Norwegian Institute
of International
Affairs

Technical barriers to trade and SPS measures and export dynamics

Elena Besedina

NUPI Working Paper 842

Department of International Economics

Publisher: Norwegian Institute of International Affairs

Visiting address: C.J. Hambros plass 2d
Address: P.O. Box 8159 Dep.
NO-0033 Oslo, Norway
Internet: www.nupi.no
E-mail: info@nupi.no
Fax: [+ 47] 22 99 40 50
Tel: [+ 47] 22 99 40 00

Technical barriers to trade and SPS measures and export dynamics

Elena Besedina, Kyiv School of Economics

Abstract

Traditional trade policy tools like tariffs and quotas are being actively replaced with non-tariff policy tools (NTB) by governments throughout the world. In this paper we investigate how introduction of two types of non-tariff measures, technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures, affects exporters in different countries. According to the heterogeneous firms trade theory commenced with Melitz model any additional cost of exporting will force some of the firms to stop exporting, thus reducing the number of exporting firms and products exported. We test this prediction using two primary data sources: WTO data on trade concerns related to TBT and SPS measures and World Bank Exporter Dynamics Database controlling for other factors influencing export dynamics. Contrary to the previous studies our results seem to suggest no casual effect of the introduction of NTBs on export concentration and firms' exit/entry rates.

Published by Norwegian Institute of International Affairs

---

* This paper is written with financial support by "Non-tariff barriers, food safety and international food trade" joint project of Norwegian Institute of International Affairs (NUPI), University of Life Sciences and Kyiv School of Economics (KSE) funded by the Research Council of Norway (Contract no. 216742/O10).

Contents

Introduction

Recent decades have seen significant reduction in the average level of tariffs applied by most countries to a majority of the traded goods. But have we really come closer to free trade in at least in final goods? Now when majority of countries are members of the World Trade Organization and are constrained to adhere to tariff schedules and concessions, governments often find other ways to 'protect' domestic market from the outside competition. Recent episodes of trade wars between Russia and Ukraine (both the WTO members), when Ukrainian food products (cheese, and the most recent case, chocolates and candies) were declared by the Russian controlling authorities to violate safety standards, clearly show that free trade still remains an objective rather than an achievement.

The importance of non-tariff barriers (NTBs) as substantial impedements to international trade has been increasingly recognized by economists, policy makers and international organizations. The World Bank published a book on NTBs where different authors contributed chapters addressing many aspects of the NTBs (World Bank, 2012). The World Trade Organization (WTO) itself devoted its entire 2012 World Trade Report to such measures with a particular focus on technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures. According to these two publications, there has been a steady increase in the application of the non-tariff measures with recent economic crisis only intensifying the usage of such measures. Importantly, the largest countries either in terms of population (China and India) or size of the economy (EU and USA) are the most 'active' ones in this area. The increased usage of NTBs is also confirmed in various business surveys across the globe (WTO, 2012).

According to the WTO agreements countries have to notify the WTO about the measures they are planning to impose. Hence, countries' self-notifications are the first source to look for the information about non-tariff measures. According to Kallummal (2012), the notifications about non-tariff measures increased more than fivefold from just around 600 notifications in 1995 to more than 3000 notifications in 2010. At the same time, partner countries started to officially raise concerns over the NTBs more often within the WTO framework. Thus, partner countries' concerns constitute the second source of information about the NTBs.

Nicita and Gourdon (2013) explore another source of data on NTBs created jointly by UNCTAD and the World Bank, which by the end of 2011 contained detailed information about such measures in 26 countries. They also confirm that the use of NTMs varies considerably across countries with NTBs in agriculture and food industry being more frequent and stringent than those in the manufacturing sector.

Availability of the new datasets on NTBs allowed researchers to study the effect of these measures on trade volumes (intensive margin). The most common approach used in the literature is a gravity model which is based on the new trade theory models commenced by Krugman and widely used in the international trade research. Disdier et al. (2008) investigate impact of TBTs and SPS measures on trade in agricultural products using information from countries' self-notifications to the WTO. In their econometric analysis they use three different variables: TBT/SPS dummy, frequency index and ad-valorem equivalent discussed below. Frequency index is defined as the percentage of products to which one or more NTMs are applied within a product category. Disdier et al. (2008) find that TBTs and SPS measures have negative significant effect on bilateral agricultural trade flows regardless of the type of variable used. When they look separately at the agricultural sub-sectors they find that for some sub-sectors the effect is zero and for some it is actually positive giving support to the explanation that stricter rules work as a signal of quality for consumers. Similar findings are demonstrated by earlier contributions as well (Moenius, 2004, Fontagné et al., 2005, etc.)

Another approach is to use simulation to quantify the effect of the NTBs. Kee et al. (2009) using data for more than 90 countries estimate the "ad-valorem equivalent (AVE)" of the core NTM (that include price control measures, quantitative restrictions, monopolistic measures, antidumping and countervailing measures and technical regulations) or "agricultural domestic support" for each 6-digit category of the Harmonized System (HS) where NTMs were applied. The quantity impact of the NTMs is obtained as the difference between actual imports and predicted imports following Leamer comparative advantage approach. The quantity impact is then converted into an AVE using the import demand elasticities. In other words, similar to the case of quotas an AVE shows the level of an ad-valorem tariff that would have the same effect on trade flows as a particular NTM. Their estimates suggest that on average non-tariff measure is comparable to a hypothetical 12 percent tariff.

In another cross-country study that looks specifically at the technical standards and regulations, Chen et al. (2006) examine effect of these trade barriers on activities of exporting firms' measured as (1) a share in total exports and (2) number of overseas markets served. In their theoretical model standards and regulation impose additional cost on exporters and meeting a standard in each export market is assumed to create two types of costs: fixed and variable costs. To test their hypotheses of negative relationship between exporting activities and TBT they use the World Bank Technical Barriers to Trade Survey

(2002) of 619 firms in 17 developing countries. In line with their theoretical model, they find that different technical trade barriers reduce firms' export capacity (export share) and market diversification (number of export destinations). It is worth pointing out that different standard and regulations reduce export share to a different extent (e.g. testing procedures lead to a 9% decline while the effect of information barriers is twice as large, 18%).

Several papers look at the effect of technical barriers and SPS measures on trade flows of specific countries. Using data on Senegalese exporters Maertens and Swinnen (2009) demonstrate that the EU standards and regulations actually promoted exports of fruit and vegetables from Senegal to the EU. However, stricter standards and regulation imposed costs on exporters. And since in many developing countries smaller firms are often financially constrained and cannot easily comply with higher standards this has lead to more consolidation and vertical integration among Senegalese fruit and vegetables exporters. Nakakeeto (2011) also focuses on Senegal and two other countries--Uganda and Mali. She investigates the effect of the different NTMs on trade in foodstuff between these countries and the rest of the world. She shows that type of the NTM matters: while technical measures are found to promote trade, the non-technical measures do not seem to affect trade in food products in the above countries. A case study analyzes the effect of technical barriers to trade on Chinese trade in textile products and notices that these measures have both positive and negative effect on textile exporters (Jiang, 2008). On the one hand, stricter standards increase exporting costs and hence reduce current trade flows and number of exporters but, on the other hand, they improve future performance by creating incentives for the textile producers to modernize production processes to comply with the rules.

In this paper we are investigating the effect of the introduction of an NTM (either TBT or SPS) on the export dynamics, with a special focus on trade in foodstuff. In particular, we examine how TBT and SPS measures affect export concentration and diversification (both at product and destination level) as well as entry and exit of firms into exporting. If introduction of an NTM increases costs of exporting, the 'new' new trade theory started by Melitz (2003) predicts that some exporters will stop to export and thus the number of exported varieties will fall as well (extensive margin).

To identify the effect of the NTBs on export dynamics we need to control for other possible factors that can influence export diversification and firms' churning rates. Here we should first make a clear distinction between the types of diversification studied in the literature. Export flows can be diversified in terms of varieties (products), markets (destinations) and producers (exporters). Majority of existing studies look at the product diversification of exports. Agosin et al. (2011) use a panel dataset and divide the determinants of export diversification into three groups: (1) institutional factors (e.g. level of financial development), (2) comparative advantage factors (e.g. endowments), and (3) macroeconomic factors (e.g. exchange rate volatility). Their results from GMM estimation are not robust as none of the factors has a consistent impact on export diversification across specification. Parteka and Tamberi (2011) also use a panel dataset covering 60 countries and twenty years (1985-2004) and a large set of explanatory variables to determine which country-specific factors can explain the degree of export concentration at the product level. Similarly to Agosin et al. (2011), these factors are grouped into several categories like institutional quality, geography, etc. Only country size, trade regime and proximity to major markets are found to be robust determinants of the export diversification. Balavac (2012) estimates the impact of different trade barriers and country capacity factors on the degree of export diversification using GMM approach. The degree of product diversification is measured by Theil index. She finds that, in accordance with the theory, higher export costs, presence of tariffs and transportation costs, proxied by distance, decrease export diversification.

