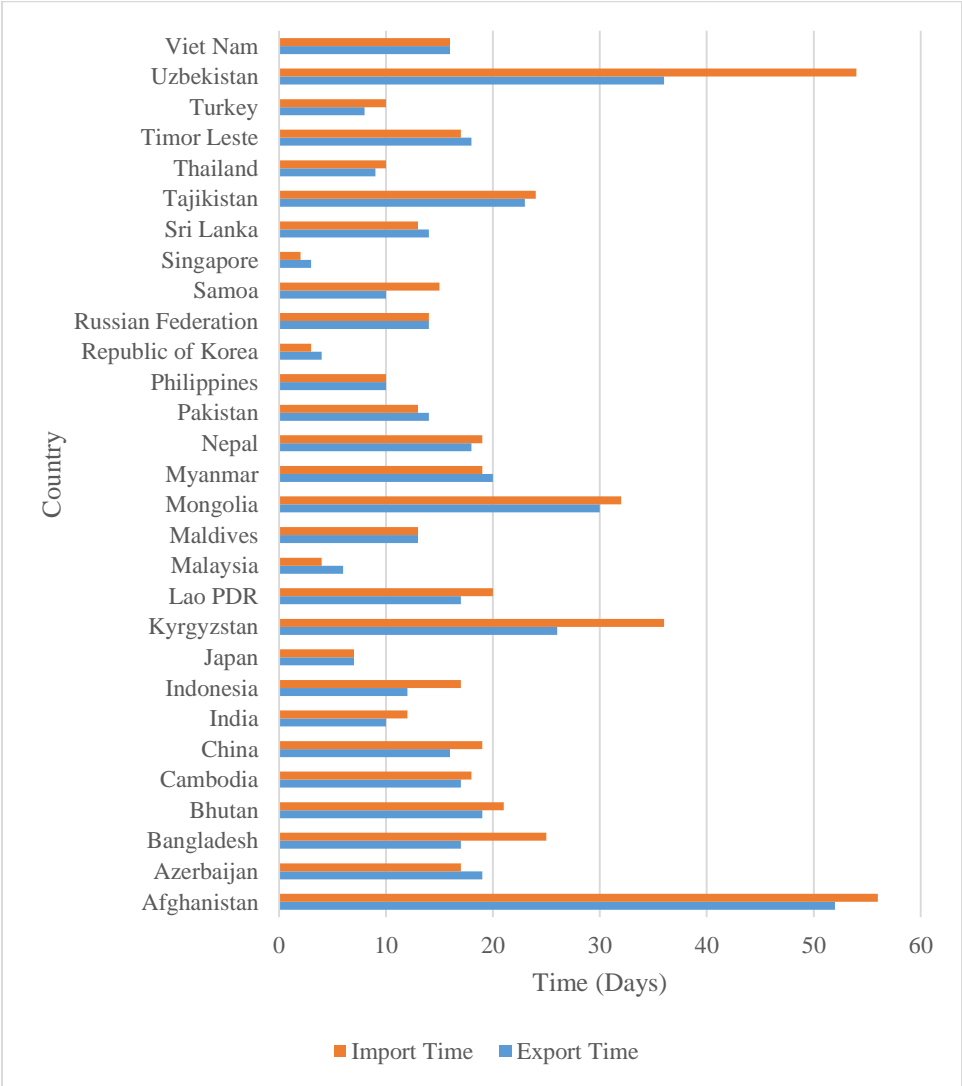
3.1 Estimation of the Relationship between Paperless Trade Reforms and Trade Times  
 The World Bank’s Doing Business database provides comprehensive information on import and export times around the world.<sup>6</sup> The times are based on a hypothetical transaction taking place under circumstances set out in a detailed scenario given to data providers. They include the time required for four steps: document preparation; inland transit; customs clearance and inspections; and port and terminal handling. The data do not include the time required for movement of goods between seaports: trade times are thus measured as the times required to move goods between the seller’s factory or the buyer’s warehouse and the sea vessel. In the remainder of this paper, “trade time” is used specifically to refer to two components of the Doing Business data: document preparation; and customs clearance and inspections. These are the two parts of the overall time figure that can be expected to be influenced by cross-border paperless trade reforms. (“Export time” and “import time” are used in the corresponding senses.)

Although actual trade times differ in particular cases, the Doing Business data provide a useful guide to the relative difficulty of exporting and importing in different countries. They have been

<sup>6</sup> All data used in this report are for 2013 or the latest year for which data are available.

extensively used by analysts, including in the Asia-Pacific region.<sup>7</sup> They have also been validated through publication in a leading economics journal, and extensive subsequent use by researchers around the world (Djankov et al., 2010). Figure 2 presents Doing Business trade time data for Asia-Pacific countries. Singapore has the fastest trade times, and the landlocked countries of Central Asia report the longest times, due partly to long inland transit times linked to the need for goods to cross third countries before reaching a port.

Figure 2: Trade times for Asia-Pacific countries, 2013.



Source: Doing Business database.

