Impact assessment of implementing GHS (Globally Harmonised System of Classification and Labelling of Chemicals)

ENTR/05/054

European Commission
Enterprise DG

Final report for work package 2
by London Economics

May 2006

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Executive summary

In July 2003, the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) was formally adopted by the UN ECOSOC. Its aim is to bring together the major world classification and labelling (C&L) systems of chemicals (substances and preparations/mixtures) into a single new system. The main components of the GHS are a globally harmonised classification system for chemical substances and for mixtures/preparations and a globally harmonised system for hazard communication for workers, consumers and in transport. This includes labelling and safety data sheets (SDSs).

Amidst the current EU policy discussions on the adoption of the GHS, the Commission has requested that an Impact Assessment study be carried out. The general objective of the study is to gather empirical evidence on the likely business and trade impacts of GHS implementation. This study has been divided into two work packages. The first work package is charged with the empirical study of the likely impact of the GHS implementation on the business sector. The second work package concerns the global trade aspects of the GHS implementation.

The general objective of this part of the study is thus to gather empirical evidence on the likely trade impacts of GHS implementation. The emphasis is on the chemicals exports from and imports into the EU area.

The methodology employed for this work has three main components: estimation of an empirical relation between trade flows and trade barriers; estimation of the change in the level of relevant barriers resulting from GHS implementation; and estimation of the total trade impact of GHS, taking into account the two above.

Empirical relation between trade flows and trade barriers

The primary methodological component for work package 2 is the formulation and empirical estimation of a model which relates the relevant trade flows with explanatory variables that include, among others, different measures of trade barriers.

The final model is estimated with a Tobit estimation procedure with instrumental variables (IV). The use of a Tobit estimation procedure is justified by the presence of zeros in the dependent variable (for some products and for some country pairs, trade flow is zero). The use of instrumental variables has been required due to endogeneity of some explanatory variables. The reason for this endogeneity is that that there is a greater likelihood of finding a high number of barriers to trade in relation to trade flows that are large. Without IV estimation, this would result in a positive estimated coefficient for the trade barrier.

In our final model, the elasticity of trade flows with respect to level of non-tariff barriers (NTBs) is estimated at around -0.025 with a 90% confidence interval ranging from -0.012 to -0.038.

The final model delivers a robust econometric relationship between trade flows of chemicals and related products and a set of explanatory variables that include measures of tariff and non-tariff barriers, for the EU and its main chemicals trading partners. We are reassured of this by the statistical properties of the final estimated model. The detailed results of our preferred "Model 1", presented in Table 11 (page 60), based on 40,859 observations, include very high values for the statistical tests on the overall statistical significance of the model and on the endogeneity of the instrumental variables (a necessary condition for the chosen instruments to be statistically adequate). In addition, practically all coefficients of the explanatory variables are statistically significant (i.e. statistically different from zero) at the 99% level. This also means that the standard errors of the parameter estimates are relatively small; therefore the estimated values can be considered robust.

Our model has further withstood other robustness checks:

- alternative specifications for some of the explanatory variables and some of the instrumental variables have left the parameter estimates and the statistical properties of the model generally unchanged (see tables from Table 12 to Table 16);

- as commented in the main text, we have also attempted the same regression but leaving Brazil out of the sample (since Brazil appears to be an outlier due to the extremely large number of NTBs reported) (Table 17). This has in no way affected the estimates for our parameters of interest;

- the use of an alternative estimation technique (2SLS instead of Tobit) has resulted in the expected difference in relation to the estimates of our parameters of interest (Table 18 and Table 19), lending additional support to our original parameter estimates; and

- a correction for particular patterns in the model residuals (Table 20) has also confirmed that our original estimates are not affected by these error patterns.

Estimates of the change in the level of barriers

The second component of our work is to conclude on the impact of GHS implementation on the size of the barriers affecting trade flows in and out of the EU area.

This part of the work has relied heavily on the responses to the questionnaires sent out to chemicals companies and trade associations as part of Work Package 1. Unfortunately, most respondents were unable to answer questions concerning trade-related costs impacts and the current level of NTBs that they face. As a result, the study has had to rely on the responses of

only a few of the companies contacted. However, it has been possible to draw some conclusions based on the information received.

1. Respondents had trouble isolating costs related to trade barriers in general and to C&L requirements in particular.
2. According to a large subset of the respondents, most trading partners fully accept the C&L from the EU or differences in the C&L requirements of these countries are automatically accommodated by the software used for C&L so that currently the EU companies seem to incur, in effect, very low export-related costs due to the non-harmonised C&L of chemicals.
3. A small number of respondents were able to provide us with estimates of the trade-related costs of C&L requirements. These estimates were not always in a very "user-friendly" form, but they convey important information for our study.
4. A small number of respondents showed concern with the issue of transition periods and un-co-ordinated adoption. As during such a transition two different systems are operational, there is the potential that trade costs increase rather than decrease.

Estimation of the trade effects of the GHS implementation

The third and last component combines the results of the two previous components to reach estimated ranges for the trade impact of a global GHS implementation. The numerical results are summarised below. Ranges for the 90% confidence interval can be constructed from the point estimates given below. The range includes 50% below to 50% above the point estimate.

Most importantly, we need to define scenarios for the evolution of the GHS implementation in the EU as compared to that of its trading partners. We have considered the following scenarios for the assessment:

(1) "GHS global with EU lagging behind"

- The GHS is globally implemented, with every country adopting the same starting date;
- The transition period for non-EU countries is 3 years for substances and 5 further years for mixtures;
- The transition period for the EU is 11 years for substances and 6 further years for mixtures, lagging behind the rest of the world.

(2) "GHS global and simultaneous"

- The GHS is globally implemented, with every country adopting the same starting date;
- The transition period for non-EU countries and the EU is 3 years for substances and 5 further years for mixtures. (Note that the 3-year period in the EU corresponds to the timing for notification of the C&L of substances to the REACH Inventory).

(3) "GHS global with EU delay for partial REACH implementation"

- The GHS is globally implemented, with every country adopting the same starting date;
- The transition period for non-EU countries is 3 years for substances and 5 further years for mixtures;
- The transition period for the EU is 6 years for substances and 5 further years for mixtures, with this linked to the first two tranches of substance registration under REACH.

(4) "Fragmented Global C&L" or "worst case scenario"

- The GHS is not implemented;
- All countries/trade blocks fall back to national C&L systems (either one already in place or newly created where none currently exists);
- EU C&L not assumed to be automatically accepted.

Note that the ***baseline*** is the non-adoption of the GHS in the EU; the trading partners of the EU implement GHS with a transition period of 3 years for substances and 5 further years for mixtures; EU C&L and SDS are no longer accepted by non-EU countries, with GHS-based information required. In both baseline and the scenarios, REACH is assumed to enter into force in year 0.

In order to assess the impact of the different scenarios on trade costs and trade flows, we have separated the analysis between imports and exports. The summary of what each entails is given in the two tables below.

Table 1: Analysis of scenarios for EU exports

	Predicted reduction in exports per year (in 1,000s Euros)					PV sum
	years 3 to 5	years 6 to 7	years 8 to 10	years 11 to 16	years 17 and after	
Baseline	18,887	18,887	37,774	37,774	37,774	**504,204**
scenario 1	18,887	18,887	37,774	18,887	0	**224,283**
scenario 2	0	0	0	0	0	**0**
scenario 3	18,887	0	18,887	0	0	**113,322**
scenario 4	75,548	75,548	75,548	75,548	75,548	**1,163,884**

Note: PV = present value

Table 2: Analysis of scenarios for EU imports

	Predicted reduction in imports per year (in 1,000s Euros)					PV sum
	years 3 to 5	years 6 to 7	years 8 to 10	years 11 to 16	years 17 and after	
Baseline	15,727	15,727	31,454	31,454	31,454	**419,852**
scenario 1	15,727	15,727	31,454	15,727	0	**186,761**
scenario 2	0	0	0	0	0	**0**
scenario 3	15,727	0	15,727	0	0	**73,518**
scenario 4	62,909	62,909	62,909	62,909	62,909	**969,168**

Note: PV = present value

Conclusion

The main results from our quantitative analysis which has been based on the various scenarios on the timing of the GHS implementation in the EU as compared to that in the rest of the world can be summarised as follows:

- Non-implementation of GHS in the EU is estimated to result in a loss of roughly €504 million for exports and €420 million for imports.
- A delayed implementation of GHS in the EU until after the completion of the REACH phase-in period (namely a transition period of 11+6 years) is estimated to result in a loss of roughly €224 million for exports and €184 million for imports.
- A shorter delay in of the GHS implementation in the EU (a transition period of 6+5 years) results in a loss of roughly €113 million for exports and €74 million for imports.

The worst-case scenario of a complete breakdown of the GHS systems is estimated to result in a loss of € 1163 million and €969 million for EU-exports and imports respectively.

1 Introduction

In July 2003, the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) was formally adopted by the UN ECOSOC. Its aim is to bring together the major world classification and labelling systems of chemicals (substances and preparations/mixtures) into a single new system. The main components of the GHS are a globally harmonised classification system for chemical substances and for mixtures/preparations and a globally harmonised system for hazard communication for workers, consumers and in transport. This includes labelling and safety data sheets (SDSs).

Amidst the current EU policy discussions on the adoption of the GHS, the Commission has requested that an Impact Assessment study be carried out. The general objective of the study is to gather empirical evidence on the likely business and trade impacts of GHS implementation. This study has been divided into two work packages. The first work package is charged with the empirical study of the likely impact of the GHS implementation on the business sector. The second work package concerns the global trade aspects of the GHS implementation.

This is the final report for Work Package 2 submitted by London Economics to Enterprise Directorate General in the context of the impact assessment of implementing the Globally Harmonised System of Classification and Labelling of Chemicals (GHS).

The purpose of Work Package 2, in the context of this overall assessment, is to estimate the impact of GHS on chemicals' trade flows in and out of the EU.

For this purpose, we have estimated an empirical model describing the relationship between trade flows in chemicals to and from the EU area (as the dependent variable) and explanatory variables including, among others, both tariff and non-tariff barriers to trade.

Estimation of this model with trade data from various sources results in an estimated confidence interval (or a range estimate) for the coefficient that measures the effect on trade of changes in our measure of non-tariff barriers (NTBs).

The other main step of our analysis is the assessment of the impact of the adoption of GHS on the level of NTBs currently affecting these bilateral trade flows. The inputs for this assessment come from the results of Work Package 1. Given the on-going decision process considering the adoption of GHS by all EU countries, it is reasonable to consider a number of alternative scenarios with respect to this adoption and its respective timing.

The combination of the two elements above results in a range of estimates for the change in the chemicals trade flows to and from the EU as a result of changing levels of NTBs. This report describes in more detail the steps taken to reach these estimations and their respective results.

1.1 Contents of the final report

This final report comprises the following elements:

In Section 2, we include a summary of the conclusions from discussions between LE, RPA and steering group members about the most relevant econometric modelling options for the study. This summary includes a brief review of the chosen alternatives in relation to comparable relevant studies.

Section 3 provides a description of the data collected for the study and a brief summary of the data treatment techniques that have been used to prepare the data for the econometric work. This section includes an empirical description of the global trade in chemicals to and from the EU area with relation to its main chemicals trading partners.

Section 4 describes and discusses the econometric methodology; indicates the different steps taken to arrive at the final stage of the econometric work; and provides the estimation results generated by the proposed econometric modelling methodology. Section 4 also contains a discussion of their robustness and sensitivity to certain changes.

Section 5 reports on the trade-relevant data collected through Work Package 1 and describes how it fits with the GHS trade impact assessment exercise. Our subsequent work takes, to the fullest extent possible, account of the results from the interviews and forecasts undertaken for Work Package 1.

Section 6 uses the results from the previous two sections to construct the desired estimated ranges for the impact of GHS on chemicals trade flows in and out of the EU.

2 The choice of method and model specification

This section reports on the choice of method (section 2.1) and the choice of the precise model specification in view of the data situation (section 2.2)

2.1 The gravity equation for disaggregated trade flows

Four approaches exist in the economic literature for studying the trade impact of non-tariff barriers to trade. These include surveys of firms' cost responses to NTBs, macro-level econometric analysis of NTBs and trade, partial equilibrium models, and computable general equilibrium (CGE) models.

Our choice was to perform an econometric analysis of the impact of NTBs on trade while also taking into account the information gathered through a number of interviews with industry experts on the costs of particular types of barriers. We believe that the other two methods, while providing considerable scope for understanding how NTB changes might affect trade and investment in various market settings, do not lend themselves to a highly disaggregated measure of barriers that seemed better suited for the purpose of the present study.

Among methods for econometric analysis of the impact of barriers on trade stands prominently the approach based on the so-called "gravity equation". Therefore, it was decided to base the empirical analysis in this study on the standard "gravity" framework, whereby trade flows between regions/countries are a function of their "economic mass" and "economic distance". Economic mass is related to the size of the economy and thus can be proxied by GDP. Economic distance relates not only to physical distance but also to other potential sources of limitations to trade such as trade barriers (both tariff and non-tariff).

Gravity-model estimation has proved successful and robust in a wide variety of empirical applications. Moreover, the gravity model has now a solid foundation in the economics of international trade theories as its specification envelops a variety of trade theories ranging from those based on country differences in factor endowments or technology to trade models of increasing returns to scale and monopolistic competition. For example, the gravity equation specification is compatible with the well-known trade model with monopolistic competition of Helpman and Krugman (1995) and also with a Heckscher-Ohlin model with specialisation (Anderson, 1979; Deardorff, 1998; and Anderson and van Wincoop, 2003).

2.2 The cross-section "fixed effect" version of the gravity equation

Anderson and van Wincoop (2003) provide a theoretically grounded version of the gravity equation. As remarked by Anderson (1979) in his theoretical foundation for the gravity model (based on constant elasticity of substitution (CES) for preferences and goods that are differentiated by region of origin), the authors note that the gravity equation should include, apart from the traditionally used "mass" and "distance" terms, also "price" terms, in the following way:

$$\ln T_{ijk} = a + \alpha_1 \ln y_i + \alpha_2 \ln y_j + (1-\sigma)\rho \ln d_{ij} + (1-\sigma)\ln P_{ik} + (1-\sigma)\ln P_{jk} + \varepsilon_{ijk}$$

where a is a constant, yi and yj represent income in country i and country j respectively, dij represents the distance between i and j, and Pi and Pj are what the authors denote "price terms", and k is an indicator of the traded goods.

These price terms constitute the main difference between this specification and some of those encountered in empirical work is the presence of these price terms. The authors interpret them as "multilateral resistance variables" which also bear some resemblance to "remoteness" indices that have been included in gravity equation estimates[1]. Multilateral resistance terms represent the extent to which (a given product/sector in) a given country "resists" trade with respect to its overall partners. These terms can be approximated with an index reflecting overall level of protection, a measurement of insularity, and similar.

In essence, these "price" terms must be thought of in a broad sense. They represent a set of unobservable country-specific characteristics that combine to restrict trade.

Anderson and van Wincoop suggest the use of country fixed effects to replace these "price" variables (one for $\ln P_i$ and one for $\ln P_j$). This leads to consistent estimates of model parameters. The main advantage is simplicity given that for estimation ordinary least squares can be used as there are no restrictions on the parameters that need to be taken on board.

Moenius (2004), in a paper with a very similar objective to the one of the present study[2], takes even further the approach based on fixed-effects

[1] Following McCallum, John. "National borders matter: Canada-US regional trade patterns." American Economic Review, June 1995, 85(3), pp. 615-623.

[2] While we propose to estimate the impact on trade flows of harmonisation of labelling requirements (for a subset of products), Moenius (2004) studies the impact on trade flows of "shared standards" across countries. His study has, therefore, an objective that is very close to ours. Moenius (2004) regresses sectoral bilateral trade volumes (4-digit SITC) on counts of bilaterally shared standards (SST) using a country-pair-year fixed-effects model.

estimators, by including country-pair fixed effects which replace both the "size" and "distance" variables in the specification above. His empirical specification is given by:

$$\ln T_{ijk} = a + \alpha F_{ij} + \beta \ln(SST_{ijk}) + \varepsilon_{ijk}$$

where Fij are country-pair fixed effects reflecting variables that are likely to have an impact on the bilateral trade flows but are constant across all products/sectors for a given country pair; and SST is a variable that Moenius constructed to represent the number of standards for product/sector k shared by the countries i and j.

In our final model specification, we do not go as far as Moenius, i.e. collapsing all gravity equation variables into country-pair fixed effects. However, we do go a bit further than Anderson and van Wincoop in that we allow for two types of fixed effects: country fixed effects and country pair fixed effects. The only elements we leave out of the "fixed effect" variables are those which change across products/sectors, namely the barriers to trade. We include one variable for tariff barriers and one variable for non-tariff barriers. In this way, our proposed specification is given by:

$$\ln T_{ijk} = a + \alpha_0 F_i + \alpha_1 F_j + \alpha_2 F_{ij} + \alpha_3 TB_{ijk} + \alpha_4 NTB_{ik} + Other + \varepsilon_{ijk},$$

where TB_{ijk} and NTB_{ijk} represent the level of tariff and non-tariff barriers imposed on country i imports from country j, on sector k. "Other" represent additional variables that may be added to this specification.[3]

It is nevertheless important to point out that the use of country and country-pair fixed effects leads to a less efficient estimator than an approach where "multilateral resistance" is proxied only by measures of trade impediments relative to other partners. However, this problem is less acute when the number of observations is large, as is the case in the present study. Moreover, the fixed effects estimator is unbiased and to some extent more robust to specification error.