Shepard (2007) studies how harmonization of the EU standards in three sectors--textile, clothing and footwear industries--has affected extensive and intensive margins of trade. He uses disaggregated trade data (8-digit level) and shows that higher number of standards in a particular category is associated with the smaller number of varieties exported by partner countries. At the same time harmonization of standards across markets have the opposite effect increasing export diversity.

A number of recent studies look at the exporting firms' performance (including entry and exit into exporting) using firm-level data and are particularly relevant for our analysis. Reyes (2011) studies the response of the US manufacturing firms to harmonization of the standards by the EU countries. He finds that such harmonization (i.e. decrease in technical trade barriers) promoted entrance of new firms that previously served other than EU markets and decreased export volumes of the incumbent firms. Reis and Taglioni (2013) investigate how growth rate of Pakistani exports at the firm-destination-product-year level is affected by a number of factors related to foreign demand and exporting costs measured by number of days needed to clear customs procedures in destination countries. Both factors related to foreign demand and exporting costs are found to be important determinants of export growth in Pakistan.

Fontagné et al. (2013) use complete customs data on French firm-level exports over the period 1995-2005 to study the effect of TBT and SPS on the exports dynamics of French firms. Our paper is closely related to Fontagné et al. (2013) as we use the same NTB dataset as they do. In particular, they construct firm/sector/destination/year dependent variables at 4-digit aggregation level (HS4) to define: (1)

probability of exporting and stopping to export (dummy variables for exporting and exit) (2) export value and (3) export unit value (prices). Authors find that presence of SPS measure reduces probability of exporting and exported value and increases probability of exit. Higher exporting costs are also partially shifted to foreign customers as the presence of SPS is associated with higher unit values. Authors also find that the effect of SPS measure is lower for larger exporters, which is consistent with Melitz model implications (Melitz, 2003).

This paper contributes to the existing literature in several important aspects. First, we study the effect of SPS and TBT on the food exports dynamics in 42 countries which represent different parts of the world and different levels of development. The sectoral indicators used in the analysis are constructed from the firm-level customs data and hence provide much richer basis for the analysis than even the most disaggregated trade flows[1]. Second, we study a different question than Fontagné et al. (2013) do since we examine how introduction (one-time event) of a TBT or/and SPS affects export concentration at firm, product and destination level as well as entry/exit rate. Third, we include both TBTs and SPS measures in our analysis as our research question is not affected by TBT data limitations discussed further.

We estimate the effect of the introduction of an NTM measure on several dependent variables describing export dynamics. In order to disentangle the effect of TBT and SPS measures we use a set of control variables suggested by economic theory and/or used in the empirical literature. Since our empirical analysis may suffer from unobserved heterogeneity we use first-difference model to estimate the effect of NTMs. The results of our analysis are at odds with the existing literature as we do not find any effect of the introduction of the TBTs and SPS measures on the export dynamics at the sectoral level. At the same time, costs of exporting (both in terms of money and time) appear to influence export product and market diversification as well as concentration at the level of firms.

This paper is structured as follows. Next section provides a brief discussion of the underlying trade theory. Section 3 describes data sources used in the analysis while Section 4 outlines empirical model and provides economic intuition for the expected signs of the variables of interest and choice of control variables. Results are presented in Section 5 which is followed by concluding remarks.

---

1 Unfortunately access to the primary firm-level data is restricted by the data provider (World Bank). Data are discussed in more detail in Section 3.

Theoretical background

Traditional trade models predict that countries will specialize in the goods in which they have comparative advantage either due to technology/productivity (Ricardo model) or factor endowments (Heckscher-Ohlin model). In these models goods are produced in perfectly competitive markets hence there will be many producers of the same good and hence many of them will export.

In the trade models with monopolistic competition identical firms produce differentiated products and consumers exhibit 'love for variety' (Krugman, 1979, 1980). Country will produce a large amount of differentiated goods. Monopolistic competition is preserved in the heterogeneous firms models (Melitz, 2003; Eaton and Kortum, 2002; Melitz and Ottaviano, 2007, etc.) however, in these models only the most productive firms export. The partitioning of firms occurs because of the costs of exporting. For a given level of exporting costs countries with more productive firms will have a larger number of exporters and products shipped to overseas markets. On the other hand if exporting costs increase, these models predict reduction in the number of exporters and hence number of products exported.

Here, the distinction should be made between fixed costs of exporting and variable costs often called trade costs. Economists usually model and estimate trade costs as multiplicative (iceberg) costs; however, recently several papers introduced so called additive costs (Berman et al, 2012; Irarrazabal et al. 2013). While for iceberg costs, the price of the good matters as more expensive goods are costlier to export, with additive costs there is no price advantage for exporters: both low-price and high-price producers have to incur the same level of costs. The additive costs are more consistent with reality since many low-priced perishable goods face significant exporting costs (customs, certification, etc.) as compared to high-priced electronics for example. Berman et al. (2012) interpret these additive costs as local distribution costs that are independent of firms' underlying productivity. In presence of these costs, impact of changes in exchange rates on exporters varies by firms' productivity: currency depreciation, increases export prices (mark-ups) of high productivity firms and increases export volumes of low productivity firms.

Empirical evidence of the presence of large trade costs other than those associated with tariffs suggests that along with distribution and transportation costs, compliance costs are also significant. The costs associated with compliance with non-tariff measures usually (but not always) do not depend on firms' productivity, mark-ups and prices charged. For example, additional product certification required to enter foreign market will generate the same costs for all exporting firms. Irarrazabal et al. (2013) estimate additive trade costs relative to median price for Norwegian firms and find that, on average, Norwegian firms bear additive trade costs at the level of 14 per cent of the median price in the sector.

Even though the trade theory does not specifically address the question of the non-tariff barriers that include technical regulations and sanitary and phytosanitary measures the logic of the models for fixed/additive costs can be easily extended to the TBT and SPS measures. These measures can be thought of as part of the fixed/additive costs for exporting firms. Technical barriers to trade and SPS measures impose compliance costs on exporters. These compliance costs are related to potential adjustments of production process, certification procedures needed to meet the requirements of the countries imposing such regulations and standards (Schlueter et al., 2009). In Melitz-type model these costs are expected to have negative impact on the volumes of trade, number of exporters and number of goods exported. At the same time, the average exports per firm may actually increase, as the export market shares are reallocated towards more efficient firms.

Graphically implications of Melitz-type models with and without TBT and SPS measures can be presented as follows (Figure 1):

1. In the model, all firms vary by productivity level and since exporting is costly, only most productive firms export.

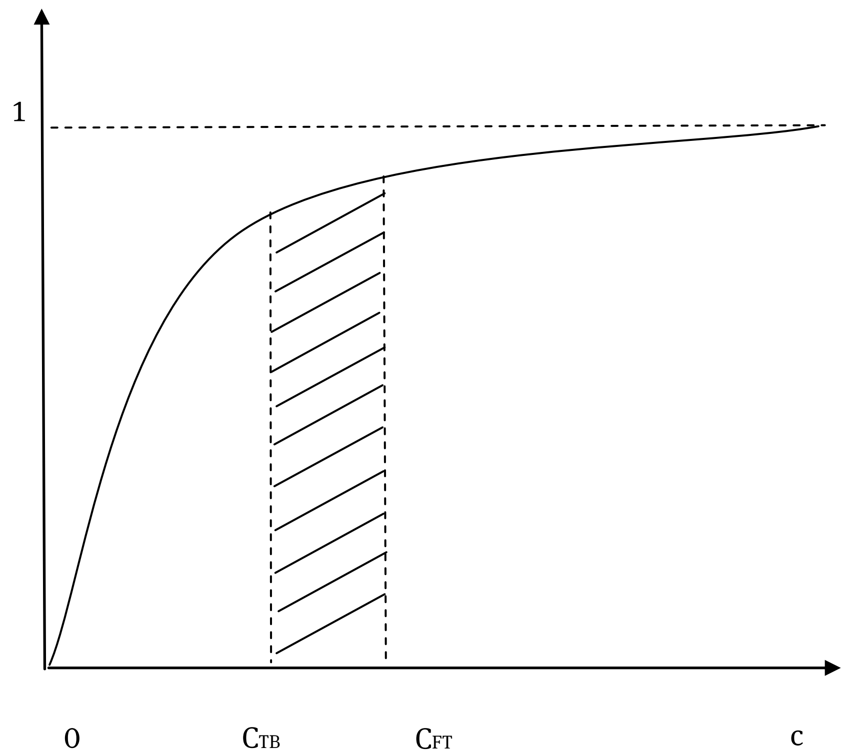
2. Without non-tariff trade barriers, the cutoff level of costs (inverse of productivity) for firms in country B to export to country A is C_{FT}. All firms to the left of this cutoff export to country A.

3. Once a TBT/SPS measure is imposed, exporters have to bear additional costs and hence cutoff level moves to the left and becomes C_{TB}. Firms that are located between C_{FT} and C_{TB} (shaded area) exported under free trade but were the least productive among exporters. Now with additional costs they are no longer able to compete in foreign market (country A) and hence will only serve domestic market of country B.

4. This implies that we should observe ***fewer exporters*** and since in the model each exporter produces one particular differrentiated good the ***number of variety should fall*** as well.

