Impact of Sanitary and Technical Measures on Brazilian Exports of Poultry Meat

Luiza Meneguelli Fassarella[a],

Maurício Jorge Pinto de Souza

and

Heloisa Lee Burnquist

Fassarella is a Graduate Research Assistant of the Department of Agricultural, Economics and Sociology of Esalq/University of São Paulo/Brazil, email: luizameneguelli@hotmail.com; Souza is a PhD Professor of the Department of Economics of FEARP, University of São Paulo**,** e-mail: mjpsouza@fearp.usp.br; Burnquist is Associate Professor of the Department of Agricultural, Economics and Sociology of Esalq/University of São Paulo/Brazil, email: hlburnqu@esalq.usp.br. We gratefully acknowledge funding for this research by the NTM-EU IMPACT FP7 Project.

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ABSTRACT

The major objective of this work is to evaluate the effects of technical and sanitary measures introduced by the main world importers upon Brazilian poultry meat in the international market. The impact of the measures is estimated using a gravity model constructed with disaggregated data about bilateral poultry meat between Brazil and its major trade partners for the period from 1996 to 2009. The gravity model is estimated with a fixed effects model and the results indicate that the impact of TBT and SPS measures upon Brazilian poultry meat exports is ambiguous. The results indicated that the existence of technical and sanitary regulations related to labelling might be stimulating trade of this product, while the presence regulations related to compliance appears to reduce the volume of Brazilian exports of poultry meat. In addition, the existence of prohibitive (and/or subject to quarantine) technical and sanitary measures may present a positive impact upon the traded volume of Brazilian exports of poultry meat. This result is relevant since it indicates the importance in considering different characteristics and content of regulations to analyse the impacts of TBT and SPS measures upon trade.

Keywords: Technical and Sanitary measure; Poultry meat; Gravity equation

1 INTRODUCTION

Exporters are increasingly confronting non-tariff barriers in the form of product standards, testing requirements, and other technical requirements as they seek to sell their products around the world. Several analyzes have shown that with the lowering of tariff barriers to industrial and agricultural trade, after successful rounds of multilateral tariff reductions in the WTO and its predecessor, the General Agreement on Tariffs and Trade (GATT), standard-related measures have emerged as a primary concern to policy-makers since the trade effects of these measures can be similar to classical trade policy instruments (Roberts, Orden and Josling, 1999; Beghin and Bureau, 2001; Henson and Wilson, 2005). Broadly speaking, standards-related measures are documents and procedures that set out specific technical or other requirements for products and processes as well as procedures to ensure that these requirements are met. However, while introduced to ensure public goods such as food safety, animal health, plant protection, and the protection of humans from pests or diseases, it can also become an effective protectionist instrument to support domestic producers.

Therefore, contrary to what is expected for tariffs, the effect of standard-related measures to trade cannot be previously determined since they can either be positive or

negative. Standards-related measures can be used by governments and market players to achieve legitimate commercial and policy objectives. However, overly burdensome, discriminatory or otherwise inappropriate measures can restrict trade by creating unnecessary technical barriers to trade. Thilmany and Barrett (1997), Roberts, Orden and Josling (1999), Moenius (2004) and Chen et al (2008), are among some of the researchers that have stressed that the net effect of a regulation depends on the relative impact of the measure upon costs to exporters and on the amount and quality of information provided to end consumers. Measures that introduce requirements that increase costs can restrict trade, while the introduction of a regulation with a permanent informative character can enhance the acceptance of imported products, facilitating trade. There is empirical evidence that technical and sanitary regulations can present positive impact upon trade in some instances, while in others the effect is negative (Moenius, 2004; Schlueter, Wieck; Heckelei, 2009; Burnquist and Souza, 2010).