We believe that, given that the purpose of the study is ultimately to perform a comparative statics analysis, the use of the fixed effects model is justified (we do not require parameter estimates for any of the other terms of either bilateral or multilateral resistance). As further discussed in chapter 3, the limitations of the available data also point to the fixed effects specification.

[3] Also note that the full set of dummies depicted above cannot be included for reasons of co-linearity. In our estimation we choose to drop one set of country fixed effects (this can be either the importing country or the exporting country fixed effects).

2.2.1 Results from previous work on the trade impact of NTBs

"Non-tariff barriers" (NTBs) is a generic denomination that encompasses many different types of impositions on importers and exporters.

NTBs are any of several non-tax measures which restrict a foreign company's ability to penetrate the inland markets. They include, inter alia, quantitative and qualitative restrictions on exports and imports (such as voluntary export restraints (VERs) and licensing and standards requirements), price controls, rules of origin, and anti-dumping and countervailing measures.

Many of these NTBs are much more difficult to monitor than tariffs, and have potentially large trade-restrictive effects. Therefore, they can be seen as attractive alternatives for States seeking trade protection but unwilling or unable to impose tariffs for fear of immediate retaliation or because their imposition would infringe upon trade agreements, from bilateral or more generic ones to global ones such as WTO. However, many NTBs arguably follow from mere differences in non-trade policies between countries, without an overriding trade policy objective. For all these reasons, countries vary in the numbers of NTBs, NTB types and their stringency.

While for some types of NTB the expected impact on trade is most clearly negative, there are exceptions. Some authors have argued that, for example, NTBs of a technical nature, such as standards, can in certain circumstances have a positive impact on trade. In particular, standards that are shared among trading partners may contribute to an increase of respective bilateral flows.

These observations bear relevance to the present study where we aggregate different types of NTBs into single comprehensive measures of NTB protection. The trade impact of such a composite NTB measure may be smaller than the impact of certain of its components. Ideally, thus, we would like to be able to isolate and estimate the impact of particular sub-set of NTBs, namely those that relate to classification and labelling of chemical substances and mixtures.

2.2.2 The impact of harmonisation

The harmonisation of technical requirements and shared standards are similar examples of moves to reduce NTBs. Both types can be expected to have a positive impact on trade since country pairs that share standards and harmonise technical requirements have lower trading costs than other country pairs.

Empirical studies seem to confirm the expected positive effects. One example is Moenius (2004) who found that shared standards raise imports

significantly, with an elasticity of 0.16. Another is Vancauteren and de Frahan (2000) who report elasticities larger than 1 for the impact of harmonised food standards but, curiously, the effect of harmonisation is negative for some of the sub-sectors.

2.2.3 Other studies

A number of studies have looked at the impact of different types of trade barriers at a disaggregated level or for particular sectors only. We observe a wide variation of parameter estimates in these contexts. For example, the sensitivity of trade flows to all trade barriers is estimated at -0.01 to -0.03 by Guillotreau Péridy and Bernard (1999) for seafood trade.

Brülhart and Trionfetti (2005) estimated a much larger coefficient of -0.45 for the overall effect of NTBs on trade. The authors refer that they have also estimated the same coefficient on a sector-by-sector basis but unfortunately these are not reported.

3 Data

This section describes the datasets used for our estimation work.

3.1 Data description

We use data at the 6-digit level of the Harmonised System (HS) classification for:

- bilateral trade between the EU and its main trading partners in chemicals and related products;
- bilateral tariffs; and
- non-tariff barriers.

Each one observation for the purpose of our estimation model must thus include the following information:

- the value of product k imports of country i from country j;
- the value of the bilateral tariff imposed by country i on imports of product k from country j; and
- the value of the non-tariff barriers imposed by country i on imports of product k.

In the full estimation model, we have 40,859 such observations.

There is a difference between the data which are used in the estimation of the parameters of the model and those that are used for calculating our estimates of the trade impacts. While for estimation purposes (and in order to increase the number of observations and therefore the efficiency of our estimates) we use all chemicals sectors as described in Table 1, when computing the estimated impact of GHS on total trade flows we exclude those chemical sectors which fall completely out of the scope of the GHS (Chapters 30, 31 and part of Chapter 28).

3.1.1 A product classification for trade flows in chemicals

We have selected the trade flows of the goods that are ranged under the categories 28 to 39 of the HS classification for our regressions. We are aware that not all of these categories are going to be fully affected by the proposed GHS implementation. However, the selected categories share some common features and thus the associated trade flows may be included in the set of observations for the regression where we estimate the impact of certain types of barriers on trade.

Table 1: Product categories HS 28 to HS 39

	SECTION VI
	Products of the Chemical or Allied Industries (Chapters 28-38)
	Chapter 28
	Inorganic Chemicals; Organic or Inorganic Compounds of Precious Metals, of Rare-Earth Metals, of Radioactive Elements or of Isotopes *Note: GHS will not apply to radioactive elements or isotopes – thus while we include all the HS28 products in our econometric estimation, we use only a fraction of the total trade under HS28 for the computation of our estimates of the trade impact of GHS.*
	Chapter 29
	Organic Chemicals
	Chapter 30
	Pharmaceutical Products *Note: GHS will not apply to pharmaceutical products – thus while we include all the HS30 products in our econometric estimation, we exclude HS30 for the computation of our estimates of the trade impact of GHS.*
	Chapter 31
	Fertilisers *Note: GHS will not apply to fertilisers – thus while we include all the HS31 products in our econometric estimation, we exclude HS31 for the computation of our estimates of the trade impact of GHS.*
	Chapter 32
	Tanning or Dyeing Extracts; Tannins and Their Derivatives; Dyes, Pigments and Other Colouring Matter; Paints and Varnishes; Putty and Other Mastics; Inks
	Chapter 33
	Essential Oils and Resinoids; Perfumery, Cosmetics or Toilet Preparations
	Chapter 34
	Soap, Organic Surface-active Agents, Washing Preparations, Lubricating Preparations, Artificial Waxes, Prepared Waxes, Polishing or Scouring Preparations, Candles and Similar Articles, Modelling Pastes, "Dental Waxes" and Dental Preparations with a Basis of Plaster
	Chapter 35

Table 1: Product categories HS 28 to HS 39
SECTION VI
Albuminoidal Substances; Modified Starches; Glues; Enzymes
Chapter 36
Explosives; Pyrotechnic Products; Matches; Pyrophoric Alloys; Certain Combustible Preparations
Chapter 37
Photographic or Cinematographic Goods
Chapter 38
Miscellaneous Chemical Products
SECTION VII
Plastics and Articles Thereof; Rubber and Articles Thereof (Chapters 39-40)
Chapter 39
Plastics and Articles Thereof

3.1.2 The main trade partners of the EU in the global chemicals trade

We have selected the main EU trading partners for the SITC category 5 Chemicals and related products.

Table 2: EU chemical main trading partners

Partner	*Total Trade*	*Share* Total Trade	*Cum Share*
us **United States**	77.76	35.6%	35.6%
ch **Switzerland**	34.46	15.8%	51.4%
jp **Japan**	14.46	6.6%	58.0%
ru **Russian Federation**	9.43	4.3%	62.3%
cn_not_hk **China (excl hk)**	8.42	3.9%	66.2%
tr **Turkey**	7.26	3.3%	69.5%
sg **Singapore**	6.71	3.1%	72.6%
no **Norway**	5.4	2.5%	75.1%
ca **Canada**	5.21	2.4%	77.4%
au **Australia**	4.59	2.1%	79.5%
br **Brazil**	3.99	1.8%	81.4%
kr **Korea (Republic of) (South)**	3.89	1.8%	83.2%
il **Israel**	3.66	1.7%	84.8%
sa **Saudi Arabia**	3.46	1.6%	86.4%
in **India**	3.25	1.5%	87.9%
tw **Taiwan**	2.58	1.2%	89.1%
za **South africa**	2.42	1.1%	90.2%
hk **Hong Kong (special adm. Reg of China)**	2.26	1.0%	91.2%
ro **Romania**	2.25	1.0%	92.3%
ua **Ukraine**	2.13	1.0%	93.2%
ae **United Arab Emirates**	1.53	0.7%	93.9%
dz **Algeria**	1.47	0.7%	94.6%
th **Thailand**	1.39	0.6%	95.2%
ir **Iran (Islamic Republic of)**	1.21	0.6%	95.8%
ma **Morocco**	1.21	0.6%	96.4%
my **Malaysia**	1.21	0.6%	96.9%
id **Indonesia**	1.16	0.5%	97.4%

Table 2: EU chemical main trading partners

Partner	*Total Trade*	*Share* Total Trade	*Cum Share*
ar **Argentina**	1.03	0.5%	97.9%
tn **Tunisia**	1	0.5%	98.4%
cl **Chile**	0.78	0.4%	98.7%
ng **Nigeria**	0.56	0.3%	99.0%
nz **New Zealand**	0.56	0.3%	99.2%
kz **Kazakhstan**	0.48	0.2%	99.5%
ly **Libyan (Arab Jamahiriya)**	0.47	0.2%	99.7%
sy **Syrian Arab Republic**	0.38	0.2%	99.8%
ci **Côte d'Ivoire**	0.24	0.1%	100.0%
iq **Iraq**	0.09	0.0%	100.0%

We chose to include all the countries in the list up to and including New Zealand. This covers 99.2% of the total chemicals flows in and out of the EU25.

Out of this set of countries, we had to drop those for which we did not have NTB information (Israel, Iran, United Arab Emirates) or for which this information was very old (the case of Hong Kong). This leaves us with 28 countries, covering 95.3% of total EU25 chemicals trade in 2004. The number of observations that our sample includes for each country is provided in the annex. Naturally, the EU has more observations than each of the other countries because we are looking at all the bilateral flows coming from and going to the EU.

3.1.3 Bilateral tariff data

We use bilateral tariff data from the Worldbank dataset which is constructed based on information contained in the TRAINS/WITS and the MACMap databases, developed jointly by ITC (UNCTAD-WTO, Geneva) and CEPII (Paris).

The bilateral tariff dataset includes ad-valorem tariffs, as well as the specific component of each bilateral tariff line (at the six digit of the Harmonized System). In the case of "specific tariffs ad-valorem equivalents" the dataset includes results of computations by Bouët et al (2004)[4]. Antidumping duties

[4] A careful description of the respective methodology is discussed in Bouët et al (2004).

are also included in the ad-valorem and specific components of the bilateral tariffs. Also, all unilateral, bilateral and regional preferences notified to the WTO are included in the ad-valorem and specific components of the tariffs.

The data files contain the following information:

Importer:	Three digit country code of the importer;
Exporter:	Three digit country code of the exporter;
hscode:	Six digit Harmonized System code;
ut_ave:	Ad-valorem component of the bilateral tariff (including preferences and antidumping duties);
ut_spe:	Ad-valorem equivalent of the specific tariff component ((including preferences and antidumping duties).

Treatment of these data for the purpose of our study

We have interpreted the ad-valorem component of the bilateral tariff and the ad-valorem equivalent of the specific tariff as components of the overall tariff equivalence of the trade barrier. We thus use as an explanatory variable for our regressions the *sum* of the ad-valorem component with the ad-valorem equivalent of the specific component.

We also note that the dataset contains the EU as an importer but not as an exporter. Rather, in terms of exports, the dataset considers each EU country separately. We therefore construct an "average" tariff paid by the EU as a block when exporting to each of the relevant trading partners.

The bilateral tariff information in this dataset is updated regularly. We have used the most recent available tariff data, namely corresponding to 2004. A summary of these data at the HS group level is offered in Annex 2.

3.1.4 Data on Non Tariff Barriers

The UNCTAD TRAINS database provides a comprehensive inventory of the many different types of non-tariff barriers. The data is provided at a very high level of disaggregation, which allows for a very detailed consideration of sectors and barriers.

TRAINS data on NTBs are recorded for different years in different countries. However, the data for the EU NTBs are all from 1999. This fact has conditioned our estimations: the equation has been estimated with a cross section of sectors/products across country pairs, instead of a panel covering products, sectors, countries and years. The developments over time for specific combinations of products – sectors and country pairs have therefore not been taken on board in the estimation work.

The table below summarises information about the total number of NTBs imposed by each country in each group of products at the H2 level. What this table reports is the sum of the number of NTBs imposed on each of the sub-products of a given H2 group. It is interesting to compare across countries and across products to uncover patterns.

Countries such as Argentina, Brazil, Chile, and the EU, have a high total number of NTBs. On the other hand, Ukraine, Malaysia, Norway, Nigeria and Algeria, are among those with the lowest number of NTBs.

Table 3: number of NTBs; totals by importer and by HS 2-digit categories

h2 / Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
dz	0	4	0	0	0	2	7	0	1	0	3	0	17
ar	1,984	6,295	4,293	227	134	273	125	111	18	22	493	450	14,425
au	7	60	92	0	0	1	7	0	1	0	4	8	180
br	5,451	22,507	8,695	158	140	521	200	234	4	53	894	159	39,016
ca	15	28	0	0	0	0	0	0	15	0	0	0	58
cl	892	1,819	471	91	46	103	13	51	32	0	224	44	3,786
cn	18	43	2	56	0	10	0	0	0	15	9	19	172
in	11	31	7	17	13	39	17	5	7	6	17	48	218
id	0	32	0	2	0	0	0	0	3	2	7	0	46
jp	5	25	3	0	0	0	1	1	0	0	1	0	36
my	16	1	0	0	0	0	0	0	0	0	0	0	17
ma	18	7	0	0	0	1	0	0	9	0	0	0	35
nz	7	270	46	25	52	37	12	16	8	0	26	3	502
ng	1	12	0	0	0	0	1	0	2	0	7	0	23
no	1	2	0	0	0	5	0	17	8	0	5	0	38
ro	220	430	114	67	84	121	28	56	10	0	109	196	1,435
ru	2	1	6	4	0	0	3	1	6	0	5	12	40
sa	208	282	31	60	0	0	0	0	4	0	19	1	605
za	8	42	14	0	1	23	0	0	0	0	2	2	92
ch	24	135	14	25	0	1	14	14	6	0	18	3	254
th	2	47	20	0	2	0	0	2	0	11	0	0	84
tn	33	16	2	0	0	0	0	0	4	0	0	0	55
ua	0	0	1	0	0	1	0	0	0	0	2	0	4
us	43	138	98	1	6	62	1	6	13	0	46	18	432
eu	279	1,356	70	204	144	393	0	0	167	0	2,112	695	5,420
Total	9,245	33,583	13,979	937	622	1,593	429	514	318	109	4,003	1,658	66,990

Only a small subset of the very long list of NTB measures directly or indirectly relates to labelling requirements. It is likely that different types of barriers impact trade flows in different ways or with different strength. It would be ideal for our estimation if we could isolate the impact of labelling and related barriers on trade flows. With enough observations and enough variation in the data we should be able to estimate trade effects of individual groups of NTBs. This has been attempted following the techniques suggested by Haveman and Thursby (2000).

We created a grouping of NTBs into 4 categories including similar types of barriers within each group. We broke up the barriers into categories which we have denoted: "price", "quantitative", "technical" and "labelling", in relation to the type of restrictions that each NTB included.

It is not always easy to classify NTBs according to one of those four categories. For "technical" and "labelling" restrictions we included those that state some requirement of either a technical nature or a labelling/marking requirement, respectively. For quantitative restrictions we included all NTBs can impose some quantitative restriction on trade. Finally, for "price" related restrictions, we included those NTBs which appeared to most directly affect price, such as special types of duties, and other costs.

For our purposes, we would like to have found a separate estimate of the impact of labelling-related restrictions on trade flows, as these would, in principle, provide us with a more precise estimate of the impact on trade flows of a change such as the GHS.

When we consider the break-down of NTBs according to those four categories, we note that different countries favour different types of NTB. The country totals of barriers reported in the TRAINS database, for our grouping of non tariff barriers, is given below.

Table 4: Types of NTB by importer country (all sectors)

Country	Label	Quant	Tech	Price
dz	0	4	13	0
ar	529	856	15,905	251
au	41	9	132	12
br	4,052	3,248	40,576	29
ca	10	16	47	0
cl	400	163	3,765	1
cn	0	27	153	0
in	0	8	202	0

Table 4: Types of NTB by importer country (all sectors)

Country	Label	Quant	Tech	Price
id	0	20	27	2
jp	0	43	0	0
my	0	0	17	1
ma	0	25	10	0
nz	101	0	419	0
ng	1	22	9	0
no	0	8	19	10
ro	0	0	1,509	0
ru	0	0	45	0
sa	0	0	636	0
za	59	0	31	11
ch	0	10	258	4
th	1	5	81	0
tn	0	0	68	0
ua	0	0	4	0
us	24	72	327	64
eu	18	28	142	60
Total	5,236	4,564	64,395	445

We find that Brazil is by far the most liberal user of NTBs, at least as far as the data reported in TRAINS can inform us. This is particularly noticeable for labelling barriers where Brazil imposes almost eight times as many as the second highest country, Argentina. Barriers of a technical nature are by far the most pervasive in the sample. Labelling is the second highest category but it has very low numbers for a very large fraction of our sample. 16 of the 25 countries reported 0 or 1 labelling-related barriers.

