



Abstract

Trade Facilitation Indicators: The Impact on Trade Costs

This report presents the findings of the OECD indicators for assessing the economic and trade impact of specific trade facilitation measures in OECD countries. Twelve trade

Table of contents

Executive Summary	5
Trade facilitation indicators: The impact on trade costs.....	7
I. Background and objectives.....	7
II. The structure of the work and the dataset.....	8
III. The impact of trade facilitation indicators on trade flows and trade costs	10
IV. Reflections on the indicators	13
V. Conclusions	26
References	27
Annex 1. The variables.....	29
Annex 2. The trade facilitation indicators: relevance and organisation of the variables.....	45
Annex 3. Gravity specifications	48
Annex 4. Calculation of trade costs.....	51
Annex 5. The trade costs specifications	52
Annex 6. Contribution to the variance	54
Annex 7. Evidence from the us cross database on advance rulings	56
Appendix 1. Correlation between variables within each indicator.....	61
Appendix 2. Correlation matrix.....	65
Appendix 3. Gravity and trade costs regressions	66
Appendix 4. Regressions with all the TFIS.....	70
Appendix 5. Correlation between the tfis and alternative sources	71

Tables

Table 1.	Average standard error among variables	45
Table 2.	Variation for each indicator.....	46
Table 3.	US advance rulings.....	56
Table 4.	US imports and advance rulings.....	57
Table 5.	Regression 1-2 predicting advance rulings ($R^2 = 0.57$)	58

Figures

Figure 1.	Information availability	14
Figure 2.	Enquiry points.....	14
Figure 3.	Opening hours of Customs supports.....	15
Figure 4.	Involvement of the trade community.....	15
Figure 5.	Total number of advance rulings	17
Figure 6.	Number of advance rulings and non-oil/gas imports.....	18
Figure 7.	Set period of time by which an AR is issued.....	19
Figure 8.	Appeal procedures	20
Figure 9.	Procedure cleared electronically	21
Figure 10.	Rate of physical inspections	22
Figure 11.	Post clearance audits.....	23
Figure 12.	Percent of pre-arrival processing	23
Figure 13.	Authorized traders	24
Figure 14.	What are the benefits linked to AT status?.....	24
Figure 15.	Internal border agency co-operation.....	25
Figure 16.	External border agency co-operation.....	25
Figure A7.1.	US advance rulings and US imports (non-oil and gas).....	59

Executive Summary

This paper presents findings from the project designed to develop indicators for assessing the economic and trade impact of specific trade facilitation measures. In particular, twelve trade facilitation indicators (TFIs) have been constructed, corresponding to the main policy areas under negotiation at the WTO. For this first report, the relationship of the TFIs to bilateral trade patterns and trade costs has been studied. The preliminary analysis shows that the TFIs can be exploited in order to identify which areas contribute the most to increases in trade and the greatest reductions in trade costs.

The Trade Facilitation Indicators (TFIs) are consistent with the twelve articles of the WTO Draft Consolidated Negotiating Text on trade facilitation (DCNT), corresponding to twelve large categories of measures included in the negotiations. These twelve indicators are composed of some ninety-eight variables, whose values are drawn from questionnaire replies as well as publicly available data. The relationships between variables in each category were analyzed to identify logical links and attribute different weights according to their relative importance.

Country scores clearly show that the overall performance of countries within each indicator is determined by a handful of critical variables, where we observe the most important disparities between top and bottom performers. These critical variables include information on appeal procedures, advance rulings and penalty provisions for the indicator *information availability*; and, single windows, pre-arrival processing and authorised traders for the indicator covering the e5[(i)-4(1)-4(ng)u5-359(r)-3[-17 m530.1 75nsüelve arti to

greatest contributors: the former have the potential of reducing trade costs by 5.4% and the latter by 3.7%. Other measures that have an important cost reduction potential are *automation* (2.7% in total), and measures to streamline *fees and charges* (1.7%). These are quite significant savings bearing in mind that similar studies have estimated that improvements regarding technical barriers to trade taken as a whole would account for 4.5% of trade cost reductions. If we add all the TFIs together, their cost reduction potential would reach almost 10% of trade costs, which is an estimate consistent with several existing studies on the overall impact of trade facilitation on trade costs.

