ESTIMATED GAINS IN TRADE FROM IMPROVEMENT IN TRADE FACILITATION

A. Introduction

1. Nepal needs faster and sustained growth to meet its development goals.[1] Nepal's average annual gross domestic product (GDP) growth since 2002 (3.8%) has been slower than the average growth in the rest of the South Asia Subregional Economic Cooperation (SASEC) countries (6.6%). Nepal's growth during this period has been service-led, followed by agriculture sector as the second biggest contributor to growth. On the expenditure side, remittances-supported consumption has driven growth. Owing to a small manufacturing base, Nepal's imports have historically outstripped exports and balance in goods trade in Nepal has thus been negative. Over time the trade deficit has increased, doubling more than 13.8% in fiscal year (FY) 2000 to 30.3% in FY2016. The decline in export–GDP ratio is mirrored in the decline of the share of manufacturing sector in GDP, from 9.5% in the mid-1990s to 6.5% in 2015. A diversified economic base and a greater share of manufacturing sector will be crucial for Nepal to achieve its economic vision of graduating out of less developed country (LDC) status by 2022 and attaining middle-income status by 2032.

2. Personal remittance inflows increased from 2.0% of GDP in 2000 to 11.2% in 2002 and to 31.8% in 2016. Remittances have played a critical role in keeping Nepal's current account position manageable, bolstering household income and consumption, reducing poverty, and sustaining growth. But they also expose the economy to external shocks and can lead to real effective exchange rate appreciation which hurts competitiveness. Additional sources of foreign exchange earnings are thus needed. Goods export is one possible avenue. Government plans and strategies note that exports currently do not contribute to Nepal's economic development but have the potential to drive economic growth and inclusive development.[2]

3. Several growth diagnostics studies have been undertaken to examine the constraints to growth in Nepal.[3] Constraints identified include: weak governance and policy uncertainty from prolonged political transition, inadequate infrastructure (transport and energy), poor industrial relations and weak human capital, and inability to address market failures in the provision of key inputs. One such missing input from market failure is the adequate provision of soft and hard infrastructure to facilitate movement of goods across borders. The Nepal Trade Integration Strategy (NTIS) 2016, for example, seeks to address trade and competitiveness challenges in the export sector through improved trade and transport facilitation. The recently launched Customs Reform and Modernization Strategy and Action Plan (CRMSAP) 2017–2021 also recognizes the role of trade in economic wellbeing and the importance of trade facilitation, particularly customs reforms and modernization, to improve export performance.[4]

---

[1] A more detailed analysis of Nepal's development context is in Nepal's Development Context and the Role of Trade Facilitation (accessible from the list of linked documents in Appendix 2).

[2] Government of Nepal. Ministry of Commerce. 2016. *Nepal Trade Integration Strategy 2016: Executive Summary and Action.* Kathmandu.

[3] ADB. 2009. *Nepal Critical Development Constraints*. Manila; Millennium Challenge Corporation. 2014. *Nepal Growth Diagnostic*. Washington, DC; and Overseas Development Institute. 2014. *Structural Economic Transformation in Nepal*. London.

[4] Government of Nepal. Ministry of Commerce. 2016. *Nepal Trade Integration Strategy 2016: Executive Summary and Action.* Kathmandu; and Government of Nepal. Ministry of Finance. Department of Customs. *Customs Reform and Modernization Strategy and Action Plan (CRMSAP) 2017–2021.* Kathmandu.

4. It is by now well established in the literature that trade raises national incomes.[5] A recent World Trade Organization (WTO)–Organisation for Economic Co-operation and Development (OECD) report observes that there is "incontrovertible" evidence that trade leads to higher income.[6] Trade is seen as essential for development through transfer of knowledge, technology and skills. Trade also contributes to new and better jobs and improved overall working conditions. In relatively small economies like Nepal, trade plays an additional role by providing access to markets overseas and to sources of supply to meet consumption and investment needs. In case of LDCs like Nepal, imports are a source of technology and high quality intermediate inputs which help make exports more competitive.

5. Tariff barriers have declined through the 1990s and the first decade of 2000s. Alongside, the role of customs administration has evolved from revenue collection to being viewed as facilitators of government policies to promote export and investment. Nontariff barriers are considered the next frontier in addressing the remaining barriers to trade. Trade facilitation has thus moved up the agenda of policy makers. In recognition of this, one such nontariff barrier, namely, trade facilitation is a considered a win–win.[7] This culminated in the conclusion of the new Trade Facilitation Agreement (TFA) at the WTO Ministerial Conference in Bali in December 2013 and in the adoption of a Protocol of Amendment in November 2014 inserting the TFA into the agreement establishing the WTO.

6. Nepal's Parliament approved the decision to accede to the TFA in January 2017. With entry into force of the WTO–TFA on 21 February 2017, Nepal and other acceding members are under time-bound commitments to implement the measures (37 in total) under Section 1 of the TFA.[8] Fifth phase of Nepal's CRMSAP is aligned to its commitments under the WTO–TFA.[9]

7. A modeling exercise was undertaken to estimate the potential gain in Nepal's trade from improvement in its trade facilitation. This Supplementary Appendix provides details of the modeling exercise, its results, and discusses the simulation exercise. As discussed below, several indicators of trade facilitation are available. For the purposes of this exercise, the newly developed trade facilitation indicators (TFI) by the OECD is used.[10]

---

[5] J. Frankel, and D. Romer. Does Trade Cause Growth? *American Economic Review*. 89 (3): 379–399.

[6] WTO–OECD. 2015. *Aid for Trade at a Glance: Reducing Trade Costs for Inclusive, Sustainable Growth 2015*. Geneva.

[7] Trade facilitation, as per World Trade Organization (WTO) definition, is *"the simplification of trade procedures"*, that is, the *"activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade".*

[8] The TFA consists of three sections. Section 1 details the reform measures. The other two sections are: Special and Differential Treatment Provisions for Developing Country Members and Least Developed Country Members (Section 2) and Institutional Arrangements and Final Provisions (Section 3). https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm.