Since the establishment of rules under the WTO related agreements: the Agreement of the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Technical Barriers to Trade Agreement (TBT Agreement), member countries have been stimulated to launch initiatives to promote greater international cooperation among regulatory authorities, trade officials and standards experts to prevent the emergence of unjustifiable barriers to exports. However, heterogeneity of sanitary or technical measure in content and characteristics between countries might occur even when these have the same objective. Although technical and sanitary measures may have common objectives such as protect human and animal health and minimize market failure there are several reasons that explain why countries adopt different forms of regulations to reach similar objectives. These differences may be due to the way the product is defined and characterized, or due to requirements about the production process, requirements on conformity assessment, among others. Whenever there is heterogeneity on requirements these can raise trade issues (Schlueter, Wieck and Heckelei, 2009).

Technical and sanitary standard-related measures can play a critical role in shaping meat trade. With the spread of diseases and pandemics in recent years, producers' and consumers' perception regarding the importance of product and process control has increased, such that poultry meat has been particularly subject to a diverse set of technical and sanitary measures. These measures include a set of diversified aspects such as temperature control, salt content, certifications, inspections, evaluations,

religious patterns and issues related to contamination such a *Salmonella spp*, *Listeria, monocytogenes*, *Nitrofuran, Nitrofurazon*, among others.

Considering that Brazilian poultry exports has been ranked first in the world market in the last five years, the evaluation of the net impact of technical and sanitary measures upon trade is essential to assure that the country's government and exporters remains well informed about relevant restrictions. This information is also fundamental concerning means to facilitate trade in order to be able to establish trade strategies that provide greater transparency and confidence to exporters and also facilitates and enhances trade in safe, high-quality Brazilian poultry products. The monitoring the identification of unnecessary standard-related barriers is an important piece of information in this policy framework.

The analysis presented in this article is based on a quantitative approach to evaluate the impacts of sanitary and technical standards-related measures applied to Brazilian exports of poultry meat by major importing markets. An extended form of a gravity model is used to include the sanitary and technical requirements as a component of the trade cost.

The hypothesis being tested is that the impact upon poultry meat trade can vary according to the relative importance of different categories used to aggregate the notifications. For that, the various technical and sanitary requirements are classified in categories, according to their content and purpose.

The work is structured in four sections, besides this introduction. The next section discusses selected papers that evaluate similar aspects, related to technical and sanitary measures and international agribusiness trade. Section 3 describes the methodology used to measure the impacts of technical and sanitary measures upon Brazilian exports of poultry meat. Section 4 presents the results of the econometric estimates of the gravity model. Finally, section 5 refers to conclusions of this study.

2 Related Literature

Several different approaches have been used to model and quantify the effects of technical and sanitary measures upon trade. A first review of these approaches was organized by Beghin and Bureau (2001) which led them to identify that an important distinction in the definition of standards-related measures is whether these are trade oriented or welfare-oriented concepts. It was argued that each concept leads to a

different approach for empirical measurement. According to the authors, a set of methods that rely on the measurement of possible trade impacts could be identified as: price-wedge estimation, surveys and gravity models. As methods grounded on welfare economics the study indicated comparative statics or cost-benefit analysis and general equilibrium analysis. More recently, Korinek, Melatos and Rau (2008) reviewed several applied studies to quantify the trade effects of standards and technical regulations. Their conclusion suggests that there can be serious limitations associated to analyses based on inventory results such as frequency and coverage measures while disregarding particular information about the regulation content and/or process attributes of products underlying the regulations.

Otsuki, Wilson and Sewadeh (2001) introduced the use of gravity model to estimate the impact of regulations upon trade. The results obtained in their article suggest that these regulations could be reducing African exports of cereals, dried fruits and nuts to the European market by 64 percent. Beghin and Xiong (2010) extended this work by using a methodological approach appropriate for dealing with zeros and missing values and obtained results that challenged the conventional view that regulation for food is a barrier to trade. In their work, regulations for aflatoxin adopted by the EU countries did not present significant effects for African exports. In addition, the results indicated that the export potential of African exporter was more constrained by domestic supply than by restrictions to enter the European market.