The use of individual trade facilitation indicators should enable countries to better assess which trade facilitation dimensions deserve priority. Future steps in the work could include refining the analysis in a more sector-specific, firm-specific manner and expanding the analysis to cover countries outside the OECD area, including emerging and other developing countries.

Trade Facilitation Indicators: The Impact on Trade Costs

I. Background and objectives

Trade facilitation refers to policies and measures aimed at easing trade costs by improving efficiency at each stage of the international trade chain. According to the WTO *simplification of trade procedures*”, understood as the *activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade*¹ This is the definition also followed by OECD work on trade facilitation, while wider definitions, such as those used by UNCTAD or APEC, may include customs, transport and transit issues, banking and insurance, business practices and telecommunications. Whatever the definition and scope, existing economic analysis of trade facilitation usually draws on the notion of trade transaction costs and seeks to assess the benefits of (efficiency-enhancing) trade facilitating measures by estimating the costs of inefficiency in the various policy areas influencing the movement of goods. Such analysis

articles

III. The impact of Trade Facilitation Indicators (TFIs) on trade flows and trade costs

Following the construction of the indicators, their relevance and robustness have been tested through gravity and trade costs models. We sought to evaluate which area (indicator) of trade facilitation leads to higher increases in trade and greatest reductions in trade costs, so as to provide advice for prioritizing trade facilitation policies. However, this does not allow organising the indicators in a preferential implementation order (sequencing). In order to do this, additional data on the implementation date of every relevant variable would be needed. This kind of information is not available in the current dataset, but could be sought for inclusion in the future. As the TFIs do not have a sector specific design (even if they should mainly cover goods), regressions were run for the total economy for different sectors at aggregated levels,⁶ but also separately for the manufacturing and agricultural sectors.

The impact of the TFIs on bilateral trade patterns

The relevance of the TFIs was first tested with a gravity equation,⁷ linking trade flows to economic attributes and a series of variables controlling for bilateral costs, such as distance.⁸ This is based on the premise that trade facilitation measures are supposed to increase bilateral trade flows.⁹

A first important observation is that the most (statistically) meaningful results are obtained when all sectors are included.¹⁰ Sector specific analysis shows that the indicators are particularly significant for manufactured goods, but less so for agricultural goods. This is mainly due to the poor reply rate on variables accounting for specificities of agricultural goods (such as the distinction between perishable and non-perishable goods).

When the **manufacturing sector**

regressions account for 0.7% (languages), 0.9% (contiguity) or 33% of cost reductions (distance, which incorporates all transport costs)²⁰. The results are meaningful for

(c) *Advance rulings*

Almost all countries in the sample provide a mechanism for advance rulings, apart from Hong-Kong, China, for which they are irrelevant, as it is a free port.²⁴ However, levels of use are not at all comparable across countries (between 0 and 28 000 requests per year, depending on the country, see Figure 5, although accurate statistics on this issue do not exist in all countries). They may be issued by national or regional offices.²⁵ Existing advance ruling mechanisms mainly concern tariff classification (91.96% on average; within the sample they range from 90 to 100%), the second most important area being origin.²⁶ This is a much more limited scope than the scope of the mandatory advance ruling scheme proposed in the WTO negotiations. The latter may also cover, depending on the outcome of the negotiations, methods used for customs valuation, requirements for duty drawback, use of quotas and the fees and charges applying to a specific good. This means that, based on current data, little can be said about the trade impact of advance rulings in areas other than classification and origin.

The positive results of the indicator on advance rulings are not surprising, as they
s of
predictability, consistency, transparency and reduced disputes. However, the importance of these results in comparison to the other indicators was unexpected, since advance rulings have never before been a subject of significant empirical research by

Figure 7. Set period of time by which an AR is issued



In summary, the significance of advance rulings on trade costs is not a result of correlation with trade volumes, but is likely one of causation. Advance rulings are minimally related to trade volumes. Other factors, such as the complexity of the trade regime and the diversity of products are likely to determine the value (benefit) of advance rulings and their influence on trade volumes. To the extent that advance rulings lower the barriers presented by complex trade regimes, they likely stimulate trade. To the extent advance rulings reduce delays and provide predictability they lower trading costs. At the same time, the construction of the indicator in close relation to WTO negotiating texts may omit other variables of significance for which advance rulings are a strong proxy.