This analysis will equally apply to both types of exporting costs, fixed and variable, associated with the new non-tariff measures. This analysis can be extended to case with many countries. For example, suppose there are three countries A, B and C engaged in bilateral trade (i.e. firms from B serve both A and C). Again, suppose country A imposes a non-tariff measure for exporters from B and C. Since some exporters will exit market of country A, then the ***number of destinations*** for these exporters ***will decrease***. [ADD Chaney ?]

Figure 1. Impoact of introduction of NTMs in Melitz type model



Data description

Several data sources are used in this paper. First, the data on technical barriers to trade (TBT) and sanitary and phytosanitary measures (SPS) are provided by the World Trade Organization. The metadata are collected from the minutes of the meetings of the respective Committees (TBT Committee and SPS Committee) or from countries' notifications to the WTO about measures imposed on imports. In the first case, the affected countries raise their concerns during the meetings about the barriers maintained by partner country/countries. For example, on June 5 2009 during the TBT Committee meeting Norway raised concerns, which were also supported by Canada, about the EU trade restrictions for seal products. The EU notified the WTO about such restrictions in March 2009 (recorded as G/TBT/N/EEC/249). According to the Norway's representative, these trade restrictions would signifycantly affect trade between Norway and the EU but also Norwegian trade shipments that transit through the EU territory. This concern is recorded in the TBT measures dataset under number 222 with the information about the maintaining country (EU), affected/concerned countries (Norway, Canada, Iceland and Brazil), time it was first raised, type of the measure (technical regulation) and product type (seal products, HS code: 430170).

In the case of notification, the country that imposed technical or SPS measure notifies the WTO about such measure before its imposition according to the WTO agreements on SPS and TBT. In this paper we use data about concerns raised by trading partners. Our motivation to use concerns dataset is that first, in case of notification, the measure may actually be introduced much later than it is notified or even not introduced at all. Second, if countries do raise concerns about the measures imposed by partner countries then these measures are viewed as substantial barriers to exports. Overall the dataset contains information on concerns raised about 318 and 312 TBT and SPS measures, respecttively. Prevailing majority of two types of measures affects products in more than one HS4 category. However, for some measures there is no information about the product affected and consequently about HS category it belongs to. Thus, the final numbers of the measures used in the analysis are 283 and 273, respectively.

TBT and SPS measures are further classified according to the objecttive of the measure. The SPS measures refer to only one objective while TBT measures as a rule refer to several objectives. We assumed that the first objective mentioned is the most important one. Given this assumption, the TBT measures are most frequently imposed to protect human health and safety, while SPS measures are primarily related to animal health concerns (Figure 2 and Figure 3, respectively).

Figure 2. Distribution of TBT measures according to the objective

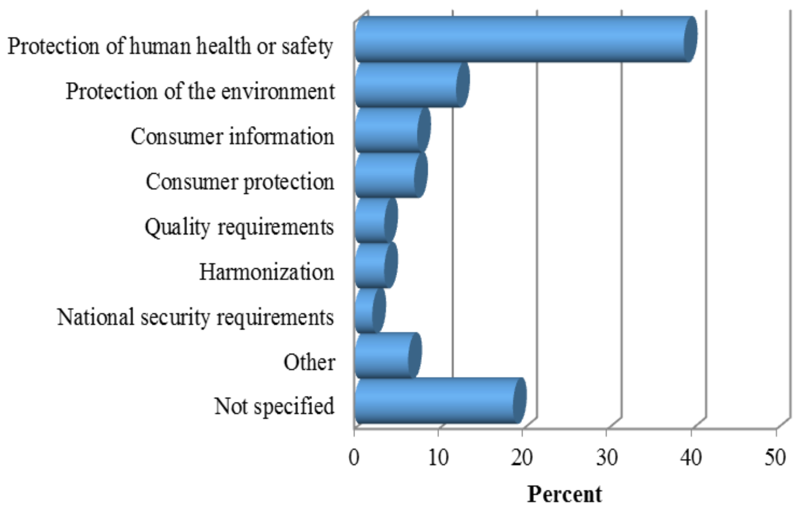
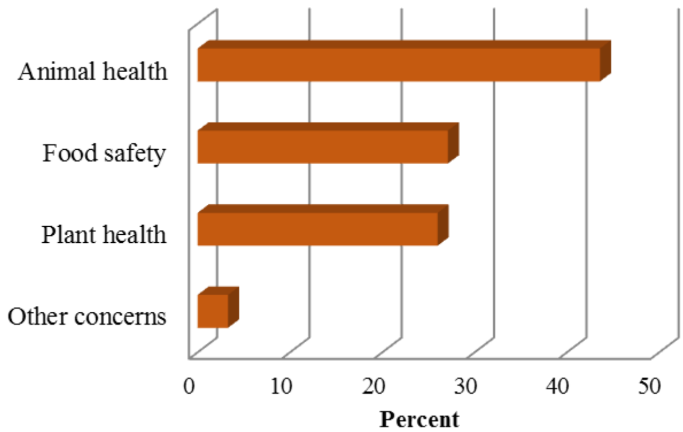


Figure 3. Distribution of SPS measures according to the objective



A more detailed description of the above dataset can be found in Fontagné et al. (2013).

Second, data about exporting firms come from the World Bank Exporters database that contains aggregated information about exporters from 42 developing and high-income economies over 1997-2011. The data is an unbalanced panel and the information for majority of the countries is available from 2000. The greatest potential advantage of this dataset is that allows to empirically analyze dynamic aspects of exporters' behavior.

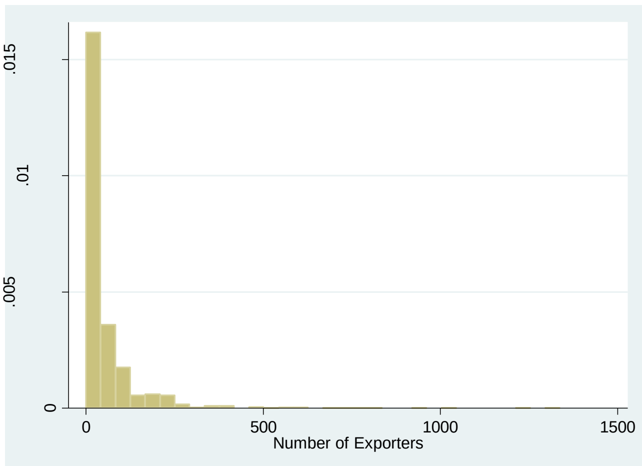
The Database contains information at country-year-product level (HS 2-digit, HS 4-digit, or HS 6-digit) about main characteristics of the exporters in each country, including size of the exporting sector, average exporter size, exporter growth rates, entry, exit and survival rates; as well as information about concentration/diversification of export flows (such as Herfindahl index, share of top exporters, number of products and destinations per exporter) and unit value of exports per exporter, product or market (Cebeci et al., 2012).

Given that information for majority of TBT and SPS measures is available only for 4-digit disaggregation level our analysis is conducted at HS4 disaggregation level.

There is a large variation in the dataset across sectors and across countries. For example, over this period, countries, on average, exported fish and seafood products in seven 4-digit categories, displaying significant variability in terms of number of product lines: from one line for Laos to 7 lines for majority of the countries. There is also a considerable variation in the number of exporters within each 4-digit category across countries, ranging from 0 (for some countries in every category) to more than 1338 exporters (Mexico in 0306 – “Crustaceans, live, fresh etc.”) but majority of fish and seafood categories have few exporters (Figure 3 below). More detailed description of the dataset can be found in Cebeci et al. (2012). This is in line with the findings of Bernard et al. (2007) that “engaging in international trade is an exceedingly rare activity”.

The data for control variables come from multiple sources: World Development Indicators, World Governance Indicators, Economic Freedom indicators. The variables used in the econometric analysis are discussed in the next section.

Figure 3. Distribution of exporters across 4-digit fish and seafood categories



Empirical Strategy

In our benchmark analysis we look only at the effect of the introduction of a measure on export dynamics. We are interested in the effect of introduction of the measure which can be viewed as an exogenous shock on exporters, not presence of the measure(s) in particular sectors over time. The primary and the most important reason for our focus on the introduction of the measure is that the original Melitz model is a comparative static model and hence makes predictions about the one-time change in economic variables in response to exogenous shocks (change in trade costs).

The presence of the non-tariff barriers can be studied in the light of how firms adjust to the presence of the SPS or TBT measures, for example, by diversifying across products and/or markets. If one wants to study the effect of the presence of a non-tariff measure she needs to know if this measure is still applied in a given year. The SPS concerns dataset can be used to study this effect as well as it does contain information on the status of the concern (whether it was resolved or not) and date of resolution. Differently, from the SPS concerns, the TBT measures dataset does not have information about the resolution/ termination date.