Analysis conducted by Chen, Yang and Findlay (2008) also used a gravity model to measure the effects of regulations applied to maximum residue limits for pesticides and medicine for Chinese exports of vegetables, fish and aquatic products. The estimates obtained by these authors showed that the insurance patterns imposed by importing countries had a negative impact which is also statistically significant for Chinese exports and agricultural products.

Disdier, Fontagné and Mimouni (2008) presents a quantitative approach for the effects of technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) notifications to the WTO upon trade of agricultural products among a set of countries. The results indicated that among the products evaluated, only four were not subject to notification by any of the importing countries.

Disdier, Fekadu, Murillo and Wong (2008) evaluated the effects of sanitary and technical measures applied by the United States, European Union, Japan, Canada, Australia, Switzerland to exported tropical products from countries within the Africa,

Caribbean and Pacific (ACP), Asia and Latin American countries. The results indicate that SPS and TBT regulations present a negative impact for international trade. It also suggests that the ACP group is more affected by these measures than Latin American countries.

Jayasinghe, Beghin and Moschini (2009) conducted a detailed investigation of the commercial costs that impede export trade of corn seed from the United States to several markets. The results show that the impact of trade costs is negative for exports of corn seed. In addition, it was verified that the effect of tariffs and distance are higher than those resulting from SPS measures.

Schlueter, Wieck and Heckelei (2009) evaluated the effect of sanitary and phytosanitary regulations related to the meat sector upon trade. Regulations were organized according to the SPS areas they apply to and according to the political objectives they serve. For the disaggregated analysis of trade effect the regulations were ordered into six classes according to the *Trade Analysis and Information System* (TRAINS), established as: (1) prevent dispersion of pests and diseases, (2) microbiological testing for zoonoses (3) maximum residue limits, (4) processing of meat; (5) control of production, and (6) treatment and distribution. The analysis shows that the impact of sanitary and phytosanitary measures upon trade can be ambiguous: a positive impact upon trade flows is expected for classes related to prevention of pests and diseases, microbiological tests for zoonoses, maximum residual levels and production control. The impact of an introduction of regulation that restricts processing systems and regulation of treatment and distribution is expected to be negative.

Karov et al (2009) examined sanitary and phytosanitary measures that impact the level and composition of imports of fresh fruits and vegetables from the United States. This work evaluated sanitary measures relative to treatments such as fumigation, irradiation and cold treatment and identified a negative impact upon trade.

Burnquist and Souza (2010) presented an investigation of the impact of sanitary and phytosanitary regulations upon the bilateral trade of goods between Brazil and some of its major trading partners. According to their results, sanitary and phytosanitary regulations restrict commercial flows between the countries evaluated. Products subject to a lower level of food processing were more affected by these regulations compared to those with higher level of processing.

This work follows the analytical approach presented by Schlueter, Wieck and Heckelei (2009) and by Karov *et al* (2009) which are applied to evaluate the impacts of

different categories of technical and sanitary measures imposed by major importing countries upon Brazilian exports of poultry meat, considering the possible heterogeneity between these measures. The methodology is presented in the next section.

3 METHODOLOGY

The methodological approach adopted for this study involves two basic steps. First, the sanitary and technical measures are classified and organized. Secondly, an extended form of a gravity model is used to include the sanitary and technical requirements.

3.1 Classification of sanitary and technical measures

Notifications presented by the major importers of Brazilian poultry meat to the World Trade Organization (WTO) were the primary source of information about the sanitary and technical measures imposed upon trade for this analysis. These are collected for the period from 1996 to 2009 when the SPS and TBT Agreements were established. Currently, the WTO SPS and TBT notifications are the only source of information suitable for this type of analysis. As a first stage, notifications related to poultry meat and the major categories of this meat were selected. The data system about these notifications presented at the WTO[1] site allows a search for products disaggregated by six digits of the Harmonized System (HS). A second stage involved an analysis of the content of each notification. Based on the content analysis, the notifications were classified using the World Integrated Trade Solution (WITS) - Multi-Agency Classification of Non-Tariff Measures (2009) - and organized in five categories selected for this analysis: (1) product measures, (2) process measures, (3) labelling measures, (4) measures for conformity assessment, e (5) prohibitive/restrictive measures. This definition of categories was based on the work conducted by Rau, Shutes and Schlueter (2010). Table 1 illustrates how the WITS (2009) classification was organized to aggregate SPS and TBT measures into the five categories indicated.

