Analysing EU dairy exports: indicators of non-tariff measures and gravity

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Abstract

In the prospect of on-going EU trade negotiations, we investigate non-tariff measures (NTMs) on key EU dairy exports markets. After combining latest publicly available NTM datasets, we calculate frequency and coverage ratios in order to take stock of existing measures. Subsequently, we quantify the NTM impact on EU dairy exports by a gravity estimation. In our model, we explicitly single out SPS and TBT measures and find that they dominate the negative trade effect. Our results underline the need to address NTM issues in EU trade negotiations to secure potential export markets.

Keywords: international trade, non-tariff measures, frequency ratio, gravity model, NTM impact

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1 Introduction

The phasing out of the production quota system led to an increasing export-orientation of the EU dairy sector. Global dairy markets have traditionally been highly regulated, and thus information about the various regulations worldwide as well as about their effect on current obstacles to trade (including tariff protection) seem to be essential for successful trade negotiations. With respect to dairy products, the EU has often taken the position that promotes exports in trade negotiations. Non-tariff measures (NTM) are an important part of the current trade negotiations, where partners seek to increase market access. Some NTMs are used to achieve valid aims of public policy, for example food safety, and cannot simply negotiated away. Dairy products are subject to many such NTMs due to their perishability that can cause severe food safety, hygiene and health problems to humans. Other NTMs, however, might serve protectionist intentions and hence abolishing them can be expected to have a positive impact on bilateral trade.

In this paper, we focus on NTMs for EU dairy exports to key markets in African, South American and Asian countries, with which the EU has started or is about to start trade negotiations. We investigate the impact of these NTMs on the trade of dairy products. More specifically, we are interested in the distinct effect of sanitary and phytosanitary (SPS) measures and/or technical barriers to trade (TBT) since they tend to have the clear purpose of achieving governments' public policy goals, as mentioned. We shed light on the following questions: What is the importance of SPS/TBT measures in trade of dairy products, in particular EU dairy exports? Which combinations of dairy products and export destinations are affected most by NTMs? What is the trade effect of these measures? And, what is the tariff equivalent of these measures? If they have a negative trade effect, agreements between the EU and the respective partner countries may help to open markets and overcome the obstacles caused by the measures.

The paper is structured as follows: First, we introduce the NTM data set that we have specifically constructed for our analysis. Then, we present NTMs indicators based on frequency counts and coverage ratios in order to identify which NTMs matter most in trade with the respective trading partners under review. Finally, we conduct a gravity analysis in which we account for bilateral effects and explicitly distinguish between SPS/TBT measures and other NTMs. Accounting for the bilateral and district effect of specific NTMs adds to the existing literature that usually considers NTMs in total and for all partner countries. The paper ends with concluding remarks.

2 Analysing NTMs – data and indicators

Non-tariff measures are generally defined as policy measures other than ordinary customs tariffs, that potentially have an effect on international trade, changing quantities traded, prices or both (UNCTAD, 2015). The more neutral term "measures", instead of "barriers", has become widely used in the literature in the last decade since NTMs are not necessarily protectionist in nature, and may pursuit legitimate goals, such as correcting market failures, negative externalities, and reduce information asymmetries between producers and consumers. NTMs may constitute trade barriers and increase trading costs but may also cause welfare improvements. SPS and TBT measures clearly show a link to public policy goals, such as animal, plant and human health as well as product safety.

We apply the NTM classification by the MAST team (Multi-Agency Support Team) that consists of NTM experts with links to international institutions (e.g. FAO, ITC, UNCTAD, WTO, World Bank, OECD and practitioners). The different categories of NTMs according to the MAST classification are presented in table 1.

NTM data sources considered in our analysis

The TRAINS NTM data comprises regulatory inventories of 40-46 countries (for which more than one type of NTM is registered). The years of data collection are 2007 to 2014, differing per country. The TRAINS NTM data are publically available in the WTO database management system I-ITP. In cooperation with UNCTAD, NTM ASEAN data was collected in 2015 and has also been made available in I-TIP.

ITC has been mainly conducting regulatory inventories in developing and transition countries and completed them by other sources. The ITC NTM data is particularly relevant since more detailed information is provided for the developing and/or transition countries included in the inventory. Information about Algeria, Egypt, Morocco, Tunisia and Philippines is particularly relevant since these countries are either not covered by NTM TRAINS and NTM ASEAN or only information about antidumping measures is available for them.

What NTM data are provided?

The NTM data comprise information about what category of measure is implemented, when they are applied and also what the respective regulations actually stipulate. The measures are reported by country pairs and for specific tariff lines at the HS6 digit level. The reporting country is the country imposing the measure, and the partner country is the country affected by the measures of the reporting country. Many measures affect all partners and therefore the partner country is often indicated as "the world". Similarly, not all reporting countries report measures for the EU Member States individually. They consider the EU Member States as one broader regional entity and apply the same measure to any EU Member State.

We use the details of the HS6 digit level in order to benefit from the full range of information, before aggregating to the HS4 digit level by applying the indicators systematically. For the details of the dairy products covered see table 2. Concerning the time dimension, the indicators should represent the most recent year for which NTM information is available. This is the year 2014. In our NTM data set, measures with a start date being after 31/12/2014 or an end date before 31/12/2013 are therfore excluded from the indicator analysis.

Indicator analysis

We apply the NTM data to indicators of frequency counts and coverage ratios. As mentioned, the individual EU Member States are not always captured in the database. Hence, we consider the EU as one entity and ensure an analysis comparable across countries and products. Furthermore, we confine ourselves to the EU export perspective, given the focus on the EU dairy exports. The exporter

perspective refers to NTMs that a country faces on the markets of other countries, which report their measures in the regulatory inventory of NTMs. For an indicator analysis of agri-food products in total, see Disdier et al (2008).