Correlation among categories of NTB

It turned out that the correlation between some of these groups of NTBs was very high in our sample of 40,860 observations. In particular, the correlation between "quantitative" and "labelling" NTBs was 0.87 (of a maximum of 1) and that between "technical" and "labelling" was 0.83.

Such high values for the correlation among different explanatory variables render the regression results unreliable. This is known as the problem of "colinearity in the regressors". Given this, we have instead opted for estimating the NTBs impact through their original aggregated version.

Constructing variables based on NTB counts

TRAINS contains binary information on a very large number of non tariff categories. For a particular product or product category, we thus have a list of 1s and 0s. For the present study we have experimented with different comprehensive NTB measures. These include an aggregate NTB measure corresponding to the sum of all the 1's found for a given product; and a "deviations from average" NTB measure where for each product line and each importer we compute the number of NTBs relative to the average number of NTBs that that importer imposes across all its imports.[5]

Cross-section with variables from different years

As mentioned above, our NTB data is available only for different years in different countries, and for some countries the latest recorded observations are from 1999 or before.

As a result, we need to combine information from different years in the same dataset and in the same regressions.

For about half the countries in our sample, we believe that this does not present a major issue since data for NTBs for those countries is for 2001, 2002 and 2003. In addition, non-tariff measures, to the extent that they have a deterrent impact on trade, are likely to be felt for several years after their initial implementation. Their effect is unlikely to reduce quickly and NTBs, by their nature, are unlikely to be changed quickly over the years.

[5] One general criticism that can be made with respect to any approach that is based on counting and summing the number of NTBs is that it may not provide an adequate measure of the level of trade barrier they correspond to. Some NTBs are more demanding than others and result in much larger cost increases for exporters. NTBs under the same classification may differ across countries, as different countries may enforce NTBs in different ways. Moreover, it has been found by other authors that different types of NTBs have effects on trade flows of different magnitudes. Finally, countries' reporting practices of NTBs are likely to differ in many respects.

We acknowledge that adding up all these terms and using the result as a proxy for the level of the NTB may fail to fully reflect the level of the corresponding NTBs. However, it is unclear how this can be improved upon without resorting to some other arbitrary criterion to weigh NTBs and there is no guarantee that this would not result in worse biases.

3.1.5 Bilateral trade data

Data on bilateral trade is taken from the Eurostat trade dataset ComExt. This dataset provides bilateral trade data at the 6-digit level of the HS classification. We have taken data for 2004 as the most recent available year. In Annex 6, we summarise the data on trade based on product groups (28 to 39 of the HS nomenclature).

4 Estimation

In this section, we describe our proposed equation and empirical approach used in its estimation.

Our specification uses volume of trade between country *i* and *j* (T_{ijk}) as a function of a NTB and country-specific effects[6] that account for other factors affecting trade and can be written as follows:

$$\ln T_{ijk} = \alpha_0 + F_i + F_{ij} + \alpha_1 TB_{ijk} + \alpha_2 NTB_{ik} + \varepsilon_{ijk} ,$$

where F_i are country-specific fixed effects for each importing country *i;*[7]

F_{ij} are country-pair fixed effects for each *ij* country-pairs;

TB_{ijk} are the trade barriers for product category *k* and between country *i* and *j* (ad-valorem component plus ad-valorem equivalent of the specific tariff component);

NTB_{ik} is a measure of non-tariff barriers in importer country *i* for product *k* (in estimation we use different measures of NTB, as we describe below);

finally, ε_{ijk} is an error term.

As discussed in section2, for the NTB variable, we have considered in our estimations different forms and different groupings. Where the variable NTB_sum is reported, this represents the sum of all the NTBs as reported by TRAINS for all the products under the particular 6 digit HS code. Where NTB_dev is reported, this represents the deviations from the average number of NTBs imposed by that country.

Different products are traded at different volumes and hence we will observe very disperse volumes in our dependent variable. This is a characteristic that is specific to the products included (and not countries) and will not be captured by the fixed effects (which are country-specific). As a robustness check, we have included a variable that represents the total trade flows aggregated (by country pair) at the h6 product category-level in our sample. However, results did not change significantly after inclusion of this variable.

[6] As discussed in section 2, the fixed effects should absorb all country-specific factors affecting trade and other factors affecting bilateral trade, such as distance, differences in GDP, etc. so that the coefficients on NTB are estimated without bias.

[7] Note that we make no restriction with respect to these fixed effects, we allow each country and each country pair to have individualised impact on trade.

Estimation techniques for the case of "zeros" in the dependent variable

The dataset contains some trade values equal to zero for some combinations of country-pairs and products. We have considered a number of different procedures to deal with zero values in the dependent variable as suggested by the literature (see e.g. Frankel, 1997). The problem of censored data in the dependent variable may be addressed by employing an iterated maximum likelihood estimation of the Tobit model (see e.g. Greene, 1997).

It is important not to drop all the observations where the trade flow is zero, as some zero observations may well be the result of trade barriers. Exclusion of these cases would result in a bias and inconsistency of parameter estimates. On the other hand, it is also possible that some trade flows are zero for other reasons that do not relate to any type of trade-related issue. To take account of this, we propose to follow the approach suggested by Haveman and Thursby (2000). These authors do not include zero observations when the exporter does not export the good to any country or the importer does not import the good from any country. This accounts for the fact that the lack of trade may be due to the small (or zero) scale of production or level of consumption.

4.1 Estimation method

In our proposed equation, there is the potential problem of endogeneity of some of the regressors. This means that some of the regressors may be causing the dependent variable but may also be caused by the dependent variable at the same time. In that case, the causality between exogenous and endogenous variables runs in both directions.

Intuitively, one may expect that NTBs are likely to restrict trade. According to this, in our proposed equation one would expect a negative sign in the coefficient of the NTB. However, at the same time, it is also likely that countries use NTBs as a protectionist mechanism to prevent imports so that the number of NTB would increase where higher trade volumes are observed. According to this second interpretation, NTBs would be *positively* related to high volumes of trade.[8]

To solve the problem of endogeneity bias, we used instrumental variable (IV) estimation. IV can be used in regression analysis to produce consistent estimators when the explanatory variables are correlated with the error terms as a result of the problem of endogeneity.

[8] In addition, this could also be driven by data problems: the higher the trade volumes the more likely that trade barriers will be reported by TRAINS.

IV estimation relies on finding an additional variable or set of variables that have the following characteristics: they must be as much correlated as possible with the regressors that we believe are causing the problem (tariff and non tariff barriers by country pair and by h6 product category); and at the same time they must be as little correlated as possible with the error term.

Our chosen instruments have been the number of NTBs but at a higher level of aggregation (such as h4 or h5). Therefore, for each observation set (recorded at h8) we use the sum of NTB recorded at the h4. The intuition behind this is that the instrument (barriers aggregated at h4) will be still correlated with the original variable (as different NTB are likely to be the same within the same h4 category) but it is likely that they are less affected by changes in the volume of trade (since trade volumes of products at the h6 level are unlikely to determine the NTB at the h4 level). A similar argument would apply for NTBs aggregated at the h5 level.

After the choice of the instruments, we have estimated a Tobit model with the two-step estimation method described in Amemiya (1979) and Smith and Blundell (1986). In the second step of the Tobit regression, the dependent variable is regressed on values of the problematic regressors as predicted by the chosen instrumental variables, as well as on estimated residuals for endogenous variables obtained from the first step OLS regressions. Correction of biases in standard errors of parameter estimates resulting from the first stage OLS regressions for endogenous variables follows the Huber/White/Sandwich estimator of variance, used in place of the traditional calculation, obtaining robust variance estimates.

We also combine this robust estimation of standard errors with an allowance for clusters of observations. This allows for observations that are not independent within a cluster (although they must be independent between clusters). One obvious set of clusters to experiment with is "by importer". This implies that in such a particular regression we allow for the possibility that estimation errors are not independent among observations belonging to the same importer (for example because of the size of the importer) but are independent across importers. This, in essence, is yet another way to check for robustness of our estimates. The results are presented in Table 20 in Annex 3, which shows that our results are not affected by possible clustering of error terms by importer.

As said above, a Tobit model is used to address the presence of zeroes in the dependent variable. As the trade flows can have zero and positive values, we have a censored regression. In such a model, the impact of the change of a regressor on the dependent variable can be decomposed into two parts: the increase in trade for those products for which trade was already positive, weighted by the proportion of trade flows that are positive, plus the change in the proportion of trade flows that are positive weighted by the mean value of trade for those flows that are positive.

The OLS regression does not take account of the latter effect. Thus, OLS estimates tend to be biased downwards by a certain fixed proportion that

roughly reflects the proportion of "zeros" in the sample. Thus, one more way to cross check our results is to run an IV OLS regression and check whether the parameters of interest indeed appear somewhat lower than our estimates with the tobit model. As reported in Annex 3, this has indeed been the case: compare the pair of Table 11 and Table 18 and the pair of Table 12 and Table 19 - which report the IV Tobit and IV OLS procedure for two slightly different model specifications respectively. The estimated values of the NTB coefficient are .025 and .012 respectively, which is in line with the anticipated effect of the zero observations.

4.2 Estimation results

A summary of our regression results can be found in Table 5. The more detailed estimation results can be found in the tables of Annex 3.

Model (1), reported in Table 11 is our preferred model. In this model, we use the tariffs and the sum of NTBs, in addition to the importer and bilateral fixed effects. We have used the sum of trade barriers as provided by TRAINS as the variable for NTB. Both variables are instrumented with their aggregation at the h4 level. The tariff variable has a coefficient of -0.810 which is statistically significant at the 1% level. The coefficient for the NTB variable has an estimated value of -.025 and is also statistically significant at the 1% level. Throughout Models (2) to (7) we include alternative specifications to check for the robustness of our results. All of the additional models support our main conclusions.

In Model (2) (Table 12) we have expressed the tariff and NTB in deviations from the respective averages. Each original observation is replaced by its original value minus the corresponding average at country level. The results for these two variables are practically identical to Model (1).

Model (3) (Table 13) is equivalent to Model (1) but with a different form for the tariff instrumental variable – we use tariff at the h4 level divided by value of trade at the same aggregation level. This tests sensitivity to slightly different forms of the instruments. The results confirm robustness.

Model (4) (Table 14) expresses the NTB variable as a ratio. Each original observation is replaced by its original value divided by the corresponding average at country level. This model also includes the total trade flows aggregated at the h6 product categories in our sample. The regression results change slightly for the variable on tariff (estimated now at -0.422) and for the variable for NTB (now -0.034).

In models (5) and (6) (Table 15 and Table 16) we use different combinations of tariffs and NTB expressed as deviations and ratios relative to respective averages. There are slight differences for the variable on tariff but some important differences for the NTB variables.

Finally, in Model (7) (Table 17) we test the robustness of our estimates by excluding Brazil as an importer from the sample. We note that Brazil has a disproportionately large number of NTBs reported in the data set. We note that the results are practically entirely unchanged, particularly when compared to the previous two models. When compared to our preferred specification, the model without Brazil has a higher coefficient for the NTB variable.

Table 5: Summary of Tobit models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
tariff	-0.81**		-0.748**	-0.422**	-0.782**		-0.809**
tariffdev		-0.81**				-0.782**	
NTB_num	-0.025**		-0.026**				-0.063*
NTB_dev		-0.025**					
NTBratio				-0.034*	-0.06**	-0.06**	
lh6trade				2.059**			
Importer fixed effects	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**
Bilateral fixed effects	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**

Note: ** Statistically significant at 1% * at 5%.
Source: See Annex.

Overall, we believe that our choice of -0.025 coefficient for the impact of NTBs on trade is a conservative choice, and we are confident to proceed with this number to our analysis of the overall impact of GHS on EU chemicals trade flows.

5 Inputs from work package 1

In this section, we summarise the conclusions of the consultation undertaken in Work Package 1, in addition to some of the assumptions which we derived from its findings and which we have fed into this part of the study.

The principal task of Work Package 1 was to quantify the costs and benefits of implementing the GHS for businesses in the EU. This was accomplished by collecting information through interviews and questionnaires with individual companies and trade associations. The data collected through the interviews was used, together with other data sources, to model the impacts of three scenarios based on differing transition periods for applying the GHS to substances and mixtures.

As part of the consultation process, individual companies and trade associations within the EU were asked to give quantitative information on their current trade-related costs and its share related to differences in classification and labelling requirements; to quantify the potential trade impacts of GHS implementation; to mention any trade issue or impact resulting from the GHS. Unfortunately, most respondents were unable to answer these questions concerning trade related impacts and the current level of NTBs that they face. As a result, this exercise has had to rely on the responses of only a few of the companies contacted. However, it has been possible to draw some conclusions based on the information received.

We group our conclusions into the following:

1. Respondents had trouble isolating costs related to trade barriers in general and to C&L requirements in particular.
2. According to a large subset of the respondents, most trading partners fully accept the C&L from the EU or differences in the C&L requirements of these countries are automatically accommodated by the software used for C&L so that currently the EU companies seem to incur, in effect, very low export-related costs due to the non-harmonised C&L of chemicals[9].

[9] Note that the non-EU customers may incur costs, namely to keep up two systems. These costs as such fall out of the scope of the IA. Moreover, the costs are more of a systemic nature (keeping track of more than one C&L system) than operational (the translation from EU C&L is either straightforward as the national C&L system is less elaborate, or not required as customers also understand EU C&L). The systemic costs, however, do constitute a trade barrier to imports from the EU, as the customer supposedly needs to have some knowledge about the EU C&L system. Companies without that knowledge may be (slightly) less inclined to buy from the EU than with such knowledge, and prefer a domestic alternative instead. The same applies to resold EU C&L labelled products versus domestically labelled products. The trade barrier is then not situated at the border but in fact inland, namely between firms with and without EU C&L expertise. What matters for the analysis here is not so much the costs but the extent to which it hampers the EU exports.

3. A small number of respondents were able to provide us with estimates of the trade-related costs of C&L requirements. These estimates were not always in a very "user-friendly" form, but they convey important information for our study.
4. A number of respondents showed concern with the issue of transition periods and un-co-ordinated adoption. As during such a transition two different systems are operational, there is the potential that trade costs increase rather than decrease.

5.1 An overview of the relevant responses

General comments

- Trade impacts are difficult to quantify because NTBs are simply associated with the cost of doing business, so that no records are kept in the way the survey questions have been put
- Most countries fully accept the C&L from the EU countries, as it is considered to represent one of the more reliable sources of chemical information given the testing and classification requirements set out in the Dangerous Substances and Preparations Directives. Consequently, minimal costs in general are incurred by exporters when exporting to non-EU clients[10].
- A number of respondents have singled out the US as a particularly onerous destination in terms of C&L and related requirements. Japan, Switzerland, Russia, and ex-soviet countries have also been mentioned as generally onerous destinations in terms of C&L requirements.

Quantification of costs

- One respondent estimated that C&L costs relative to trade with the USA would decrease by 20% after GHS.

This is a type of response that is extremely useful for the present exercise.

- NTB-related costs plus marketing costs are estimated to represent 1.6% of the cost of sales, according to another response.

[10] Yet, the fact that they run a dual system points to a barrier; to the extent that they lead to less EU exports, it is a benefit foregone. We discuss how we take these elements into account in our calculation of the relevant scenarios in the following section.

This type of statement illustrates the difficulty we have had in obtaining usable estimations of the impact of GHS on trade-related costs. For most firms, trade costs are not considered separately from general selling-related costs. This particular estimate quoted above is quite difficult to incorporate within the framework of our model.

- €100,000 is another estimate of C&L costs for a company exporting to the USA. To 70 other destinations, the C&L costs estimated by the same company are zero.
- One respondent has estimated that the total cost arising from the non-harmonisation of C&L requirements amounts to about the cost of 1 person/year.

These two responses illustrate that this type of trade barrier damages smaller firms disproportionately, as some of the reported costs are independent of the volume of trade and depend only on the destinations of trade. Small volume specialists supplying niche markets in a large number of countries are therefore likely to be most adversely affected.

About transition periods

- Some companies have expressed concerns that transition periods as well as partial, un-coordinated and un-harmonised introduction of GHS may imply larger rather than smaller C&L trade-related costs. Transition periods involve the maintenance of several systems in parallel.
- One respondent considered that the GHS adoption by some trading partners may actually increase export costs for EU countries. This could happen with exports to less developed countries who currently accept the EU C&L as is, but after their own version of GHS could become more demanding and therefore more onerous destinations.

One particularly helpful reply

- We received a very detailed reply from a company that trades and distributes both substances and mixtures (and does no manufacturing). The respondent says that about 2.5% of non-tariff trade costs are C&L-related costs.
- However, the respondent does not expect these costs to go down to zero once GHS is fully adhered to by all countries because GHS changes the format to a common format but does not prevent errors, inaccuracies and incomplete information in safety data sheets (SDSs). In this way, practically the same amount of time will have to be devoted to checking the information in received SDS. The revised SDS will then need to be put into company letterhead and so on.