[9] The Supplementary Appendix on Nepal's Compliance with the WTO–TFA provides more details on (i) gaps that exist in meeting WTO–TFA standards based on a recent gap assessment; (ii) correspondence of WTO–TFA with World Customs Organization's revised Kyoto Convention (RKC) and related international standards, and (iii) the six areas (post-clearance audit, advance rulings, pre-arrival clearance, expedited shipment, risk management, and trusted traders program) in which Nepal's commitments need to be met to enable Nepal's Department of Customs to become a modern, paperless, and a risk-based customs.

[10] E. Moïsé and S. Sorescu. 2013. Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade. *OECD Trade Policy Papers*, No. 144. Paris: OECD.

B. Trade facilitation: Nepal and comparators

8. Nepal continues to lag in various indicators of trade facilitation.[11] Some of the widely-used indicators of trade facilitation performance such as the World Bank's Logistic Performance Index (LPI) and the World Economic Forum's Enabling Trade Index (ETI) show that Nepal continues to rank low. For example, on the overall LPI, Nepal was ranked 124th out of 160 countries in 2016. Nepal's score in 2016 for overall LPI and for efficiency of customs clearance is less than the average score of comparator groups. ETI also shows that Nepal ranks low in various indicators of efficiency and transparency of border administration, and the situation has not changed much since 2014. On the other hand, World Bank's ease of trading across borders ranks Nepal relatively higher at 69th out of 190 economies.[12] However, Nepal ranks much lower if time taken to import and export is examined separately and if costs are adjusted for level of development.[13]

9. WTO–TFA, which entered into force in February 2017 after ratification by two-thirds of its members, commits WTO members who have ratified the TFA to achieving current best practices in border management practices and reducing the time and cost of clearing customs. WTO–TFA is thus focused on a well-defined, but what may be considered a "narrow" aspect of trade facilitation. However, most of the trade facilitation indicators discussed above such as the ease of trading across borders, ETI, and LPI, while commonly used indicators, suffer from the drawback that they are "high-level", go beyond border management and customs, and do not cover the same breadth within the space of customs practices.[14] These measures, while they may be correlated with the state of current practices in customs, are not exclusively focused on customs and neither the indicator itself, nor its components, cover the same breadth of custom practices as covered envisaged the WTO–TFA. To fill this gap and to allow for quantification of compliance with the WTO–TFA and to allow for crosscountry comparability, OECD came up with a set of 12 indicators initially (later expanded to 16) under the umbrella of trade facilitation indicators.[15] These indicators cover different aspects of border management such as advance rulings, appeals procedures, fees and charges, and transit facilitation in case of land-based trade. The full list of indicators and its description is in Table 1. To quantify the state of customs practices, OECD identifies a wide range, a total of 97, of border management and customs practices and procedures and places them into these 16 baskets. Appendix Table A1 lists the practices covered under the various OECD–TFI indicators. Based on a detailed study of custom practices in the 16 areas, and in some cases supported by secondary data, OECD then scored procedures as 0 (worst), 1, or 2 (best). Scores on the individual policies within each of the 16 areas was then averaged to come up with score for each indicator for each country.[16]

---

[11] The Supplementary Appendix on Nepal's Development Context and the Role of Trade Facilitation provides a more detailed discussion of Nepal's performance on various trade facilitation indicators. This paragraph provides only a summary.

[12] In 2014, Nepal ranked 171st out of 189 economies. The improvement in ranking is partly due to implementation of Automated System for Customs Data (ASYCUDA) World and partly due to change in methodology of how economies are ranked in the ease of trading across borders.

[13] The Supplementary Appendix on Nepal's Development Context and the Role of Trade Facilitation provides more details on the comparisons of time and cost component of the World Bank's ease of trading across borders.

[14] R. Hillberry and X. Zhang. 2015. Policy and Performance in Customs Evaluating the Trade Facilitation Agreement. *Policy Working Paper Series* # 7211. Washington, DC: World Bank.

[15] E. Moïsé T. Orliac, and P. Minor. 2011. Trade Facilitation Indicators. *OECD Trade Policy Papers*, No. 118. Paris: OECD; and E. Moïsé and S. Sorescu. 2013. Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade. *OECD Trade Policy Papers*, No. 144. Paris: OECD.

[16] OECD–TFI data for 2012 and 2015 used for the analysis was shared by Silvia Sorescu of the OECD. The database comprised country level average for 11 of the 12 indicators. The 12th indicator is "Consularization" which contains information on consular transaction requirements, but data from OECD does not include this indicator as only 59 developing countries have the required information, and only 22 of these currently impose consular transaction requirements. The data is available for 2012 and 2015 and covers 132 and 163 countries, for each year, respectively.

Table 1: Short Description of Organisation for Economic Co-operation and Development Trade Facilitation Indicators

Indicator	Description
A. Information availability	Refers to both web-based and other forms of publications about customs and border-related rules and procedures, including transparency mechanism, such as enquiry points
B. Involvement of the trade community	Refers to consultations between traders and the government to ensure the involvement of the trade community to the design and operation of border-related policies and procedures
C. Advance rulings	Refers to prior statements by the customs administration to requesting traders concerning the classification, origin, valuation method, etc., applied to specific goods at the time of importation; the rules and process applied to such statements
D. Appeal procedures	Refers to the number of basic characteristics of the appeal system, such as, transparency, fairness, accessibility, timeliness, and effectiveness of the applicable rules and outcomes
E. Fees and charges	Refers to publicly available information on applicable fees and charges imposed on exports and imports
F. Formalities—documents	Refers to the simplification of documentary requirements, extent of harmonization of trade documents, and the acceptance of copies
G. Formalities—automation	Refers to automated border, electronic interchange of documents, and application of risk management procedures
H. Formalities—procedures	Refers to single windows, pre-arrival processing, physical inspections, post-clearance audits, separation of release from clearance, and the concept of authorized traders, among others
I. Border agency cooperation—internal	Refers to cooperation between agencies, control delegation, and regular meetings held at the national level
J. Border agency cooperation—external	Refers to alignment of work hours, alignment of procedures and formalities, development and sharing of common facilities, and joint controls with bordering and third countries
K. Consularization	Refers to information on consular transaction requirements.
L. Governance and impartiality	Refers to a list of good governance characteristics, including clearly established and transparent structures and functions, the existence of a Code of Conduct and an ethics policy, internal audits, and transparent provisions for financing and for internal sanctions in the customs administration
M. Transit fees and charges	Refers to publicly available information on applicable fees and charges imposed on transit fees and charges
N. Transit formalities	Refers to information on transit formalities and documentation, transit infrastructure, single windows for transit trade, pre-arrival processing for transit trade, physical inspection
O. Transit guarantees	Refers to the kind of guarantees required, amount of guarantee, whether or not supported by some form of agreement, timeliness and full release of guarantee, and use of convoys
P. Transit agreements and cooperation	Refers to existence of bilateral or multilateral agreements supporting transit trade, simplification of documentation, and cooperation between agencies of the countries involved