[1] SPS Information Management System e TBT Information Management System.

Table 1 – WITS Classification of SPS and TBT measures and aggregation by Category

Category	WITS*
Product	A200/B200 – Tolerance limits
	A410 – Microbiological criteria
	A700/B500 - GMO
Process	A420 – Hygiene practices
	B410 - TBT regulations for process
	B420 - Transport and storing
	A500 – Treatment to eliminate pests and diseases
	A600 – Other requirements for products and process
	A850/B850 – Traceability
Labeling	A300/B300 - Labeling, marketing and packaging
Conformity	A800/B800 - Conformity evaluation
Prohibition/Restrictions	A100/B100 - Prohibition/Restrictions: based in issues related to regionalization, eligibility e *systems approach*
	A860 – Quarantine

*Codes A and B in WITS classification indicates a measure SPS and TBT, respectively
Source: WITS System; Rau, Shutes e Schlueter (2010)

3.2 Gravity Model: theory and empirical approach

The model applied for this study is based on a theoretical micro-foundation of the gravity model developed by Anderson and van Wincoop (2003, 2004). The model is based on a system of preferences of the CES type (Constant elasticity of substitution), subject to a budget constraint that incorporates heterogeneity for all products within the k sectors, classified according to consumers' preferences. In addition, a cost factor that explains trade is introduced as a log linear function of the observable variables, such as distance, trade agreements, tariffs and other non-tariff barrier to trade. Anderson and Van Wincoop (2004) showed that exports form country i to country j, related to a given sector k, at a given time period t, can be represented in the following form:

$$X_{ij}^{k} = \frac{E_j^k Y_i^k}{Y^k} \left(\frac{t_{ij}^k}{P_j^k \Pi_i^k} \right)^{1-\sigma_k} \quad (1)$$

where: X_{ij}^{k} indicates exports from country *i* to country *j* of a certain class of products *k*; Y_i^k and Y^k represent the production of country *i* and aggregate production (world) from

sector *k*, respectively*;* E_j^k is the expenditure *j* with the group of *k* products; σ_k represents the elasticity of substitution between groups of products; t_{ij}^k are the exporters' trade costs of trade for sector *k*, from country *i* to country *j*. The terms P_j^k *e* Π_i^k express price indices that identify multilateral resistance terms. These indices indicate that trade depends not only on the trade costs between two countries as well as on the trade costs with other partners.

Considerations must be made regarding the theoretical approach described and the empirical treatment of the gravity model. First, the gravity equation is normally estimated for all pair of countries *ij* involved in international trade. However, considering the objective of the work is to evaluate the impact of technical and sanitary measure upon Brazilian exports of poultry meat, the data about trade flux includes only one exporting country (Brazil = i) that exports poultry meat of type k for country j, at the period of time (t). Karov et al. (2009) and Mata and Freitas (2008) also estimated a gravity equation considering only one country at one of the sides of the flux.

A second consideration is that the theoretical approach proposed by Anderson and van Wincoop (2003) can be subject to an appropriate econometric treatment to employ the fixed effects method (FEENSTRA, 2004; ANDERSON; VAN WINCOOP, 2003). This method allows to control the heterogeneity of the countries and the effect of omitted variables which are non observable or difficult to measures (such as the multilateral resistance index) in order to impede that the omission introduces any bias to the estimate (CHENG; WALL, 2005). The fixed effects model is different for each pair i and j, which are specific to the country and do not vary through time[2].