The other ingredient required for the first stage of the analysis is a common baseline indicator of the extent of paperless trade reforms in the various countries of the Asia-Pacific. UNESCAP has provided these data, based on the 2013 Asia-Pacific Trade Facilitation Forum Survey, with

<sup>7</sup> For example, APEC uses Doing Business time data as performance indicators for its Supply Chain Connectivity Framework Action Plan (APEC PSU, 2013); and ESCAP also uses such data in its International Supply Chain Connectivity Index (ESCAP, 2013).

subsequent follow up to ensure maximum accuracy of responses.<sup>8</sup> The survey asks respondents to indicate the extent of implementation of various trade facilitation measures: full, partial, or none. The measures covered include paperless trade, and cross-border paperless trade more specifically. Because reforms that enable cross-border paperless trade rely on, and often accompany, reforms affecting paperless trade in general, it is convenient for the analysis to group the two sets of reforms together, under the heading of “paperless trade”.

In addition to information on implementation of other trade facilitation measures, respondents to the 2013 UNESCAP survey supply details on the following aspects of paperless trade:

1. Electronic/automated Customs system.
2. Internet connection available to Customs and other trade control agencies at border crossings.
3. Electronic Single Window System.
4. Electronic submission of Customs declarations.
5. Electronic application and issuance of trade licenses.
6. Electronic submission of sea cargo manifests.
7. Electronic submission of air cargo manifests.
8. Electronic application and issuance of preferential Certificate of Origin.
9. Electronic payment of Customs duties and fees.
10. Electronic application for Customs refunds.
11. Laws and regulations for electronic transactions.
12. Recognized certification authority.
13. Engagement of cross-border electronic data exchange.
14. Electronic exchange of Certificate of Origin.
15. Electronic exchange of Sanitary & Phyto-Sanitary certificates.
16. Banks and insurers retrieving letters of credit electronically without lodging paper-based documents.

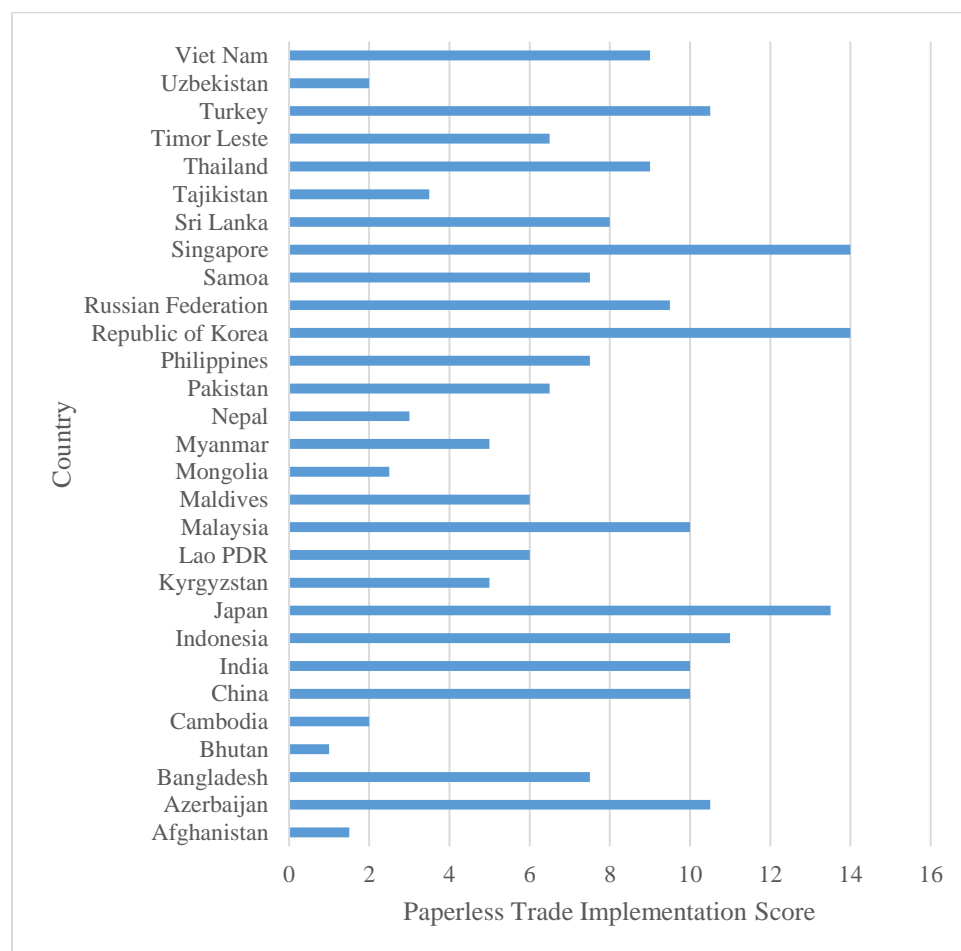
The first 10 items refer to paperless trade facilitation as narrowly understood, and the remainder deal with cross-border paperless trade specifically. As previously indicated, this report groups the two sets of information together under the heading of paperless trade. When the term cross-border paperless trade is used in relation to the survey data, it refers to the last six elements (11-16).

To make it possible to estimate the relationship between paperless trade reforms and trade times, it is necessary to convert UNESCAP’s qualitative data into quantitative data. To do so, a simple scale is applied: no implementation corresponds to zero; partial implementation corresponds to 0.5; and full implementation corresponds to one. Using this transformation of the data, Figure 3 presents a score for each country on paperless trade reform implementation, with a maximum value of 16 indicating full implementation of all measures. Singapore and Republic of Korea have the highest score, and Bhutan has the lowest.