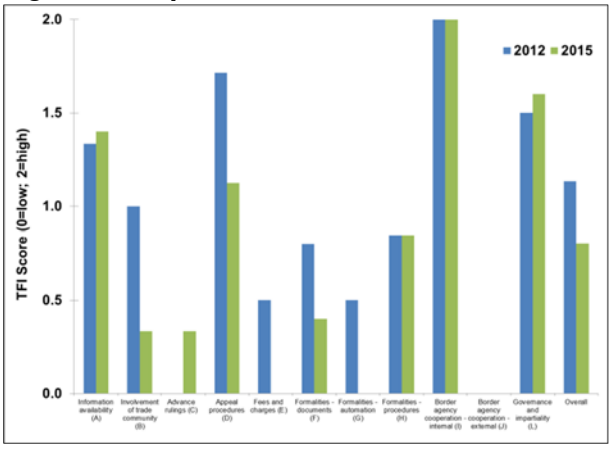
Sources: E. Moïsé and S. Sorescu. 2013. Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade. *OECD Trade Policy Papers*, No. 144. Paris: OECD; and E. Moïsé and S. Sorescu. 2015. Contribution of Trade Facilitation Measures to the Operation of Supply Chains. *OECD Trade Policy Papers*, No. 181. Paris: OECD.

10. As previously mentioned, OECD's motivation behind developing yet another set of indicators to track trade facilitation was precisely in anticipation of the WTO–TFA. The existing measures did not allow an in-depth analysis of customs practices and the idea was that the new set of indicators would allow tracking progress over time and across countries in border management and customs practices once the WTO–TFA entered into force. Thus, from the beginning, each of the indicators under TFI was closely linked with trade facilitation measures under the WTO–TFA. Initially they were mapped into the "Draft Consolidated Negotiating Text" and since then different mappings with the actual WTO–TFA have been proposed (Appendix

Table 2). The OECD–TFI was designed to measure and understand the economic and trade impact of trade facilitation measures across different dimensions.

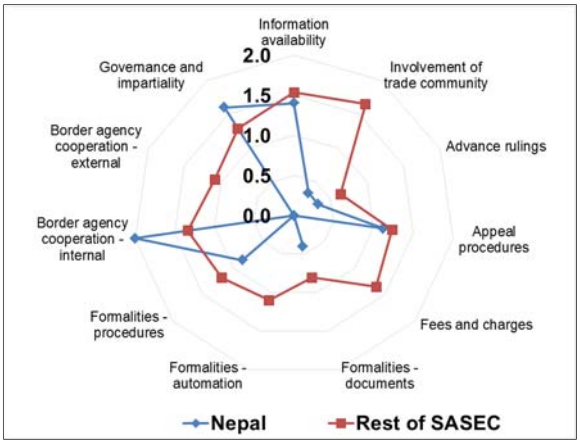
11. Nepal's performance in OECD–TFI shows a decline. While OECD's official database does not report an "overall" measure of trade facilitation, it is possible to construct using a simple average of 11 of the first 12 components (consularization is not included). Indicators related to transit trade are not considered as they were not included in 2012. The 11 components are measured on a scale of 0 to 2, with 2 being the best performance on trade facilitation and 0 being the worst. Thus, the overall TFI also varies from 0 to 2. In 2015, Nepal's overall TFI was 0.804, lower than overall score of 1.133 in 2012. Between 2012 and 2015, Nepal's score improved in terms of information availability and governance and impartiality, but dropped in terms of most other indicators (Figure 1). In 2015, Nepal ranked 101st out of 130 non-OECD economies in the OECD–TFI database. OECD's TFI show that with a score of 0.8 in 2015, Nepal is ranked lowest among SASEC countries on the overall TFI.[17] On the various components of TFI, Nepal performs well compared to SASEC in terms of border agency cooperation (internal), and governance and impartiality (Figure 2). On the remaining indicators, however, Nepal's score is lower than average of SASEC.

Figure 1: Nepal's TFI Scores: 2012 and 2015



TFI = trade facilitation indicator
Note: Overall TFI is the simple average of the rest of the indicators.
Source: Organisation for Economic Co-operation and Development. http://www.oecd.org/trade/facilitation/indicators.htm (accessed 06 January 2017).

Figure 2: Overall TFI Scores: Nepal and Rest of SASEC, 2015



SASEC = South Asia Subregional Economic Cooperation, TFI = trade facilitation indicator.
Note: Data for "Rest of SASEC" is a simple average of the score of each TFI for Bangladesh, Bhutan, India, Maldives, and Sri Lanka. Data for Nepal's border agency cooperation – external is reported as "n.a." implying scarce unavailability of information.
Source: Organisation for Economic Co-operation and Development. http://www.oecd.org/trade/facilitation/indicators.htm (accessed 06 January 2017).

C. Methodology: Background, Estimation Issues, and Specification

12. The two most widely used approaches to estimate the effect of policies such as improvement in trade facilitation on trade flows are the gravity model and the computable general

[17] Overall TFI score of other South Asian countries in 2015 is: India (1.5), Sri Lanka (1.4), Bangladesh (1.1), the Maldives (1.1), and Bhutan (0.9).

equilibrium (CGE) model.[18] Introduced by Tinbergen (1962), the gravity model postulates that trade between two countries is directly related to their size (mass and inversely related to the trade costs between them (distance).[19] It is this analogy with mass and distance and the similarity of its relation with trade that gives it, borrowing from the Newton's Law of Universal Gravitation, the name "gravity model".[20] The gravity model uses actual trade data to establish an ex post relationship between bilateral trade flows and determinants of trade. This estimated relation is then used to simulate ex ante effects of policies.