A third aspect to be emphasized is that the gravity model is estimated with disaggregated panel data by type of poultry meat (HS-6 digits) for the period 1996 to 2009. In this case, dummy variables are introduced to control the product dimension and also for time. The purpose is to control a possible bias caused by omitted variables or others which are not subject to measurement and that vary through time. A similar set of fixed effects is used by Karov et al (2009), Helble, Shepherd and Wilson (2007) and by Souza and Burnquist (2011).

The econometric specification proposed for this study is given as:

[2] In this study, variation is a function of country j (importing country), since i is one unique exporter, representing Brazil. The fixed effects for pairs of countries allow the capture without direct estimation of multilateral resistance terms and also other trade costs that are not directly observed, such as transport costs, particularly geographic and historic factors that do not vary through time (CHENG; WALL, 2005).

$$ln(X_{ij,t}^{k}) = \alpha_{ij} + \gamma_t + \theta_k + \beta_1 \ln(Y_{i,t}) + \beta_2 \ln(Y_{j,t}) + \beta_3 \ln(\tau_{ji}^{k})$$

$$+\sum_d \beta_d \left(NTM_{j,t}^{k}{}_d\right) + \varepsilon_{ij,t}^{k} \qquad (2)$$

where $X_{ij,t}^{k}$ represents exports of country *i* (i=Brazil) for country *j* by type of poultry meat *k* at year *t*; *t* = 1996 to 2009; α_{ij} are the bilateral fixed effects that are invariant through time; γ_t represent binary variables for the years of the sample θ_k indicate the *k* dummy variables for each product; $Y_{i,t}$ *e* $Y_{j,t}$ are introduced for Gross Domestic Product – GDP for the exporting country *i* and importing country *j* at time *t*, respectively; (τ_{ji}^{k}) represents applied bilateral tariffs to sector *k* by the importer *j*; $NTM_j^k{}_d$ represent binary variables that indicate the existence of technical and sanitary measures imposed by importers *j* of products *k* in period *t*. and $\varepsilon_{ij,t}^{k}$ is a random error term.

A fourth consideration is related to the logarithmic form of equation (2) which implicitly assumes that trade flows cannot be equal to zero. This proposition can be considered relatively strong, particularly when the work is conducted with disaggregated data by product categories (such as for HS-6 digits). Due to these data characteristics the choice of best estimation methods for the gravity model remains unresolved due to the problem of bilateral flows that are zero or *missing*. A simple and frequent solution in empirical work has been the estimation of an OLS model to eliminate null bilateral trade flows in the sample. This problem was approached in this analysis using the Poisson Pseudo-Maximum-Likelihood (PPML) method introduced by Santos Silva and Tenreyro (2006). Such method has been considered appropriate to estimate the gravity model since it presents results which are consistent when there is hereroscedasticity and when there are bilateral trade flows that are null or missing in the database (Santos Silva and Tenreyo, 2006; Shephard and Wilson, 2008). The approach establishes that equation 2 is expressed in a multiplicative form that follows an exponential function with the dependent variable expressed in level, as demonstrated by Santos Silva e Tenreyro (2006).

Two models were estimated to explain Brazilian exports of poultry meat. Model I is specified with a dummy variable for NTMs which assumes value 1 if there is any regulation imposed by the importing country and zero otherwise. Model II assumes that

this dummy variable for NTM can be substituted by 5 dummy variables (d = 1 to 5), defined to indicate the existence of different types (categories) of NTMs imposed by the importer country *j*, classified and organized as presented in Table 1. Dummy variables in Model II were specified as: Prod: dummy for measures related to product; Proc: dummy for measures related to process, Lab: dummy for measures related to labeling, Conf: dummy for measures related to conformity assessment, Prob: dummy for measures related to prohibitions/restrictions.

Data about poultry meat export disaggregated at six digits (HS-6) for the years 1996 to 2009 were obtained at the Brazilian Ministry of Development, Industry and External Trade. The period chosen for estimation represents the post Uruguay Round period when the SPS and TBT agreements were enforced. The statistics of the Gross Domestic Product were obtained at the World Bank (World Development Indicators). The World Trade Organization (WTO) was the source of information for applied tariffs.