To study the effect of the introduction of the TBT and SPS measures on the export dynamics we estimate the following empirical model in first differences:

$$\Delta Y_{ijt} = \alpha_0 + \beta_1 \Delta TBT_{ij,t-1} + \beta_2 \Delta SPS_{ij,t-1} + \gamma \Delta Controls_{ijt} + \Delta u_{ijt}$$

where

Dependent variable:

ΔY_{ijt} is the **change** in an export dynamic variable for sector ***j*** in country ***i*** in period ***t*** from the list below from *t-1* to *t*:

NUM_EXP	Number of exporters
H-H_index	Herfindahl-Hirschman Index
PROD_DIV	Average number of HS6 products per exporter
MARKET_DIV	Average number of destinations per exporter
ENTRY	Entry rate (# Entrants$_t$ / # Exporters$_t$ * 100)

EXIT	Exit rate (# Entrants $_t$ / # Exporters $_{t-1}$ * 100)

The choice of the first-differences model allows to get rid of potential unobserved heterogeneity in the 4-digit sectors in different countries, which if pooled OLS is used would lead to bias in estimates. The underlying assumption behind this model is that unobserved heterogeneity is time invariant and hence can be cleared by differencing across period. The second important assumption which should hold to make first-differenced estimator unbiased is that changes in right-hand side variables are uncorrelated with error terms (Wooldridge, 2002). Changes in Xs and error term can be correlated if important variables that are correlated with other regressors are omitted from the model. To mitigate this potential problems we will include a wide range of controls. Some researchers use fixed effect models instead (e.g. Medin and Melchior, 2014) to deal with unobserved heterogeneity. We believe that in our case the first-difference model is more appropriate since some of regressors are potentially non-stationary (GDP per capita, population) and FD model removes any unit roots in the variables.

The expected signs of the effect of the TBT and SPS variables on different export dynamics variables as well as economic explanation are provided below.

Indicator	Expected sign	Explanation
NUM_EXP	-	Introduction of a TBT/SPS measure brings additional costs associated with compliance and hence will impede some firms to export. This will result in smaller number of exporters in a particular category following introduction of the measure.
H-H_index	+	Introduction of a TBT/SPS measure brings additional costs associated with compliance. As hypothesized above, these additional costs associated with compliance will decrease the number of exporting firms. Also since large exporters are less financially constrained and have higher turnout it is easier for them to comply with the new rules both operationally and financially. Hence exports are likely to become more concentrated in the hands of fewer larger exporters: HHI is expected to increase after introduction of a TBT/SPS measure.
PROD_DIV	-/+	The effect of the introduction of a TBT/SPS measure is ambiguous since: (1) firm can try to diversify away from affected variety/market, increasing number of products shipped/markets served. (+) (2) firm may not be able to afford to export the affected variety/to affected market and will discontinue exporting the affected variety/to affected market (-). Second explanation is consistent with Melitz model.
MARK_DIV	-/+	
EXIT	+	In Melitz model, additional trade costs (change in exporting cutoff) force the least productive firms to discontinue exporting: additional costs associated with compliance with a new TBT/SPS will increase the exit rate from exporting.
ENTRY	-	Introduction of a TBT/SPS and additional costs associated with compliance will impede new firms to enter export markets decreasing entry rate.

Descriptive statistics for a set of dependent variables presented in Table 1 demonstrates significant variability across sector/country pairs. On average, 35 firms export goods within a particular 4-digit sector with the maximum number exceeding 3000 (wine exporters from Spain). The exports seem to be notably concentrated which is confirmed by a rather high average value of Herfindahl-Hirschman Index. Exporters tend to export fewer products within 4-digit sector and serve on average two destinations. The latter is consistent with the estimates by Cebeci et al. (2012) of the average share of exporters and of total exports accounted for by single-product single-destination firms at country level over the period 2006-2008.[2] According to their estimates, in majority of the 42 countries covered in the dataset more than one third of exporters are of this type (and in some countries this number is even higher, e.g. 45.4% in Albania). At the same time, this type of firms account only for less than 3 percent of total exports in majority of countries. We also observe a high degree of churning: many firms that exit are replaced by new entrants.[3]

Trade barriers variables:

$\Delta TBT_{ij,t-1}$ is a dummy variable equal to 1 if at least one TBT measure was introduced and applied to products exported by country i in the sector 4-digit sector j at time $t-1$ but was not present at $t-2$. The subscript i is not accidental as it varies across countries as well since some measures are maintained by exporting country itself and hence does not affect country's exports in this sector. Whenever it is the case, TBT dummy is set to zero for the specific country maintaining the measure, while for the rest of the countries this dummy variable is equal to 1.

$\Delta SPS_{ij,t-1}$ is a dummy variable equal to 1 if at least one SPS measure was introduced and applied to products exported by country i in the sector 4-digit sector j at time $t-1$ but was not present at $t-2$. By the same logic, SPS dummy variable also varies across countries.

Clearly, the effect of the new measure may vary depending on whether this sector is already been affected by other measures introduced before. Since we are interested in the effect of the introduction of such measures on export dynamics we limit our attention only to sectors where no such measures were present at $t-2$ to rule out the effect of the measures introduced earlier.

Since the dummy variables defined above do not take into account the number of TBT or SPS measures, one can argue that the effect of introduction of TBT/SPS will be stronger if more than one measure is introduced. In order to control for this, we replace the two trade dummy variables with two continuous variables, which count the change in the number of such measures maintained in a particular 4-digit sector from time $t-2$ to time $t-1$ ($TBT\_count_{ij,t-1}$ and $SPS\_count_{ij,t-1}$,

---

2 Cebeci et al. (2012) use disaggregated firm-level data from these 42 countries.

3 The correlation between exit and entry rate is extremely high and exceeds 90% (Cebeci et al., 2012).

respectively). Then we re-estimate our empirical model. Note that these variables can be negative if the number of such measures declined from ***t-2*** to ***t-1.*** Interestingly, whereas introduction of SPS measures and introduction of TBTs is not correlated, changes in the number of such measures is positively correlated (correlation coefficient is above 40%).

Control variables:

The set of control variables is chosen based on trade theory and recent empirical literature. Similarly to dependent variables, the control variables are also first differenced (defined as the change from period ***t-1*** to period ***t***).

Country size and economic development level

GDP_PCAP_{it} – log of GDP per capita (constant 2000 US$)

Level of economic development can affect export dynamics and, in particular, the degree of diversification at product and market level as well as the number of exporters. In particular rich countries are expected to have larger number of exporters and be more diversified (Agosin et al., 2011)

POP_TOT_{it} – log of total population

Large countries have larger number of firms operating in the economy and hence can be expected to have more exporting firms. Also due to the potential presence of increasing returns to scale in manufacturing industries, small countries usually are more specialized than large ones (Parteka and Tamberi, 2011).

AGR_EMP_{it} – employment in agriculture, % of total.

Share of population employed in agriculture can be a proxy for comparative advantage in agricultural production. This variable is used only for a subsample limited to trade in foodstuff.

$Landlocked_i$ – dummy variable =1 if country does not have access to sea/ocean and 0 otherwise.

Variable $Landlocked_i$ is used for analysis of export dynamics in fish and seafood sector as access to sea is an important factor influencing this sector.

Sector specific variables

$Importance_{ijt}$ - share of HS4 sector in total exports of the country.

Larger export sectors are very likely to serve more destinations and to have more product varieties. In addition, if these sectors are favored by government, which often happens in developing countries, more firms will be attracted to these sectors and hence these sectors will be characterized by a higher entry rate.

***S_TYPE**$_j$* - Sector type is defined according to Rauch classification where goods are classified in differentiated goods (base category), reference priced goods (group 2) and homogeneous goods (group 3). We use conservative version of this classification[4]. We convert the original classification, which is done for SITC codes into HS4 using UNCTAD conversion tables.

According to the economic theory homogeneous goods are usually produced in competitive markets which are characterized by different level of concentration and entry rate than markets with differentiated products.

Institutional and business environment variables

***EXP_COST**$_{it}$* - Cost to export (US$ per container, in logs)

***EXP_DOC**$_{it}$* - Documents to export (number)

***EXP_DUR**$_{it}$* - Time to export (days)

According to the heterogeneous firms trade theory high export costs increase the export cutoff level of productivity, i.e. decrease the number of firms that can export to overseas markets. Thus in countries with higher export costs we should observe fewer exporters and lower product and market diversification.

***FREE_TRADE** $_{it}$* – Fraser Institute Index of freedom to trade internationally[5].

Index ranges from 0 (no freedom to trade internationally) to 10 (maximum freedom to trade internationally) and is expected to affect both number of exporters and export diversification.

***FREE_REGUL** $_{it}$* – Fraser Institute Index of regulatory environment. Index ranges from 0 (poor regulatory quality) to 10 (excellent regulatory environment).

State of regulatory environment affects easiness of setting up a company as well as daily operating activities of the company. The better the regulatory environment the easier it is to set up and expand business.

---

4 We also used more liberal classification but the results did not change hence we stick only to the conservative one in the empirical analysis.

5 2012 Economic Freedom Dataset, published in James Gwartney, Robert Lawson, and Joshua Hall, *Economic Freedom of the World: 2012 Annual Report*, Fraser Institute, available online at http://www.freetheworld.com/datasets_efw.html

CORRUPT_rank $_{it}$ – WGI "Control over Corruption" percentile rank among all countries. Indicator ranges from 0 (lowest) to 100 (highest), where larger values of index being associated with better control over corruption and hence lower level of corruption in the country.