Figure 1 presents the frequency indicator of NTMs according to MAST classification for the EU partner countries under review. The indicator represents the minimum number of distinct NTM codes, after cleaning the data for duplicates. The underlying assumption is that an NTM code is not reported twice or more often for the same HS6 product level. This means that the NTM code should only count in the frequency indicator if the measure including the details, the legal text and so is actually different. Note that we retrieve the frequency counts for each NTM code at the HS6 product level but present the counts at the HS4 product level of interest.

The number of NTMs varies across country but also across product and type of measures. SPS/TBT and pre-shipment inspection (PSI) measures dominate with regard of the number of measures. Overall, Egypt, Morocco and Tunisia (three Mediterranean non-EU partners) and Malaysia and Japan (two Asian countries) apply only one or two measures on the same product. In contrast, Uruguay imposes many more measures on one product, up to a total of 16 SPS/TBT measures. It is tempting to identify countries as regulating trade more strictly than others based on frequency measures, given the assumption that more measures for a product imply that the product is more regulated. Note, however, that the number of measures for products indicates neither the level of strictness nor the trade impact a measure can have.

Figure 2 presents the trade coverage ratio as the share of trade affected by the respective measures. The trade coverage relates the affected imports from the EU28 to the partner countries' imports from all other countries. Note that incidences of no trade are not considered and hence NTMs that entirely prohibit trade are not reflected in the indicator. The share of trade affected by NTMs defined according to the MAST chapters is rather low (less than 2%). Japan reaches the highest share of 100% for milk and cream, not concentrates (0401), being affected by SPS and TBT measures, while 70% of trade of buttermilk, curdled milk, is affected by quantity control measures.

3 Quantifying the effect of NTMs - gravity on EU dairy trade

We apply a gravity approach in order to quantify the impact of NTMs on EU dairy exports. This is the standard approach of gravity estimation, with the coefficients estimated being subsequently used to calculate the AVE of the NTMs. Our contribution to the gravity literature is the application of newly compiled NTM data for dairy products. Furthermore, we consider the bilateral effect of NTMs by taking into account trade routes from Europe to third countries, whereby the focus is on the main trading partners. Furthermore, we differentiate between SPS/TBT and other measures. This allows us to provide insights into the distinct effect of SPS/TBT measures that tend to have the clear purpose of achieving governments' public policy goals, e.g. maximum residue level, hygiene requirements, food labelling. Other NTMs comprise many different types of measures, ranging from border measures (e.g. customs checks at the border, trade certificates, fees and charges), antidumping, countervailing measures and quantity restrictions (e.g. quotas, tariff rate quotas).

The gravity equation

We apply a Pseudo Poisson Maximum Likelihood estimator (PPML) in order to include the entire trade information available, i.e. including bilateral zero trade values and avoid inconsistent estimates derived from the log-linear approach (Santos Silva and Tenreyro, 2006). The gravity equation applied is specified as follows:

$$Poisson: E(y|\boldsymbol{x}) = E\left(M_{ijts}|\boldsymbol{x}\right) = exp(\boldsymbol{x}'\boldsymbol{\beta}) =$$

$$\boldsymbol{exp}\big(\beta_0 + \beta_{Mt}Mt_{ijts} + \beta_{NTM}NTM_{ijts} + \beta_1 Dist_{ij} + \beta_2 NoSo_{ij} + \beta_3 Remote + \beta_4 Lock_{ij} + \beta_5 Contig_{ij} + \beta_6 Lang_{ij} + \beta_7 Col_{ij} + \beta_8 PTA_{ijt} + \beta_9 SqIncome_{ijt} + \beta_{10} Gdp_{ijt} + \sum_{t=2}^{T}\beta_{yt}F_t + \sum_{s=2}^{S}\beta_{Ss}F_s + \sum_{i=2}^{NX}\beta_{Xi}F_i + \sum_{j=2}^{NM}\beta_{Mj}F_j\big) \quad (1)$$

where $E(y|\boldsymbol{x})$ (i.e. expected value) is the mean of the dependent variable y (bilateral trade M_{ijts}) conditional on explanatory variables **x** and $\boldsymbol{\beta}$ is the matrix of coefficients to estimate. The sub-index i and j refer to the exporter (i=1,…,NX) and importer (j=1,…,NM), respectively, while t refers to the year (t=1,…,T) and s to the Hs 6-digit sector (s=1,..,S).

The dependent variable is bilateral imports (in thousand USD). As usual in a gravity equation specification, the independent variables are economic variables such as GDP, GDP per capita and a dummy variable to account for the existence of Regional Trade Agreements (RTAs) (variable "PTA"), in addition to language, colonial ties and indicators of geographical distance. Furthermore, we also account for multi-lateral resistance terms by using importer and exporter fixed effects (Anderson and van Wincoop, 2003) and by the explanatory variable "Remote" (Melitz, 2007). For the explanation of the variables as well as the respective data sources see table 4.

Capturing NTMs in the gravity estimation – estimation strategy

NTMs are captured by dummy variables that account for the mere existence of measures (yes/no). On the other hand, we also apply NTM variables to explicitly shed light on the trade effect of two specific types of NTMs, namely SPS/TBT and other NTMs. In the estimation, we consider the time period 2009-2014.As mentioned, 2014 is the most recent year available for NTM data, and we use the information about the start and end date of measures reported by TRAINS/ITC to reflect changes in the NTMs application.