Impact on imports

- For this company, non-harmonisation has costs for importing because SDS come in different formats making the task of checking them more time consuming. This company estimates a cost of £50,000[11] relative to C&L of imports.[12]

5.2 Other data and assumptions carried over from work package 1

For this exercise, in order to determine the impact of different transition periods on trade, it is necessary to allocate the share of trade that is accounted for by substances versus mixtures. This is important as Work Package 1 has concluded that the costs and potential trade impacts are much more severe in the case of mixtures because of the complexities of the supply chain, the interaction between the REACH and GHS requirements, and the potential need to revise documentation and labelling more than once as new information keeps on being provided by upstream suppliers of individual substances and other mixtures.

Information on sectoral trade flows that stems from the data collected for Work Package 1 suggests that an overall 50:50 split between substances and mixtures be adopted to reflect the relative shares of both in the trade flow analysis.

[11] The trade barrier could be larger because of the costs incurred at the other side of the transaction, namely by the non-EU supplier

[12] Some EU importers send ready-prepared labels and instructions for EU-compliant SDS to non-EU exporters. Often, non-EU exporters are visited by an agent from the EU before a contract is let. The agent conveys information about EU C&L and related requirements.

Table 6: Approximate Weight of Mixtures Versus Substances

Sector	**Percentage**		
	Total Trade Surplus	Substances	Mixtures
Inorganics and Organics	18%	100%	0%
Other Chemicals	24%	90%	10%
Plastics	15%	0%	100%
Paints, Inks, Dyes & Pigments	13%	30%	70%
Soaps & Detergents	6%	10%	90%
Perfumes & Cosmetics	24%	30%	70%
Average Assumed Across All Sectors	**100%**	**50%**	**50%**

6 Estimated trade impact of the GHS

6.1 Scenarios

In order to estimate the trade impact of GHS on chemicals trade flows into and from the EU, we will consider a number of alternative scenarios with respect to the adoption of the GHS in the EU countries. Of prime importance for this exercise is the definition of the baseline case. The baseline case must represent what we expect to happen in the absence of a policy change, in this case, in the absence of GHS implementation by the EU.

There are three major determinants of the baseline: (1) the degree of implementation of the GHS outside of the EU; (2) the degree of future acceptability of the current EU C&L system outside of the EU (in particular, the acceptance of EU based SDS and hence classification by trading partners); and (3) the transition period for GHS implementation outside the EU.

The consultations carried out as part of Work Package 1 found that some countries currently accept an EU C&L as it is viewed as being less onerous than most other systems. This does not mean that this acceptance will continue, however. As discussed in Work Package 1, the development of the GHS has prevented countries in Africa, Asia and the Middle East from developing their own systems and both the United Nations and the International Labour Organisation have established a Global GHS Capacity Building Programme. As a result, the level of implementation globally is expected to be high. Furthermore, it can be argued that the absence of rigorous C&L systems in many countries has been one factor underlying the ready acceptance of EU C&L. The introduction of the GHS will, however, change this situation and provide an equivalent basis for C&L. It is therefore much less likely that other countries which have moved to the GHS will continue to accept EU C&L; EU exporters will be required to provide data in the GHS format. IT systems will be developed so as to provide GHS-based C&L, meeting any country specific requirements in terms of the optional categories.

For the above reasons, we have adopted a baseline (consistent with Work Package 1) that assumes:

- the GHS is implemented by non-EU countries;
- the transition period adopted by non-EU countries is 3 years for substances and 5 further years for mixtures; and
- EU C&L and SDS are no longer accepted by non-EU countries, with GHS-based information required.

Moreover, we assume that the GHS implementation starts at the entry into force date of REACH.

We have then looked at four scenarios. As the purpose of this analysis is different, the scenarios vary from those considered in Work Package 1. Given that there is a possible reversal of trade effects caused by maintaining the old and the new system in parallel, we have considered different transition periods for the GHS implementation in the EU, ranging from an implementation running synchronously with the global GHS implementation to EU transition periods lagging behind global implementation. We also consider a worst-case scenario under which the failure of the EU to implement the GHS on time results in the global fragmentation of C&L with all countries relying on their own national C&L systems (existing or newly developed).

These four scenarios are as follows:

(1) "GHS global with EU lagging behind"

- The GHS is globally implemented, with every country adopting the same starting date;
- The transition period for non-EU countries is 3 years for substances and 5 further years for mixtures;
- The transition period for the EU is 11 years for substances and 6 further years for mixtures, lagging behind the rest of the world.

(2) "GHS global and simultaneous"

- The GHS is globally implemented, with every country adopting the same starting date;
- The transition period for non-EU countries and the EU is 3 years for substances and 5 further years for mixtures. (Note that the 3 year period in the EU corresponds to the timing for notification of the C&L of substances to the REACH Inventory).

(3) "GHS global with EU delay for partial REACH implementation"

- The GHS is globally implemented, with every country adopting the same starting date;
- The transition period for non-EU countries is 3 years for substances and 5 further years for mixtures;
- The transition period for the EU is 6 years for substances and 5 further years for mixtures, with this linked to the first two tranches of substance registration under REACH.

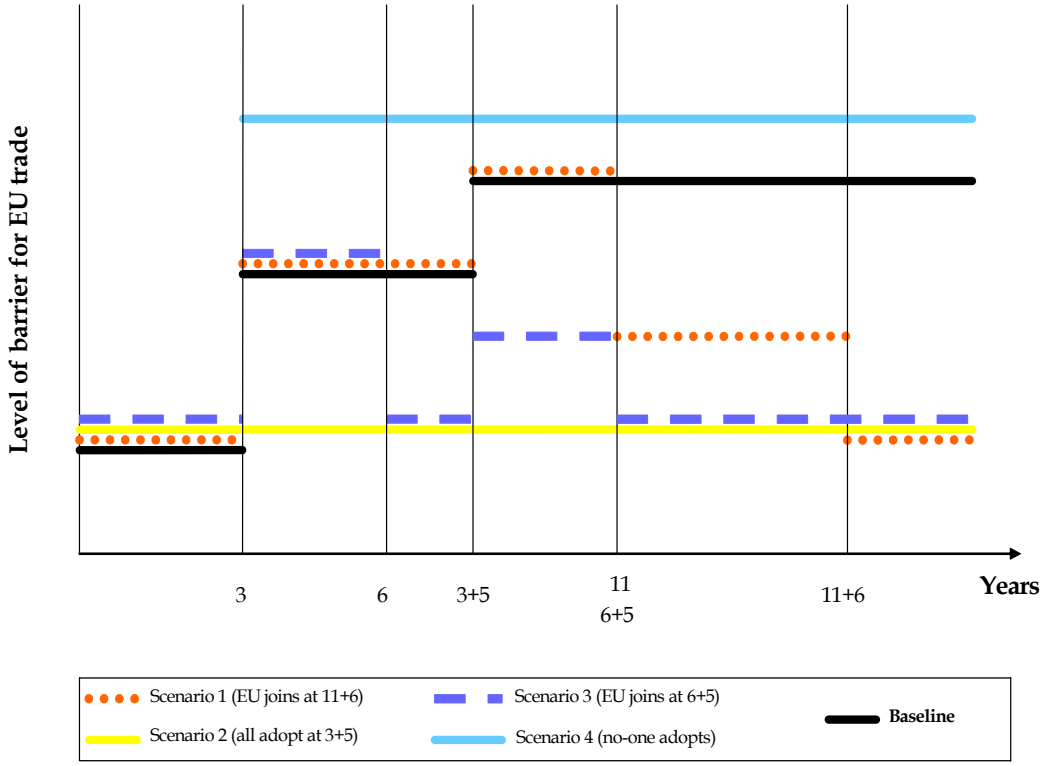
(4) "Fragmented Global C&L" or "worst case scenario"

- The GHS is not implemented;
- All countries/trade blocks fall back to national C&L systems (either one already in place or newly created where none currently exists);
- There is, however, no fall back to the current status of the existing EU C&L system, namely there is no longer an automatic acceptance by the EU's trading partners.

For quantification of each of these scenarios, we resort to a graphic depiction. In terms of their impact on trade, we need to distinguish what each scenario implies for the evolution of barriers to EU exports and barriers imposed by EU on exporters (i.e. costs of partners to export to the EU).

We start with an analysis of the evolution of the level of C&L-related export barrier for EU exporters, in each of the 5 cases. As per the description of the scenarios given above, we consider a time frame where changes happen at 3 and 3+5, 6 and 6+5, and 11 and 11+6 years.

Figure 1: Evolution of level of C&L-barriers for EU trade under the four scenarios



Our baseline case considers that once our partners have fully implemented the GHS, EU SDSs will no longer be accepted. EU exporters will thus have larger costs and thus trade barriers because they will have to prepare GHS-compliant SDSs and C&L in order to export. This cost increase will take shape in two steps, first for substances in year 3 and then for substances and mixtures in year 3+5. This is represented by the bold black line in the figure above.

Scenario 1 considers that the EU will fully implement the GHS only after the REACH registration phase-in period, thus several years after the rest of the world has implemented the GHS. In the interim period (when the rest of the world has fully implemented but the EU has not) we assume that the current EU SDSs are no longer accepted by trading partners. In this case, as the EU gradually moves towards full GHS implementation, first in substances then in mixtures, the level of trading barriers for exporters gradually moves back down to the lowest level once GHS is also fully implemented by the EU. This Scenario is represented by a dotted line in the figure above.

Under Scenario 2, all countries implement GHS within a standard 3+5 timeframe. Since the move to GHS is simultaneous, none of the parties needs to comply with more than one set of C&L requirements. This is represented by the straight yellow line in the figure above.

As for Scenario 3, the behaviour is very similar to that of Scenario 1 except for the fact that the EU moves quicker to implement the GHS common standard. This is displayed as a dashed line, above. In year 6 and 7, the GHS is applied to substances all over the world, while the transition period in the rest of the world still allows for the EU C&L; that is why the trade barrier briefly falls back to the lowest level. From year 8 to the end of the EU's transition period (year 11), EU exporters of mixtures face a trade barrier, as the existing EU C&L for mixtures is no longer accepted in the rest of the world.

It remains to comment on the depiction of Scenario 4. Under this worst case scenario, we assume that each country will move to a potentially different C&L system so that EU exporters will have to prepare SDSs of several different types, depending on the destination. This will represent a higher cost / trade barrier for exporters than any of the previous scenarios. We represent the situation by a light blue line at the top of the figure.

A similar line of argumentation can be applied for the evolution of C&L costs from the point of view of EU importers. Again, let us begin with the baseline. Under the baseline case, the EU does not implement GHS while the world does implement. As a result, exporters into the EU will have to supply separate EU-compliant SDSs so their costs, relative to other sales destinations will be higher. The corresponding trade barrier renders the EU a less attractive sales destination for chemicals suppliers from the rest of the world.

Under Scenario 1, the EU finishes the GHS implementation only after a considerable lag. After 11 years, the cost and trade barrier of exporting to the EU will come down, first for substances and 6 years later for mixtures.

Under Scenario 2, all countries implement GHS at the same time, so there is no change in the relative costs of exporting to the EU.

Scenario 3 is again similar to Scenario 1 except that the EU implements the GHS sooner, at 6+5 rather than 11+6. As with exports under this scenario, there is a "pause" in the trade barriers attributable to differences in C&L systems. In the years 6 and 7, non-EU suppliers of mixtures can continue their current C&L practices as regards their export to the EU. From year 8

onwards, however, a new trade barrier emerges as the non-EU GHS regulations require the non-EU mixtures suppliers to provide GHS C&L while they need also to provide the EU C&L for their EU sales destinations. The resulting barrier disappears when the EU transition period ends.

As for Scenario 4, where the entire world uses different C&L systems, the costs / trade barrier of importing into the EU are higher than in the other scenarios, because the non-EU suppliers' provision of EU SDSs is specific for the EU sales destinations only.

According to our estimation results reported in the previous Section, we use as the point estimate for the coefficient of NTBs the value of 0.025. The 90% confidence interval gives a range from roughly 0.012 to 0.038 (i.e. about 50% lower to 50% higher the point estimate). Therefore, our final estimates presented in the table overleaf can be transformed into confidence intervals by taking numbers 50% below and 50% above the predicted values.

For our computations of the impact of the GHS under the different scenarios we need first to subtract from total chemical trade flows the values corresponding to flows that will not be affected by the GHS. This is the case for HS groups 30 and 31 and for roughly 1/3 of HS group 28. The totals for GHS-relevant exports and imports are computed in the table below.

Table 7: GHS-relevant exports and imports for scenario analysis

EU exports - size of flow		100,469,973
subtract 1/3 of HS group 28	1,053,606	
subtract HS group 30	38,583,097	
subtract HS group 31	395,045	
relevant flow for impact on EU exports		**60,438,225**
EU imports - size of flow		75,099,000
subtract 1/3 of HS group 28	1,555,000	
subtract HS group 30	21,980,000	
subtract HS group 31	1,237,000	
relevant flow for impact on EU imports		**50,327,000**

We have made a series of steps and a number of assumptions in order to compute a final estimate for the impact of each of the four scenarios. The table below provides a summary of these.

Table 8: Main steps and assumptions for scenario analysis	
0.025	estimated coefficient from LE econometric work
2.50%	currently C&L costs are estimated at 2.5% of all NTB costs, but this corresponds to a situation where EU SDSs are accepted by all this cost share is assumed to correspond to a comparable share in C&L in the Non-Tariff Barriers to trade
100%	We would propose to assume a 100% increase in costs (relative to the 2.5% component)which we believe to be a conservative assumption The change in costs / trade barriers takes place over two stages - in the first stage chemical substances are affected and in the second stage the mixtures. For the relative weight of substances and mixtures in the chemicals sectors of interest, we concluded that roughly half and half would be a fair estimate.
4%	For scenario 4 where EU exporters would need several different types of SDS depending on the importing country, we will assume that the C&L costs of this are twice as high as when only one type of alien SDS needs to be constructed, namely the GHS-compliant one Discount rate assumed. Impact computed for up to 30 years from present.

Currently C&L costs are estimated at only 2.5% of all NTB costs, but this corresponds to a situation of a very wide acceptance of the EU SDSs by the EU trading partners. Replication of SDS, labels and other documentation in conformity with other C&L systems are therefore not often demanded by overseas companies. But if they had to prepare labels specifically for exporting, this would change. It is likely that the increase in costs would be substantial - from a situation where no specific SDSs need to be prepared to one where multiple documents need to be prepared.

As we learned about this wide acceptance of the current EU C&L system only through the responses on the questionnaires, an in-depth investigation of this phenomenon was beyond the scope of this exercise. However, the consultation revealed that in cases where the EU C&L was not accepted, this was mostly due to differences in EU and non-EU downstream legislation.

Based on the interview responses, we need to make an reasoned assumption as to the level of increase in C&L and related costs that the fact that other countries no longer accept EU SDSs entails. We would propose to assume a 100% increase in NTB-related costs relative to the mentioned 2.5% component; and thus a 2.5% increase in the level of the Non-Tariff Barriers to trade. We believe that this is a conservative estimate.

The change in costs takes place over two stages - in the first part of the transition period the substances are affected; in the second part the mixtures. For the relative weight of substances and mixtures in the chemicals trade flows coming from or going to the EU, we have used the rough estimate of 50% for each (see also the previous section). Thus we take 50% of the change in each step.

For Scenario 4, where EU exporters would need several different types of SDS depending on the importing country, we will assume that the corresponding C&L costs / trade barriers are twice as high as when only one type of SDS needs to be constructed, namely the GHS-compliant one.

Table 9: Analysis of scenarios for EU exports

	Predicted reduction in exports per year (in 1,000s Euros)					PV sum
	years 3 to 5	years 6 to 7	years 8 to 10	years 11 to 16	years 17 and after	
Baseline	18,887	18,887	37,774	37,774	37,774	**504,204**
Scenario 1	18,887	18,887	37,774	18,887	0	**224,283**
Scenario 2	0	0	0	0	0	**0**
Scenario 3	18,887	0	18,887	0	0	**113,322**
Scenario 4	75,548	75,548	75,548	75,548	75,548	**1,163,884**

Note: PV = present value

In order to help reading Table 9, we provide here a few illustrations on how to interpret the figures. Scenario 2 corresponds to the case where the EU and the rest of the World all adopt GHS simultaneously with 3+5 years timeframe. As explained above, under this scenario there are no changes in trade barriers to EU exporters. In the baseline case where the EU will never adopt the GHS, the Present Value of the reduced future export flows to €504 million. In case the EU implements the GHS more slowly than its trading partners, the foregone exports flows are worth €224 million for the case where EU adopts at 11+6 and €113 million for the case where EU adopts at 6+5.

The results of the corresponding analysis with relation to EU imports are given in Table 10.