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<sup>8</sup> See Tengfei and Duval (2013) for details.

Figure 3: Paperless trade implementation in the Asia-Pacific, 2013.



Source: UNESCAP survey. Note: The data cover 16 measures, with zero corresponding to no implementation, 0.5 to partial implementation, and one to full implementation of each measure.

Once the two pieces of data are in place, it is possible to use basic econometric models to estimate relationships between paperless trade reform implementation on the one hand, and export and import times on the other.<sup>9</sup> The models can also control for other factors that determine export and import times, but not many due to the small number of observations in the dataset (29—the number of countries for which survey results are available). In terms of control variables, the models used here include implementation of other trade facilitation reforms.<sup>10</sup>

<sup>9</sup> Estimation is conducted by ordinary least squares, which is a standard statistical technique.

<sup>10</sup> Data on other trade facilitation reforms are also sourced from the 2013 UNESCAP survey. These data cover the following areas: national trade facilitation body; publication of existing import-export regulations on the internet; stakeholder consultation on new draft regulations (prior to their finalization); advance publication/ notification of new regulation before their implementation; advance ruling (on tariff classification); risk management; pre-arrival processing; post-clearance audit; independent appeal mechanism; separation of release from final determination of customs duties, taxes, fees and charges; establishment and publication of



The outputs from stage one of the analysis are estimated elasticities (i.e., sensitivities) of trade times with respect to implementation of paperless trade reforms. These estimates provide the analysis with quantitative information on the percentage impact on trade times that a ten percent change in a country's paperless trade implementation score from the UNESCAP survey has. These numbers are the crucial building blocks for the remainder of the analysis.

### 3.2 Simulation of Export and Import Times under Reform Scenarios

The remaining two stages in the methodology rely on counterfactual simulations, i.e. “what if” scenarios for further implementation of paperless trade reforms. The report considers two scenarios:

1. All countries in the region achieve at least partial implementation of cross-border paperless trade.
2. All countries in the region achieve full implementation of cross-border paperless trade.

To conduct the simulations, the first requirement is to construct counterfactual paperless trade implementation scores. To do so, it is necessary to take the actual scores—presented in Figure 3 above—and replace those cross-border paperless trade components (six measures) lower than a certain value with a different, counterfactual value. For the first simulation, all scores below 0.5 for individual cross-border paperless trade facilitation measures are replaced with 0.5; those that are greater than 0.5 remain the same. For the second simulation, all scores for individual cross-border paperless trade facilitation measures are set equal to one. In both cases, the scores for individual measures are freshly summed to produce counterfactual values of overall paperless trade implementation (including both general and cross-border elements) under each scenario.

The next requirement for the simulations is to translate the changes in paperless trade implementation scores between the actual and counterfactual values into changes in import and export times. To do that, the changes are first expressed as percentages of the baseline values. These percentage changes in paperless trade implementation scores are then translated into percentage changes in import and export times using the estimated elasticities from the econometric models from stage one of the methodology. It is assumed that no country can have an import or export time less than one day.

To sum up, the second step of the methodology therefore constructs the following type of statement for each country, using Scenario One to provide the example: “if country x were to at least partially implement all cross-border paperless trade reforms, it would be associated with a reduction in import time of y% and a reduction in export time of z%, keeping all other factors constant”.

### 3.3 Simulation of Trade Gains and Cost Savings under Reform Scenarios

Results from the counterfactual exercises in stage two are used to produce overall indicators of the economic impact of paperless trade reforms in stage three. The process involves translating counterfactual values for trade times into simulation results in terms of outcome variables of interest. Results focus on two areas: trade gains; and cost savings. Each one is dealt with separately, because of the slightly different approaches used in the two cases. It is important to stress that in both cases, however, results must be interpreted in the same way: they are not

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average release times; trade facilitation measures for authorized operators; expedited shipments; and national single window.

forecasts of the future impacts of reforms, but counterfactual simulations based on the assumption that all other factors remain constant.

### 3.3.1 Trade Gains

Djankov et al. (2010) show that a 10% decrease in Doing Business export time is associated with a 3.5% increase in exports. Their result has been widely cited in the academic and policy literature, and is generally accepted in the trade community as the best estimate of the relationship between Doing Business trade times and trade outcomes. Assuming that imports and exports are equally sensitive to time—which is reasonable—this result provides the basis for translating changes in time based on the counterfactual values from stage two into changes in imports and exports.

The trade simulation proceeds by first expressing the counterfactual trade times as percentage changes relative to the baselines reported in the Doing Business database. Next, those percentage changes are multiplied by the Djankov et al. (2010) elasticity to produce counterfactual values for imports and exports. Results can be expressed in terms of percentage changes, so that they are easily comparable across countries. By summing together changes across countries, it is also possible to provide a figure for total potential trade gains to the region.

### 3.3.2 Cost Savings

There is no ready-made result linking trade times and trade costs, both as captured in the Doing Business database. As a result, it is necessary to estimate the relationship between time and cost per container using a simple econometric model. On the basis of the model, it is possible to obtain an estimate of the relationship between a 10% decrease in trade time and the associated decrease in trade costs per container.