We use the maximum level of sectoral disaggregation, HS6-digit, for which, bilateral trade, NTMs and tariffs are defined. We exclude country pairs that have never traded throughout the time period 2000-2014. We hence assume that, if a country has not exported a certain product in this period, the likelihood of this particular country being a relevant producer and exporter is rather low.

We aim is to estimate the effect of NTMs imposed by those countries in North Africa, Mercosur and Asia, that constitute an interesting destination for EU dairy exports and with which trade negotiations are being pursued. To this goal, we consider a group of importers of dairy products which belong to the same income group as our regions of interest in order to count with a counterfactual sample with similar characteristics. Except for Argentina and Uruguay (Mercosur members), the majority of countries of interest fall into the group of lower or upper middle income countries. Thus, we use the income group of lower or upper middle income categories according to the World Bank country classification, and all Mercosur members in our estimation rendering a total of 38 importers. Note that there is not a perfect match between reporters analysed with the inventory approach and in the estimation part, given to different times in data collection. Thus, for instance, countries covered by the indicator analysis such as Thailand, Malaysia, Indonesia and Japan are not included in the estimation sample.

Summing up, we apply the PPML estimator to a panel dataset composed by 38 importers, 124 exporters (including EU Member States individually), 20 dairy HS 6-digit subsectors, in the period 2009-2014. Fixed effects for importers, exporters, years and HS 6-digit sectors are included (Table 3). The fixed effects control for correlation between omitted and observed variables (Greene, 2012), and in this sense, are expected to mitigate possible endogeneity problems induced by explanatory variables such as tariffs, PTA and NTMs. Finally, standard errors are clustered by exporter-importer.

We estimate the following four model specifications:

i. **Model "no NTM"**: with no NTM variable. This gives a first indication about the general performance of the model. We pay special attention to a negative expected sign of the tariffs coefficient. This is particularly relevant because we will use the tariff coefficient as the trade cost elasticity necessary to translate the quantity NTM impact into an ad-valorem equivalent.
ii. **Model "NTM":** includes a dummy variable for the presence of NTMs: NTM_{ijts} = 1 if importer *j* imposes at least one NTM of any type on imports from *i*; 0 otherwise.
iii. **Model "Routes"**: includes interactions between the NTM dummy variable and the regions of interest that we denote "$Route_{ijts}$" and defined as:
    feutmerco = 1 if *i* is a member of the EU and *j* is a member of Mercosur; 0 otherwise,
    feutNAfr = =1 if *i* is a member of the EU and *j* is a North African country (Algeria, Egypt, Tunisia, Morocco); 0 otherwise or
    feutAsia=1 if *i* is a member of the EU and *j* is a member of Asian (Philippines); 0 otherwise.
iv. **Model "Segmented NTM"**: including the dummy NTM_Other_{ijts} =1 if importer *j* imposes at least one NTM of categories different from A or B to imports from *i*; 0 otherwise.
v. **Model "Segmented NTMs by Route**": includes interaction between the NTM and NTM_Other variables and the routes.

In Model ii 'NTM', the presence of at least one NTM induces a change in the mean of bilateral trade of $\exp(\boldsymbol{\beta_{NTM}}) - \mathbf{1}$, and the tariff or ad-valorem equivalent that leads to the same proportional change in trade is:

$$\boldsymbol{\tau}^* = \boldsymbol{exp}\left(\frac{\boldsymbol{\beta_{NTM}}}{\boldsymbol{\beta_{Mt}}}\right) - \mathbf{1} \qquad (2)$$

In Model iii 'Routes', the AVE of NTMs in the Route is $\boldsymbol{\tau}^* = \boldsymbol{exp}\left(\frac{\boldsymbol{\beta_{NTM}}+\boldsymbol{\beta_{NTM\_Route}}}{\boldsymbol{\beta_{Mt}}}\right) - \mathbf{1}$**,** where the coefficient $\boldsymbol{\beta_{NTM\_Route}}$ accompanies the variable of interaction between the NTM and Routes dummies. In Model iv 'Segmented NTM' the AVE of NTMs for 'Other than A and B categories' will add the coefficient $\boldsymbol{\beta_{NTM\_Other}}$ to the numerator in (2). And finally, in Model v "Segmented NTM by Route" the numerator in (2) is modified with respective NTM and Routes coefficients, following the same logic as in Model iv.

Estimation results

The estimation results are presented in Table 5. Overall, the coefficient of the standard gravity variables show the expected signs, with the exception of 'common language'. They are also within the range of the expected magnitude of coefficients. Focusing on the variables reflecting NTMs, the sign of the coefficient is negative, which indicates that the presence of NTMs in the third countries have an overall negative effect on trade. We note that the estimates for model specification (ii) and (iii) are unfortunately not significant. This could be due to the fact that the NTM dummy variables take the value of 1 for almost 90% of the data observations, thereby limiting the variability of the NTM data. In fact, significance is clearly obtained when segmenting by categories of NTMs.

With regard to bilateral NTM effects, the model specification (iii) provides insights by the interaction terms of NTMs and trade routes from the EU to the respective regions (Mercosur, North Africa and Asia). As shown, the coefficient of the interaction term for Mercosur is positive (and significant) and hence the negative effect of NTMs is found to be alleviated in comparison to the average NTM effect when trading with other countries. In contrast, the negative effect of NTMs on exports from the EU to North Africa is reinforced, given the negative coefficient estimated. This indicates that EU exports to North Africa seem to be more negatively affected than other exports. For the other export destinations, no significant differences with respect to an average destination country are observed.