4 RESULTS

Estimated results of the gravity equation are presented in this section and used to measure the impacts of technical and sanitary measures upon Brazilian exports of poultry meat.

Table 2 presents the results of the estimates obtained by estimating as a Pseudo Poisson Maximum Likelihood (PPML) Fixed Effect model. The first column presents the results of the model in an "aggregate" form (Model I) and the second column the results for Model II, which considers the existence of several types of technical and sanitary requirements.

The estimated coefficients of the Gross Domestic Product (GDP) for the exporting country (Brazil) and for the importing countries were all positive and statistically significant. These results are similar to those found by Santos Silva and Tenreyro (2006), Helble, Shepherd and Wilson (2007), Burnquist and Souza (2010). Philippidis and Sanjuán (2007) estimated a gravity model for various sectors including meat. These authors identified similar results related to the positive impact of the Gross domestic product upon trade. Following a similar research line, Tamini et al. (2010) estimated a two stage gravity model to show that the coefficients of the domestic product for importers and exporters were positive and significant.

The coefficient for applied tariff presented an expected negative sign, although with a non-statistically level of significance. This result reflects specific characteristics of the meat markets, since Brazil continues to export poultry for countries with high tariffs such as the European Union countries. This might be indicating that tariffs are not restricting national exports. In a similar work, Schlueter, Wieck and Heckelei (2009) identified a slightly significant positive coefficient for tariffs, which according to the authors suggests a lower influence of tariffs upon meat trade. Although non-significant, the tariff variable was maintained in the model to avoid a possible bias if binary variables introduced to represent TBT and SPS notifications expressed the effect of omitted variables. Disdier, Fontagné and Mimouni (2008, p. 11) acknowledged that whenever tariffs are not included, there might be problems to interpret the impacts of non tariff measures upon trade, since it becomes impossible to distinguish the effects of these measures from the effects of the tariffs.

Regarding the aggregated model, the binary NTM variable was not statistically significant. However, in model II, the coefficients for variables representing product, label and prohibition/quarantine were positive, while the coefficient related to product category is not statistically significant. The variables for process and conformity presented negative signs. However, only the coefficient for the conformity assessment measures was significant. These results suggest that TBT and SPS measures related to labeling and prohibition/quarantine are associated to a higher volume of Brazilian exports of poultry meat. However, technical and sanitary measures that involve a conformity evaluation are associated to a reduction in external trade of poultry meat in Brazil.

Table 2 – Gravity Model Results

Variables	Model I Fixed Effects (FE) - (PPML)	Model II Fixed Effects (FE) - (PPML)
ln Y_i	1,079*	0,617**
	(0,2120)	(0,2645)
ln Y_j	0,524***	0,845*
	(0,3088)	(0,3173)
ltarif	-0,3119 (NS)	-0,347 (NS)
	(0,3283)	(0,3147)
NTM	-0,015 (NS)	-
	(0,2062)	-
Prod	-	0,187 (NS)
	-	(0,3787)
Proc	-	- 0,143 (NS)
	-	(0,0949)
Lab	-	0,578**
	-	(0,2387)
Conf	-	-0,397**
	-	(0,1784)
Prob	-	0,891*
	-	(0,2699)
Constant	-	-
	-	-
Observations	2429	2429
Groups	62	62
Control Variable		
Dummies - year 1996 - 2009	Yes	Yes
Dummies – product category (06)	Yes	Yes

* significant at 1% ; ** significant at 5% ; *** significant at 10%
Note: standard error in parenthesis
Source: Research results

The estimated coefficient for "product" requirements was not statistically significant suggesting that requirements such as tolerance limits, microbiological criteria and GMO have not affected Brazilian exports of poultry meat in the period of the analysis.