Table 10: Analysis of scenarios for EU imports

	Predicted reduction in imports per year (in 1,000s Euros)					PV sum
	years 3 to 5	years 6 to 7	years 8 to 10	years 11 to 16	years 17 and after	
Baseline	15,727	15,727	31,454	31,454	31,454	**419,852**
Scenario 1	15,727	15,727	31,454	15,727	0	**186,761**
Scenario 2	0	0	0	0	0	**0**
Scenario 3	15,727	0	15,727	0	0	**73,518**
Scenario 4	62,909	62,909	62,909	62,909	62,909	**969,168**

Note: PV = present value

With respect to imports, we conclude that the Present Value between a simultaneous adoption of GHS in the EU and the non-EU and non-adoption in the EU is €420 million in present value of imports.

Conclusions

The main results from our quantitative analysis which has been based on the various scenarios on the timing of the GHS implementation in the EU as compared to that in the rest of the world can be summarised as follows:

- Non-implementation of GHS in the EU is estimated to result in a loss of roughly €504 million for exports and €420 million for imports.
- A delayed implementation of GHS in the EU until after the completion of the REACH phase-in period (namely a transition period of 11+6 years) is estimated to result in a loss of roughly €224 million for exports and €184 million for imports.
- A shorter delay in of the GHS implementation in the EU (a transition period of 6+5 years) results in a loss of roughly €113 million for exports and €74 million for imports.
- The worst-case scenario of a complete breakdown of the GHS systems is estimated to result in a loss of € 1163 million and €969 million for EU-exports and imports respectively.

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Annex 1 Country-by-country number of observations

For each country in our sample, we have observations respective to their chemical products imports from the EU and exports to the EU. We report the total number of observations in the two tables below. (Table 2 in the main text explains the country codes.)

importer	Freq.	Percent	Cum.
dz	650	2.43	2.43
ar	704	2.63	5.06
au	739	2.76	7.82
br	759	2.83	10.65
ca	672	2.51	13.16
cl	651	2.43	15.59
cn	754	2.82	18.41
in	753	2.81	21.22
id	707	2.64	23.86
jp	737	2.75	26.61
my	684	2.55	29.16
ma	726	2.71	31.88
nz	601	2.24	34.12
ng	590	2.20	36.32
no	795	2.97	39.29
ro	748	2.79	42.09
ru	763	2.85	44.93
sa	712	2.66	47.59
za	770	2.88	50.47
ch	855	3.19	53.66
th	697	2.60	56.26
tn	687	2.57	58.83
ua	639	2.39	61.22
us	843	3.15	64.36
eu	9,543	35.64	100.00
Total	26,779	100.00	

exporter	Freq.	Percent	Cum.
dz	55	0.21	0.21
ar	264	0.99	1.19
au	384	1.43	2.63
br	496	1.85	4.48
ca	559	2.09	6.56
cl	146	0.55	7.11
cn	792	2.96	10.07
in	643	2.40	12.47
id	278	1.04	13.51
jp	754	2.82	16.32
my	290	1.08	17.41
ma	196	0.73	18.14
nz	189	0.71	18.84
ng	63	0.24	19.08
no	603	2.25	21.33
ro	315	1.18	22.51
ru	457	1.71	24.21
sa	184	0.69	24.90
za	443	1.65	26.55
ch	862	3.22	29.77
th	296	1.11	30.88
tn	167	0.62	31.50
ua	239	0.89	32.39
us	868	3.24	35.64
eu	17,236	64.36	100.00
Total	26,779	100.00	

Annex 2 Country-by-country trade barriers information

Our dataset has a broad coverage of NTBs as we have previously mentioned. The Table below displays the number of occurrences at the 10-digit level of the HS nomenclature, the NTB categories and corresponding frequencies of NTBs. For our estimation we have used the aggregation of HS10 level barriers to the HS6 level.

MeasureName	Freq.	Percent	Cum.
Antidumping duties	59	0.08	0.08
Antidumping duty	78	0.10	0.18
Antidumping investigation	2	0.00	0.19
Antidumping investigations	46	0.06	0.25
Antidumping price undertakings	3	0.00	0.25
Authorization	173	0.23	0.48
Authorization (sensitive product catego	1	0.00	0.48
Authorization for animal health protect	27	0.04	0.52
Authorization for human health protecti	11,730	15.70	16.23
Authorization for plant health protecti	121	0.16	16.39
Authorization to control drug abuset	3	0.00	16.39
Authorization to ensure human safety	66	0.09	16.48
Authorization to ensure national securi	966	1.29	17.77
Authorization to prevent drug abuse	52	0.07	17.84
Authorization to prevent drug onment	2,716	3.64	21.48
Authorization to protect animal health	2,717	3.64	25.12
Authorization to protect animal health	1	0.00	25.12
Authorization to protect environment	3,246	4.35	29.46
Authorization to protect human health	43	0.06	29.52
Authorization to protect wildlife	28	0.04	29.56
Authorization to protect wildlife (CITE	3	0.00	29.56
Authorization, n.e.s.	320	0.43	29.99
Automatic Licence	6	0.01	30.00
Automatic licence	23	0.03	30.03
Countervailing duties	3	0.00	30.03
Countervailing duty	2	0.00	30.04
Decreed customs valuation	11	0.01	30.05
Global quotas	27	0.04	30.09
Health and safety regulations	2	0.00	30.09
Import authorization	68	0.09	30.18
Internal tax levied on imports	4	0.01	30.19
Labelling requirements	4,600	6.16	36.35
Labelling requirements to ensure human	2	0.00	36.35
Labelling requirements to protect human	83	0.11	36.46
Labelling requirements to protect human	101	0.14	36.59
Licence	24	0.03	36.63
Licence for selected purchasers	4	0.01	36.63
Licence to protect animal health	2	0.00	36.63
Licence to protect environment	59	0.08	36.71
Licence to protect human health	117	0.16	36.87
Licence to protect human safety	46	0.06	36.93
Licence to protect national security	34	0.05	36.98
Licence with no specific 'ex-ante' crit	1	0.00	36.98
Local Content Requirement	7	0.01	36.99
Marking requirements to ensure human sa	5	0.01	36.99
Non-automatic Licence to protect human	17	0.02	37.02
Non-automatic licence	71	0.10	37.11
Non-automatic licence to control drug a	4	0.01	37.12
Non-automatic licence to ensure nationa	24	0.03	37.15
Non-automatic licence to protect enviro	6	0.01	37.16
Non-automatic licence(n.e.s.)	17	0.02	37.18

Non-commercial prohibition	8	0.01	37.19
Packaging requirements	399	0.53	37.73
Packaging requirements to ensure human	5	0.01	37.73
Packaging requirements to protect human	41	0.05	37.79
Price undertakings	3	0.00	37.79
Prior authorization to ensure human saf	2	0.00	37.79
Prior surveillance	96	0.13	37.92
Prior surveillance to protect environme	3	0.00	37.93
Prior surveillance to protect human hea	18	0.02	37.95
Prod characteristics req. to ensure hum	117	0.16	38.11
Prod characteristics req. to protect an	9,778	13.09	51.20
Prod characteristics req. to protect en	7,606	10.18	61.38
Product characteristic requirement for	20	0.03	61.41
Product characteristic requirement to p	5	0.01	61.41
Product characteristic requirement to p	10	0.01	61.43
Product characteristic requirements to	17	0.02	61.45
Product characteristics req. to control	164	0.22	61.67
Product characteristics req. to protect	10,327	13.83	75.50
Product characteristics req. to protect	6	0.01	75.50
Product characteristics requirements	7	0.01	75.51
Product characteristics requirements (h	2	0.00	75.52
Product characteristics requirements fo	143	0.19	75.71
Product characteristics requirements to	65	0.09	75.80
Product characteristics requirements to	6	0.01	75.80
Product characteristics requirements to	37	0.05	75.85
Product characteristics requirements to	364	0.49	76.34
Product characteristics requirements to	369	0.49	76.83
Product characteristics requirements to	28	0.04	76.87
Product characteristics requirements, n	238	0.32	77.19
Prohibition	4	0.01	77.20
Prohibition on the basis of origin (Emb	4	0.01	77.20
Prohibition to control drug abuse	1,027	1.37	78.58
Prohibition to ensure human safety	3	0.00	78.58
Prohibition to protect animal health an	1,841	2.46	81.04
Prohibition to protect environment	432	0.58	81.62
Prohibition to protect human health	994	1.33	82.95
Prohibition to protect plant health	9	0.01	82.97
Prohibition to protect wildlife	18	0.02	82.99
Prohibition, n.e.s.	1	0.00	82.99
Quota to control	65	0.09	83.08
Quota to prevent drug abuse	16	0.02	83.10
Quota to protect environment	10	0.01	83.11
Quota to protect environment (Montreal	23	0.03	83.14
Quota to protect human health	1	0.00	83.15
Quotas to ensure national security	17	0.02	83.17
Quotas to protect environment	26	0.03	83.20
Quotas to protect human health	38	0.05	83.25
REGULATIONS CONCERNING TERMS OF PAYMENT	222	0.30	83.55
Requirement to use specific points of e	931	1.25	84.80
SPECIAL CUSTOMS FORMALITIES	1,117	1.50	86.29
Single channel for imports to protect h	7	0.01	86.30
Sole importing agency	2	0.00	86.31
State monopoly of imports	1	0.00	86.31
State trading administration	36	0.05	86.35
Tariff quota	12	0.02	86.37
Technical regulations	14	0.02	86.39
Test, inspection and quarantine against	229	0.31	86.70
Test, inspection and quarantine for ani	2,651	3.55	90.25
Test, inspection and quarantine for hum	4,369	5.85	96.09
Test, inspection and quarantine for pla	57	0.08	96.17
Testing, inspection etc. req. for purpo	342	0.46	96.63
Testing, inspection etc. req. to protec	2,040	2.73	99.36
Testing, inspection or quarantine requi	7	0.01	99.37
Testing, inspection or quarantine requi	71	0.10	99.46
Testing, inspection or quarantine requi	39	0.05	99.52
Transit requirements	361	0.48	100.00
Total	74,692	100.00	