Differentiating between SPS/TBT measures and all other measures, the model specification (iv) reveals that SPS/TBT measures dominate the NTM effect in dairy trade. As mentioned, the coefficient of the "NTM" variable is found to be negative and significant, indicating an overall trade-hampering NTM effect. However, the estimated coefficient of the variable "NTM_other" is found positive and significant. Hence the effect of measures other than SPS/TBT measures appears to alleviate the overall negative effect of all NTMs in total (reflected by the NTM variable). Note that this does not mean that NTMs other than SPS/TBT measure have a positive effect on trade. With the positive coefficient of "NTM_other", the overall negative effect is to a large extent caused by SPS/TBT measures. As a note, it is important to clarify that 97% of the observations with at least one NTM correspond to NTMs of type A and B, and other categories appear in 70% of the observations with an NTM (in particular, C, D, E, F, G, I and N). The pairwise correlation between NTM and NTM_Other variables is 0.47, not excessively high to compromise the reliability of the results.

Combing model specifications, i.e. differentiating between SPS/TBT measures and other NTMs as well as considering the exports destinations for EU dairy products under review, we can confirm the pervasiveness of SPS/TBT measures for exports from the EU to North Africa and to Asia, respectively. For EU dairy exports to Mercosur, however, SPS/TBT measures seem to have a positive effect. In other words, the SPS/TBT measures imposed by Mercosur countries do not hamper EU dairy exports. This could have many reasons. One reason could be the long-time cooperation in SPS and TBT matters with some of the countries in the region. For example, the EU has had an association agreement with Chile since 2005 and completed trade agreements with Colombia and Peru in 2012. Usually such cooperation, as in the Mercosur region, aims to overcome trade barriers like SPS/TBT measures. Similarly, knowing more about each other's food safety and quality systems could also foster rather than hamper trade. Note that in the estimation, the estimated coefficients of the "PTA" variable show a positive and significant trade effect of regional trade agreements for all model specifications. This confirms a positive trade effect due to RTAs.

The estimations show a substantial negative trade effect for SPS/TBT measures on EU exports to North Africa as well as to the Asian region. While being engaged in the region, the political situation may have cooled down the relations between the EU and the North African region that may have become more protectionist towards the EU. For the Asian region, the EU cooperation on SPS/TBT measures has just started with trade negotiations being under way with several countries in the region. For example, the free trade agreement with Vietnam was only signed in January 2016 (expected to enter into force in 2018). Negotiations with Thailand were launched in March 2013 and with Singapore and Malaysia in 2010 (and taken up again in 2016). Furthermore, trade negotiations between the EU and Japan have been on-going, with a completion being expected in 2017.

Ad-Valorem Equivalents

Ad-Valorem estimates are presented in Table 6, together with Kee et al.(2009) (KNO) estimates (when available) and observed tariffs in the sample. Middle income countries impose NTMs on their imports equivalent to an ad-valorem tariff of 48%. Segmenting by categories, the AVE is 78% for NTM categories for SPS and TBT measures (chapter A and B) and 33% for other categories. A differential AVE is found for exports to North Africa, where the AVE is of lower magnitude than the rest of the regions considered, 14% vs 48%. In the case of NTMs other than SPS and TBT measures (chapter A and B), the differences across routes become even more prominent. Thus, North Africa becomes even less restrictive (9%), where Mercosur stands out as the most restrictive in categories different from A and B (118%).

Despite the methodological differences, our estimates are in line with those obtained by KNO. Thus, averaging KNO estimates (based SPS and TBT measures) across HS 6-digit sectors and countries included in our sample, we obtain a mean AVE of 70%, which is close to our 78% for SPS and TBT measures. Comparing for specific regions, the main difference is that we get less restrictive AVEs in North Africa. Finally, the comparison of NTM AVE estimates with tariffs highlights, with a few exceptions, the higher costs imposed by NTMs than by tariffs.

4 Concluding remarks

In this paper we first apply NTM data in order to investigate frequency indicators and trade coverage ratios that indicate which combinations of products, measures and countries are relevant when analysing NTMs from the perspective of EU dairy exporters.

According to the frequency indicator, Uruguay imposes distinct NTMs most frequently, followed by Indonesia, Argentina and India. Furthermore, the number of SPS/TBT measures is the largest and hence these measures dominate amongst all NTMs. Overall, the trade coverage ratio remains rather small, except for NTMs imposed by Japan where 100% of milk and cream, not concentrates (HS code 0401) seems to be affected by SPS/TBT measures. The small trade coverage ratio in general indicates that there are not many EU exports, which could be due to NTMs that potentially prohibit trade between partner countries. However, the interpretation of a causal relationship between NTMs and trade coverage cannot be made due to endogeneity problems.

In order to quantify the trade effect of NTMs, we conduct gravity estimations that account for bilateral effects and distinguish between SPS/TBT measures and other NTMs. The NTM effect estimated should be interpreted in the context of the sample of importers selected that constitutes the counterfactual in the comparative analysis. For EU dairy exports, we selected upper and lower middle income countries as they compare with the regions under review. Interaction terms allow us to estimate the bilateral NTM effect on exports from the EU to the partner countries in Africa, South America and Asia, respectively.

Overall, the estimation results show that NTMs cause a negative trade effect. Furthermore, we find that SPS/TBT measures dominate the negative NTM effect. Interestingly, the effect of tariffs is found to be significant in most of the specifications, and bilateral trade is highly responsive (i.e. elasticities higher than 1) to tariffs. This could be due to the high sensitiveness of dairy products and their high tariff protection. As such, negotiating tariff reductions would also contribute to a potential increase in EU exports to the partner countries.

Looking at the NTM effect per export destination, the estimation results show a considerable negative effect for North African and Asian countries. With trade negotiations only recently started or continued, the negative effects could be mitigated by the cooperation on NTM matters. Cooperation on NTMs could involve the opening of markets for EU dairy exporter, but at the same time the EU would need to improve market access for products from the partner countries.