Rather than changes in trade costs per container, it is of more relevance to produce figures for the total cost savings potentially associated with paperless trade reforms. To do so, it is necessary to multiply cost savings per container by the total number of container movements, sourced from the World Development Indicators.<sup>11</sup> The final figures represent each country's potential cost savings from partial or full implementation of paperless trade, and they can be summed to produce an indication of possible cost savings for the region as a whole.

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<sup>11</sup> The data cover all container movements, not just imports and exports. However, there is no way to net out domestic container movements, so the total figure is used in this analysis.

## 4 Results

This section presents the results of applying the methodology to the data, as discussed in the previous section. Detailed outcomes are presented for each stage in turn.

### 4.1 Relationship between Paperless Trade Reforms and Trade Times

From the previous section, the first stage in the application of the methodology is to estimate a relationship between paperless trade reform implementation and trade times using a simple econometric model. Results are in Table 1, with column 1 dealing with export time, and column 2 with import time.

It can immediately be seen that results are very similar between the two columns. This finding means that paperless trade reforms—as well as other trade facilitation reforms—have similar impacts on export and import times, and do not affect one substantially more than the other. Results for all variables—paperless trade implementation as well as the control variable—are in line with expectations: paperless trade is associated with lower export and import times, an effect which is strongly statistically significant; other trade facilitation reforms have a similar association, but it is not statistically significant.<sup>12</sup>

For both export and import times, a 10% increase in a country's paperless trade implementation score—as measured by the UNESCAP survey and the quantitative translation methodology outlined in the previous section—is associated with an approximately 6% decrease in trade times. For a hypothetical country with the regional average level of paperless trade implementation, this result means that implementing one extra measure would be associated with a decrease in trade times of about 8%. This figure is very reasonable in terms of the underlying economics, as well as accrued policy experience. It is perhaps on the low end of what is to be expected in light of the results presented in Table 1 above, which cover implementation of different numbers of measures in each of the countries considered.

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<sup>12</sup> The reason for this result is that paperless trade and other trade facilitation measures are strongly correlated: countries that introduce reforms in one area tend to introduce at least some reforms in the other as well. As a result, it is difficult to identify their independent effects on trade times. It is important to stress that, from a statistical point of view, correlation between the two variables does not lead to biased results: it only tends to reduce statistical significance in both cases.

Table 2: Regression results for trade times and paperless trade implementation.

	(1)	(2)
	Log(Export Time)	Log(Import Time)
Log(Trade Facilitation)	-0.204 (0.145)	-0.281 (0.132)
Log(Paperless Trade)	-0.550*** (0.047)	-0.598** (0.068)
Constant	4.043*** (0.000)	4.344*** (0.000)
Observations	29	29
R2	0.547	0.479

*Note: Regression is by ordinary least squares in both cases. The dependent variable is listed at the top of each column. Prob. values based on robust standard errors are in parentheses under the coefficient estimates. Statistical significance is indicated as follows: \* (10%), \*\* (5%), and \*\*\* (1%).*

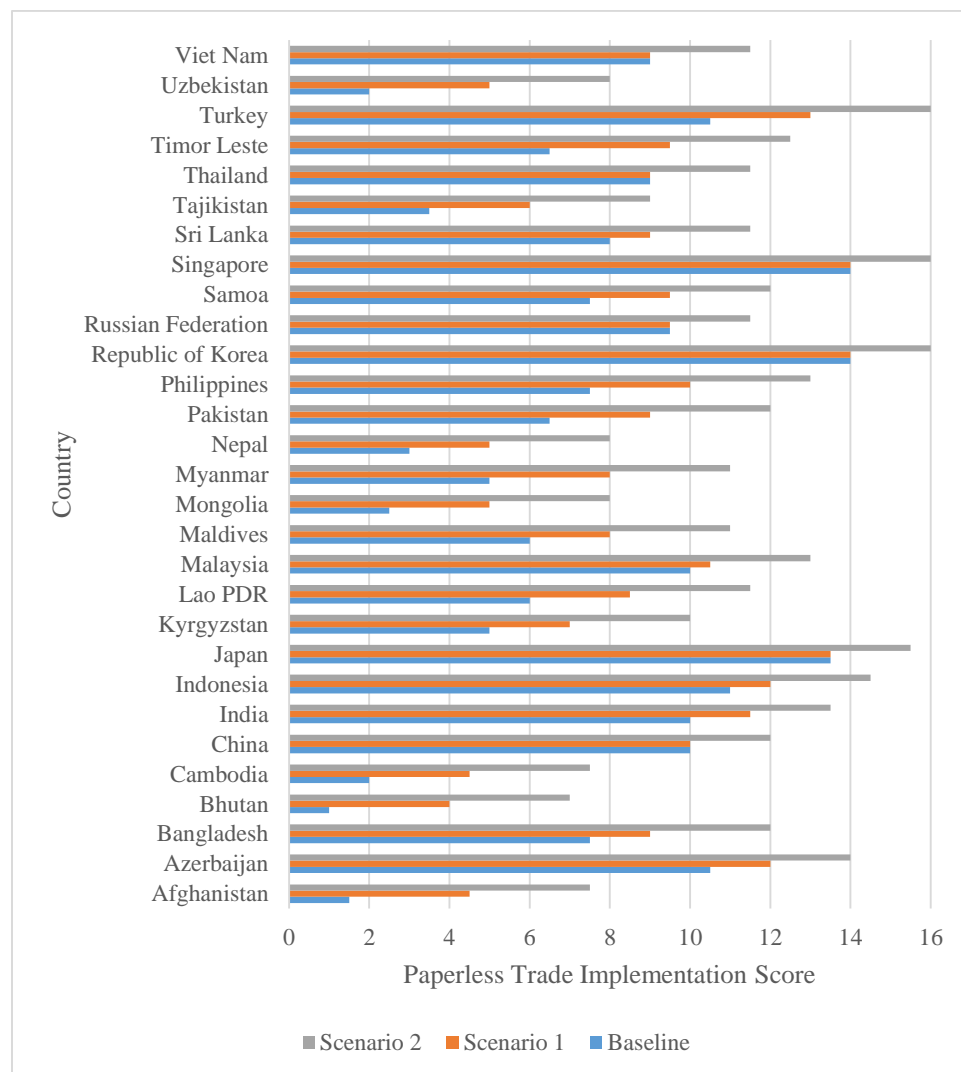
#### 4.2 Simulated Export and Import Times under Reform Scenarios