As we describe below, the use of NTBs varies greatly across countries, at least to the extent it is reported in the TRAINS database. The categories of barriers used by the different countries are quite different.

```
-> importer = dz

                          MeasureName |      Freq.     Percent        Cum.
--------------------------------------+-----------------------------------
Authorization for human health protecti |          4       23.53       23.53
Authorization to ensure national securi |          1        5.88       29.41
        Licence for selected purchasers |          2       11.76       41.18
     Prohibition to protect environment |          1        5.88       47.06
          Quotas to protect environment |          3       17.65       64.71
Test, inspection and quarantine for hum |          3       17.65       82.35
Test, inspection and quarantine for pla |          3       17.65      100.00
--------------------------------------+-----------------------------------
                                Total |         17      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = ar

                          MeasureName |      Freq.     Percent        Cum.
--------------------------------------+-----------------------------------
                    Antidumping duties |         10        0.06        0.06
             Antidumping investigations |          6        0.03        0.09
Authorization for human health protecti |      5,638       32.14       32.23
Authorization for plant health protecti |         20        0.11       32.35
Authorization to ensure national securi |         74        0.42       32.77
   Authorization to prevent drug onment |        900        5.13       37.90
 Authorization to protect animal health |        368        2.10       40.00
   Authorization to protect environment |        259        1.48       41.47
      Authorization to protect wildlife |         24        0.14       41.61
                Authorization, n.e.s. |        111        0.63       42.24
             Decreed customs valuation |         11        0.06       42.31
                Labelling requirements |        481        2.74       45.05
             Local Content Requirement |          7        0.04       45.09
                Packaging requirements |         48        0.27       45.36
                    Price undertakings |          2        0.01       45.37
Prod characteristics req. to ensure hum |        116        0.66       46.04
Prod characteristics req. to protect an |          6        0.03       46.07
Product characteristics req. to control |         47        0.27       46.34
Product characteristics req. to protect |      6,047       34.47       80.81
Product characteristics requirements, n |        135        0.77       81.58
      Prohibition to control drug abuse |         89        0.51       82.09
Prohibition to protect animal health an |         32        0.18       82.27
     Prohibition to protect environment |        127        0.72       82.99
    Prohibition to protect human health |        586        3.34       86.33
    Prohibition to protect plant health |          4        0.02       86.36
        Prohibition to protect wildlife |         18        0.10       86.46
REGULATIONS CONCERNING TERMS OF PAYMENT |        222        1.27       87.73
Requirement to use specific points of e |        441        2.51       90.24
            SPECIAL CUSTOMS FORMALITIES |        114        0.65       90.89
Test, inspection and quarantine for ani |        315        1.80       92.69
Test, inspection and quarantine for hum |        859        4.90       97.58
Test, inspection and quarantine for pla |          7        0.04       97.62
Testing, inspection etc. req. for purpo |         56        0.32       97.94
                  Transit requirements |        361        2.06      100.00
--------------------------------------+-----------------------------------
                                Total |     17,541      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = au

                          MeasureName |      Freq.     Percent        Cum.
--------------------------------------+-----------------------------------
                      Antidumping duty |          7        3.61        3.61
              Antidumping investigation |          2        1.03        4.64
         Antidumping price undertakings |          3        1.55        6.19
```

```
    Authorization to prevent drug abuse |         16        8.25       14.43
  Authorization to protect human health |         43       22.16       36.60
Packaging requirements to protect human |         41       21.13       57.73
Product characteristics requirements to |         73       37.63       95.36
     Prohibition to protect environment |          8        4.12       99.48
    Prohibition to protect human health |          1        0.52      100.00
----------------------------------------+-----------------------------------
                                  Total |        194      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = br

                           MeasureName |      Freq.     Percent        Cum.
----------------------------------------+-----------------------------------
                     Antidumping duties |         16        0.03        0.03
             Antidumping investigations |         12        0.03        0.06
                          Authorization |         77        0.16        0.22
Authorization for human health protecti |      5,096       10.63       10.85
Authorization for plant health protecti |         40        0.08       10.94
Authorization to ensure national securi |        319        0.67       11.60
   Authorization to prevent drug onment |      1,697        3.54       15.14
 Authorization to protect animal health |      2,332        4.87       20.01
   Authorization to protect environment |      2,374        4.95       24.96
                 Authorization, n.e.s. |        200        0.42       25.38
                Labelling requirements |      3,701        7.72       33.10
                               Licence |         20        0.04       33.14
                Packaging requirements |        351        0.73       33.87
                    Price undertakings |          1        0.00       33.88
Prod characteristics req. to ensure hum |          1        0.00       33.88
Prod characteristics req. to protect an |      9,733       20.31       54.19
Prod characteristics req. to protect en |      7,604       15.87       70.05
Product characteristics req. to control |         36        0.08       70.13
Product characteristics req. to protect |      3,233        6.75       76.87
Product characteristics requirements, n |        103        0.21       77.09
      Prohibition to control drug abuse |        917        1.91       79.00
Prohibition to protect animal health an |      1,806        3.77       82.77
     Prohibition to protect environment |        172        0.36       83.13
    Prohibition to protect human health |        341        0.71       83.84
     Quotas to ensure national security |         12        0.03       83.87
Requirement to use specific points of e |        489        1.02       84.89
            SPECIAL CUSTOMS FORMALITIES |         33        0.07       84.95
          State trading administration  |         22        0.05       85.00
                  Technical regulations |         14        0.03       85.03
Test, inspection and quarantine against |        112        0.23       85.26
Test, inspection and quarantine for ani |      2,332        4.87       90.13
Test, inspection and quarantine for hum |      2,494        5.20       95.33
Test, inspection and quarantine for pla |         40        0.08       95.42
Testing, inspection etc. req. for purpo |        200        0.42       95.83
Testing, inspection etc. req. to protec |      1,997        4.17      100.00
----------------------------------------+-----------------------------------
                                  Total |     47,927      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = ca

                           MeasureName |      Freq.     Percent        Cum.
----------------------------------------+-----------------------------------
Authorization for human health protecti |         17       23.29       23.29
   Authorization to ensure human safety |          5        6.85       30.14
Marking requirements to ensure human sa |          5        6.85       36.99
Packaging requirements to ensure human  |          5        6.85       43.84
Product characteristics requirements to |         15       20.55       64.38
Product characteristics requirements to |         10       13.70       78.08
            Quota to prevent drug abuse |         16       21.92      100.00
----------------------------------------+-----------------------------------
                                  Total |         73      100.00

------------------------------------------------------------------------------
-----------------------------
```

```
-> importer = cl

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
            Antidumping investigations |          1        0.02        0.02
Authorization for human health protecti |         48        1.11        1.13
Authorization to ensure national securi |        276        6.38        7.51
   Authorization to prevent drug onment |        119        2.75       10.26
 Authorization to protect animal health |         10        0.23       10.49
   Authorization to protect environment |         51        1.18       11.67
                Labelling requirements |        400        9.24       20.91
Prior authorization to ensure human saf |          2        0.05       20.95
Prod characteristics req. to protect an |         20        0.46       21.41
Prod characteristics req. to protect en |          2        0.05       21.46
Product characteristics req. to control |         78        1.80       23.26
Product characteristics req. to protect |        972       22.45       45.71
Product characteristics req. to protect |          2        0.05       45.76
      Prohibition to control drug abuse |         21        0.49       46.25
     Prohibition to ensure human safety |          2        0.05       46.29
Prohibition to protect animal health an |          3        0.07       46.36
     Prohibition to protect environment |         87        2.01       48.37
    Prohibition to protect human health |         45        1.04       49.41
    Prohibition to protect plant health |          5        0.12       49.53
Requirement to use specific points of e |          1        0.02       49.55
            SPECIAL CUSTOMS FORMALITIES |        970       22.41       71.96
Test, inspection and quarantine against |        117        2.70       74.66
Test, inspection and quarantine for ani |          4        0.09       74.75
Test, inspection and quarantine for hum |        999       23.08       97.83
Test, inspection and quarantine for pla |          6        0.14       97.97
Testing, inspection etc. req. for purpo |         72        1.66       99.63
Testing, inspection etc. req. to protec |         16        0.37      100.00
---------------------------------------+-----------------------------------
                                 Total |      4,329      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = cn

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
                         Authorization |         96       53.33       53.33
                         Global quotas |         27       15.00       68.33
Product characteristics req. to protect |          4        2.22       70.56
   Product characteristics requirements |          7        3.89       74.44
Test, inspection and quarantine for hum |         10        5.56       80.00
Testing, inspection etc. req. for purpo |         14        7.78       87.78
Testing, inspection etc. req. to protec |         22       12.22      100.00
---------------------------------------+-----------------------------------
                                 Total |        180      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = in

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
                  Import authorization |         68       29.96       29.96
Non-automatic Licence to protect human  |         17        7.49       37.44
                Non-automatic licence |         66       29.07       66.52
Non-automatic licence to control drug a |          4        1.76       68.28
Non-automatic licence to ensure nationa |         24       10.57       78.85
Non-automatic licence to protect enviro |          6        2.64       81.50
          Non-automatic licence(n.e.s.) |         17        7.49       88.99
     Prohibition to protect environment |          2        0.88       89.87
    Prohibition to protect human health |          5        2.20       92.07
                   Prohibition, n.e.s. |          1        0.44       92.51
Single channel for imports to protect h |          7        3.08       95.59
           State trading administration |         10        4.41      100.00
---------------------------------------+-----------------------------------
                                 Total |        227      100.00
```

```
------------------------------------------------------------------------------
-----------------------------
-> importer = id

                         MeasureName |      Freq.     Percent        Cum.
-------------------------------------+-----------------------------------
                   Antidumping duties |          2        3.70        3.70
Authorization for human health protecti |          4        7.41       11.11
                             Licence |          4        7.41       18.52
       Licence for selected purchasers |          2        3.70       22.22
Product characteristics req. to control |          3        5.56       27.78
Product characteristics req. to protect |          5        9.26       37.04
    Prohibition to protect environment |          6       11.11       48.15
         Quotas to protect environment |         14       25.93       74.07
                 Sole importing agency |          2        3.70       77.78
          State trading administration |          3        5.56       83.33
Test, inspection and quarantine for hum |          4        7.41       90.74
Testing, inspection etc. req. to protec |          5        9.26      100.00
-------------------------------------+-----------------------------------
                               Total |         54      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = jp

                         MeasureName |      Freq.     Percent        Cum.
-------------------------------------+-----------------------------------
    Quotas to ensure national security |          5       11.63       11.63
        Quotas to protect human health |         38       88.37      100.00
-------------------------------------+-----------------------------------
                               Total |         43      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = my

                         MeasureName |      Freq.     Percent        Cum.
-------------------------------------+-----------------------------------
            Antidumping investigations |          1        5.56        5.56
Authorization to ensure national securi |          2       11.11       16.67
   Authorization to protect environment |         14       77.78       94.44
                Authorization, n.e.s. |          1        5.56      100.00
-------------------------------------+-----------------------------------
                               Total |         18      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = ma

                         MeasureName |      Freq.     Percent        Cum.
-------------------------------------+-----------------------------------
Authorization to ensure national securi |          9       25.71       25.71
                         Prohibition |          1        2.86       28.57
    Prohibition to protect environment |         24       68.57       97.14
Test, inspection and quarantine for pla |          1        2.86      100.00
-------------------------------------+-----------------------------------
                               Total |         35      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = nz

                         MeasureName |      Freq.     Percent        Cum.
-------------------------------------+-----------------------------------
Authorization for animal health protect |         27        5.19        5.19
Authorization for human health protecti |         17        3.27        8.46
   Authorization to ensure human safety |          8        1.54       10.00
Authorization to ensure national securi |        257       49.42       59.42
    Authorization to prevent drug abuse |         14        2.69       62.12
   Authorization to protect environment |         96       18.46       80.58
Labelling requirements to protect human |        101       19.42      100.00
```

```
--------------------------------------+----------------------------------
                               Total |        520      100.00

-------------------------------------------------------------------------------
----------------------------
-> importer = ng

                         MeasureName |      Freq.     Percent        Cum.
--------------------------------------+----------------------------------
Authorization to ensure national securi |          1        3.13        3.13
Labelling requirements to protect human |          1        3.13        6.25
Product characteristics req. to protect |          8       25.00       31.25
                         Prohibition |          3        9.38       40.63
    Prohibition to protect human health |         10       31.25       71.88
          Quotas to protect environment |          9       28.13      100.00
--------------------------------------+----------------------------------
                               Total |         32      100.00

-------------------------------------------------------------------------------
----------------------------
-> importer = no

                         MeasureName |      Freq.     Percent        Cum.
--------------------------------------+----------------------------------
          Health and safety regulations |          2        5.26        5.26
         Internal tax levied on imports |          4       10.53       15.79
             Non-commercial prohibition |          8       21.05       36.84
Product characteristic requirements to  |         17       44.74       81.58
              State monopoly of imports |          1        2.63       84.21
                        Tariff quota |          6       15.79      100.00
--------------------------------------+----------------------------------
                               Total |         38      100.00

-------------------------------------------------------------------------------
----------------------------
-> importer = ro

                         MeasureName |      Freq.     Percent        Cum.
--------------------------------------+----------------------------------
Authorization for human health protecti |        321       21.27       21.27
Authorization for plant health protecti |         30        1.99       23.26
   Authorization to ensure human safety |         36        2.39       25.65
    Authorization to prevent drug abuse |         22        1.46       27.10
   Authorization to protect environment |        369       24.45       51.56
                     Automatic licence |         23        1.52       53.08
                 Non-automatic licence |          5        0.33       53.41
Product characteristics requirements to |          4        0.27       53.68
Product characteristics requirements to |         22        1.46       55.14
Product characteristics requirements to |        354       23.46       78.60
Product characteristics requirements to |        295       19.55       98.14
Product characteristics requirements to |         28        1.86      100.00
--------------------------------------+----------------------------------
                               Total |      1,509      100.00

-------------------------------------------------------------------------------
----------------------------
-> importer = ru

                         MeasureName |      Freq.     Percent        Cum.
--------------------------------------+----------------------------------
   Authorization to control drug abuset |          3        6.67        6.67
Authorization to ensure national securi |          6       13.33       20.00
Licence with no specific 'ex-ante' crit |          1        2.22       22.22
Product characteristic requirement for  |         20       44.44       66.67
Product characteristic requirement to p |          5       11.11       77.78
Product characteristic requirement to p |         10       22.22      100.00
--------------------------------------+----------------------------------
                               Total |         45      100.00

-------------------------------------------------------------------------------
----------------------------
```

```
-> importer = sa

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
Authorization for human health protecti |        560       88.05       88.05
Authorization for plant health protecti |         31        4.87       92.92
Authorization to ensure national securi |          6        0.94       93.87
Testing, inspection or quarantine requi |         39        6.13      100.00
---------------------------------------+-----------------------------------
                                 Total |        636      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = za

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
                       Antidumping duty |         11       10.89       10.89
Authorization (sensitive product catego |          1        0.99       11.88
   Authorization to protect environment |         30       29.70       41.58
Labelling requirements to protect human |         59       58.42      100.00
---------------------------------------+-----------------------------------
                                 Total |        101      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = ch

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
                      Automatic Licence |          6        2.16        2.16
       Licence to protect animal health |          2        0.72        2.88
         Licence to protect environment |         59       21.22       24.10
        Licence to protect human health |        117       42.09       66.19
        Licence to protect human safety |         46       16.55       82.73
   Licence to protect national security |         34       12.23       94.96
           Quota to protect environment |         10        3.60       98.56
                         Tariff quota |          4        1.44      100.00
---------------------------------------+-----------------------------------
                                 Total |        278      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = th

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
Labelling requirements to protect human |          1        1.15        1.15
Prod characteristics req. to protect an |         19       21.84       22.99
Product characteristics req. to protect |         62       71.26       94.25
     Prohibition to protect environment |          5        5.75      100.00
---------------------------------------+-----------------------------------
                                 Total |         87      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = tn

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
Authorization for human health protecti |         25       36.23       36.23
Authorization to ensure national securi |          4        5.80       42.03
   Authorization to protect environment |         31       44.93       86.96
                 Authorization, n.e.s. |          8       11.59       98.55
          State trading administration |          1        1.45      100.00
---------------------------------------+-----------------------------------
                                 Total |         69      100.00

------------------------------------------------------------------------------
----------------------------
-> importer = ua
```

```
                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
Authorization to protect animal health  |          1       25.00       25.00
Product characteristics requirements (h |          2       50.00       75.00
Product characteristics requirements to |          1       25.00      100.00
---------------------------------------+-----------------------------------
                                 Total |          4      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = us

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
                       Antidumping duty |         60       12.32       12.32
   Authorization to ensure human safety |         17        3.49       15.81
Authorization to ensure national securi |         11        2.26       18.07
 Authorization to protect animal health |          7        1.44       19.51
      Authorization to protect wildlife |          4        0.82       20.33
                  Countervailing duty |          2        0.41       20.74
Labelling requirements to ensure human  |          2        0.41       21.15
Labelling requirements to protect human |         22        4.52       25.67
Product characteristics requirements fo |        143       29.36       55.03
Product characteristics requirements to |         65       13.35       68.38
Product characteristics requirements to |          2        0.41       68.79
     Prohibition to ensure human safety |          1        0.21       68.99
    Prohibition to protect human health |          6        1.23       70.23
                       Quota to control |         65       13.35       83.57
                           Tariff quota |          2        0.41       83.98
Testing, inspection or quarantine requi |          7        1.44       85.42
Testing, inspection or quarantine requi |         71       14.58      100.00
---------------------------------------+-----------------------------------
                                 Total |        487      100.00

------------------------------------------------------------------------------
-----------------------------
-> importer = eu

                           MeasureName |      Freq.     Percent        Cum.
---------------------------------------+-----------------------------------
                     Antidumping duties |         31       12.50       12.50
             Antidumping investigations |         26       10.48       22.98
   Authorization to protect environment |         22        8.87       31.85
Authorization to protect wildlife (CITE |          3        1.21       33.06
                  Countervailing duties |          3        1.21       34.27
                Labelling requirements |         18        7.26       41.53
                    Prior surveillance |         96       38.71       80.24
Prior surveillance to protect environme |          3        1.21       81.45
Prior surveillance to protect human hea |         18        7.26       88.71
Prohibition on the basis of origin (Emb |          4        1.61       90.32
Quota to protect environment (Montreal  |         23        9.27       99.60
          Quota to protect human health |          1        0.40      100.00
---------------------------------------+-----------------------------------
                                 Total |        248      100.00
```

Annex 3 Detailed regression results

Table 11: IV-Tobit with h4tariffs and h4NTBs (Model 1)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.810	0.045	**				
NTB_num	-0.025	0.008	**				
ar	-12.556	0.777	**	au_eu	7.090	0.505	**
au	-24.336	1.077	**	br_eu	5.445	0.449	**
br	-15.443	0.817	**	ca_eu	10.567	0.491	**
ca	-28.200	1.037	**	cl_eu	-4.501	0.500	**
cl	-11.706	0.823	**	cn_eu	12.251	0.440	**
cn	-24.157	0.790	**	dz_eu	-9.061	0.574	**
in	-14.148	0.690	**	in_eu	8.519	0.442	**
id	-15.940	0.849	**	id_eu	0.436	0.464	
jp	-30.892	1.042	**	jp_eu	15.124	0.484	**
my	-17.652	0.894	**	my_eu	0.352	0.462	
ma	-4.901	0.716	**	ma_eu	-2.602	0.485	**
nz	-25.917	1.135	**	nz_eu	4.307	0.567	**
ng	2.194	0.796	**	ng_eu	-9.087	0.572	**
no	-23.913	0.945	**	no_eu	6.796	0.447	**
ro	-17.096	0.869	**	ro_eu	0.814	0.465	
ru	-16.623	0.794	**	ru_eu	4.568	0.451	**
sa	-11.705	0.828	**	sa_eu	-2.565	0.482	**
za	-19.821	0.895	**	za_eu	3.551	0.454	**
ch	-27.554	0.954	**	ch_eu	12.593	0.440	**
th	-16.385	0.852	**	th_eu	0.813	0.464	
tn	-14.018	0.880	**	tn_eu	-3.418	0.491	**
ua	-15.625	0.832	**	ua_eu	-0.848	0.473	
us	-30.865	1.021	**	us_eu	18.722	0.482	**
eu	-28.758	0.869	**	_cons	28.731	0.954	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(49) = 13349.35
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 127.16 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 12: IV-Tobit with h4tariffs and h4NTBs (Model 2)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariffdev	-0.810	0.045	**				
NTB_dev	-0.025	0.008	**				
ar	-8.044	0.709	**	au_eu	7.090	0.505	**
au	-14.015	0.744	**	br_eu	5.445	0.449	**
br	-11.617	0.695	**	ca_eu	10.567	0.491	**
ca	-18.699	0.735	**	cl_eu	-4.501	0.500	**
cl	-4.889	0.727	**	cn_eu	12.251	0.440	**
cn	-18.318	0.691	**	dz_eu	-9.061	0.574	**
in	-14.924	0.692	**	in_eu	8.519	0.442	**
id	-8.506	0.706	**	id_eu	0.436	0.464	
jp	-21.189	0.729	**	jp_eu	15.124	0.484	**
my	-8.744	0.705	**	my_eu	0.352	0.462	
ma	-4.982	0.716	**	ma_eu	-2.602	0.485	**
nz	-14.815	0.788	**	nz_eu	4.307	0.567	**
ng	-0.244	0.783		ng_eu	-9.087	0.572	**
no	-12.648	0.691	**	no_eu	6.796	0.447	**
ro	-8.114	0.703	**	ro_eu	0.814	0.465	
ru	-10.644	0.697	**	ru_eu	4.568	0.451	**
sa	-5.037	0.717	**	sa_eu	-2.565	0.482	**
za	-9.956	0.696	**	za_eu	3.551	0.454	**
ch	-16.079	0.686	**	ch_eu	12.593	0.440	**
th	-8.745	0.705	**	th_eu	0.813	0.464	
tn	-5.067	0.721	**	tn_eu	-3.418	0.491	**
ua	-8.615	0.711	**	ua_eu	-0.848	0.473	
us	-21.622	0.727	**	us_eu	18.722	0.482	**
eu	-18.108	0.557	**	_cons	16.945	0.645	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(49) = 13349.35
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 127.15 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 13: IV-Tobit with h4tariffs/trade and h4NTBs (Model 3)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.748	0.039	**				
NTB_num	-0.026	0.008	**				
ar	-12.111	0.752	**	au_eu	6.831	0.488	**
au	-23.241	0.989	**	br_eu	5.439	0.442	**
br	-14.958	0.793	**	ca_eu	10.309	0.474	**
ca	-27.170	0.955	**	cl_eu	-4.450	0.492	**
cl	-11.175	0.791	**	cn_eu	12.235	0.432	**
cn	-23.648	0.757	**	dz_eu	-9.009	0.567	**
in	-14.160	0.680	**	in_eu	8.516	0.435	**
id	-15.307	0.806	**	id_eu	0.418	0.456	
jp	-29.850	0.958	**	jp_eu	14.870	0.467	**
my	-16.915	0.841	**	my_eu	0.342	0.455	
ma	-4.911	0.706	**	ma_eu	-2.554	0.477	**
nz	-24.778	1.043	**	nz_eu	4.066	0.551	**
ng	2.010	0.783	**	ng_eu	-9.040	0.565	**
no	-23.053	0.880	**	no_eu	6.843	0.439	**
ro	-16.411	0.822	**	ro_eu	0.867	0.457	
ru	-16.120	0.762	**	ru_eu	4.567	0.444	**
sa	-11.148	0.792	**	sa_eu	-2.564	0.475	**
za	-19.069	0.841	**	za_eu	3.598	0.446	**
ch	-26.672	0.886	**	ch_eu	12.633	0.432	**
th	-15.742	0.809	**	th_eu	0.800	0.456	
tn	-13.337	0.834	**	tn_eu	-3.368	0.484	**
ua	-15.049	0.794	**	ua_eu	-0.843	0.465	
us	-29.860	0.940	**	us_eu	18.469	0.465	**
eu	-27.867	0.796	**	_cons	27.785	0.879	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(49) = 13777.69
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 144.97 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 14: IV-Tobit with h4tariffs and h4NTBs (Model 4)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.422	0.034	**				
NTBratio	-0.034	0.015	*				
lh6trade	2.059	0.020	**	au_eu	4.860	0.388	**
ar	-9.789	0.611	**	br_eu	5.259	0.348	**
au	-16.298	0.819	**	ca_eu	8.440	0.376	**
br	-13.163	0.601	**	cl_eu	-3.912	0.397	**
ca	-20.646	0.790	**	cn_eu	12.029	0.339	**
cl	-8.248	0.650	**	dz_eu	-8.154	0.469	**
cn	-20.295	0.615	**	in_eu	8.428	0.341	**
in	-13.629	0.547	**	id_eu	0.324	0.363	
id	-11.408	0.661	**	jp_eu	13.159	0.369	**
jp	-23.417	0.793	**	my_eu	0.261	0.362	
my	-12.461	0.692	**	ma_eu	-2.071	0.382	**
ma	-4.598	0.572	**	nz_eu	1.198	0.437	**
nz	-16.600	0.862	**	ng_eu	-8.309	0.470	**
ng	0.838	0.646		no_eu	6.986	0.345	**
no	-17.846	0.725	**	ro_eu	1.166	0.363	**
ro	-12.306	0.675	**	ru_eu	4.463	0.350	**
ru	-12.849	0.620	**	sa_eu	-2.575	0.383	**
sa	-7.687	0.650	**	za_eu	3.820	0.352	**
za	-14.558	0.691	**	ch_eu	12.705	0.338	**
ch	-21.297	0.730	**	th_eu	0.701	0.363	
th	-11.759	0.663	**	tn_eu	-2.858	0.389	**
tn	-9.423	0.687	**	ua_eu	-0.867	0.372	
ua	-11.371	0.651	**	us_eu	16.802	0.368	**
us	-23.675	0.777	**	_cons	-13.54229	0.7591	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(50) = 28150.98
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 55.84 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 15: IV-Tobit with h4tariffs and h4NTBs (Model 5)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.782	0.044	**				
NTBratio	-0.060	0.019	**				
ar	-12.793	0.771	**	au_eu	6.970	0.501	**
au	-23.862	1.062	**	br_eu	5.445	0.447	**
br	-16.379	0.761	**	ca_eu	10.450	0.487	**
ca	-27.753	1.023	**	cl_eu	-4.483	0.497	**
cl	-11.590	0.819	**	cn_eu	12.246	0.437	**
cn	-23.952	0.783	**	dz_eu	-9.058	0.572	**
in	-14.177	0.687	**	in_eu	8.519	0.440	**
id	-15.671	0.841	**	id_eu	0.426	0.461	
jp	-30.445	1.027	**	jp_eu	15.014	0.479	**
my	-17.335	0.884	**	my_eu	0.346	0.460	
ma	-4.916	0.713	**	ma_eu	-2.584	0.482	**
nz	-25.447	1.119	**	nz_eu	4.209	0.563	**
ng	2.111	0.793	**	ng_eu	-9.085	0.570	**
no	-23.546	0.933	**	no_eu	6.819	0.444	**
ro	-16.847	0.861	**	ro_eu	0.839	0.462	
ru	-16.415	0.788	**	ru_eu	4.569	0.449	**
sa	-11.483	0.821	**	sa_eu	-2.570	0.480	**
za	-19.502	0.885	**	za_eu	3.573	0.451	**
ch	-27.184	0.942	**	ch_eu	12.614	0.437	**
th	-16.115	0.844	**	th_eu	0.807	0.461	
tn	-13.730	0.871	**	tn_eu	-3.395	0.489	**
ua	-15.382	0.825	**	ua_eu	-0.847	0.470	
us	-30.446	1.007	**	us_eu	18.612	0.477	**
eu	-28.383	0.856	**	_cons	28.381	0.940	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(49) = 13497.17
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 132.93 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 16: IV-Tobit with h4tariffs and h4NTBs (Model 6)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariffdev	-0.782	0.044	**				
NTBratio	-0.060	0.019	**				
ar	-8.036	0.706	**	au_eu	6.970	0.501	**
au	-13.891	0.739	**	br_eu	5.445	0.447	**
br	-11.607	0.692	**	ca_eu	10.450	0.487	**
ca	-18.578	0.731	**	cl_eu	-4.483	0.497	**
cl	-4.903	0.724	**	cn_eu	12.246	0.437	**
cn	-18.309	0.687	**	dz_eu	-9.058	0.572	**
in	-14.920	0.689	**	in_eu	8.519	0.440	**
id	-8.492	0.702	**	id_eu	0.426	0.461	
jp	-21.076	0.725	**	jp_eu	15.014	0.479	**
my	-8.732	0.702	**	my_eu	0.346	0.460	
ma	-4.994	0.713	**	ma_eu	-2.584	0.482	**
nz	-14.713	0.783	**	nz_eu	4.209	0.563	**
ng	-0.244	0.781		ng_eu	-9.085	0.570	**
no	-12.668	0.688	**	no_eu	6.819	0.444	**
ro	-8.135	0.700	**	ro_eu	0.839	0.462	
ru	-10.642	0.694	**	ru_eu	4.569	0.449	**
sa	-5.027	0.714	**	sa_eu	-2.570	0.480	**
za	-9.974	0.693	**	za_eu	3.573	0.451	**
ch	-16.097	0.683	**	ch_eu	12.614	0.437	**
th	-8.736	0.702	**	th_eu	0.807	0.461	
tn	-5.085	0.718	**	tn_eu	-3.395	0.489	**
ua	-8.614	0.708	**	ua_eu	-0.847	0.470	
us	-21.510	0.723	**	us_eu	18.612	0.477	**
eu	-18.094	0.555	**	_cons	17.001	0.643	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(49) = 13497.17
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 132.93 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 17: IV-Tobit with h4tariffs and h4NTBs (Brazil dropped) (Model 7)