The estimated AVE for NTMs imposed by middle income countries in dairy is 48%. By routes, a significant lower AVE is found however in the case of North Africa (although not in the SPS/TBT categories), that favour in particular the exports from the EU (14% in dairy and 66% in cheese and curd). By type of NTM, SPS and TBT are more stringent in dairy in general, leading to an AVE of 78%, more than double than the AVE of other categories (33% on average).

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6 List of Tables

Table 1: International Classification of non-tariff measures

		Chapter	Types of measures
Imports	Technical measures	A	Sanitary and Phytosanitary measures (SPS)
		B	Technical barriers to trade (TBT)
		C	Pre-shipment inspection and other formalities
	Non-technical measures	D	Contingent trade-protective measures
		E	Licensing, quotas, bans and quantity-control (not SPS/TBT)
		F	Price-control measures, incl. taxes, charges
		G	Finance measures
		H	Measures affecting competition
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restrictions on post-sales services
		L	Subsidies (excl. export subsidies under P7)
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin
Exports		P	Export-related measures

Source: UNCTAD (2015). Classification of non-tariff measures. 2012 Version.

Table 2: HS classification of dairy products – HS chapter 4

0401 - Milk and cream, not concentrated nor containing added sugar
040110 - Milk & cream, not concentrated, 040120 - Milk & cream, not concentred, 040130 - - Milk & cream, not concentrated , 040140 - Milk and cream, not concentrated nor, 040150 - Milk and cream, not concentrated nor;
0402 - Milk and cream, concentrated
040210 - Milk in powder/granules/.., 040221 - Milk in powder/granules/..., 040229 Milk in powder/granules/..., 040291 - Milk & cream, concentrate, 040299 - Milk & cream, concentrate
0403 - Buttermilk, curdled milk and cream, yogurt, kephir and other fermented
040310 Yogurt, 040390 - Buttermilk/curdled milk...
0404 - Whey, whether or not concentrated
040410 - Whey & modified whey, 040490 - H0H1H2H3H4 - Milk products...;
0405 - Butter and other fats and oils
040500 - Butter and other fats and oils derived, 040510 - Butter, 040520 - Dairy spreads, 040590 - Fats & oils derived from milk;
0406 - Cheese and curd.
040610 - Fresh (un-ripened/uncured), 040620 -Grated/powdered cheese, 040630 - Processed cheese, not gra, 040640 - Blue-veined cheese, 040690 – Cheese;

Source: COMTRADE

Table 3: Sample used in the estimation

Dairy products (HS codes)	04010: 040110, 040120, 040130
	04020: 040210, 040221, 040229, 040291, 040299
	04030: 040310, 040390
	04040: 040410, 040490
	04050: 040510, 040520, 040590
	04060: 040610, 040620, 040630, 040640, 040690
Period	2009-2014
Partners/Exporters	124 countries; EU as individual Member States
Reporters/Importers	38 importers: Lower (Philippines, India, Morocco, Egypt, Algeria) and Upper Middle Income (Brazil, Paraguay); Other Mercosur (Argentina, Uruguay).

Source: own compilation.

Table 4: Variables in the gravity equation

Variable	Description	Data source
	Dependent variable	
M_{ijts}	Value of imports into country *j* from country *i* at current prices in year t and HS 6-digit sector *s* (million US$)	UN Comtrade
	Explanatory variables	
Mt_{ijts}	Power of the import tariff rate ($AdvRate_{ijts}$) applied by importer *j* on imports from *i* in year *t* and HS 6-digit sector *s*, in logs: $$Mt_{ijts} = ln\left(1 + \frac{AdvRate_{ijts}}{100}\right) = ln(1 + \tau_{ijts})$$	Effectively applied tariffs by TRAINS-WITS
$Dist_{ij}$	Weighted bilateral distance by internal population, between the main cities of country *i* and *j*, in logs	CEPII (2014), Mayer and Zignago (2011)
$IntDist_{ij}$	Internal distance of countries *i* and *j*:ln($DistInt_i$ + $DistInt_j$). Internal distance of country *i* is calculated as $0.67\sqrt{area_j/\pi}$.	CEPII (2014), Mayer and Zignago (2011)
$NoSo_{ij}$	Difference in latitudes between countries *i* and *j*, in logs: ln(abs($latitude_i$ – $latitude_j$))	CEPII (2014), Mayer and Zignago (2011)
$Remote_{it}$	Indicator of Remoteness of countries *i* and *j* in year *t*, calculated as: ln(Remote $_{i,t}$ + Remote *j*,*t*) with $$Remote_{it} = ln\left(\sum_{j}^{T(i)} \frac{GDP_{jt}}{GDP_{Wt} - GDP_{it}} \times Dist_{ij}\right)$$ where $Dist_{ij}$ is the distance between *i* and *j* (as above), $GDPW_t$ is the world GDP in year *t*, and T(i) is the number of the destination countries of exports from i.	See above
$Lock_{ij}$	Dummy variable that values 1 when countries *i* and *j* are landlocked; 0 otherwise.	CEPII (2014)
$Contig_{ij}$	Dummy variable that values 1 when countries *i* and *j* share a border; 0 otherwise	CEPII (2014)
$Lang_{ij}$	Dummy variable that values 1 when countries *i* and *j* share the same language (at least 9% of the population speaks it); 0 otherwise.	CEPII (2014)
Col_{ij}	Dummy variable that values 1 when countries *i* and *j* have or have had a colonial linkage.	CEPII (2014)
PTA_{ijt}	Dummy variable that values 1 when countries *i* and *j* belong to the same Preferential Trade Area.	Egger and Larch (2008)
$CCurrency_{ijt}$	Dummy variable that values 1 when countries *i* and *j* share the same official currency.	CEPII (2014)
$Sqincome_{ijt}$	Square of the difference in per capita income in countries *i* and *j*, in logs: ln(($GDPpc_{it}$ – $GDPpc_{jt}$)^2) with GDP_{pc} measured in US$ per habitant (in nominal terms)	Calculated using World Bank (2014)
Gdp_{ijt}	Product of GDP in country *i* and country *j* in year *t*, in logs: ln(GDP_{it} × GDP_{jt}), with GDP measured in million US$ (in nominal terms)	World Bank (2014)
NTM_{ijts}	Dummy variable that is 1 when at least one NTM is imposed by country j on trade with country i in year t.	
F_t	Fixed effect for each year t (t= 2000 to 2014), i.e. dummy variable that is 1 for year =t; 0 otherwise.	
F_i (F_j)	Fixed effects for exporter (importer) country *i* (*j*). F_i(F_j) are dummy variables, that are 1 for the exporter (importer) being *i* (*j*); 0 otherwise.	
F_s	Fixed effect for each HS 6-digit sector *s*, i.e. dummy variable that is 1 for HS6 sector being *s;* 0 otherwise.	