(h) Formalities - procedures

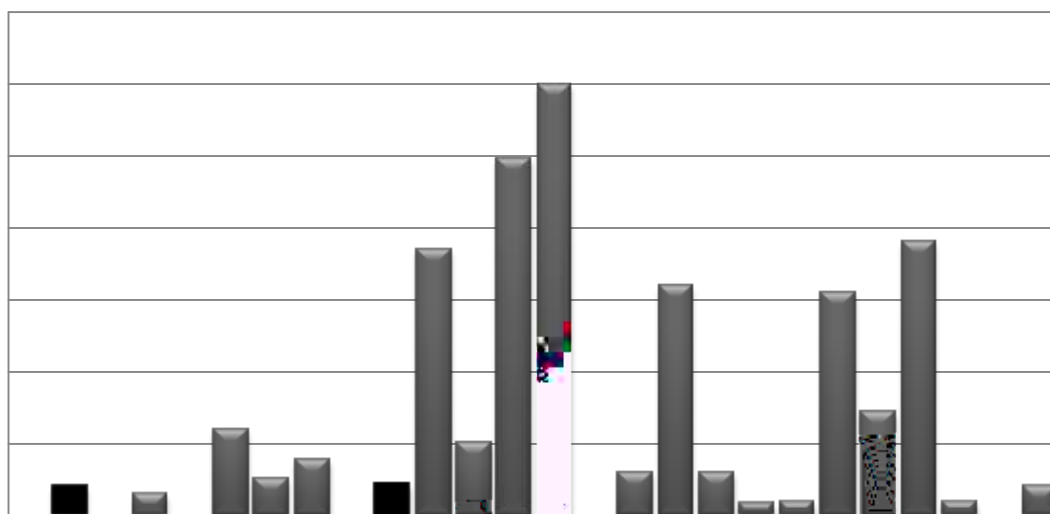
The *Procedures* indicator incorporates a series of very important dimensions of trade facilitation, including single windows, pre-arrival processing, physical inspections, post-clearance audits (PCAs), separation of release from clearance and the concept of authorized traders, all of which play a leading role in indicator (h).

Single Windows are an important trade facilitating measure, which is not yet prevalent in the OECD area. According to the questionnaire only one third of the sample countries use a single window. Presumably for this reason, if more weight is attributed to the *Single Window* variable (V61)³¹ indicator (h) appears to have a greater impact on trade volumes and trade costs.