Corruption imposes additional costs on all firms, including exporting ones, in the economy and hence is likely to be associated with a fewer opportunities for firms to trade internationally.

The advantage of the Exporter database described earlier is that it contains data for countries at different stages of economic development (Table 2). GDP per capita ranges from mere 141 constant USD in Malawi to more than 40 thousand constant USD in Norway. Around 12 percent of countries are landlocked which increases costs of exporting (correlation is more than 60%). Monetary and other costs of exporting do vary a lot across countries. While exporting costs per container are the lowest in Morocco, the highest costs are observed in a landlocked Uganda. The simplest procedures for exporting are observed in Estonia where firms need only 3 documents and 5 days to export while exporting requires 12 documents and more than 50 days in Laos. There is also significant variation in the overall business and institutional environment across countries and also across time. For example, control over corruption rank of Senegal decreased by 16 points from 2005 to 2006 while Tanzania, on the contrary, showed remarkable improvement in the rank by 20 points during the same period.

The absence of tariff rates as the control variable deserves a separate explanation. It is common in the literature studying effect of the non-tariff measures on the trade flows to include sector-specific tariff rates applied by countries to imports. This approach works well when bilateral trade flows or destination-specific dependent variables (like exit and entry rates) are used (e.g. Fontagné et al., 2013). In our case dependent variables describing export dynamics are aggregated across different destinations and hence it is unclear what tariff rates should be used. One way to deal with this would be to use a tariff rate averaged across destinations with country shares as weights. We used time dummy variables to account for any changes in other factors (including tariff rates) that might have influenced the export dynamics. Our negligence of tariff rates can be also justified by the findings of Fontagné et al. (2013) of no effect of tariff rates on the extensive and intensive margin for French exporters. The only effect (negative) of the tariff rates is observed for the trade unit values which are not subject of investigation in this paper. Also in Medin and Melchior (2014) the results are robust to exclusion of the tariff variable.

Econometric concerns

One of the econometric problems that we face is possible endogeneity of the TBT and SPS measures: countries that experience increase in the number of importers can be prone to increase or to impose new trade barriers to prevent new entrants or drive some incumbents out. This problem is partially mitigated by the inclusion of the lagged values of the measures. Also our dependent variables differently from Fontagné et al. (2013) are not destination specific but are calculated across destinations for total exports of the country in a particular 4-digit sector. Hence even if country has a lot of exporters in one sector they do not all necessarily serve each destination. In our view this reduces endogeneity problem as the change in the average number of exporters across destinations is unlikely to be correlated with the possibility that specific country imposes a TBT or SPS measure in response to increase the number of foreign firms.

As discussed in the previous section, first-differenced estimator can still be biased if strict exogeneity assumption is violated. In order to verify is this assumption holds a test for strict exogeneity suggested in Wooldridge (2002) is performed.[6]

Another problem is a possible correlation of the regression residuals. Since we include aggregated independent variables (at sector level or country level) as controls for the changes in the dependent variables which are at more disaggregated level (country-sector level), it is reasonable to expect that, for example, sectors in the same country will share unobservable characteristics that are not captured by country-level variables. This would lead to the correlation/clustering of the regression disturbances making the regular standard errors from the estimation to be biased downward even at low levels of correlation (Moulton, 1990).

To account for possible correlation of the standard errors we use Liang and Zeger (1986) clustered standard errors as suggested by Angrist and Pischke (2008). This approach works well in our case as we have sufficient number of clusters that ensures consistency of the clustered variance estimator.

6 The test failed to reject hypothesis of strict exogeneity in majority of the specifications.

Results

5.1. Introduction of a TBT/SPS measure

The results for all exports are presented in Table 3a. The most important result from our analysis is that introduction of a TBT or an SPS measure does not seem to affect sectoral export dynamics. Only in once case a TBT dummy is significant and is positive (column 3) implying that introduction of a technical barrier is associated with the increase in the average number of products per exporter.

Absence of the effect is obviously at odds with the previous empirical papers mentioned in Introduction. Firm-level studies and cross-country studies do find negative effect of the non-tariff measures and TBTs and SPS measures in particular on trade volumes as well as on export diversification (Shepherd, 2007; Fontagné et al, 2013, etc.) What possibly can explain this zero effect? First, sector dynamic variables that we use in our analysis may not capture well changes in behavior of economic agents (firms): while marginal firms may be affected by technical barriers and SPS, averaging across firms may actually conceal this. This explanation would be in line with country studies that use firm-level data and do find the effect of the NTMs on exporters' behavior (e.g. Fontagné et al., 2013). Nevertheless the advantage of our analysis is that it looks at the issue of the NTMs in the cross-country perspective: we investigate changes at relatively disaggregated level (4-digit product lines). Second, the effect of the introduction of an NTM measure may not be felt immediately (in one year). In order to verify this, we lagged trade barriers variables two periods but the results were unchanged. Third, it may be the case that it is the number of measures (or countries maintaining) that matters. In order to address this point we performed the same type of analysis using two other trade variables defined above as the number of new measures introduced. The results are discussed later in the paper.

The control variables as expected seem to influence export dynamics though the extent of this effect varies across export dynamics dimensions. While increase in the country size is associated with the decrease in product and market diversification and increase in the exit rate, change in the level of economic development does not seem to affect exports dynamics. Sector size (relative total exports) is associated with the larger number of exporting firms and lower probability for them to exit from exporting. Importantly, costs of exporting both in terms of money and time appear to affect exports diversification at product level and firms' entry and exit rate. Thus, if export costs per container increase by 1% (slightly more than 11 dollars) the exit rate from exporting increases by almost 4 percent, ceteris paribus. Similarly, additional documents required for exporting reduces the number of products shipped by an average exporter. At the same time, a positive coefficient on time to export variable in the regression with the entry rate as dependent variable (column 6) seems to be at odds with economic logic: increase in entry rate is positively associated with the increase in the time required to export. Improvement in the overall regulatory environment is linked to more destination-diversified exports. On the other hand, some results for institutional variables are unexpected and even puzzling: for example, larger freedom to trade internationally seems to reduce the number of exporters as well as the number of destination markets.

In line with the economic theory, firms try to move away from exporting less sophisticated products towards differentiated goods: number of exporters is falling for reference priced goods and new exporters are not likely to export homogeneous or referenced goods. The entry and exit rates for homogeneous and referenced goods are statistically significantly different than for the sectors with differentiated goods.

Next, we restrict our sample first to food and then to fish and seafood sector only as the effect of NTM measures and especially SPS measures might be significant for these sectors. Again we find almost no effect of the NTMs on the export dynamic variables while the results for control variables are to some extent similar (Tables 3b and 3c). Consistently with the Melitz-type models, introduction of an SPS measure reduces the number of destinations served by an average exporter. A TBT dummy is significant in only one case but has unexpected sign: introduction of a technical barrier is associated with the increase in the entry rate. Some earlier papers do find that non-tariff measures can have a positive effect on the exporting country (e.g. Moenius (2004) finds positive effect of NTM on manufacturing exports; Medin and Melchior, (2014) as well).

Again, costs of exporting seem to be even more important determinants of the market diversification and exporter concentration for exporters of foodstuff: each additional dollar that adds to container costs and each additional document required for exporting reduce market diversification (column 4). Also more developed (richer) economies seem to have more stable pool of exporters in the sector as the change in the exit rate is negatively associated with income change. As economies become richer their exports of foodstuff become less concentrated (Table 3b, column 2) as the new firms start exporting activities (column 6).

The results for fish and seafood exports are even less conclusive, with no effect of TBT/SPS measures on exports dynamics and varying effect of institutional characteristics (Table 3c).

5.2. Changes in the number of TBT/SPS measures

As discussed in the previous section, the two trade barriers dummy variables do not account for the number of the new measures introduced, which can have differential effects on exporters depending on how many such measures were put in place. Since this differential effect potentially can be important and can explain the absence of the results when trade barriers dummies are used we constructed continuous variables measuring the change in the number of measures applied in the sector. Next we used those new NTMs variables to re-estimate the effect of the NTMs on export dynamics. The results for all exports and separately for foodstuff and fish and seafood industry are presented in Tables 4a-4c.

Again, except for a few cases the NTMs do not seem to be important drivers of exports dynamics. While increase in the number of SPS measures appears to have a positive significant effect on firm entry rate into exporting (column 6 in Tables 4a-4b), other dimensions like number of exporters and exports diversification are not affected. The only exception is found for fish and seafood exports product diversify-cation on which two types of measures have opposite effect (Table 4c, column 3): whereas increase in technical barriers to trade decreases the number of products exported by an average firm, increase in SPS measures is associated with the increase in such number. The effect of the control variables on exports dynamics is mainly preserved: again costs associated with exporting seem to be important determinants of the exports diversification.