13. For the purposes of the program impact assessment, gravity framework, the standard model used in empirical trade, is used to assess the relationship between bilateral trade flows and trade facilitation as captured by border management and customs procedures. OECD's new indicator, the TFI, which focuses on custom practices, is used as a measure of trade facilitation as they can be mapped into the various tenets of the WTO–TFA (Appendix Table A2). Gravity framework, by now well founded in theory, provides a framework to analyze the determinants of bilateral trade flows.[21] Gravity model provides a framework which establishes a relationship between bilateral trade flows and its determinants. The latter includes country-pair characteristics such as distance, participation in a common preferential trading agreement, common language, common border, common colonizer, tariff, and landlockness; and country specific characteristics such as size and level of development. For the purposes of this exercise the model is augmented with OECD–TFI to estimate the impact of trade facilitation on trade flows.

14. The starting point of the estimating equation for the gravity model is the theoretical framework provided of Anderson and van Wincoop.[22] The details of the theoretical foundations are beyond the scope of this note.[23] The theoretical framework yields the following log-linearized gravity equation:

$$\ln x_{ij} = \ln E_j + \ln Y_i - \ln Y^W + (1-\sigma)\ln t_{ij} - (1-\sigma)\ln P_j - (1-\sigma)\ln \Pi_i + \varepsilon_{ij} \qquad (1)$$

[18] Another commonly used framework is the computable general equilibrium (CGE) model. CGE models seek to model the behavior of economic actors taking into account interdependence among them and reproduce observed data for a reference year. The model is then subject to policy shocks which reproduces a counterfactual scenario. Difference between reference and counterfactual scenarios is the effect resulting from policy change.

[19] J. Tinbergen. 1962. *Shaping the World Economy: Suggestions for an International Economic Policy*. New York: The Twentieth Century Fund.

[20] The gravity model is considered to be a partial equilibrium analysis (i.e., examines the direct impact of trade facilitation on trade flows ignoring the impact on other sectors of the economy and their positive or negative impact on trade flows). CGE, on the other hand, as the name suggests, is a general equilibrium approach and it captures how the economy is affected by policy changes directly and indirectly by taking into account interdependence among all economic entities in an economy. The modeling exercise undertaken here uses only gravity model framework and a CGE model was not calibrated. However, a recent report from WTO argues that estimated changes in trade may not differ much between those from partial equilibrium gravity model and the CGE models in case of nondiscriminatory policy measures, such as trade facilitation reforms, which reduce trade cost for all trading partners as opposed to those which are not, such as a preferential trade agreement which benefits only the members.

[21] For a long time, gravity model was based on this intuitive relation between bilateral trade, distance, and size. However, recently much attention has been dedicated to building theoretically-grounded gravity models. Early theoretical framework, based on demand-driven model, was provided by Anderson (1979) and the recent work builds on it. Anderson and van Wincoop (2003), which build on Anderson (1979), but emphasis on theoretically-grounded models were seriously considered in the literature only since the "gravity with gravitas" model of Anderson and van Wincoop (2003). J. Anderson. 1979. A Theoretical Foundation for the Gravity Model. *American Economic Review*. 69 (1): 106–116; and J. Anderson and E. van Wincoop. 2003. Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*. 93 (1): 170–192.

[22] This can be found in, for example, B. Shepherd 2012. *The Gravity Model of International Trade: A User Guide*. Bangkok: UNESCAP.

[23] J. Anderson and E. van Wincoop. 2003. Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*. 93 (1): 170–192.

Where, ln is natural logarithm, x_{ij} is the exports from country *i* to country *j*, E_j is the total expenditure in the country j, Y_i is the value of total output in country, Y^W is the total value of total output in all countries in the world, t_{ij} is the bilateral trade cost *function*[24] for exporting from country *i* to country *j*, σ is the intrasectorial elasticity of substitution between product varieties, and ε_{ij} is the random error term. Finally, P_j and Π_i are referred to as the "multilateral resistance" which account for the fact that trade between two countries depends not only on the bilateral trade costs but also on that bilateral cost relative to the cost of trading with all other countries in the world.[25] Omission of the multilateral resistance term from gravity framework may lead to what is referred to as an "omitted variable bias" in the standard gravity model. It has thus become commonplace to correct for this problem. This is discussed later.

15. Standard practice in empirical trade literature is to proxy bilateral trade cost function with a set of observable variables which are by now considered to be standard covariates in empirical applications of gravity model. This trade cost function takes the following form:

$$(1-\sigma)\ln t_{ij} = \beta_1 \ln dist_{ij} + \beta_2 contig_{ij} + \beta_3 comlang\_off_{ij} + \beta_4 colony_{ij} + \beta_5 comcol_{ij} + \beta_6 landlock_{ij} + \beta_7 RTA_{ij} \quad (2)$$

Where $\ln dist_{ij}$ is the natural logarithm of bilateral distance between trading partners *i* and *j*, $contig_{ij}$ is a binary (dummy) variable which takes the value 1 if the trading partner *i* and *j* share a common border and 0 otherwise, $comlang\_off_{ij}$ takes the value 1 if the trading partner *i* and *j* share a common official language and 0 otherwise, $colony_{ij}$ takes the value 1 if the trading partner *i* was a colony of *j* or vice-versa and 0 otherwise, $comcol_{ij}$ takes the value 1 if the trading partner *i* and *j* shared a common colonizer and 0 otherwise, $landlock_{ij}$ takes the value 1 if either of the trading partner *i* or *j* or both is landlocked and 0 otherwise, and RTA_{ij} takes the value 1 if the trading partner *i* and *j* are in shared regional trade agreement and 0 otherwise.

16. Two approaches are commonly used to correct for multilateral resistance. First is to use the country-level fixed effects in the estimating equation. This has the disadvantage that any country specific policy variable such as TFI cannot be included in the model. To get around this, as shown below, TFI used for estimation is constructed as a bilateral variable. Second, a simplified multilateral resistance term for each of the cost variables in the trade cost function (equation [2]) is calculated and subtracted from the original variable of the corresponding term to obtain the multilateral resistance term adjusted trade cost variables as shown below in equation (3).[26]

$$Z_{ij}^{*} = Z_{ij} - \left(\sum_{j=1}^{N} \theta_j Z_{ij} + \sum_{i=1}^{N} \theta_i Z_{ji} - \sum_{i=1}^{N}\sum_{j=1}^{N} \theta_i \theta_j Z_{ij}\right) \quad (3)$$

[24] As will be made clear subsequently, t_{ij} refers not just to the transport costs but any factor that creates a friction to trade between two countries and is hence referred to as "function".