Source: own illustration.

Table 5: Gravity estimation results

Model specification	i	ii	iii				iv	v. combined iv and iii			
	No NTM	NTM	Routes	Routes	Routes	Routes	Segmented NTM	Segmented NTM	Segmented NTM	Segmented NTM	Segmented NTM
VARIABLES			feutMerco	feutNAfrica	feutAsia	feutIND		feutmerco	feutNAfr	feutAsia	feutIND
Mt	-1.488	-1.494	-1.492	-1.392	-1.495	-1.494	-1.727*	-1.761*	-1.630*	-1.729*	-1.780*
	(1.032)	(1.031)	(1.031)	(1.011)	(1.032)	(1.031)	(0.976)	(0.983)	(0.955)	(0.975)	(0.975)
PTA	0.401***	0.399***	0.396***	0.483***	0.397**	0.399***	0.338**	0.335**	0.410***	0.338**	0.248
	(0.155)	(0.154)	(0.154)	(0.139)	(0.158)	(0.155)	(0.163)	(0.163)	(0.143)	(0.166)	(0.160)
CCurrency	1.193*	1.182*	1.187*	1.322**	1.185*	1.176*	1.157*	1.153*	1.293**	1.153*	1.092
	(0.687)	(0.689)	(0.693)	(0.622)	(0.693)	(0.693)	(0.689)	(0.687)	(0.618)	(0.693)	(0.702)
Dist	-1.005***	-0.994***	-0.995***	-1.209***	-0.994***	-0.993***	-1.000***	-1.001***	-1.226***	-1.000***	-0.996***
	(0.145)	(0.143)	(0.144)	(0.148)	(0.143)	(0.144)	(0.145)	(0.145)	(0.147)	(0.145)	(0.142)
DistInt	-0.0810	-0.0542	-0.0545	-0.0719	-0.0564	-0.0562	-0.120	-0.125	-0.135	-0.119	-0.181
	(0.262)	(0.264)	(0.264)	(0.263)	(0.264)	(0.264)	(0.257)	(0.256)	(0.258)	(0.257)	(0.259)
Lock	-0.0789	-0.0622	-0.0662	-0.219	-0.0637	-0.0610	-0.201	-0.207	-0.333	-0.203	-0.133
	(0.890)	(0.886)	(0.884)	(0.897)	(0.886)	(0.886)	(0.889)	(0.891)	(0.902)	(0.889)	(0.875)
Contig	0.795***	0.812***	0.821***	0.525**	0.813***	0.812***	0.849***	0.843***	0.557**	0.849***	0.926***
	(0.229)	(0.229)	(0.230)	(0.235)	(0.231)	(0.229)	(0.236)	(0.237)	(0.241)	(0.240)	(0.235)
Lang	-0.183	-0.180	-0.187	-0.176	-0.183	-0.177	-0.164	-0.159	-0.151	-0.161	-0.132
	(0.194)	(0.196)	(0.197)	(0.192)	(0.202)	(0.199)	(0.191)	(0.192)	(0.187)	(0.197)	(0.190)
Col	1.255***	1.260***	1.266***	1.390***	1.260***	1.258***	1.243***	1.239***	1.372***	1.240***	1.185***
	(0.413)	(0.406)	(0.408)	(0.440)	(0.405)	(0.406)	(0.407)	(0.408)	(0.436)	(0.411)	(0.386)
NoSo	-0.105	-0.105	-0.108*	-0.113*	-0.105	-0.105	-0.154**	-0.156**	-0.162**	-0.155**	-0.135**
	(0.0644)	(0.0642)	(0.0647)	(0.0681)	(0.0650)	(0.0642)	(0.0636)	(0.0636)	(0.0693)	(0.0648)	(0.0618)
Remote	12.35***	12.68***	12.43***	6.943**	12.71***	12.68***	14.40***	14.70***	8.730***	14.40***	13.45***
	(3.269)	(3.274)	(3.244)	(3.368)	(3.269)	(3.275)	(3.223)	(3.181)	(3.194)	(3.219)	(3.100)
Gdp	1.660***	1.678***	1.667***	1.415***	1.680***	1.677***	1.518***	1.518***	1.257***	1.516***	1.426***
	(0.343)	(0.335)	(0.334)	(0.323)	(0.333)	(0.335)	(0.200)	(0.198)	(0.194)	(0.199)	(0.173)
Sqincome	-0.0757*	-0.0757*	-0.0774*	-0.0689*	-0.0759*	-0.0756*	-0.0836**	-0.0837**	-0.0760**	-0.0835**	-0.0790**
	(0.0400)	(0.0399)	(0.0405)	(0.0376)	(0.0400)	(0.0399)	(0.0409)	(0.0420)	(0.0384)	(0.0410)	(0.0393)
NTM		-0.585	-0.585	-0.535	-0.585	-0.585	-0.998***	-1.025***	-0.942**	-1.002***	-1.097***
		(0.359)	(0.359)	(0.388)	(0.359)	(0.359)	(0.338)	(0.338)	(0.381)	(0.338)	(0.338)
feutmerco			-1.729*					-2.282**			
			(1.008)					(1.043)			
NTM_feutmerco			1.996**					3.540***			
			(0.828)					(0.763)			
feutNAfr				-1.740***					-1.698***		
				(0.414)					-0.412		
NTM_feutNAfr				0.356					0.282		
				(0.464)					(0.477)		
feutAsia					-0.0522					0.148	
					(0.374)					(0.446)	
NTM_feutAsia					n.a.						
feutIND						0.147					0.0703
						(0.453)					(0.454)
NTM_feutIND						n.a.					n.a.
NTM_Other							0.511***	0.542***	0.521***	0.515***	0.633***
							(0.184)	(0.186)	(0.177)	(0.187)	(0.177)
NTM_Other_feutmerco								-4.429***			
								(0.805)			
NTM_Other_feutNAfr									n.a.		
NTM_Other_feutAsia										-0.198	
										(0.444)	
NTM_Other_feutIND											n.a.
Constant	-162.8***	-166.2***	-163.5***	-102.4***	-166.4***	-166.1***	-178.9***	-181.8***	-115.9***	-178.8***	-167.0***
	(34.06)	(33.85)	(33.56)	(35.15)	(33.73)	(33.86)	(34.81)	(34.46)	(34.63)	(34.76)	(33.19)
% Zero trade values	63%										
% NTM=1	87%										
Observations	73,554	73,554	73,554	73,554	73,554	73,554	73,554	73,554	73,554	73,554	73,554
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Correlation	0.576	0.569	0.569	0.575	0.569	0.569	0.595	0.597	0.601	0.595	0.598
LogLikelihood	-98806	-98549	-98543	-97300	-98549	-98548	-97826	-97557	-96556	-97824	-97535