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.809	0.046	**				
NTB_num	-0.063	0.029	*				
ar	-11.968	0.907	**	au_eu	7.097	0.508	**
au	-24.356	1.083	**	br_eu	5.461	0.451	**
				ca_eu	10.583	0.494	**
ca	-28.239	1.043	**	cl_eu	-4.515	0.502	**
cl	-11.557	0.836	**	cn_eu	12.280	0.442	**
cn	-24.205	0.794	**	dz_eu	-9.098	0.577	**
in	-14.197	0.694	**	in_eu	8.543	0.444	**
id	-15.964	0.854	**	id_eu	0.436	0.466	
jp	-30.937	1.048	**	jp_eu	15.149	0.486	**
my	-17.677	0.899	**	my_eu	0.352	0.464	
ma	-4.927	0.720	**	ma_eu	-2.609	0.487	**
nz	-25.925	1.141	**	nz_eu	4.310	0.570	**
ng	2.190	0.800	**	ng_eu	-9.123	0.575	**
no	-23.952	0.951	**	no_eu	6.819	0.449	**
ro	-17.062	0.875	**	ro_eu	0.820	0.467	
ru	-16.661	0.799	**	ru_eu	4.583	0.454	**
sa	-11.695	0.833	**	sa_eu	-2.575	0.485	**
za	-19.852	0.900	**	za_eu	3.565	0.456	**
ch	-27.591	0.960	**	ch_eu	12.625	0.442	**
th	-16.409	0.857	**	th_eu	0.815	0.466	
tn	-14.031	0.885	**	tn_eu	-3.427	0.494	**
ua	-15.651	0.837	**	ua_eu	-0.851	0.475	
us	-30.894	1.026	**	us_eu	18.751	0.484	**
eu	-28.796	0.874	**	_cons	28.745	0.959	-

Two-step tobit with endogenous regressors Number of obs = 40859
Wald chi2(48) = 13096.82
Prob > chi2 = 0.0000

Wald test of exogeneity: chi2(2) = 125.41 Prob > chi2 = 0.0000
Obs. summary: 14081 left-censored observations at ltrade2<=0
26778 uncensored observations

Table 18: 2SLS with h4tariffs and h4NTBs I

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.419	0.032	**				
NTB_num	-0.012	0.006					
ar	-4.656	0.426	**	au_eu	3.710	0.302	**
au	-10.389	0.669	**	br_eu	3.165	0.279	**
br	-5.868	0.487	**	ca_eu	6.099	0.300	**
ca	-13.270	0.645	**	cl_eu	-1.928	0.232	**
cl	-4.989	0.423	**	cn_eu	8.393	0.254	**
cn	-11.970	0.431	**	dz_eu	-3.039	0.207	**
in	-5.929	0.351	**	in_eu	5.411	0.269	**
id	-6.407	0.474	**	id_eu	0.230	0.267	
jp	-15.311	0.640	**	jp_eu	9.796	0.287	**
my	-7.311	0.526	**	my_eu	0.136	0.260	
ma	-0.683	0.424		ma_eu	-1.193	0.246	**
nz	-12.041	0.702	**	nz_eu	2.086	0.317	**
ng	1.103	0.416	**	ng_eu	-3.141	0.199	**
no	-10.492	0.576	**	no_eu	4.175	0.273	**
ro	-6.802	0.494	**	ro_eu	0.411	0.266	
ru	-6.273	0.448	**	ru_eu	2.569	0.279	**
sa	-4.247	0.450	**	sa_eu	-1.116	0.242	**
za	-8.051	0.529	**	za_eu	2.004	0.272	**
ch	-13.090	0.557	**	ch_eu	8.846	0.229	**
th	-6.513	0.494	**	th_eu	0.403	0.269	
tn	-5.812	0.507	**	tn_eu	-1.470	0.244	**
ua	-6.595	0.465	**	ua_eu	-0.418	0.251	
us	-15.523	0.592	**	us_eu	13.021	0.244	**
eu	-14.216	0.516	**	_cons	17.962	0.573	-

Instrumental variables (2SLS) regression Number of obs = 40859
F(49,40809) = 738.34
Prob > F = 0.0000
R-squared = 0.1826
Root MSE = 5.672

Table 19: 2SLS with h4tariffs and h4NTBs II

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariffdev	-0.419	0.027	**				
NTB_dev	-0.012	0.005	*				
ar	-2.301	0.392	**	au_eu	3.710	0.306	**
au	-5.047	0.418	**	br_eu	3.165	0.275	**
br	-3.834	0.389	**	ca_eu	6.099	0.300	**
ca	-8.353	0.413	**	cl_eu	-1.928	0.280	**
cl	-1.456	0.392	**	cn_eu	8.393	0.273	**
cn	-8.948	0.388	**	dz_eu	-3.039	0.282	**
in	-6.330	0.389	**	in_eu	5.411	0.273	**
id	-2.560	0.390	**	id_eu	0.230	0.275	
jp	-10.289	0.411	**	jp_eu	9.796	0.296	**
my	-2.700	0.389	**	my_eu	0.136	0.274	
ma	-0.725	0.392		ma_eu	-1.193	0.280	**
nz	-6.295	0.442	**	nz_eu	2.086	0.339	**
ng	-0.159	0.398		ng_eu	-3.141	0.282	**
no	-4.662	0.388	**	no_eu	4.175	0.275	**
ro	-2.151	0.391	**	ro_eu	0.411	0.279	
ru	-3.179	0.390	**	ru_eu	2.569	0.275	**
sa	-0.796	0.391		sa_eu	-1.116	0.277	**
za	-2.945	0.389	**	za_eu	2.004	0.277	**
ch	-7.151	0.386	**	ch_eu	8.846	0.273	**
th	-2.559	0.390	**	th_eu	0.403	0.276	
tn	-1.180	0.392	**	tn_eu	-1.470	0.280	**
ua	-2.968	0.391	**	ua_eu	-0.418	0.277	
us	-10.739	0.410	**	us_eu	13.021	0.296	**
eu	-8.704	0.280	**	_cons	11.863	0.341	-

Instrumental variables (2SLS) regression Number of obs = 40859
F(49,40809) =
Prob > F = 0.0000
R-squared =
Root MSE =

Table 20: 2SLS with h4tariffs and h4NTBs cluster by importer

	Coef.	Std. Err.	** significant at 1% * at 5%		Coef.	Std. Err.	significant at 1%
tariff	-0.419	0.136	**				
NTB_num	-0.012	0.007					
ar	-4.656	0.910	**	au_eu	3.710	0.571	**
au	-10.389	2.421	**	br_eu	3.165	0.014	**
br	-5.868	0.905	**	ca_eu	6.099	0.569	**
ca	-13.270	2.281	**	cl_eu	-1.928	0.113	**
cl	-4.989	1.156	**	cn_eu	8.393	0.041	**
cn	-11.970	1.138	**	dz_eu	-3.039	0.115	**
in	-5.929	0.002	**	in_eu	5.411	0.013	**
id	-6.407	1.408	**	id_eu	0.230	0.043	**
jp	-15.311	2.310	**	jp_eu	9.796	0.564	**
my	-7.311	1.638	**	my_eu	0.136	0.026	**
ma	-0.683	0.010	**	ma_eu	-1.193	0.112	**
nz	-12.041	2.519	**	nz_eu	2.086	0.537	**
ng	1.103	0.410		ng_eu	-3.141	0.115	**
no	-10.492	1.910	**	no_eu	4.175	0.099	**
ro	-6.802	1.516	**	ro_eu	0.411	0.112	**
ru	-6.273	1.129	**	ru_eu	2.569	0.009	**
sa	-4.247	1.237	**	sa_eu	-1.116	0.000	**
za	-8.051	1.670	**	za_eu	2.004	0.104	**
ch	-13.090	1.962	**	ch_eu	8.846	0.083	**
th	-6.513	1.428	**	th_eu	0.403	0.028	**
tn	-5.812	1.508	**	tn_eu	-1.470	0.112	**
ua	-6.595	1.286	**	ua_eu	-0.418	0.008	**
us	-15.523	2.231	**	us_eu	13.021	0.561	**
eu	-14.216	1.980	**	_cons	17.962	2.096	**

Instrumental variables (2SLS) regression Number of obs = 40859
F(1, 24) = .
Prob > F = .
R-squared = 0.1826
Number of clusters (importer) = 25 Root MSE = 5.672

Annex 4 Aggregated information on tariff data covered by our sample

In the table below we include a summary of the tariff information contained in our database. For each country and for each HS group, we report (in three rows) the average tariff imposed by that country, its respective standard deviation and frequency (frequency is the number of products at the HS 6 level, within that HS group, that were subject to a reported import tariff).

Table 21: Tariff: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
dz	14.4	14.7	5.3	13.8	14.3	18.6	24.3	19.0	24.4	15.0	14.9	12.6	14.6
	2.5	1.8	2.5	3.4	8.4	12.6	8.3	6.9	7.8	0.0	4.0	8.8	6.0
	180	295	29	24	46	35	23	15	8	35	61	124	875
ar	6.2	5.9	8.5	2.6	11.7	14.4	14.5	13.6	12.6	8.0	10.5	13.2	8.5
	3.4	3.9	3.5	2.6	3.0	5.3	3.1	2.1	1.8	5.4	4.5	4.4	5.1
	178	291	29	25	46	35	23	15	8	35	61	124	870
au	0.4	0.9	0.5	0.0	3.4	2.7	4.2	1.2	3.1	3.4	1.8	4.9	1.8
	1.3	1.8	1.5	0.0	2.4	2.5	1.6	2.1	2.6	2.3	2.4	1.7	2.4
	180	295	29	25	46	35	23	15	8	35	61	124	876
br	6.3	6.2	7.3	2.1	11.7	14.4	14.4	13.4	12.6	7.6	10.0	13.1	8.4
	3.4	4.4	3.7	2.1	3.0	5.3	3.2	2.2	1.8	5.4	5.0	4.5	5.3
	180	295	29	24	46	35	23	15	8	35	61	124	875

Table 21: Tariff: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
ca	1.4	2.5	0.0	0.0	3.0	4.0	4.7	11.9	6.5	5.1	3.3	3.9	2.8
	1.8	2.4	0.0	0.0	2.7	3.0	1.9	23.5	0.0	1.9	2.7	2.1	4.1
	180	295	29	25	46	35	23	15	8	35	61	124	876
cl	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	178	291	29	25	46	35	23	15	8	35	61	124	870
cn	5.6	5.7	4.4	4.0	7.7	16.2	10.2	10.3	8.0	15.6	7.6	9.1	7.3
	0.9	1.4	1.4	0.5	2.0	3.4	2.4	3.4	1.7	9.4	3.0	1.8	3.9
	180.0	295.0	29.0	24.0	46.0	35.0	23.0	15.0	8.0	35.0	61.0	124.0	875.0
in	14.9	15.1	14.5	10.6	15.0	23.4	15.0	25.0	15.0	15.0	16.9	15.0	15.5
	1.1	1.4	2.8	5.4	.	15.2	0.0	7.8	0.0	0.0	6.6	.	4.5
	174	290	29	24	46	35	23	14	8	35	61	124	863
id	4.5	3.6	3.4	0.1	5.0	9.9	7.2	4.2	8.3	5.6	5.1	10.9	5.4
	2.0	2.6	2.2	0.3	2.5	13.8	4.6	1.8	4.5	3.2	2.4	6.6	5.1
	180	295	29	24	46	35	23	15	8	35	61	124	875
jp	2.5	2.7	0.0	0.0	3.2	1.4	0.7	6.3	4.8	0.0	2.5	4.0	2.6
	1.7	2.0	0.0	0.0	1.2	1.9	1.5	5.3	1.4	0.0	2.9	1.8	2.3
	180	295	29	25	46	35	23	15	8	35	61	124	876
my	2.1	0.2	0.0	1.1	5.9	2.4	5.2	9.8	20.7	2.3	1.8	13.3	3.6
	5.8	1.6	0.0	2.0	9.6	5.4	5.2	10.5	17.6	6.5	3.8	10.9	7.8
	178	291	29	25	46	35	23	15	8	35	61	124	870