Concluding remarks

In this paper we look at the effect of the introduction of non-tariff measures, namely technical barriers to trade (TBTs) and sanitary and phytosanitary (SPS) measures on the degree of export diversification at firm, product and market level in the sectors affected by such measures. Our results of almost no effect are far from being conclusive. There are several possible explanations for the lack of the effect. First, aggregate dynamic variables may not capture well changes in behavior of economic agents (firms): while marginal firms may be affected by technical barriers and SPS, averaging across firms may actually hide this. Second, the effect of the introduction of an NTM measure may not be felt immediately (in one year). Lack of evidence of the effect of NTBs on exports is in contrast to our other finding that home country's business environment and institutional factors are important determinants of export performance. Monetary costs and more complicated exporting procedures seem to hamper product and market diversification. Hence policy makers, especially in developing countries should not be only concerned with removing external barriers (like NTMs) to exports from their countries. Domestic policies should also aid at reduction of internal barriers and costs imposed on exporting firms by corrupted practices and burdensome regulatory procedures.

.

References

Agosin, M. R., R. Alvarez and C. Bravo-Ortega (2011), “Determinants of Export Diversification around the World: 1962 – 2000”, Central Bank of Chile Working Paper #605

Angrist, J.D. and J-S Pischke (2008), *Mostly Harmless Econometrics: An Empiricist’s Companio*n, Princeton University Press; 1st edition

Asche, Fr. and M. D. Smith (2009) “Trade and Fisheries: Key Issues for the World Trade Organization”, WTO Staff Working Paper ERSD-2010-03

Balavac, M. (2012) “Determinants of Export Diversification at the Export Margins: Reference to Transition Economies”, ETSG 2012 Annual conference paper

Berman, N., P. Martin, and T. Mayer (2012): “How do Different Exporters React to Exchange Rate Changes? Theory, Empirics and Aggregate Implications,” *Quarterly Journal of Economics*, 127(1), 437–492.

Bernard A., J.B. Jensen, S.J. Redding and P.K. Schott (2007), “Firms in International Trade”, *Journal of Economic Perspectives*, 21(3): 105-130

Cebeci, T., A.M. Fernandes, C. Freund and M.D. Pierola (2012), “Exporter Dynamics Database”, WB Policy Research working paper no. WPS 6229;

Chen, M. X., Otsuki, T. and Wilson, J. S. (2006), “Do Standards Matter for Export Success?”, World Bank Policy Research Working Paper #3809.

Disdier, A-S, L. Fontagné and M. Mimouni (2008), “The Impact of Regulations on Agricultural Trade: Evidence from the SPS and TBT Agreements”, *American Journal of Agricultural Economics* 90(2), 336-350.

Eaton, J., and S. Kortum (2002), “Technology, Geography, and Trade,” *Econometrica*, 70, 1741–1779

Fontagné, L., F. von Kirchbach, and M. Mimouni (2005). “An Assessment of Environmentally-related Non-tariff Measures”, *The World Economy* 28(10):1417-1439.

Fontagné, L., Orefice, G., Piermartini, R. and Rocha, N. (2013), "Standards and margins of trade: firm level evidence", Geneva, World Trade Organization, Staff Working Paper ERSD-2013-04.

Gwartney, J., R. Lawson and J. Hall (2012), *Economic Freedom of the World: 2012 Annual Report,* Fraser Institute

Irarrazabal, A., A. Moxnes and L.D. Opromolla (2013), "The Tip of the Iceberg: A Quantitative Framework for Estimating Trade Costs", NBER Working Paper #19236

Jiang, N. (2008), "Effect of Technical Barriers to Trade on Chinese Textile Product Trade", *International Business Research*, Vol. 1(3)

Kallummal, M. (2012), "SPS measures and possible market access implications for agricultural trade in the Doha Round: An analysis of systemic issues", ARTNeT Working Paper Series No. 116/July 2012

Kee, H.L., A. Nicita and M. Olarreaga (2009), "Estimating Trade Restrictiveness Indices", *Economic Journal*, 119 (534): 172-199

Maertens, M. and J. F. M. Swinnen, (2009), "Trade, Standards and Poverty: Evidence from Senegal", *World Development* 37(1): 161-178.

Medin H. and A. Melchior (2014) "Trade barriers or trade facilitators? On the heterogeneous impact of food standards in international trade", NUPI Working paper

Melitz, M. J. (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6), 1695–1725.

Melitz, M.J. and G.I.P. Ottaviano (2007) "Market Size, Trade, and Productivity", *Review of Economic Studies,* 75: 295-316.

Moenius, J. (2004), "Information versus Product Adaptation: The Role of Standards in Trade", Working Paper, International Business & Markets Research Center, Northwestern University.

Moulton, B.R. (1990), "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units", *Review of Economics and Statistics*, Vol. 72, No. 2, pp. 334-338

Nakakeeto, G. (2011), "The Impact of Technical Measures on Agricultural Trade: A Case of Uganda, Senegal, and Mali. Improving Food Security through Agricultural Trade", Virginia Polytechnic Institute and State University Mater thesis.

Nicita, A. and J. Gourdon (2013), “A Preliminary Analysis on Newly Collected Data on Non-Tariff Measures”, Policy Issues in International Trade and Commodities Study Series No. 53

Parteka, A. and M. Tamberi (2011), “Export Diversification and Development – Empirical Assessment”, Universita’ Politecnica delle Marche, Dipartimento di Scienze Economiche e Sociali. Quaderni di Ricerca n.359

Reis, J.G. and D. Taglioni (2013), “Determinants of export growth at the extensive and intensive margins: Evidence from product and firm-level data for Pakistan”, World Bank Policy Research Working Paper 6341

Reyes, J.D. (2011), “International harmonization of product standards and firm heterogeneity in international trade”, World Bank Policy Research Working Paper #5677

Shepherd, B. (2007), “Product Standards, Harmonization, and Trade: Evidence from the Extensive Margin”, World Bank Policy Research Working Paper #4390

Schlueter, S., M-L. Rau, Ch. Wieck, J. Humphrey, L. Colen & T. Heckelei (2009), “Analytical Framework for the NTM-impact project”, NTM-IMPACT Working Paper 09/02

Wooldridge, J.M. (2002), *Econometric Analysis of Cross Section and Panel Data,* MIT Press

World Bank (2012), *Non-Tariff Measures – A Fresh Look at Trade Policy’s New Frontier,* ed. O. Cadot and M. Malouche, The World Bank, Washington D.C.

Table 1. Descriptive statistics for export dynamics variables

Variable	Mean	SD	Min	Max	N
NUM_EXP	35.695	94.406	0	3102	43730
H-H_index	0.503	0.327	0.004	1	41206
PROD_DIV	1.199	0.369	1	7	40642
MARK_DIV	1.702	1.035	1	26	41206
ENTRY	54.085	28.935	0	100	35813
EXIT	52.286	29.175	0	100	35249

Table 2. Descriptive statistics for control variables

Variable	Mean	SD	Min	Max	N
GDP_PCAP (log)	7.838	1.289	4.997	10.626	44522
POP_TOT (log)	9.569	1.275	7.098	12.067	44665
AGR_EMP, %	11.361	9.135	0.67	40.2	43542
Landlocked	0.119	0.323	0	1	44665
Importance, %	0.133	0.812	0	31.365	38531
EXP_COST (log)	6.949	0.416	6.168	8.175	27852
EXP_DOC	6.675	1.745	3	12	27852
EXP_DUR	21.394	9.534	5	59	27852
CORR_rank	51.601	25.541	4	99	44665
FREE_REGUL	6.753	0.728	4.4	8.2	39579
FREE_TRADE	7.366	0.942	4.4	9.3	39432

Table 3a. TBT/SPS Introduction: Empirical results for trade in all goods

VARIABLES	(1) NUM_EXP	(2) H-H index	(3) PROD_ Div	(4) MARK_ Div	(5) ENTRY	(6) EXIT
TBT (t-1)	-0.202	0.000	0.004**	0.006	-0.265	0.462
	[0.660]	[0.003]	[0.002]	[0.009]	[0.330]	[0.429]
SPS (t-1)	-0.818	0.000	-0.007	-0.035	0.327	1.024
	[1.624]	[0.008]	[0.008]	[0.022]	[1.256]	[1.276]
GDP_PCAP	-4.030	-0.051	-0.017	-0.091	-10.469	2.577
	[11.091]	[0.039]	[0.030]	[0.160]	[10.634]	[6.637]
POP_TOT	-80.415	0.066	-0.257*	-0.784*	94.435***	2.655
	[56.162]	[0.148]	[0.150]	[0.432]	[33.143]	[27.631]
Importance	1.286*	0.005	0.000	0.005	-0.576**	0.162
	[0.699]	[0.004]	[0.003]	[0.011]	[0.278]	[0.229]
EXP_COST	11.150	-0.001	-0.031	-0.011	3.904***	2.092
	[7.015]	[0.009]	[0.020]	[0.021]	[1.235]	[2.113]
EXP_DOC	0.365	0.003	-0.008**	0.003	-0.344	-0.366
	[1.060]	[0.003]	[0.004]	[0.006]	[0.296]	[0.572]
EXP_DUR	0.080	0.000	0.000	0.001	-0.089	0.121*
	[0.139]	[0.001]	[0.001]	[0.003]	[0.080]	[0.063]
Ref priced goods	-1.579*	0.001	-0.004***	0.009	0.717***	-0.321*
	[0.806]	[0.001]	[0.001]	[0.005]	[0.250]	[0.180]
Homogeneous goods	-2.733**	-0.002	0.000	0.011	1.229***	-0.789**
	[1.184]	[0.004]	[0.004]	[0.010]	[0.377]	[0.375]
CORR_rank	0.043	0.000	-0.001	0.000	0.091**	0.072
	[0.088]	[0.000]	[0.000]	[0.001]	[0.041]	[0.061]
FREE_REGUL	3.119	0.003	0.005	0.045**	1.861	0.205
	[5.264]	[0.007]	[0.006]	[0.019]	[1.124]	[1.240]
FREE_TRADE	-3.410	0.003	0.004	-0.069**	1.255	1.995
	[3.507]	[0.011]	[0.008]	[0.030]	[1.908]	[2.117]
Constant	4.148*	-0.003	0.006	0.041**	-0.538	-0.649
	[2.389]	[0.004]	[0.004]	[0.015]	[0.681]	[0.719]
Observations	70860	64450	63819	64450	65073	64175
R-squared	0.005	0.000	0.001	0.001	0.004	0.001