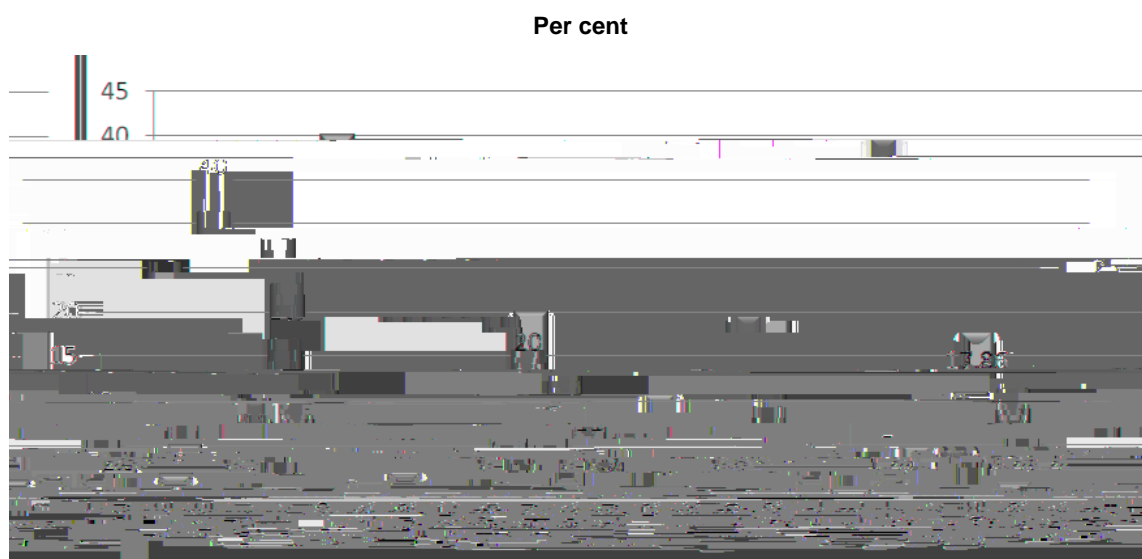
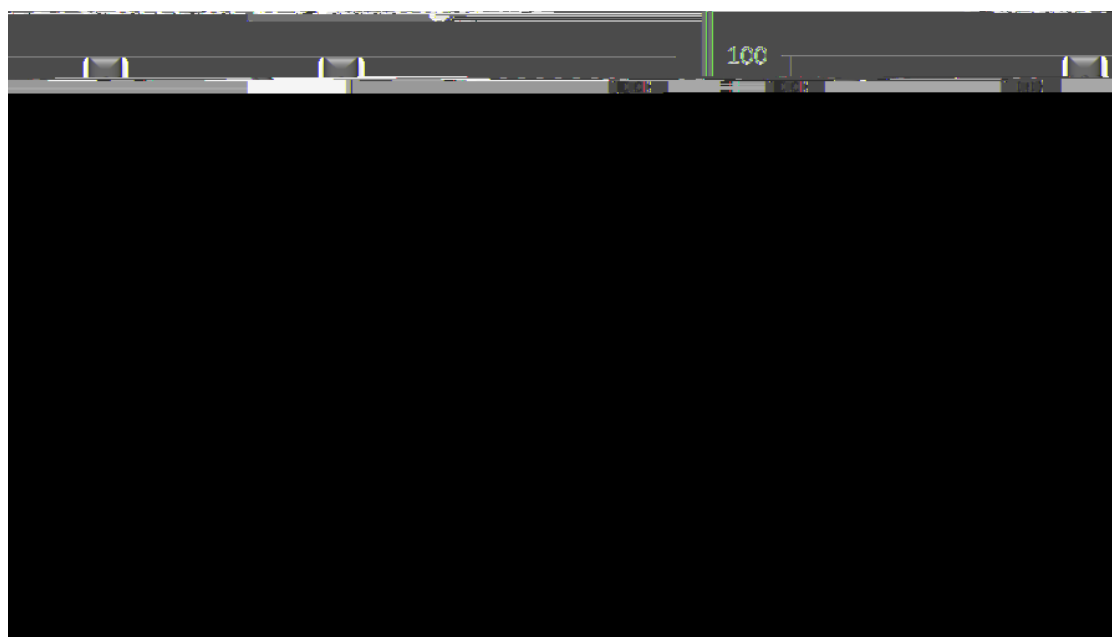
Another interesting dimension is the percentage of physical inspections. The sample presents considerable disparities (Figure 10), even if only one of the responding countries inspects more than 25% of imports. There seems to be no clear relation between the rate of physical inspections and the percentage of post-clearance audits (Figure 11), but the scarcity of data on the latter variable has led us to drop it from the indicator construction at this stage. There seems to be an inverse relationship with the percent of pre-arrival processing, as shown in Figure 12, although information on this variable is still incomplete.

Figure 10. Rate of physical inspections

Per cent of total imports



31. Under the EJ scheme.

Figure 11. Post clearance audits**Figure 12. Percent of pre-arrival processing**

Information on the distinction between perishable and non-perishable goods, is limited. According to replies to the questionnaire, only Italy, Korea, Portugal, Switzerland, and the United Kingdom apply different treatment between perishable and non-perishable goods.

Finally, although information on authorized traders is still incomplete, in the countries which have provided relevant data authorized traders are a limited percentage of total traders but they handle a very significant percentage of total trade (Figure 13). The

(i) *Internal co-operation*

A little less than half of the sample countries provide evidence of significant border agency co-operation both for one-time documentary controls and for co-ordinated physical inspections. As the co-operation between border agencies has been identified in time release studies as an important factor for reducing import lead time, we explored the relation of international cooperation variables to average clearance times. The link was only partially supported by correlation tests.