[25] This was one of the key contributions of Anderson and van Wincoop (2003, see footnote 23).

[26] This is done by taking a log-linear Taylor expansion, as proposed by Baier and Bergstrand (2009), of the multilateral resistance terms defined by Anderson and Van Wincoop (2003). J. Anderson and E. van Wincoop. 2003. Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*. 93 (1): 170–192; and S. Baier and J. Bergstrand. 2009. Bonus Vetus OLS: A Simple Method for Approximating International Trade Cost Effects using the Gravity Equation. *Journal of International Economics*. 77 (1): 77–85.

Where, Z_{ij} is the bilateral trading cost variable in equation (2) such as log distance, contig, and so on. θ_j and θ_i are weights, these could be GDP-weights or simple average. Estimations and simulations based on both average are reported here.[27]

17. Gravity framework used for estimation is obtained by combining equations (1) and (2). It is then augmented with tariffs and the preferred measured of trade facilitation. The latter in this case is the OECD's TFI. "Overall" TFI which is the simple average of the 11 original indicators (indicators A-L in Table 1) is used as the measure of TFI. The bilateral TFI for exporter country *i* and importer country *j* is calculated as the geometric mean of their respective overall average TFIs: $TFI_{ij} = \sqrt{TFI_i \times TFI_j}$, where TFI_{ij} is the bilateral TFI, $TFI_i$is the overall TFI of exporter country *i*, and TFI_j is the overall TFI of exporter country *j*.[28] The estimating equation is as follows:

$$\ln x_{ij} = \beta_0 + \beta_1 \ln dist_{ij} + \beta_2 contig_{ij} + \beta_3 comlang\_off_{ij} + \beta_4 colony_{ij} + \beta_5 comcol_{ij} + \beta_6 landlock_{ij} + \beta_7 RTA_{ij} + \beta_8 \ln(1 + tariff_{ij}) + \beta_9 TFI_{ij} + \beta_{10} \ln GDP_i + \beta_{11} \ln GDP_j + \varepsilon_{ij} \quad (4)$$

Where, $tariff_{ij}$ is the total average tariff on imports by country j from country i, GDP_i is gross domestic product of country *i* and is used as proxy for total value of output (Y_i), and GDP_j is gross domestic product of country *j* and is used as proxy for total value of output (E_j). Sign of distance, tariff, and landlock coefficients is expected to be negative, i.e., bilateral trade varies inversely with distance between the trading partners, tariff, and if either or both the countries are landlocked. Sign of all other coefficients is expected to be positive, i.e., bilateral trade is higher if trading partners share a common border, common official language, had a common colonizer, or if one was the colony of the other, and are in some kind of a regional trading agreement (the latter could take the form of a free trade agreement, customs union, economic integration agreement, and or partial scope agreement). Bilateral trade is also expected to be more, bigger are one or both the trading partners. Finally, improved customs management in trading partners is expected to lead to higher bilateral trade.

18. The gravity model is usually estimated in a log-normal specification as specified in equation (4) using the ordinary least squares (OLS) estimator. Under the OLS estimation of a log-normal specification, zero trade observations, that is, for country pairs that do not trade, are not considered since they are dropped from the estimation sample. The most frequent and conveniently used solution to this is adding a small value to all trade (e.g., adding 1 to trade data) before taking the logarithm. However, more recently, Poisson Pseudo-Maximum Likelihood (PPML) estimator is used instead has become the preferred choice of estimation to address the issue of zero trade.[29] PPML estimator also helps deal with heterogeneity in trade data.

D. Data

19. Data used for estimating equation (4) is collated from different sources. The description and source are in Table 2.

---

[27] S. Baier and J. Bergstrand. 2009. Bonus Vetus OLS: A Simple Method for Approximating International Trade Cost Effects using the Gravity Equation. *Journal of International Economics*. 77 (1): 77–85; and B. Shepherd. 2012. *The Gravity Model of International Trade: A User Guide*. Bangkok: UNESCAP.

[28] E. Moïsé and S. Sorescu. 2013. *Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade*. O*CED Trade Policy Papers*, No. 144. Paris: OECD.

[29] J. Santos Silva and S. Tenreyro. 2006. The Log of Gravity. *Review of Economics and Statistics*. 88 (4): 641–658.

Table 2: Variable and Data Source

Variable	Source
Trade(x_{ij})	Bilateral trade is taken from BACI dataset provided by CEPII. Data are in current dollars. Data for 2014 is used. Bilateral trade not shown in the dataset is taken as zero trade.
Preferential and regional trade agreements (RTA_{ij})	Indicator whether both countries *i* and *j* are part of the same Customs Union, Free Trade Agreement, Economic Integration Agreement, or Preferential Trade Agreement. The bilateral database is from Mario Larch's Regional Trade Agreements Database from Egger and Larch (2008).[30]
Tariff ($tariff_{ij}$)	Weighted average of effectively applied tariffs to imports. The effectively applied rate is equal to the MFN Applied tariff unless a Preferential tariff between the trading partners exists. It is defined as the minimum tariff granted by a reporter to a partner. The bilateral tariff rate is the average for all goods and is sourced from TRAINS via WB–WITS.
Trade facilitation (TFI_{ij})	OECD Trade Facilitation Indicators for 2015 are used.
GDP and GDP per capita	World Development Indicators. Data for 2013 is used.
Trade cost variables	Data on distance ($dist_{ij}$), common language ($comlang\_off_{ij}$), common border($contig_{ij}$), colonial relations($colony_{ij}$ and $comcol_{ij}$), and landlocked is from CEPII.

CEPII = Centre d'Etudes Prospectives et d'Informations Internationales, GDP = gross domestic product, MFN = most favored nation, OECD = Organisation for Economic Co-operation and Development, TRAINS = Trade Analysis Information System, WB–WITS = World Bank–World Integrated Trade Solutions.
Source: Asian Development Bank (ADB), South Asia Regional Cooperation and Operations Coordination (SARC) Division.