Note: Robust standard errors (clustered at country level) in brackets
*** p<0.01, ** p<0.05, * p<0.1
Year dummies, interaction terms of institutional indices with sector type are included (not reported). All variables (except for NTM variables and type of sector) are first differenced.

Table 3b. TBT/SPS Introduction: Empirical results for trade in foodstuff (Categories 1-22 in HS2)

VARIABLES	(1) NUM_EXP	(2) H-H index	(3) PROD_Div	(4) MARK_Div	(5) ENTRY	(6) EXIT
TBT (t-1)	0.508	-0.005	-0.002	-0.001	-1.305	2.027*
	[0.914]	[0.008]	[0.006]	[0.027]	[1.166]	[1.160]
SPS (t-1)	0.354	0.011	-0.001	-0.047*	2.037	0.210
	[1.232]	[0.011]	[0.009]	[0.024]	[1.617]	[1.242]
GDP_PCAP	0.122	-0.158*	0.149	0.017	-19.493	28.191**
	[8.377]	[0.091]	[0.093]	[0.274]	[15.739]	[12.355]
POP_TOT	-29.193	0.322	-0.198	-0.999	37.940	45.533
	[22.795]	[0.376]	[0.232]	[1.420]	[50.600]	[57.177]
AGRO_EMP	0.563	-0.003	0.001	0.023	-0.539	0.494
	[0.476]	[0.004]	[0.003]	[0.025]	[0.574]	[0.625]
Importance	0.570	-0.007	-0.001	0.006	-0.343	0.926
	[1.393]	[0.004]	[0.005]	[0.029]	[0.977]	[0.980]
EXP_COST	-3.045**	0.085***	-0.026	0.252**	7.651***	-2.915
	[1.471]	[0.027]	[0.018]	[0.120]	[2.244]	[4.669]
EXP_DOC	-1.065	0.020	-0.004	0.040*	-1.492	-2.090
	[0.654]	[0.012]	[0.005]	[0.023]	[1.016]	[1.868]
EXP_DUR	0.053	0.000	0.000	-0.004	-0.230	0.281
	[0.057]	[0.002]	[0.001]	[0.006]	[0.184]	[0.170]
Ref priced goods	-0.887**	0.002	-0.009*	0.016	0.241	-0.851
	[0.429]	[0.005]	[0.006]	[0.028]	[0.798]	[0.743]
Homogeneous goods	0.050	-0.012	-0.006	0.007	1.161	-1.012
	[0.640]	[0.011]	[0.007]	[0.015]	[1.185]	[0.781]
CORR_rank	-0.094	0.002***	0.000	-0.001	0.180	0.053
	[0.059]	[0.001]	[0.001]	[0.003]	[0.183]	[0.099]
FREE_REGUL	-1.454	0.019	-0.019	0.164*	7.171**	-3.387
	[1.903]	[0.022]	[0.016]	[0.086]	[2.784]	[2.533]
FREE_TRADE	-1.556*	-0.001	0.019*	0.053	0.985	-0.165
	[0.772]	[0.016]	[0.011]	[0.068]	[2.097]	[2.224]
Constant	0.757	-0.008	-0.011	-0.027	0.094	-2.570
	[0.644]	[0.019]	[0.015]	[0.039]	[2.670]	[1.964]
Observations	5356	4922	4899	4922	5014	4923
R-squared	0.013	0.006	0.005	0.007	0.013	0.006

Note: Robust standard errors (clustered at country level) in brackets
*** p<0.01, ** p<0.05, * p<0.1
Year dummies are included (not reported). All variables (except for NTM variables and type of sector) are first differenced.

Table 3c. TBT/SPS Introduction: Empirical results for trade in fish and seafood products

VARIABLES	(1) NUM_EXP	(2) H-H index	(3) PROD_ Div	(4) MARK_ Div	(5) ENTRY	(6) EXIT
TBT (t-1)	0.038 [3.624]	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	-2.887 [7.992]
SPS (t-1)	-4.304 [2.943]	0.019 [0.035]	-0.007 [0.037]	-0.062 [0.051]	4.214 [5.375]	3.268 [3.788]
GDP_PCAP	-19.648 [31.004]	-0.225 [0.503]	0.454 [0.609]	1.628** [0.686]	-4.417 [62.570]	-115.982** [49.743]
POP_TOT	-8.529 [59.255]	0.887 [0.989]	4.677 [2.855]	-1.387 [2.931]	-194.660 [198.438]	-131.206 [290.694]
Landlocked	0.890 [0.897]	-0.020 [0.032]	-0.318 [0.295]	-0.167*** [0.058]	1.184 [3.702]	3.492 [16.687]
Importance	1.870 [1.718]	0.025 [0.022]	-0.048* [0.025]	-0.166 [0.181]	-1.994 [3.441]	-3.556 [3.302]
EXP_COST	2.171 [2.891]	0.097 [0.115]	-0.200 [0.131]	-0.087 [0.220]	12.773 [16.991]	13.701 [15.342]
EXP_DOC	0.296 [1.320]	0.039 [0.049]	0.029 [0.060]	0.126 [0.082]	4.203 [5.070]	2.263 [8.295]
EXP_DUR	-0.020 [0.104]	0.000 [0.002]	0.004 [0.004]	0.013** [0.005]	0.334 [0.367]	-0.419 [0.524]
CORR_rank	0.077 [0.129]	0.002 [0.002]	-0.001 [0.003]	-0.004 [0.004]	0.179 [0.208]	-0.181 [0.332]
FREE_REGUL	4.826 [3.685]	-0.001 [0.069]	-0.058 [0.099]	0.117 [0.109]	2.727 [7.727]	13.982* [8.096]
FREE_TRADE	-1.913 [2.669]	0.020 [0.032]	0.063 [0.064]	-0.034 [0.061]	3.347 [4.825]	-2.061 [4.626]
Constant	0.281 [2.785]	0.010 [0.034]	-0.097 [0.061]	0.074 [0.061]	-0.030 [3.857]	4.965 [4.899]
Observations	329	311	311	311	311	308
R-squared	0.035	0.023	0.073	0.083	0.02	0.021

Note: Robust standard errors (clustered at country level) in brackets
*** p<0.01, ** p<0.05, * p<0.1
Year dummies are included (not reported). All variables (except for NTM variables and landlocked) are first differenced.

Table 4a. Change in the number of TBT/SPS: Empirical results for trade in all goods

VARIABLES	(1) NUM_EXP	(2) H-H index	(3) PROD_Div	(4) MARK_Div	(5) ENTRY	(6) EXIT
TBT Change	-0.182	0.002	-0.001	-0.012	0.468	0.686
	[0.242]	[0.004]	[0.003]	[0.009]	[0.296]	[0.625]
SPS Change	0.260	-0.009	-0.013	0.019	0.680	2.597*
	[0.488]	[0.010]	[0.010]	[0.026]	[1.007]	[1.410]
GDP_PCAP	-19.280	0.023	0.278	0.334	4.863	32.153
	[16.246]	[0.148]	[0.222]	[0.527]	[35.530]	[24.897]
POP_TOT	-34.632	0.233	-1.648**	-2.712	184.431	80.191
	[35.944]	[0.713]	[0.626]	[1.724]	[114.475]	[140.479]
Importance	1.354**	0.004	-0.001	0.021	-0.018	-1.411
	[0.611]	[0.004]	[0.006]	[0.036]	[1.810]	[1.033]
EXP_COST	-0.802	-0.050	-0.228**	-0.077	16.065*	16.934
	[2.409]	[0.067]	[0.091]	[0.166]	[8.156]	[12.337]
EXP_DOC	0.561	-0.005	-0.015	0.000	-0.750	-3.757
	[0.641]	[0.026]	[0.018]	[0.027]	[2.031]	[2.275]
EXP_DUR	0.079	-0.002	0.003	-0.005	-0.956**	0.049
	[0.122]	[0.004]	[0.003]	[0.005]	[0.387]	[0.351]
Ref priced goods	-0.011	0.013	-0.014	-0.076	2.146	3.064
	[0.418]	[0.014]	[0.014]	[0.049]	[1.845]	[2.636]
Homogeneous goods	0.833	-0.008	0.000	-0.029	2.476	1.752
	[0.604]	[0.015]	[0.014]	[0.045]	[3.215]	[2.736]
CORR_rank	0.080	0.000	-0.001	-0.012	-0.523	0.041
	[0.058]	[0.004]	[0.002]	[0.008]	[0.431]	[0.405]
FREE_REGUL	1.305	-0.015	0.021	0.304**	11.024	-10.196
	[2.221]	[0.046]	[0.079]	[0.145]	[7.566]	[6.937]
FREE_TRADE	1.980	-0.038	-0.005	-0.040	0.429	2.318
	[1.413]	[0.061]	[0.044]	[0.129]	[5.617]	[5.976]
Constant	0.684	-0.026	0.012	0.182**	-9.825***	-2.781
	[0.721]	[0.036]	[0.021]	[0.068]	[2.618]	[4.808]
Observations	1,584	1,418	1,382	1,418	1,339	1,360
R-squared	0.013	0.012	0.019	0.018	0.028	0.022