Figure 15. Internal border agency co-

(k) Consularization

Not surprisingly, none of the sample countries impose consular transaction requirements. The “*procedure of obtaining from a consul of the importing Member in the territory of the exporting Member, or in the territory of a third party, a consular invoice*”

References

- Anderson and van Wincoop (2003), *Gravity with Gravitas: A Solution to the Border Puzzle*, American Economic Review 93(1), 170-92.
- Anderson and van Wincoop (2004), *Trade costs*, NBER Working Paper n°10480, May 2004.
- Baier and Bergstrand (2009), *Bonus vetus OLS: A simple method for approximating international trade-cost effects using the gravity equation*, Journal of International Economics, Vol. 77 No 1, February 2009, pp. 77-85
- Baldwin and Taglioni (2006), *Gravity for dummies and dummies for gravity equations*, NBER Working Paper n°12516, September 2006.
- Chaney (2008), *Distorted gravity: the intensive and extensive margins of International Trade*, American Economic Review, 2008, Vol. 98, No 4, pp. 1707-1721
- Chen and Novy (2009), *International Trade Integration: A Disaggregated Approach*, CEP Discussion Paper No. 908, January 2009
- Eaton and Kortum (2002), *Technology, Geography and Trade*, Econometrica, 2002, 70(5), 1741-1779.
- Helpman, Melitz and Rubinstein (2008), *Estimating Trade Flows: Trading Partners and Trading Volumes*

- OECD (2009b), *Testing the Services Trade Restrictiveness Index: Gravity Regressions and Trade Costs Analysis*, OECD Experts meeting on the services trade restrictiveness Index (STRI), Paris, 2-3 July 2009
- Santos Silva & Tenreyro (2005), *The Log of Gravity*, CEP Discussion Papers 0701, Centre for Economic Performance, LSE
- Shepherd (2008), *Notes on the “theoretical” gravity model of International trade*, Niehaus center, Princeton University & GEM, Sciences-Po, November 2008.
- Shepherd (2009), *Trade Costs and Facilitation in APEC and ASEAN: Delivering the Goods?* Revised, January 19, 2009
- Shepherd and Wilson (2009), *Trade Facilitation in ASEAN Member Countries: Measuring progress and assessing priorities*, Journal of Asian Economics, 20(4), pp.367-383
- Wilson, Mann and Otsuki (2003), *Trade facilitation and Economic development: measuring the impact*, Policy Research Working Paper No. 2988, The World Bank
- World Economic Forum (2009), *The global enabling trade report*,
- Wooldridge (2008), *Econometric Analysis of Cross Section and Panel Data, 2nd Edition*, MIT Press Books, The MIT Press, edition 2, volume 1, December 2008.

Scores follow a multiple binary scheme where the top score (2) generally corresponds to the best performance

Indicator (b) - Involvement of trade community

Variable 19. Communication of policy objectives*

Scale & weight	Definition	DCNT
0 2 *		

Indicator (c) - Advance rulings

Variable 24. Number of advance ruling requests on tariff classification
Scale &

Indicator (e) Fees and charges**Variable 40. Publication of Fees and Charges***

Scale & weight	Definition	DCNT
0 1 2 ***	(0) Information on fees and charges is not published.** (1) Information is available in paper publications (Gazette, Bulletin, Customs Code). (2) Information is displayed on the Customs website (on a dedicated page).	6.1.4

* This variable refers to all fees and charges (other than import/export duties or other than taxes within the purview of GATT Article

Indicator (f) Formalities - documents**Variable 46. Use of copies***

Definition

DCNT

Variable 51. Number of documents for export*

Scale & weight	Definition
0 1 2 **	(0) The number is above the 70th percentile of the sample. (1) The number is between the 30th and 70th percentile of the sample. (2) The number is below the 30th percentile of the sample.

* We refer to the Doing Business indicator [Trading Across the Border – Number of documents to export]. See variable 50 for methodological details.

Variable 52. Number of documents for import - According to Customs*

Scale & weight	Definition
0 1 2 ***	(0) The number is above the 70th percentile of the sample.

Variable 62. Publication of Average Clearance Time

**Scale &
weight**

Variable 69. Treatment of perishable and non perishable goods concerning the separation of release

Scale & weight	Definition
0 2 ***	(0) There is no difference of treatment. (2) There are differences of treatment.