As discussed in the previous section, this report considers two reform scenarios:

1. All countries in the region achieve at least partial implementation of cross-border paperless trade.
2. All countries in the region achieve full implementation of cross-border paperless trade.

The first step in running the counterfactual simulations is to calculate the overall paperless trade scores countries would have if they partially (Scenario One) or fully (Scenario Two) implemented the cross-border paperless trade measures captured in UNESCAP's survey. Results from that exercise are in Figure 4. The figure shows baseline numbers (actual 2013 data from the survey) compared with counterfactuals for both scenarios. Under Scenario One, the regional average overall paperless trade implementation score improves by 49%. Under the second scenario, overall paperless trade implementation scores improve by an average of 112%. Both scenarios, but particularly the second one, can therefore be seen to be ambitious in terms of the current implementation baseline, but not unreasonable in light of the substantial reforms already undertaken in some Asia-Pacific countries.

Figure 4: Paperless trade implementation scores for the baseline (2013), Scenario One (partial implementation), and scenario two (full implementation).



Source: UNESCAP survey, and author’s calculations. Note: The data cover 16 measures, with zero corresponding to no implementation, 0.5 to partial implementation, and one to full implementation of each measure.

The next step in the methodology is to translate changes in paperless trade implementation scores into changes in import and export times. As indicated in the previous section, that result is achieved by converting the changes to percentages, and applying the estimated elasticities from the previous stage. Results are in figure 5, and are expressed in terms of percentage changes in export time.<sup>13</sup> The regional average for Scenario One is a 24% decrease in export time, but the range across countries is very wide: those countries that have already implemented significant reforms, such as Singapore, see no change to their score under Scenario One, but others, like

<sup>13</sup> Percentage changes in import time are not presented separately due to space considerations, and the fact that they are very close to the results for export time due to the very similar estimated elasticities for the two cases.

Afghanistan, experience very large decreases (98%). The counterfactual changes are even larger under Scenario Two: the regional average is a 44% decrease in export time, but the range runs from Singapore and Korea (8%) to Afghanistan and Uzbekistan (98%). Although these figures are in some cases very large, they are by no means outside the range reported in Table 1 above. Indeed, the average under Scenario Two is almost identical to the time decrease reported for Thailand following its implementation of paperless trade (UNNeXT, 2009 and 2012). The large figures for countries like Bhutan, Afghanistan, and Uzbekistan are in line with the result for Singapore reported by UNNeXT (2010). These comparisons provide further evidence that the counterfactual scenarios, although ambitious, are reasonable in the context of reform efforts previously undertaken in the Asia-Pacific region.

Figure 5: Simulated export time reductions under partial (Scenario One) and full (Scenario Two) implementation of cross-border paperless trade.



Source: Author's calculations.

### 4.3 Simulated Trade Outcomes under Reform Scenarios

The final stage in the analysis is to present simulated changes in trade for each counterfactual reform scenario. Trade gains and cost savings are considered separately.