E. Estimation Results

20. Table 3 presents estimated coefficients obtained from the estimation of equation (4) using cross-sectional bilateral trade flow data for 2014. All the bilateral trade cost terms are adjusted for multilateral resistance as shown in equation (3). Columns 1, 2, and 5 show the basic gravity model without the measure of TFI. Column 1 shows estimation results using an OLS estimator and Columns 2 and 5 use PPML estimator. Statistically significant coefficients are signed as expected. OLS estimator is unable to account for zeros in trade flows which are dropped from the regressions yielding biased estimates using OLS. This can be seen when coefficients in Column 1 are compared to those in Columns 2 and 5. The absolute value of coefficients in Column 1 is higher than those estimated using PPML estimator for the same specification as reported in Columns 2 and 5. For reasons discussed above, PPML is the preferred estimator and is used for estimations reported in other columns. Subsequently, in Columns 3, 4, 6, and 7, the key variable of interest, bilateral trade facilitation (TFI_{ij}) is introduced. In Columns 2–4, multilateral adjustment is done using GDP weights, while in Columns 5–7 simple weights are used. Equation (4) is estimated using both TFI_{ij}, in level (Columns 3 and 6) and in logs (Columns 4 and 7).

21. Coefficient on (log) distance is negative and statistically significant and the size of the coefficient is in the range reported by other studies, confirming that distance remains a significant barrier to trade. Results in Columns 2–4 show that the impact of sharing a common border, having a common colonizer, sharing a colonial relationship, and participation in a common regional trade agreement with the partner country has positive and statistically significant effect on bilateral trade flows. Statistical significance of the coefficients related to colonial links disappears in Columns 5–7 when simple averages are used for multilateral resistance terms. GDP of exporter and importer

[30] P. H. Egger and M. Larch. 2008. Interdependent Preferential Trade Agreement Memberships: An Empirical Analysis. *Journal of International Economics*. 76 (2): 384–399. http://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html (accessed 12 December 2016).

is positive and statistically significant in all specifications. Coefficient of the landlocked variable is negative but statistically significant only in columns 1 and 2.

Table 3: Estimation Results

Dependent variable: exports from country *i* to country *j*							
	OLS	**PPML**					
		GDP weights for MR			**Simple averages for MR**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Ln(distance)	–1.157	–0.732	–0.715	–0.715	–0.655	–0.648	–0.647
	(0.028)***	(0.052)***	(0.052)***	(0.052)***	(0.055)***	(0.054)***	(0.054)***
Common Border	0.831	0.484	0.504	0.506	0.357	0.368	0.372
	(0.105)***	(0.168)***	(0.172)***	(0.172)***	(0.175)**	(0.178)**	(0.178)**
Common Language	0.315	–0.056	–0.056	–0.052	0.181	0.174	0.173
	(0.053)***	(0.130)	(0.131)	(0.131)	(0.164)	(0.163)	(0.163)
Common Colonizer	0.749	0.682	0.728	0.736	–0.009	–0.042	–0.048
	(0.071)***	(0.177)***	(0.175)***	(0.175)***	(0.308)	(0.320)	(0.321)
Colony ($colony_{ij}$)	0.786	0.278	0.287	0.287	0.134	0.129	0.130
	(0.089)***	(0.118)**	(0.121)**	(0.120)**	(0.125)	(0.127)	(0.127)
Landlocked ($landlocked_{ij}$)	0.215	–0.444	–0.330	–0.329	–0.386	–0.379	–0.375
	(0.113)*	(0.198)**	(0.211)	(0.210)	(0.242)	(0.235)	(0.234)
Exporter GDP (GDP_i)	1.207	0.831	0.805	0.804	0.783	0.773	0.770
	(0.008)***	(0.025)***	(0.026)***	(0.026)***	(0.029)***	(0.030)***	(0.030)***
Importer GDP (GDP_j)	0.979	0.810	0.779	0.778	0.754	0.741	0.739
	(0.008)***	(0.026)***	(0.031)***	(0.031)***	(0.026)***	(0.031)***	(0.030)***
Ln(tariff)	–0.316	–0.053	–0.023	–0.023	0.011	0.022	0.024
	(0.017)***	(0.046)	(0.045)	(0.045)	(0.043)	(0.043)	(0.043)
RTA (RTA_{ij})	0.409	0.235	0.251	0.252	0.286	0.287	0.287
	(0.041)***	(0.099)**	(0.099)**	(0.099)**	(0.084)***	(0.084)***	(0.084)***
TFI (TFI_{ij})			0.699			0.299	
			(0.172)***			(0.171)*	
Log(TFI_{ij}**)**				0.985			0.485
				(0.219)***			(0.214)**
Constant	–14.223	–6.790	–7.079	–6.384	–6.335	–6.460	–6.136
	(0.152)***	(0.545)***	(0.540)***	(0.605)***	(0.586)***	(0.575)***	(0.631)***
Number of observations	17,412	20,922	20,922	20,922	20,922	20,922	20,922
R-squared	0.67	0.64	0.63	0.63	0.59	0.58	0.58

GDP = gross domestic product, ln = natural logarithm, MR = multilateral resistance, OLS = ordinary least squares, PPML = Poisson Pseudo-Maximum Likelihood, RTA = regional trade agreement, TFI = trade facilitation indicator.

Notes:

1. Trade cost variables shown in equation (2) are adjusted for multilateral resistance using the procedure shown in equation (3).
2. Robust and clustered (on importer-exporter pair) standard errors are shown in parentheses below the respective coefficients.
3. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Source: ADB, SARC.

22. Improved customs management and border procedures, as captured by the bilateral TFI, is associated with higher bilateral trade flows. Key variable of interest is the bilateral trade facilitation (TFI_{ij}). Estimation results show that the coefficient is positive and statistically significant, i.e., better border management and customs procedures, in either exporter or importer or both, that contribute to higher values of TFI_{ij}, is associated with higher trade flows. This holds whether TFI_{ij} is measured in levels or logs.