Note: Robust standard errors (clustered at country level) in brackets
*** p<0.01, ** p<0.05, * p<0.1
Year dummies, interaction terms of institutional indices with sector type are included (not reported). All variables (except for NTM variables and type of sector) are first differenced.

Table 4b. Change in the number of TBT/SPS: Empirical results for trade in foodstuff (Categories 1-22 in HS2)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	NUM_EXP	H-H index	PROD_ Div	MARK_ Div	ENTRY	EXIT
TBT Change	-0.263	0.002	0.000	-0.005	0.569	0.575
	[0.319]	[0.003]	[0.003]	[0.007]	[0.414]	[0.742]
SPS Change	0.241	-0.009	-0.012	0.019	0.592	2.528*
	[0.494]	[0.010]	[0.010]	[0.026]	[1.010]	[1.425]
GDP_PCAP	-24.029	0.015	0.295	0.243	14.201	34.940
	[16.899]	[0.150]	[0.225]	[0.557]	[35.991]	[25.641]
POP_TOT	-13.354	0.531	-1.881***	-2.215	160.376	77.205
	[33.148]	[0.782]	[0.653]	[2.040]	[115.299]	[130.240]
AGRO_EMP	0.356	-0.009	-0.001	-0.011	-1.361	0.677
	[0.492]	[0.008]	[0.008]	[0.015]	[1.554]	[1.266]
Importance	2.674	0.009	0.003	0.157***	3.846*	-3.234
	[2.702]	[0.015]	[0.025]	[0.046]	[1.967]	[2.662]
EXP_COST	-0.974	0.013	-0.201**	0.022	16.953*	14.607
	[2.508]	[0.054]	[0.093]	[0.177]	[8.794]	[13.254]
EXP_DOC	0.616	0.015	-0.004	0.031	-0.539	-4.409
	[0.710]	[0.018]	[0.017]	[0.030]	[2.321]	[2.830]
EXP_DUR	0.095	-0.003	0.002	-0.007	-0.932**	0.144
	[0.116]	[0.004]	[0.003]	[0.005]	[0.389]	[0.390]
Ref priced goods	-0.138	0.007	-0.013	-0.089*	0.792	2.080
	[0.494]	[0.013]	[0.015]	[0.048]	[1.547]	[2.727]
Homogeneous goods	0.807	-0.015	-0.001	-0.041	0.917	0.405
	[0.613]	[0.015]	[0.015]	[0.042]	[3.172]	[2.697]
CORR_rank	0.104	0.001	-0.002	-0.001	-0.192	0.041
	[0.064]	[0.004]	[0.002]	[0.006]	[0.275]	[0.396]
FREE_REGUL	1.241	-0.007	0.028	0.249*	12.228	-9.420
	[2.519]	[0.050]	[0.080]	[0.131]	[7.847]	[6.386]
FREE_TRADE	2.206	-0.039	-0.007	0.071	-0.654	0.352
	[1.532]	[0.067]	[0.043]	[0.109]	[5.818]	[5.661]
Constant	0.202	-0.017	0.056*	0.155**	1.693	-11.647*
	[1.033]	[0.038]	[0.029]	[0.071]	[3.757]	[6.655]
Observations	1,499	1,343	1,310	1,343	1,295	1,310
R-squared	0.014	0.012	0.017	0.02	0.028	0.021

Note: Robust standard errors (clustered at country level) in brackets
*** p<0.01, ** p<0.05, * p<0.1
Year dummies are included (not reported). All variables (except for NTM variables and type of sector) are first differenced.

Table 4c. Change in the number of TBT/SPS: Empirical results for trade in fish and seafood products

VARIABLES	(1) NUM_EXP	(2) H-H index	(3) PROD_ Div	(4) MARK_ Div	(5) ENTRY	(6) EXIT
TBT Change	-0.530	0.004	-0.015**	0.006	0.978	0.417
	[0.400]	[0.007]	[0.007]	[0.014]	[1.105]	[0.858]
SPS Change	3.551	-0.012	0.089**	-0.020	-9.492	-4.626
	[2.515]	[0.035]	[0.039]	[0.088]	[6.093]	[4.967]
GDP_PCAP	7.770	-0.163	-0.006	1.233*	-128.126**	-79.783***
	[15.214]	[0.445]	[0.311]	[0.663]	[47.604]	[28.299]
POP_TOT	69.075	3.424	-1.586	-5.942	48.055	122.442
	[56.087]	[2.095]	[1.861]	[4.659]	[189.246]	[192.872]
Landlocked	2.897**	-0.048	-0.013	-0.070	-1.207	-14.814***
	[1.082]	[0.051]	[0.047]	[0.084]	[6.371]	[4.938]
Importance	4.323	-0.066*	0.063	0.014	1.070	3.291
	[3.981]	[0.035]	[0.098]	[0.122]	[4.571]	[3.174]
EXP_COST	3.567	-0.014	-0.333*	0.271	18.796	4.535
	[10.712]	[0.322]	[0.180]	[0.318]	[31.361]	[22.246]
EXP_DOC	0.188	-0.089	-0.098*	0.112	9.402	4.816
	[2.428]	[0.102]	[0.048]	[0.159]	[7.998]	[14.247]
EXP_DUR	-0.018	0.009	0.007	-0.022	1.239	-0.523
	[0.388]	[0.010]	[0.012]	[0.027]	[0.989]	[1.223]
CORR_rank	0.120	-0.001	0.002	-0.008	-0.243	0.034
	[0.113]	[0.004]	[0.004]	[0.005]	[0.378]	[0.215]
FREE_REGUL	2.024	0.000	0.075	0.089	14.290*	6.754
	[2.360]	[0.059]	[0.063]	[0.109]	[7.707]	[5.719]
FREE_TRADE	0.882	0.017	0.133**	-0.099	-10.452	-5.043
	[3.098]	[0.065]	[0.051]	[0.128]	[10.464]	[6.812]
Constant	-2.781*	-0.033	0.032	0.070	4.108	0.811
	[1.496]	[0.021]	[0.026]	[0.064]	[3.555]	[2.856]
Observations	284	266	254	266	256	260
R-squared	0.05	0.038	0.041	0.042	0.063	0.045

Note: Robust standard errors (clustered at country level) in brackets
*** p‹0.01, ** p‹0.05, * p‹0.1

Appendix

List of countries in the WB Exporter Dynamics Database

Albania
Belgium
Burkina Faso
Bangladesh
Bulgaria
Botswana
Chile
Cameroon
Colombia
Costa Rica
Dominican Republic
Ecuador
Egypt
Spain
Estonia
Guatemala
Iran, Islamic Rep.
Jordan
Kenya
Cambodia
Kuwait
Lao PDR
Lebanon
Morocco
Mexico
Macedonia, FYR
Mali
Mauritius
Malawi
Niger
Nicaragua
Norway
Pakistan
Peru
Portugal
Senegal
El Salvador
Turkey
Tanzania
Uganda
Yemen, Rep.
South Africa

Norwegian Institute of International Affairs

Established in 1959, the Norwegian Institute of International Affairs [NUPI] is a leading independent research institute on international politics and areas of relevance to Norwegian foreign policy. Formally under the Ministry of Education and Research, NUPI nevertheless operates as an independent, non-political instance in all its professional activities. Research undertaken at NUPI ranges from short-term applied research to more long-term basic research.

About the Author

Elena Besedina is Senior Economist/Assistant Professor at the Kyiv School of Economics. She holds Master Degree in Public Administration/ International Development from Harvard Kennedy School (Cambridge, MA, USA) and Ph.D in Economics from Bocconi University (Milan, Italy). Her research interests include but are not limited to international trade, political economics and cost-benefit analysis.

NUPI
Norwegian Institute of International Affairs
C.J. Hambros plass 2D
PO Box 8159 Dep. NO-0033 Oslo, Norway
www.nupi.no | info@nupi.no