Variable 70. Per cent of releases prior to final determination and payment of Customs duties

Scale & weight	Definition
0 1 2 **	(0) The number is below the 30th percentile of the sample. (1) The number is between the 30th and 70th percentile of the sample. (2) The number is above the 70th percentile of the sample.

Variable 71. Elimination of pre-shipment inspection

Scale & weight	Definition	DCNT
0 2 **	(0) The country requires pre-shipment inspection on Customs matters. (2) No pre-shipment inspection is required on Customs matters.	10.5

Variable 72. Authorized operators* as a percentage of total traders

Scale & weight	Definition	DCNT
0 1 2 **		

Variable 93. Internal systems audit function

Scale & weight	Definition
0 2 ***	(0) There is no internal audit mechanism. (2) An audit function for internal systems is established, adequately empowered and operational.

Variable 94. Transparency and proportionality of non-compliance penalties

Scale & weight	Definition
0 2 **	(0) There is no publicly available information on non-compliance penalties. (2) Systems of non-compliance penalties are transparent and balanced.

The problem is overcome when applying Expert Judgement weighting, e.g. different weights to variables within the indicator.

Variables used in the TFIs are also correlated to other datasets commonly used in indicators such as the World Bank Logistics Performance Index (LPI) and Doing Business (DB), the Global Competitiveness Report (GCR), or the World Competitiveness Yearbook (WCY). This is particularly true for indicators (a) and (b) (*information availability* and *involvement of the trade community*).³⁶ This characteristic could be usefully exploited to undertake robustness checks.

Finally checking for correlations between indicators did not reveal correlation problems for most of the indicators, with the exception of indicator (i) *Cooperation – Internal* and (j) *Cooperation – External* which are negatively correlated with each other.

Dealing with country specificities

In the case of countries where some measures or policies are not applied, the related variables or indicators are dropped. There is only one case where an entire indicator is irrelevant for a country (it concerns advancing rulings for Hong-Kong, China, where no duties exist). This problem generally concerns individual variables only. For example,

Annex 3.

Gravity Specifications

The log-linearized form used by Anderson and Van Wincoop (2003) is:

$$\log(X_{ij}^k) = \log Y_i^k + \log E_j^k - \log Y^k + (1 - \sigma_k) [\log t_{ij}^k - \log \Pi_i^k - \log P_j^k]$$

Their work shows that leaving the multilateral resistance out of an empirical estimation lead to biased estimates. The problem is to assess these two terms, Π_i^k and P_j^k . Different approaches exist: one can use non-linear estimation as in Anderson and Van Wincoop, Taylor series approximation as in Baier and Bergstrand (2009), or the easiest way with a remoteness index or fixed effects. Each method has its positive and negative aspects, for instance fixed effects give unbiased parameter estimates but could include/absorb other invariant key parameters. Finally it is necessary to proxy t_{ij}^k , by ad-hoc (and available) variables as distance. The Global Enabling Trade Report (World Economic Forum *Appendix B*, 2009) provides a good explanation of the usual attributes included in a gravity equation. The previous considerations lead to the following regression:

$$\log(X_{ij}^k) = \alpha + \beta_1 \log(DIST_{ij}^k) + \beta_2 \log(CONTIG_{ij}^k) + \beta_3 \log(LANG_{ij}^k) + \beta_4 \log(COL_{ij}^k) + \beta_5 \log(Y_i^k) + \beta_6 \log(E_j^k) + \beta_7 \log(Y^k) + \beta_8 \log(t_{ij}^k) - \beta_9 \log(\Pi_i^k) - \beta_{10} \log(P_j^k) + \epsilon_{ij}^k$$

Subscripts i , j , k , and t indicate respectively exporting country, importing country, sector, and year.³⁷ The variables are the logarithm of bilateral trade (X_{ij}), the logarithm of bilateral distance (*DIST*) and a series of usual bilateral dummies, common border (*Contig*), common language (*Lang*) and common colony ties (*Col*). In order to deal with the multilateral resistance issues and any unobserved variation over years, we also include country-year fixed effects and year dummies to capture year effects common to all countries. The inclusion of variables that only vary across country pairs prevents us from controlling for country pair fixed effects. Following the same logic, the inclusion of our indicators is incompatible with country fixed effects.³⁸ In order to resolve this problem, the solutions are to run a regression without fixed effects accounting for the