F. Potential Gains in Trade

23. To estimate potential gains in trade from improvement in customs management and border procedures, estimated equations as reported in columns 3–4 and 6–7 of Table 3 are used. Under the WTO–TFA, countries which have ratified the TFA are time bound to meet their obligations. Different scenarios of improvement in TFI are explored as shown in Column 1 of Table 4. In doing the simulations and estimating gains from trade, Nepal is assumed to benefit not only from an improvement in its own trade but also that of its trading partners. The baseline scenario is that Nepal achieves an "overall" TFI of 1.3 as envisaged under CRMSAP 2017–2021. Non-OECD countries (except Nepal), with overall TFI less than the current OECD average, improve their respective overall TFI to the current OECD average. Scenarios 2–5 present estimate gain from more ambitious improvements in the overall TFI. In all scenarios, it is assumed that all OECD countries fully meet TFA standards and improve their respective overall TFI to 2.0.

24. Under the baseline scenario, Nepal's exports are expected to increase by 12%–34% using the estimations reported in Table 3. Based on a simple average of the gains from the models, yields an expected increase of 23%. Imports are expected to increase by 11.2%–32.3%, implying an average increase of 21.6%. Table 4 also reports gains in trade from more ambitious progress in customs management and border procedures. Each of the successive scenarios improves the overall TFI score not only for Nepal but also for other countries (mostly non-OECD) as Nepal benefits from an improvement not only in its own customs procedures but also that of its trading partners. The gains in trade reported are against the current trade levels. As the estimated positive relationship between bilateral trade flows and TFI in Table 3 shows, higher levels of TFI are associated with greater increase in exports and imports.

Table 4: Simulation Results: Estimated Gains in Exports and Imports for Nepal

Scenario	Scenario Definition (Higher level of overall TFI assumed are shown)	Expected Increase in Exports and Imports Based on Specification in Table 3 (%)				
		Column 3	Column 4	Column 6	Column 7	Average
Scenario 1 (*baseline*)	-Nepal: 1.3 -Non-OECD: current average of overall TFI of OECD (1.548) if less than that -OECD countries: 2	Export: 30.4 *Import: 28.2*	Export: 34.1 *Import: 32.3*	Export: 12.0 *Import: 11.2*	Export: 15.5 *Import: 14.8*	Export: 23.0 *Import: 21.6*
Scenario 2	-All countries including OECD: 1.5 if less than 1.5	Export: 34.5 *Import: 34.9*	Export: 38.2 *Import: 39.0*	Export: 13.5 *Import: 13.6*	Export: 17.2 *Import: 17.6*	Export: 25.9 *Import: 26.3*
Scenario 3	-Nepal and non-OECD: 1.5 if less than 1.5 -OECD countries: 2	Export: 39.2 *Import: 36.1*	Export: 42.3 *Import: 40.0*	Export: 15.1 *Import: 14.0*	Export: 18.9 *Import: 18.0*	Export: 28.9 *Import: 27.0*
Scenario 4	-Nepal and non-OECD: current average of overall TFI of OECD (1.548) if less than that -OECD countries: 2	Export: 43.3 *Import: 40.4*	Export: 46.1 *Import: 44.2*	Export: 16.6 *Import: 15.6*	Export: 20.5 *Import: 19.7*	Export: 31.6 *Import: 30.0*
Scenario 5	-Nepal and non-OECD: 2 -OECD countries: 2	Export: 88.2 *Import: 90.2*	Export: 81.3 *Import: 83.6*	Export: 31.0 *Import: 31.6*	Export: 34.0 *Import: 34.8*	Export: 58.6 *Import: 60.0*

OECD = Organisation for Economic Co-operation and Development, TFI = trade facilitation indicator.
Source: ADB, SARC.

Appendix Table A1: OECD–TFI and their components

Indicator	Components
A. Information availability	1. Customs has a web site. 2. The rate of duty can be obtained through the customs web site. 3. There are enquiry points to answer reasonable enquiries. 4. It is possible to ask questions of the customs agency, specifically. 5. There is enough information on procedures and required forms and documents. 6. Some documents and forms can be downloaded from the website. 7. There is an interval between the publication of new or amended trade-related laws and regulations, and their entry into force. 8. Agreements with third countries about the above issues are published on the web site. 9. Rules and examples of customs classification are publicly available. 10. Transparency of government policymaking (GCR data).
B. Involvement of the trade community	1. Adequate and timely information on regulatory changes is provided (LPI data). 2. The introduction or amendment of laws and regulations involves consultation with the private sector. 3. Consultations are open to any interested party. 4. Public comments are taken into account.
C. Advance rulings	1. Advance rulings are issued. 2. There is a transparent online request procedure for advance rulings. 3. The number of requests for advance rulings. 4. Duration of the validity of the advance ruling. 5. Publication of average issuance times. 6. Advance rulings of general interest are publicly available. 7. It is possible to request a review of an advance ruling or its revocation/modification. 8. Refusals to issue or revocations of advance rulings are explained/motivated.
D. Appeals procedures	1. Appeals mechanisms exist and are explained on the customs web site. 2. There is possibility of judicial appeal in addition to the administrative appeal. 3. The length of the time limit for appeals, if a limit exists. 4. Information about the motives of the administration's decision is provided. 5. Efficiency of legal framework in challenging regulations (GCR data). 6. Judicial independence (GCR data). 7. Equality of treatment of national and foreign actors (IPD data). 8. Extent of implementation and speed of court rulings in commercial matters (IPD data).
E. Fees and charges	1. Fees and charges are published on the web site. 2. Fees and charges not related to the value of goods. 3. Number and diversity of fees and charges (LPI data). 4. There are no fees for customs services during normal working hours.
F. Formalities (Documents)	1. Customs and other border agencies accept copies of documents. 2. Ratified international conventions on trade facilitation. 3. Number of documents to prepare for import (DB data). 4. Same for exports (DB data). 5. Time necessary to prepare documents for import (DB data). 6. Same for exports (DB data).
G. Formalities (Automation)	1. Share of procedures that can be expedited electronically. 2. Use of risk management. 3. IT systems capable of handling electronic data exchange. 4. Availability of full time (24/7) automated processing in customs. 5. Quality of telecommunications and IT (LPI data).
H. Formalities (Procedures)	1. There is a single window. 2. Average release times for large customs offices are published on a consistent and regular basis. 3. Clearance time in days (LPI data). 4. Pre-arrival processing is implemented. 5. Share of physical inspections (LPI data). 6. Perishable goods benefit from accelerated controls. 7. Efficiency of customs for exports (LPI data). 8. Efficiency of customs for imports (LPI data).