The estimated coefficient for the binary variable for the existence of NTMs TBT and SPS measures related to a certain process (hygiene practices, treatment to eliminate pests/diseases, other requirements for product and process and traceability) were negative, although non-significant in statistical terms. Using a similar approach, Schlueter, Wieck e Heckelei (2009) obtained significant negative coefficients for SPS

measurements that regulate the production process, treatment and the distribution at the meat department. Karov et al (2009) also identified that the treatments made in fruits and vegetables by developing countries had a negative impact over North-American exportation rates. Besides, authors also found that treatments made in vegetal products from developing countries had a negative effect in United States importing.

A third binary variable for the existence of technical and sanitary requirements for labeling, trading and packing presented a positive and significant estimated coefficient indicating that these measures stimulate trade flows. Although not directly related to poultry meat market, an analysis developed by Burnquist, Souza, Bacchi and Faria (2007) showed the importance of labeling requirements as a determinant of Brazilian companies' exports.

The coefficient estimated for the fourth binary variable presented a statistically significant negative sign, relative to the presence of TBT and SPS regulations that are associated with questions about compliance assessment. This result suggests that compliance requirements imposed by the importer have a negative effect for Brazilian exports of poultry meat. One possible explanation is that the requirements are overly burdensome for the information they provide. In this context, the positive effect of information upon demand for imports could have been more than compensated by the compliance costs such that trade is restricted. The higher costs resulting from the introduction of conformity assessment requirements to exporters can be due, for example, to training investments and laboratory tests.

At last but not least, the interpretation of the binary variable introduced to indicate the existence of technical and sanitary requirements related to the prohibition/quarantine. Despite the prohibitive nature of these requirements, the coefficient showed a positive and significant signal. However, this can be interpreted considering that Brazil has not been subject to diseases such as avian influenza, while other countries have. This allowed Brazil to expand its market share in the world market explaining the estimated positive coefficient.

5 CONCLUSION

A classification of technical and sanitary measures based on their content associated with econometric estimations of a gravity model seemed to be a proper

approach to evaluate how different categories of TBT and SPS regulations affected external sales of Brazilian poultry meat. Similar to what has been observed by other studies (Thilmany and Barrett, 1997; Chen, Wilson and Otsuki, 2008), the results from Model I and Model II confirm the theoretical proposition that the impact presented by NTMs can be ambiguous in the sense that it might either restrict or enhance exports. Additionally, these have indicated how the estimated results based on count frequency of the notifications can be more properly interpreted when there is more information about their content.

The estimated coefficients of the gravity model for technical and sanitary regulations associated to a labeling category suggests that the introduction of these requirements stimulate Brazilian exports of poultry meat, while those for conformity assessment requirements might restrict trade.

The estimated coefficient for the introduction of bans and quarentine requires some further interpretation of the overall behavior of Brazilian poultry meat exports. Although the expected effect for this type of measure would be negative, in the case of Brazilian exports it has a positive sign that can be explained due to the fact that when the measures were introduced by major importing countries Brazilian poultry was not banned due to the absence of the disease in Brazil. In this context, the countries' international poultry market share has actually increased.

In general, the results seem to suggest that government policies towards stimulating the provision of information about the Brazilian poultry product can stimulate its exports. This can be particularly interesting regarding aspects of hygiene and other aspects included in technical and sanitary measures about treatment of pests and disease, requirement for production and process and conformity assessment.

These results emphasizes the importance of a countries' choice about how to regulate in order to meet their primary established purposes, since different types of requirements can have different impacts upon trade. According to the results obtained in this study, requirements about conformity assessment could emphasize labeling aspects or enhance the information content about products and processes in order to stimulate demand to a point that might compensate the additional costs introduced by the requirements.

Although it has provided additional information by introducing the category classification of the notifications, the major limitation of this research is still related to the frequency count of TBT and SPS notifications. The related literature has

emphasized the lack of systematic information in notifications which might be a driver for changes in the way these are introduced such that their effect upon trade can be improved and its use as a trade barrier avoided.

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