#### 4.3.1 Trade Gains

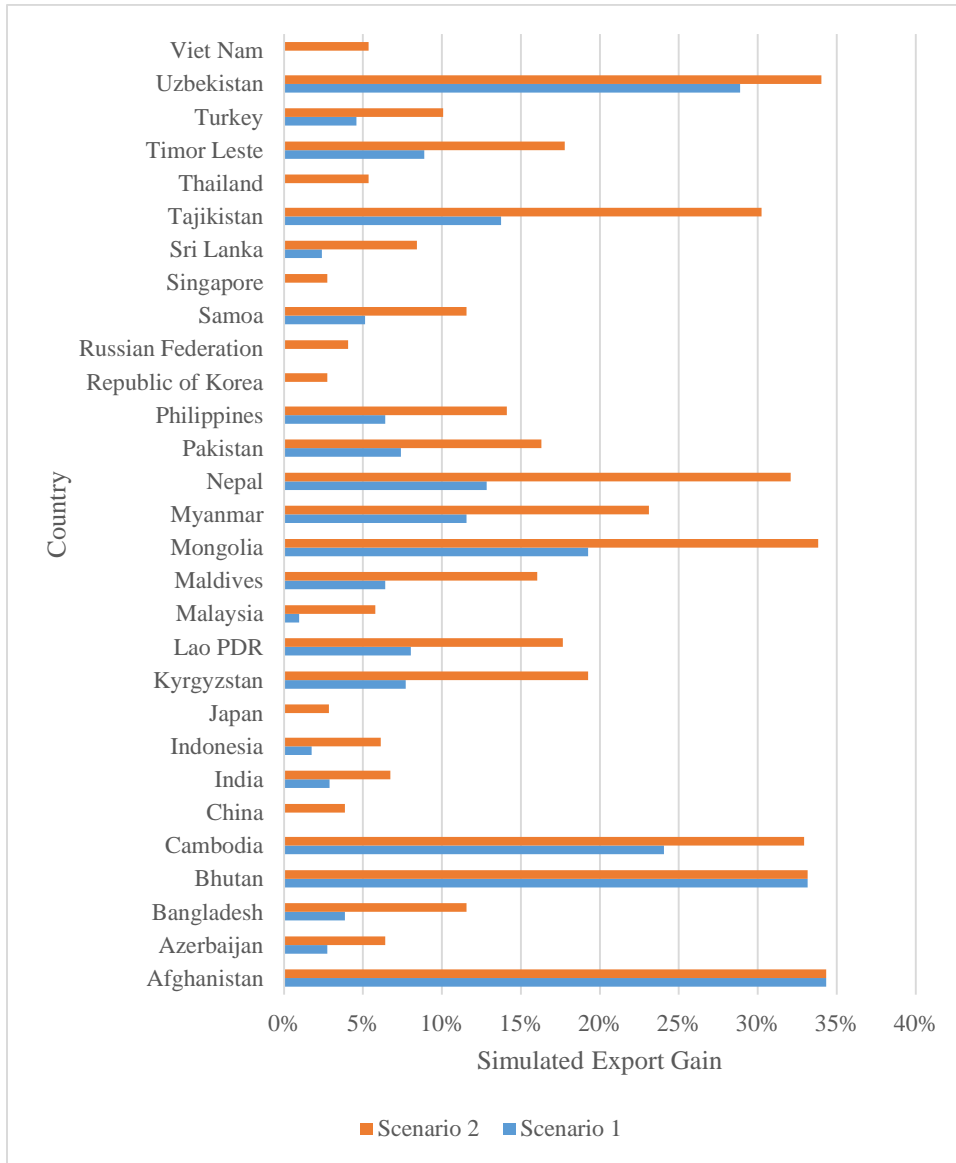
As discussed in the previous section, this stage of the analysis takes the simulated changes in import and export times and translates them into simulated changes in imports and exports using an estimated elasticity from the academic literature. The presentation of results focuses on exports only, both for considerations of space and because results for imports and exports are very similar.

Figure 6 shows percentage export gains under the two reform scenarios. For partial reform (Scenario One), the regional average gain in exports is around 9%. This figure seems reasonable, but cannot be compared with the previous literature, as none of the studies reviewed above attempted to analyze or project trade gains. As was the case for trade times, however, the range across countries is again relatively wide. Those countries that have already taken significant steps to implement paperless trade do not gain at all under Scenario One, because they have already achieved at least partial implementation of all cross-border paperless trade measures. Singapore is an example of such a country. On the other hand, the largest export gain of 34% accrues to Afghanistan, which still has major steps to undertake in terms of its implementation of cross-border paperless trade.

How reasonable are these numbers? One well-known point of comparison is Wilson et al. (2005), which calculated the potential gains from trade facilitation reform globally, including improvements to the customs environment. The reform scenario considered is improvement halfway to the global average. On that basis, East Asia and the Pacific, South Asia, and Central Asia combined would experience a counterfactual export gain of around 7%, considering only improvements in customs procedures.<sup>14</sup> The export gain reported by this study (9%) is very similar in magnitude. The comparison suggests that the figures presented here are entirely reasonable in light of previous work.

For Scenario Two, the reform counterfactual is more ambitious, so the simulated export gains are correspondingly larger. The regional average in this case is around 15%. The range is again wide, running from Singapore (3%), to Afghanistan and Uzbekistan (34%). As in the time simulations discussed above, the driving force behind the cross-country differences in simulated impact is the baseline level of paperless trade implementation: those countries that are more advanced in terms of implementation tend to gain less, because they have already undertaken many or most of the measures considered by the reform scenario.

Figure 6: Simulated export gains under partial (Scenario One) and full (Scenario Two) implementation of cross-border paperless trade.



Source: Author's calculations.

By taking baseline exports and the simulated changes, and then summing across all countries in the region, it is possible to arrive at a bottom line figure for the export gains that could result from implementation of cross-border paperless trade. Partial implementation (Scenario One) is associated with a total potential export gain of \$36bn. Full implementation (Scenario Two) is associated with a potential export gain of \$257bn. It is again important to emphasize that these figures are not forecasts, but counterfactual simulations assuming that all other factors remain constant.