Indicator	Components
	9. Share of post-clearance audits carried out. 10. Separation of release from final determination and payment of customs duties. 11. Perishable goods enjoy preferential treatment concerning the separation of release. 12. No pre-shipment inspection is required on customs matters. 13. Authorized Operator programs LPI data 14. Simplification of procedures (LPI data). 15. Simplification of procedures (DB data). 16. Working hours of customs personnel are adapted to commercial needs. 17. Mandatory use of a third-party customs broker is not required.
I. Border agency cooperation (internal)	1. Cooperation between domestic agencies on the ground (IPD data). 2. Government agencies delegate controls to customs authorities. 3. Regular meetings are held to improve cooperation, and the private sector is included.
J. Border agency cooperation (external)	1. Working days and hours are aligned with other neighboring countries. 2. Procedures and formalities are aligned with other neighboring countries. 3. Common facilities are developed and shared with other neighboring countries. 4. There are joint controls with neighboring countries.
K. Consularization	1. The country does not impose consular transaction requirements.
L. Governance and impartiality	1. Structure and functions of the Customs agency are publicly available. 2. Code of conduct is published and made available to all employees. 3. Information on disciplinary procedures and penalties for misconduct are publicly available. 4. Ethics policy is consistent with international norms and a help desk exists to guide staff on ethical issues. 5. The mechanisms for financing customs are legally defined and information is publicly available. 6. An audit function for internal systems is established, adequately empowered and operational. 7. Annual customs reports are available and contain sufficient information on customs activities. 8. Frequency of irregular payments and bribes (GCR data).
M. Transit fees and charges	1. Information on transit fees and charges are available. 2. There is prior publication of transit fees and charges. 3. Periodic review of fees and charges and adaptation to changed circumstances are available. 4. Transit fees and charges are evaluated.
N. Transit formalities	1. Information on transit formalities and documentation are available. 2. There is periodic review and adaptation to changed circumstances. 3. Physically separate border-crossing facilities/infrastructure for transit is established. 4. Limited physical inspection of goods and use of risk assessment. 5. Quality controls or technical standards are applied. 6. Pre-arrival processing for transit trade. 7. Single window for transit trade established.
O. Transit guarantees	1. Multiple forms of guarantees accepted (bonds, refund, guarantee). 2. Guarantees are limited to the value of duties and charges. 3. Guarantees supported by regional or international agreements. 4. Prompt and full release of the guarantee. 5. Use of customs convoys.
P. Transit agreements and cooperation	1. Bilateral or regional agreements available. 2. Agreements on common simplified documents established. 3. Transit Cooperation established.

DB = Doing Business (Trading Across Borders), GCR = Global Competitiveness Report, IPD = Institutional Profiles Database, IT = information technology, LPI = logistics performance index, OECD = Organisation for Economic Co-operation and Development, TFI = trade facilitation indicator.

Sources: Primary source is E. Moïsé and S. Sorescu. 2013. Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade. *OECD Trade Policy Papers*, No. 144. Paris: OECD. Part of the table is sourced from R. Hillberry and X. Zhang. 2015. Policy and Performance in Customs Evaluating the Trade Facilitation Agreement. *Policy Working Paper Series*# 7211. Washington, DC: World Bank.

Appendix Table A2: OECD–TFI and Mapping with the WTO–TFA

	Indicator	Mapping of OECD–TFI with DCNT Rev.18 *(Moïsé et al. 2011)*	Mapping of OECD–TFI with WTO–TFA (as provided by)		
			Beverelli et al. (2015)	*WTO (2015)*	*WEF and GATF (2016)*
A.	Information availability	Articles 1 and 2	Articles 1 and 2	Article 1	Articles 1.1, 1.2, and 1.3
B.	Involvement of the trade community	Article 2	Article 2	Article 2	Articles 2.1 and 2.2
C.	Advance Rulings	Article 3	Article 3	Article 3	Article 3
D.	Appeal Procedures	Article 4	Article 4	Article 4	Article 4
E.	Fees and charges	Article 6.1 and 6.2	Article 6.1 and 6.2	Article 6	Articles 6.1 and 6.2
F.	Formalities – Documents	Articles 7 and 10	Articles 7 and 10	Article 10	Articles 10.1 and 10.2
G.	Formalities-Automation	Articles 7 and 10	Articles 7 and 10	Articles 7 and 10	Articles 7.3 and 7.4
H.	Formalities – Procedures	Articles 5, 7 and 10	Articles 5, 7, and 10	Articles 7 and 10	Articles 7.1, 7.5, 7.6, 7.7, 7.8, 10.1, 10.3, 10.4, 10.5, and 10.6
I.	Cooperation – Internal	Articles 9.1 and 12	Articles 8.1 and 12	Article 8	Article 8
J.	Cooperation – External	Articles 9.2 and 12	Articles 8.2 and 12	Article 8	Article 8
K.	Consularization	Article 8	–	–	–
L.	Governance and Impartiality	–	–	–	–
M.	Transit fees and charges	Article 11	Article 11	Article 11	–
N.	Transit formalities	Article 11	Article 11	Article 11	–
O.	Transit guarantees	Article 11	Article 11	Article 11	–
P.	Transit agreements and cooperation	Article 11	Article 11	Article 11	–

– = no mapping exists in the source, DCNT = draft consolidated negotiating text, GATF = Global Alliance for Trade Facilitation, OECD = Organisation for Economic Co-operation and Development, TFA = trade facilitation agreement, TFI = trade facilitation indicator, WEF = World Economic Forum, WTO = World Trade Organization.

Notes: Details of the WTO–TFA articles are in Nepal's Compliance with the World Trade Organization Trade Facilitation Agreement (accessible from the list of linked documents in Appendix 2).

Source: C. Beverelli, S. Neumueller, and R. Teh. 2015. Export Diversification Effects of the WTO Trade Facilitation Agreement. World Development. *FIW Working Paper* No. 137. Vienna: Research Centre International Economics; E. Moïsé, T. Orliac, and P. Minor. 2011. Trade Facilitation Indicators. *OCED Trade Policy Papers*, No. 118. Paris: OECD; WEF and GATF. 2016. *Global Enabling Trade Report 2016*. Geneva; and WTO. 2015. *World Trade Report 2015—Speeding up Trade: Benefits and Challenges of Implementing the WTO Trade Facilitation Agreement.* Geneva.