37. TFIs are built for the year 2008 (with the latest information available, covering 2009). In order to enlarge the number of observations, take into account for multilateral resistance and price variation, we run Panels covering 2000-08. One could say that the indicators do not cover this period, but considering the way they were built, they could be viewed as relatively stable over time (at least for some categories). The extension of the indicators (by including implementation data, for example) could be extremely valuable in this case. We also run a cross section

Baseline results are estimated by the Ordinary Least Square (OLS) with robust standard errors. Tables in Annex 8 provide a summary of the results for several sectors. As a robustness check we also report the results obtained by the Poisson Pseudo-Maximum Likelihood estimation (PPML) and a cross section estimation.⁴¹

The remoteness index

The global enabling trade report follows the following construction for the economic remoteness index :

$$REM_i = \sum_{i \text{ to } j} DIST_{ij} \frac{GDP_j}{\sum_{k \neq i} GDP_k}$$

where $\frac{GDP_j}{\sum_{k \neq i} GDP_k}$ is proxied by the share of country j country i and all the other reference year.

41. *PPML* has the advantage of dealing with the heteroskedasticity issue (Wooldbridge 2008) and the presence of zeros (Silva and Tenreyro, 2006). With *PPML*, the gravity model can be estimated in its original multiplicative form, without being log-linearized.

Annex 5.

The Trade Costs Specifications

In our analysis we run the following specifications:

Specification 1 (S1): We introduce an interacted variable of the TFIs as independent variable in the regression. The variables are computed as a geometric mean of both directions.

Specification 2 (S2): We include the country specific TFIs (for country i and country j).

Whatever the specification, in order to calculate trade costs we need specific data, like intra-

$$(4) \quad \tau_{ijt}^k = \beta_0^k + \beta_1^k \ln DIST_{ij} + \beta_2^k Contig_{ij} + \beta_3^k Lang_{ij} + \beta_4^k Col_{ij} + \beta_5^k TFI_{it}^k + D_{ij} + D_t + D_k + \varepsilon_{ijt}^k$$

Subscripts and variables are the same as in the gravity equation. Other variables stand for trade costs (τ_{ijt}^k), the interacted index (TFI_{it}^k) and a country-time dummy (D_{ij}). Tables in Annex 8 provide the results, with OLS estimation and robust standard errors.

Then, we test a second specification, following the previous specification without an interacted index but a country specific index, in order to extract the impact of each country on trade costs. Note that as for gravity regressions, country-pair-time dummies are dropped due to the lack of degree of freedom, so we favour the country-pair dummies. This leads to the following regression (reg5_cp):

$$(5) \quad \tau_{ijt}^k = \beta_0^k + \beta_1^k TFI_j + \beta_2^k TFI_i + D_{ij} + D_t + D_k + \varepsilon_{ijt}^k$$

As for the corresponding gravity equation (2), we are faced with fixed effect issues as the TFIs could account for country-specific fixed effects by construction under such specification. Indeed, as the indicators do not vary across time and are the unique country-specific variables included in the regressions, they could act as fixed effects covering the same dimension. Accordingly, this regression should be used as a complementary tool only.

The trade costs database

The database used by Miroudot, Sauvage and Shepherd (2010) includes the variables needed for the calculation of trade costs at the sectoral level according to the methodology proposed by Chen and Novy (2009). It uses a classification of 29 sectors based on ISIC Rev.3. Domestic trade flows in a given industry are calculated as gross output minus exports. The database covers a wide range of countries and years by

database, Eurostat and the EU-KLEMS project, completed with national sources as well -Output tables. Gross output/value-added ratios are used for some non-OECD economies where no data on gross output are available. Trade data come from the OECD ITCS database for goods and the OECD TISP database for services, completed with UN data for non-OECD countries.

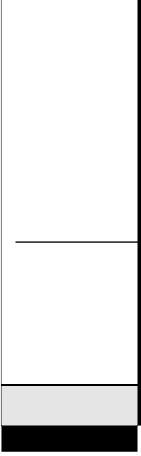
Annex 6.