#### 4.3.2 Cost Savings

To calculate cost savings, it is first necessary to estimate a relationship between trade costs and trade times. To do so, a simple econometric model is appropriate. Estimation results are in Table



3, and show that results are quite similar for exports and imports: a 10% reduction in trade time is associated with about a 7% reduction in export cost and a 5% reduction in import cost. These results make it straightforward to translate time savings into cost savings, and suggest that the rate will be somewhat less than 1:1.

On this basis, the regional average export cost saving is 17% under Scenario One, and 31% under Scenario Two. The previous work examined in the literature review can be used to check the reasonableness of these results. Four of the seven studies summarized in Table 1 present cost savings per transaction (container), which can be directly compared with results here. The range runs from 20% to 87%, with a simple average for exports of 54%. The simple average of the two scenarios considered here is 24%. For reasons discussed previously, it is likely that the estimates and simulations presented here are towards the low end of the probable range, and this comparison of average figures tends to support that view. Nonetheless, there is a reasonable correspondence between the results presented here and previous work.

Table 3: Regression results for trade costs and trade times.

	(1) Log(Export Cost)	(2) Log(Import Cost)
Log(Export Time)	0.693*** (0.120)	
Log(Import Time)		0.518*** (0.118)
Constant	4.054*** (0.398)	4.601*** (0.374)
Observations	29	29
R2	0.464	0.421

*Note: Regression is by ordinary least squares in both cases. The dependent variable is listed at the top of each column. Prob. values based on robust standard errors are in parentheses under the coefficient estimates. Statistical significance is indicated as follows: \* (10%), \*\* (5%), and \*\*\* (1%).*

To calculate total cost savings per country, it is necessary to convert the percentage changes into counterfactual totals by multiplying by baseline cost and the total number of containers, summing over exports and imports. The regional average is \$60m per country annually, with a maximum of \$295m (India) for Scenario One. The same figures for Scenario Two are \$415m, and \$4bn (China) respectively. The total regional cost saving (summing across exports and imports) is around \$1bn for Scenario One, and \$7bn for Scenario Two.

Figure 7: Simulated total cost savings under partial (Scenario One) and full (Scenario Two) implementation of cross-border paperless trade.<sup>15</sup>

	Scenario 1	Scenario 2
Afghanistan		
Azerbaijan		
Bangladesh	-44	-131
Bhutan		
Cambodia	-51	-68
China	0	-3520
India	-295	-688
Indonesia	-88	-308
Japan	0	-223
Kyrgyzstan		
Lao PDR		
Malaysia	-55	-332
Maldives	-5	-12
Mongolia		
Myanmar	-13	-25
Nepal		
Pakistan	-102	-225
Philippines	-138	-304
Republic of Korea	0	-84
Russian Federation	0	-229
Samoa		
Singapore	0	-244
Sri Lanka	-69	-240

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<sup>15</sup> This table cannot be calculated for landlocked countries or other countries with severe data limitations, as no cross-country data are available on their container movements.

Tajikistan		
Thailand	0	-206
Timor Leste		
Turkey	-223	-490
Uzbekistan		
Viet Nam	0	-148

	Scenario 1	Scenario 2
Afghanistan		
Azerbaijan		
Bangladesh	-44	-131
Bhutan		
Cambodia	-51	-68
China	0	-3520
India	-295	-688
Indonesia	-88	-308
Japan	0	-223
Kyrgyzstan		
Lao PDR		
Malaysia	-55	-332
Maldives	-5	-12
Mongolia		
Myanmar	-13	-25
Nepal		
Pakistan	-102	-225
Philippines	-138	-304
Republic of Korea	0	-84
Russian Federation	0	-229
Samoa		
Singapore	0	-244
Sri Lanka	-69	-240
Tajikistan		
Thailand	0	-206
Timor Leste		
Turkey	-223	-490
Uzbekistan		
Viet Nam	0	-148

*Source: Author's calculations.*

## 5 Conclusions and Policy Implications

This report has shown that cross-border paperless trade has significant potential to reduce trade costs and boost trade in the Asia-Pacific region. Concretely, partial implementation of cross-border paperless trade measures would be associated with an export increase of \$36bn annually. Under a more ambitious scenario of full region-wide implementation of cross border paperless trade, the export gain would be of the order of \$257bn annually. The time required to export would fall by 24% to 44%, and the cost by 17% to 31%, depending on the reform scenario considered. Total cost savings across all trade would be approximately \$1bn annually for partial reform, and \$7bn annually for full implementation. For the technical reasons discussed above, there is every reason to believe that these are low-end estimates of the possible economic gains from reform.

These figures are based on counterfactual simulations using data for 2013, and parameters estimated using simple econometric models. The report's results should not be interpreted as forecasts of the likely impact of particular reforms, but instead as general indications of the direction and relative magnitude of the changes that would take place if reform occurred today, and all other factors were held constant. Although the methodology used in the report is a relatively simple one, it produces results that are remarkably consistent with previous work that has addressed particular aspects of cross-border paperless trade at the national or regional level.