Table 21: Tariff: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
ma	11.0	4.8	21.7	0.6	15.1	43.7	29.1	30.9	7.5	8.0	13.2	34.5	14.7
	12.4	1.6	12.9	0.0	18.8	7.6	19.3	11.8	17.5	14.7	13.9	14.3	16.4
	180	295	29	24	46	35	23	15	8	35	61	124	875
nz	0.1	0.0	0.0	0.0	0.8	2.9	3.6	1.8	1.3	0.7	0.8	2.9	0.8
	0.7	0.4	0.0	0.0	1.5	2.6	2.2	2.4	1.3	1.7	1.8	3.2	2.0
	180	295	29	25	46	35	23	15	8	35	61	124	876
ng	13.8	11.2	19.3	2.5	18.3	53.4	52.8	23.9	30.6	20.3	13.1	20.6	17.6
	6.4	4.0	1.8	0.0	7.9	45.6	39.4	8.1	15.9	5.1	6.4	13.7	17.4
	151	248	29	23	46	34	23	14	8	34	61	121	792
no	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	0.0	1.4	0.0	0.6
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.4	0.0	0.0	6.4	0.0	8.0
	180	295	29	25	46	35	23	15	8	35	61	124	876
ro	3.2	3.0	1.0	3.3	2.7	3.4	3.4	8.2	4.4	4.4	2.8	5.0	3.4
	3.3	3.2	1.6	0.7	1.5	3.6	1.9	8.4	2.5	4.6	5.2	2.9	3.6
	180	295	29	24	46	35	23	15	8	35	61	124	875
ru	5.4	5.1	8.6	10.0	5.3	10.4	12.8	5.0	20.0	10.9	6.0	11.4	7.2
	1.8	0.7	3.1	0.0	1.5	5.1	4.2	0.0	0.0	3.5	3.0	3.8	3.8
	178	291	29	25	46	35	23	15	8	35	61	124	870
sa	6.0	5.3	0.2	12.0	9.4	5.6	10.6	6.4	6.9	5.2	5.5	8.3	6.3
	9.9	1.4	1.1	0.0	6.6	1.8	7.2	2.9	5.3	1.2	2.4	5.6	5.8

Table 21: Tariff: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
	178	291	29	25	46	35	23	15	8	35	61	124	870
za	0.5	1.1	0.3	0.0	1.9	6.5	11.9	0.9	1.7	2.5	1.1	7.0	2.4
	2.5	3.2	1.9	0.0	3.2	6.6	6.9	2.5	4.7	3.8	2.6	6.3	4.8
	178	293	29	25	46	35	24	15	8	35	62	126	876
ch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.2	0.0	0.0	0.7	0.0	0.4
	0.0	0.1	0.0	0.0	0.0	0.0	0.0	49.6	0.0	0.0	2.4	0.0	6.7
	181	302	29	25	46	35	24	15	8	35	61	126	887
th	1.6	1.5	2.7	4.8	6.1	16.3	6.8	5.2	18.8	12.7	5.0	12.7	5.1
	1.5	1.3	4.3	1.0	4.0	12.9	4.8	2.2	3.5	6.8	1.6	7.7	6.7
	180	295	29	24	46	35	23	15	8	35	61	124	875
tn	1.7	1.4	2.6	0.0	3.7	15.0	9.6	1.9	20.0	0.3	3.7	7.5	3.5
	4.0	3.4	8.0	0.0	6.9	14.3	12.7	7.3	8.7	1.6	7.2	7.7	7.2
	180	295	29	24	46	35	23	15	8	35	61	124	875
ua	3.9	5.8	3.5	4.8	5.1	9.8	10.8	4.9	14.9	19.5	4.0	4.6	5.9
	3.8	4.4	3.5	0.7	1.9	2.1	7.8	2.0	7.2	6.8	2.0	3.9	5.2
	180	295	29	24	46	35	23	15	8	35	61	124	875
us	2.3	3.7	0.0	0.0	3.8	1.3	1.9	3.0	2.9	2.7	3.7	4.7	3.1
	1.8	2.2	0.0	0.0	1.9	2.0	2.2	4.5	2.7	1.6	2.2	1.6	2.3
	180.0	295.0	29.0	25.0	46.0	35.0	23.0	15.0	8.0	35.0	61.0	124.0	876.0
eu	1.1	1.5	0.0	1.9	1.6	0.5	0.4	4.8	1.3	1.1	1.6	1.7	1.4

Table 21: Tariff: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
	2.0	4.2	0.0	2.2	2.4	1.6	1.3	7.4	2.5	2.3	6.4	2.5	3.6
	4052	6482	556	552	1056	787	498	341	190	825	1624	2998	19961
Total	2.9	3.0	2.5	2.6	4.2	6.3	5.9	7.9	5.9	4.1	3.6	5.5	3.8
	4.9	4.7	5.7	3.6	6.2	13.6	12.1	14.4	9.0	6.6	6.9	7.9	6.9
	8326	13495	1252	1140	2160	1626	1052	699	382	1664	3089	5975	40860

Algeria, India, Nigeria and Morocco have high protection levels, translated into very high mean values of tariff rates. The EU has very low tariff protection in relation to chemicals, as do Switzerland, Norway and New Zealand. It is also interesting to note that there are huge differences in level of tariff protection across the countries in the sample. While for some countries, the average tariff is below 1%, for others it is above 15%.

Annex 5 Additional information on the distribution of NTBs in our sample

The table below provides information on the average number of NTBs on a per product basis, for each country and for each of the H2 product groups that we include in our sample. The table report for each country-H2 group pair, the mean, standards deviation and the frequency of the corresponding NTBs (a column with three rows for each of these pairs, as can be seen below)

It is not surprising that these means are almost always close to zero. As the number of observations cab illustrate, some H2 groups have a large number of subgroups so even if a subset is protected by a number of NTBs, the average for the group may be quite small.

Table 22: NTBs: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
dz	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.1	0.0	0.0	0.0	0.0
	0.0	0.1	0.0	0.0	0.0	0.2	1.0	0.0	0.4	0.0	0.2	0.0	0.2
	180	295	29	24	46	35	23	15	8	35	61	124	875
ar	11.1	21.6	148.0	9.1	2.9	7.8	5.4	7.4	2.3	0.6	8.1	3.6	16.6
	10.4	34.6	232.0	4.3	4.4	5.2	6.4	8.1	2.3	1.4	21.6	6.6	53.4
	178	291	29	25	46	35	23	15	8	35	61	124	870
au	0.0	0.2	3.2	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.1	0.1	0.2
	0.2	0.6	0.7	0.0	0.0	0.2	0.5	0.0	0.4	0.0	0.3	0.3	0.7
	180	295	29	25	46	35	23	15	8	35	61	124	876
br	30.3	76.3	299.8	6.6	3.0	14.9	8.7	15.6	0.5	1.5	14.7	1.3	44.6

Table 22: NTBs: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
	29.2	120.3	458.6	3.2	5.5	15.9	10.4	19.6	1.4	4.9	30.1	4.3	122.6
	180	295	29	24	46	35	23	15	8	35	61	124	875
ca	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.1
	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.3
	180	295	29	25	46	35	23	15	8	35	61	124	876
cl	5.0	6.3	16.2	3.6	1.0	2.9	0.6	3.4	4.0	0.0	3.7	0.4	4.4
	3.7	7.8	12.7	2.4	2.5	2.6	1.6	3.0	4.7	0.0	13.8	2.2	7.3
	178	291	29	25	46	35	23	15	8	35	61	124	870
cn	0.1	0.1	0.1	2.3	0.0	0.3	0.0	0.0	0.0	0.4	0.1	0.2	0.2
	0.6	0.5	0.3	0.9	0.0	0.5	0.0	0.0	0.0	0.6	0.6	0.7	0.7
	180	295	29	24	46	35	23	15	8	35	61	124	875
in	0.1	0.1	0.2	0.7	0.3	1.1	0.7	0.4	0.9	0.2	0.3	0.4	0.3
	0.2	0.3	0.4	0.6	0.5	0.9	0.7	0.5	0.4	0.4	0.6	0.6	0.5
	174	290	29	24	46	35	23	14	8	35	61	124	863
id	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.1	0.1	0.0	0.1
	0.0	0.5	0.0	0.3	0.0	0.0	0.0	0.0	1.1	0.2	0.6	0.0	0.4
	180	295	29	24	46	35	23	15	8	35	61	124	875
jp	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	0.2	0.3	0.3	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.1	0.0	0.2
	180	295	29	25	46	35	23	15	8	35	61	124	876

Table 22: NTBs: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
my	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	178	291	29	25	46	35	23	15	8	35	61	124	870
ma	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
	0.7	0.2	0.0	0.0	0.0	0.2	0.0	0.0	2.2	0.0	0.0	0.0	0.4
	180	295	29	24	46	35	23	15	8	35	61	124	875
nz	0.0	0.9	1.6	1.0	1.1	1.1	0.5	1.1	1.0	0.0	0.4	0.0	0.6
	0.2	0.4	1.5	0.0	1.3	1.2	0.5	1.0	0.8	0.0	1.2	0.2	0.8
	180	295	29	25	46	35	23	15	8	35	61	124	876
ng	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0
	0.1	0.3	0.0	0.0	0.0	0.0	0.2	0.0	0.7	0.0	0.7	0.0	0.3
	151	248	29	23	46	34	23	14	8	34	61	121	792
no	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.1	1.0	0.0	0.1	0.0	0.0
	0.1	0.1	0.0	0.0	0.0	0.5	0.0	1.0	0.8	0.0	0.3	0.0	0.3
	180	295	29	25	46	35	23	15	8	35	61	124	876
ro	1.2	1.5	3.9	2.8	1.8	3.5	1.2	3.7	1.3	0.0	1.8	1.6	1.6
	3.3	2.2	2.2	1.2	2.0	2.9	1.6	2.1	1.4	0.0	4.9	2.4	2.8
	180	295	29	24	46	35	23	15	8	35	61	124	875
ru	0.0	0.0	0.2	0.2	0.0	0.0	0.1	0.1	0.8	0.0	0.1	0.1	0.0
	0.1	0.1	0.6	0.5	0.0	0.0	0.3	0.3	0.7	0.0	0.3	0.4	0.3
	178	291	29	25	46	35	23	15	8	35	61	124	870

Table 22: NTBs: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
sa	1.2	1.0	1.1	2.4	0.0	0.0	0.0	0.0	0.5	0.0	0.3	0.0	0.7
	0.6	0.6	0.5	1.6	0.0	0.0	0.0	0.0	0.5	0.0	1.1	0.1	0.8
	178	291	29	25	46	35	23	15	8	35	61	124	870
za	0.0	0.1	0.5	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	0.2	0.7	0.5	0.0	0.1	0.7	0.0	0.0	0.0	0.0	0.2	0.1	0.5
	178	293	29	25	46	35	24	15	8	35	62	126	876
ch	0.1	0.4	0.5	1.0	0.0	0.0	0.6	0.9	0.8	0.0	0.3	0.0	0.3
	0.4	0.7	0.5	0.0	0.0	0.2	0.7	1.2	0.5	0.0	0.7	0.2	0.6
	181	302	29	25	46	35	24	15	8	35	61	126	887
th	0.0	0.2	0.7	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1
	0.1	0.7	2.3	0.0	0.3	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.6
	180	295	29	24	46	35	23	15	8	35	61	124	875
tn	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.1
	0.6	0.3	0.3	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.3
	180	295	29	24	46	35	23	15	8	35	61	124	875
ua	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.1
	180	295	29	24	46	35	23	15	8	35	61	124	875
us	0.2	0.5	3.4	0.0	0.1	1.8	0.0	0.4	1.6	0.0	0.8	0.1	0.5
	1.0	1.5	2.0	0.2	0.3	2.1	0.2	1.1	2.4	0.0	2.6	0.7	1.5

Table 22: NTBs: means, standard deviations, and frequencies by importer and by HS2

h2 Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
	180	295	29	25	46	35	23	15	8	35	61	124	876
eu	0.1	0.2	0.1	0.4	0.1	0.5	0.0	0.0	0.9	0.0	1.3	0.2	0.3
	0.3	1.2	0.4	1.0	0.8	0.5	0.0	0.0	0.6	0.0	10.0	1.8	3.1
	4052	6482	556	552	1056	787	498	341	190	825	1624	2998	19961
Total	1.1	2.5	11.2	0.8	0.3	1.0	0.4	0.7	0.8	0.1	1.3	0.3	1.6
	6.6	21.8	91.6	2.0	1.4	3.5	2.3	4.0	1.2	0.8	9.4	1.9	20.8
	8326	13495	1252	1140	2160	1626	1052	699	382	1664	3089	5975	40860

Annex 6 Trade flows summary information

This annex presents summary information on the trade flows, per trading partner and per HS group (HS2).

Table 23: Trade-flows totals by importer and by HS2 (€000s)

Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
dz	27,678	61,585	658,200	4,930	61,087	86,205	28,332	11,552	1,023	11,121	114,500	220,100	1,286,313
ar	34,618	133,400	204,300	6,872	46,548	33,628	36,455	17,348	166	13,015	143,900	119,200	789,450
au	31,994	416,600	2,199,000	20,523	110,400	389,400	61,877	24,567	4,264	63,234	300,100	478,300	4,100,259
br	91,188	654,100	687,600	61,336	152,100	79,296	90,966	37,115	1,008	35,629	547,600	471,700	2,909,638
ca	49,168	487,500	2,226,000	46,192	84,004	218,900	33,100	73,600	4,742	16,948	183,100	352,300	3,775,554
cl	11,823	30,623	86,756	15,781	65,308	46,410	18,778	10,830	943	7,215	72,150	100,700	467,317
cn	141,800	864,000	512,100	10,010	360,300	113,200	180,300	73,339	697	43,625	511,100	1,273,000	4,083,471
in	65,987	408,300	206,500	1,054	102,800	47,879	50,042	19,008	2,230	45,269	203,100	345,700	1,497,869
id	29,093	180,700	78,341	13,665	87,761	89,480	39,131	17,468	264	6,386	107,800	120,000	770,089
jp	426,200	2,007,000	2,669,000	6,216	200,500	611,200	133,500	194,600	2,680	67,372	633,600	740,600	7,692,468
my	56,444	141,200	173,000	12,929	79,157	63,351	27,026	14,862	612	11,346	98,948	178,700	857,575
ma	28,248	109,700	142,900	36,627	96,421	55,027	24,699	19,937	2,275	15,922	114,600	297,500	943,856
nz	4,710	29,377	151,900	6,530	25,030	41,433	12,000	5,398	1,121	10,603	45,775	112,000	445,877
ng	13,918	41,849	137,100	11,656	40,121	85,257	26,455	13,238	130	12,181	52,020	124,000	557,925
no	140,300	238,900	841,400	29,916	269,200	302,900	176,000	43,464	6,817	64,344	282,900	977,600	3,373,741
ro	22,003	71,334	419,000	2,566	169,100	146,000	49,997	39,368	274	26,224	176,000	557,400	1,679,266
ru	75,555	207,400	1,207,000	6,414	588,400	907,600	234,200	135,200	1,285	180,800	593,400	1,408,000	5,545,254
sa	41,505	120,100	743,100	13,065	107,700	273,300	70,929	27,096	1,783	18,893	205,300	376,200	1,998,971
za	48,526	202,100	553,100	7,004	139,100	118,200	60,026	33,330	800	43,093	289,700	462,600	1,957,579
ch	204,700	3,220,000	5,909,000	38,827	533,700	792,400	291,700	152,700	8,425	107,000	771,100	2,796,000	14,825,552

Table 23: Trade-flows totals by importer and by HS2 (€000s)

Importer	28	29	30	31	32	33	34	35	36	37	38	39	Total
th	46,312	157,200	218,000	9,461	109,700	80,844	50,434	30,319	468	9,975	150,100	221,100	1,083,913
tn	25,907	55,657	181,300	3,468	64,914	51,481	20,733	20,679	1,262	11,975	73,097	314,500	824,973
ua	10,140	39,766	228,500	994	104,000	164,600	32,913	23,512	187	58,223	155,300	333,700	1,151,835
us	1,533,000	7,488,000	18,150,000	29,009	752,800	3,029,000	335,900	534,800	20,119	414,600	2,156,000	3,408,000	37,851,228
eu	4,665,000	18,220,000	21,980,000	1,237,000	2,972,000	2,912,000	1,102,000	955,900	258,100	1,397,000	6,070,000	13,330,000	75,099,000
Total	7,825,817	35,586,391	60,563,097	1,632,045	7,322,151	10,738,991	3,187,493	2,529,230	321,675	2,691,993	14,051,190	29,118,900	175,568,973