Contribution to the Variance

The contribution of each explanatory variable (var_m) to the total variance of τ_{ijt}^k is calculated as:

$$c_m = \beta_m^k cov(var_m, \tau_{ijt}^k) / var(\tau_{ijt}^k) \text{ where } \beta_m$$

Table (B)



which may be dependent on tariff classification.⁴⁸ The percent of air freight was included as a proxy for time sensitive products.⁴⁹

Equation A.7-1

$$\text{numar}_k^{2004} = \beta_0 + \beta_1 \text{tradeval}_k^{2004} + \beta_2 \text{advaltar}_k^{2004} + \beta_3 \text{numtarline}_k^{2004} + \beta_4 \text{pctpref}_k^{2004} + \beta_5 \text{pctair}_k^{2004} + \beta_6 \text{numimptr}_k^{2004} + \varepsilon_i$$

Where:

numar= number of advance rulings in HS-2 chapter *k* in 2004

tradeval=trade value in HS-2 chapter *k* in 2004

advaltar=trade weighted ad-valorem MFN tariff in HS-2 chapter *k* in 2004

numtarline=number of HS-8 digit tariff lines in HS-2 chapter *k* in 2004

pctpref= percent of preferential trade in HS-2 chapter *k* in 2004

pctair=percent of air freight in trade in HS-2 chapter *k* in 2004

numimptr=number of importers of record in HS-2 chapter *k* in 2004

The initial results of running equation 1 rejected trade value (*tradeval*) and the percent of trade air freight (*pctair*). Equation A.7-1 was then re-specified as equation A.7-2:

Equation A.7-2 results in an R squared of 0.57. Table 5 summarizes the t statistics and the contribution to variance of each variable to the regression.⁵⁰

Table 5. Regression 1-2 predicting advance rulings (R2 = 0.57)

Name of variable	Abbreviation
------------------	--------------

The results of equation 1 reject trade value as an explanatory factor in advance rulings. Moreover, equation

To further test the relationship between advance rulings and trade, a time series regression was specified relating the growth rate in advance rulings to the corresponding growth rate in trade from one quarter to the same quarter in the following year (quarter-over-quarter). Equation A.7-3 expresses this relationship in growth rates:

$$\Delta \text{numar}^t = \beta_0 + \beta_1 \Delta \text{tradval}^t + \varepsilon_i$$

Where:

$$\Delta \text{numar}^t = \ln(\text{numar}^{t+1}) - \ln(\text{numar}^{t-1}) \quad \Delta \text{tradval}^t = \ln(\text{tradval}^{t+1}) - \ln(\text{tradval}^{t-1})$$

Equation A.7-3 was run for total trade and at the HS chapter level.⁵³ In the overall regression, the quarter-over-quarter logarithmic rate of growth in trade value was significant as a predictor of advance rulings, but explained approximately 5% of the variation in advance rulings over time. When the regressions were run separately at the HS chapter level, a handful of sectors could not reject a relationship between growth rates in advance rulings and the growth rate in trade.⁵⁴ In these cases where the growth in trade value was found significant, it explained less than 10% of the total variance in quarter-over-quarter advance ruling growth rates.

-
53. Equation A.73 was also run at the HS section level, combined, and the R squared was found to be 0.35, however, examination of residuals showed that the estimates were affected by extreme growth rates at both ends of the growth spectrum (negative and positive) with the majority of observations clustered around average growth rates. This is not surprising and supports the fact that as trade disappears or grows extremely rapidly, the number of ARs filed does respond, but not for average growth rates.
54. The sectors for which trade growth was related to advance rulings included textiles and apparel, base metals, headwear and footwear, wood articles and cultured pearls and precious stones.

Appendix 1. Correlation Between Variables Within Each Indicator

TFI (a)	var1	var2	var3	var4	var5	var6	var7	var8	var9	var10	var11	var12	var13	var14	var15	var16	var17	var18
var1																		

TFI (b)	var19	var20	var21	var22	var23
var19	1				
var20	-0.17	1			

Cross-section

The following table provides the results under each specification, in cross-sections (2005), for all sectors.