Many Asia-Pacific countries are strong performers in the area of trade facilitation, and some have led the region and the world in implementing highly efficient paperless trade reforms. In general, the region has a good record of designing and implementing trade facilitation reforms that have lowered trade costs and boosted exports. However, the UNESCAP 2013 survey used in this report shows that the extent of implementation of key measures—including paperless trade—varies substantially from one country to another, as well as across sub-regions. Regional groupings like ASEAN and APEC are working towards bringing about a certain degree of homogeneity, or at least the acceptance of common targets, in the area of trade facilitation. But addressing the very real difficulties faced by low-income Asia-Pacific countries, as well as landlocked countries, needs to be a priority for the regional trade policy community going forward.

One key policy message to emerge from this report is that “new generation” trade facilitation measures, like cross-border paperless trade, have just as much potential as more traditional measures to reduce trade costs and increase intra- and extra-regional trade. The gains from comprehensive trade facilitation reform have not yet been reaped: even strong performers have areas in which improvements can be made, and weaker performers need to make progress on a broad front to catch up with the rest of the region, and improve their trade integration.

For those countries with much to do in terms of implementing cross-border paperless trade, it is clear that the first policy priority should be on general paperless initiatives, such as customs automation, and an electronic Single Window. These systems need to be fully in place before the cross-border aspects more narrowly understood can be properly dealt with. However, the two processes need to work together. For example, it is possible to build in capabilities into paperless trading systems so that cross-border expansion is more straightforward than if that possibility had not been allowed for. The two policy areas can therefore work in tandem. This point is particularly true for those countries that still have to make fundamental reforms to border processes: by getting involved in regional cooperation on cross-border paperless trade at an early

stage, they can avoid having to re-engineer processes at a later point, and thereby enjoy considerable overall implementation cost savings.

It is well known that the economic gains from trade facilitation reforms are very large: in realistic scenarios, they usually dwarf the gains from additional tariff liberalization, given the already generally low level of the latter. Trade facilitation—understood broadly as policy measures that reduce all types of trade costs—is a vital area for analysts and policymakers going forward. As the recent WTO Trade Facilitation Agreement makes clear, the costs of implementing trade facilitation can sometimes be significant. That is also the case with the implementation of paperless trade. As a result, Aid for Trade and capacity building to support the reform process have to be an integral part of ongoing discussions. The key for policymakers going forward will be to combine reformist will with adequate human, technical, and financial resources. A strong regional arrangement on cross-border paperless trade facilitation would certainly help in this regard.

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## Appendix: Detailed Simulation Results

### Scenario 1

Country	Export Time Reduction (%)	Import Time Reduction (%)	Export Gain (%)	Import Gain (%)
Afghanistan	-98	-98	34	34
Azerbaijan	-8	-9	3	3
Bangladesh	-11	-12	4	4
Bhutan	-95	-95	33	33
Cambodia	-69	-75	24	26
China	0	0	0	0
India	-8	-9	3	3
Indonesia	-5	-5	2	2
Japan	0	0	0	0
Kyrgyzstan	-22	-24	8	8
Lao PDR	-23	-25	8	9
Malaysia	-3	-3	1	1
Maldives	-18	-20	6	7
Mongolia	-55	-60	19	21
Myanmar	-33	-36	12	13
Nepal	-37	-40	13	14
Pakistan	-21	-23	7	8
Philippines	-18	-20	6	7
Republic of Korea	0	0	0	0
Russian Federation	0	0	0	0
Samoa	-15	-16	5	6
Singapore	0	0	0	0
Sri Lanka	-7	-7	2	3
Tajikistan	-39	-43	14	15
Thailand	0	0	0	0
Timor Leste	-25	-28	9	10

Country	Export Time Reduction (%)	Import Time Reduction (%)	Export Gain (%)	Import Gain (%)
Turkey	-13	-14	5	5
Uzbekistan	-83	-90	29	31
Viet Nam	0	0	0	0



Scenario 2

Country	Export Time Reduction (%)	Import Time Reduction (%)	Export Gain (%)	Import Gain (%)
Afghanistan	-98	-98	34	34
Azerbaijan	-18	-20	6	7
Bangladesh	-33	-36	12	13
Bhutan	-95	-95	33	33
Cambodia	-94	-94	33	33
China	-11	-12	4	4
India	-19	-21	7	7
Indonesia	-18	-19	6	7
Japan	-8	-9	3	3
Kyrgyzstan	-55	-60	19	21
Lao PDR	-50	-55	18	19
Malaysia	-17	-18	6	6
Maldives	-46	-50	16	17
Mongolia	-97	-97	34	34
Myanmar	-66	-72	23	25
Nepal	-92	-95	32	33
Pakistan	-47	-51	16	18
Philippines	-40	-44	14	15
Republic of Korea	-8	-9	3	3
Russian Federation	-12	-13	4	4
Samoa	-33	-36	12	13
Singapore	-8	-9	3	3
Sri Lanka	-24	-26	8	9
Tajikistan	-86	-94	30	33
Thailand	-15	-17	5	6
Timor Leste	-51	-55	18	19
Turkey	-29	-31	10	11
Uzbekistan	-97	-98	34	34
Viet Nam	-15	-17	5	6