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

n.a. means "not available" as NTM_Route = 1 when Route = 1

Correlation is squared correlation between observed and fitted values (Cameron and Trivedi, 2010)

Source: own estimation results.

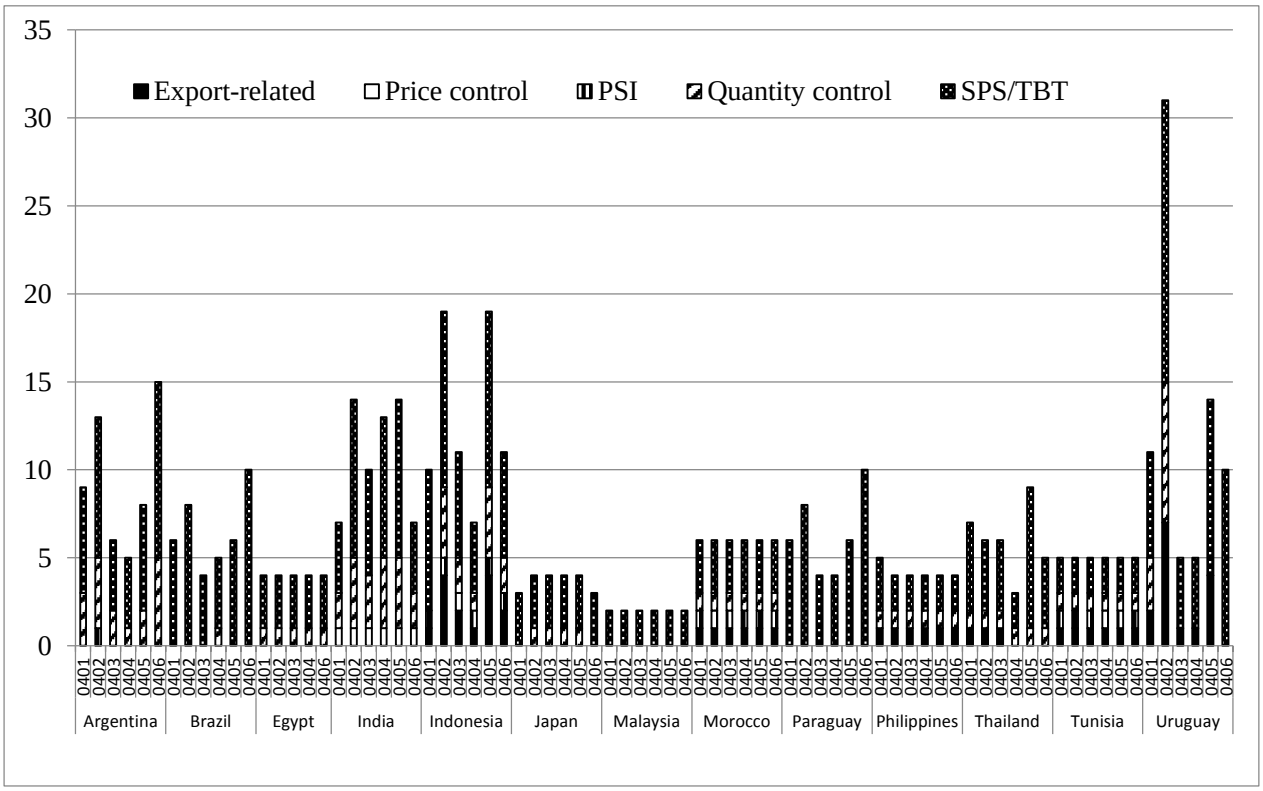
Table 6. Ad-Valorem equivalents of NTMs in dairy

		All	Mercosur	North Africa	Asia (PHL)	India
Model ii y iii	NTM General	0.48	-0.61	0.14	0.48	0.48
Model iv	A or B	0.78	-0.76	0.50	0.79[1]	0.78[1]
	Other	0.33	1.18	0.09	0.49	0.33[1]
KNO AVE		0.70	0.73	0.73	0.71 (0.68)	0.55
Tariff		0.19	0.10	0.26	0.09 (0.03)	0.34

[1] The lack of variation in the interaction term NTM_Route leads to an AVE that equals the general AVE calculated as in Equation (2). Small changes compared to the "All" column due to slightly different tariff coefficients.

7 List of figures

Figure 1: Frequency counts for NTM categories imposed by selected countries, 2014.

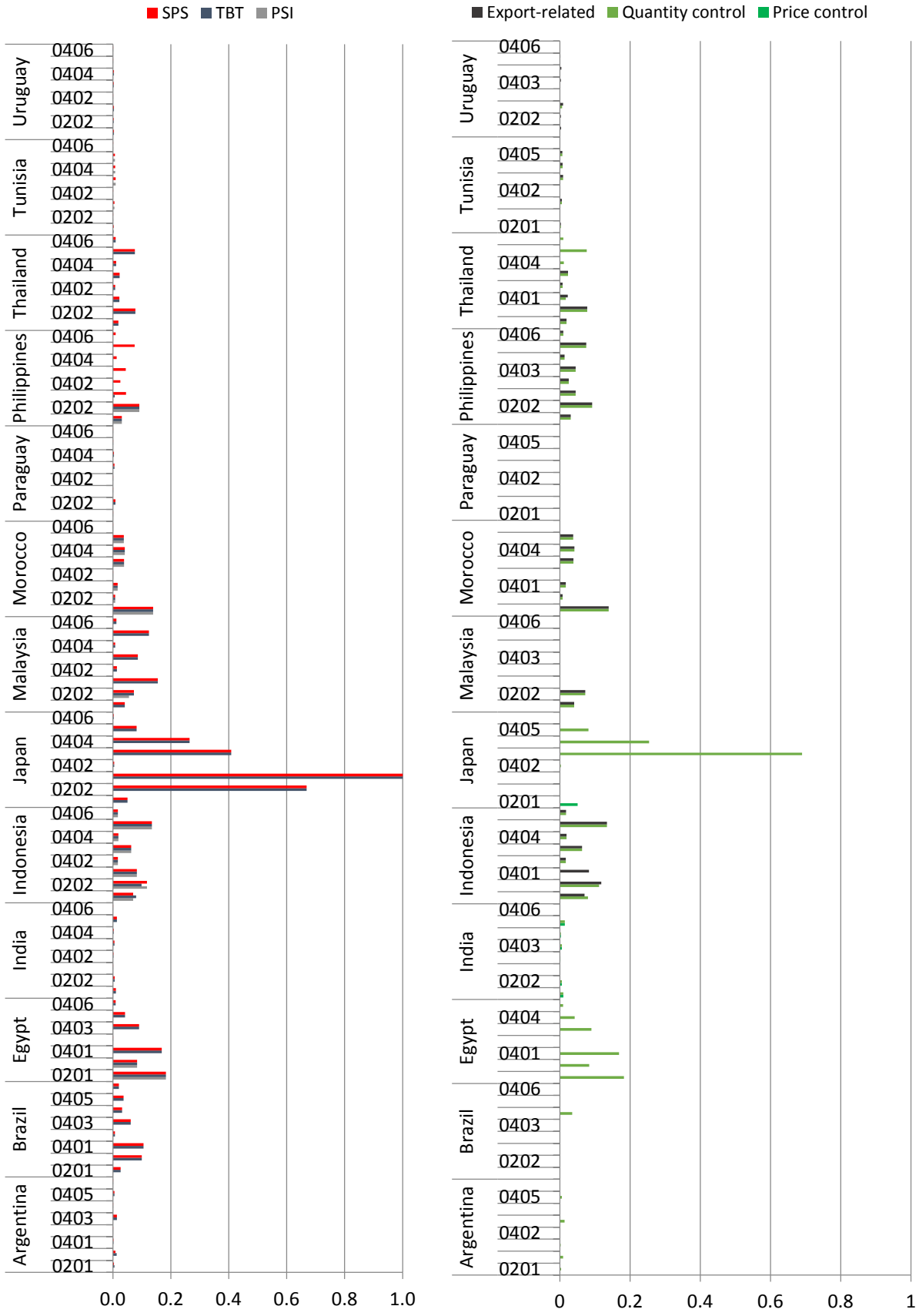


NTM groups: SPS = sanitary and phytosanitary measures (MAST chapter A), TBT = technical barriers to trade (MAST chapter B), PSI = pre-shipment inspection and other formalities (MAST chapter C); Product codes: 0401 Milk and cream, not concentrated; 0402 Milk and cream, concentrated; 0403 Buttermilk, curdled milk; 0404 Whey; 0405 Butter and other fats and oils; 0406 - Cheese and curd.

Note: The NTMs reported apply to all countries (WLD), and not specifically to products coming from the EU28.

Source: own calculation.

Figure 2: Trade coverage ratio for NTMs imposed by selected countries, 2014.



Notes: see Figure 1

Source: own illustration