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EXPLORING EU FOOD SAFETY NOTIFICATIONS ON AGRO-FOOD IMPORTS: ARE MEDITERRANEAN PARTNER COUNTRIES DISCRIMINATED?

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Abstract

Limited capacity to comply with standards and controls has constrained the trade opportunities generated by bilateral agreements and preferences given to developing countries such as those belonging to the Mediterranean region. Specifically, in this paper we focus on the implementation of a specific type of Non-Tariff Measures that includes food safety concerns by the European Union. This is carried out through exploring some of the influencing factors on food standard enforcement in the EU, which is a major importer of agro-food products from developing countries. The issue at stake emerges on the possible rationale behind the border notifications on food imports -which can be the result of the management of specific risks- but beyond that by considering the reputation of the product or of the country of origin. We explore the hypothesis that the past border notifications affect current notifications, in other words, they affect current decisions on the implementation of food standards by the EU. Methodologically, notifications are extracted from those reported on the Rapid Alert System for Feed and Food (RASFF), and count data models are used to account for the over-dispersion existing in them. The results of the paper support the hypothesis that previous food notifications may slightly affect current notifications; nevertheless this effect seems to be less relevant for products of interest for Mediterranean Partner Countries. Hence, we cannot identify a pro or anti Mediterranean bias in the way that food safety controls are implemented at the EU borders.

Key words: *Non-Tariff Measures, Mediterranean Partner Countries, SPS measures, agro-food trade.*

1. Introduction

During the last decades, agro-food trade has been rapidly developed since more countries have been integrated in the world trading system. Many efforts have been implemented to make international trade easier and to facilitate markets' access by reducing trade barriers. Even though multilateral and bilateral trade talks have succeeded in eliminating tariff barriers, they still face the challenge of providing a more transparent framework for non-tariff measures (NTMs). The concept refers to any measure, other than tariffs, which modifies price or quantities traded -see a classical discussion on the definition of the concept in Deardorff and Stern (1997). NTMs are increasingly becoming an important determinant of agro-food trade (OECD, 2005, Cadot *et al.*, 2012) and hence the international political concern about their implementation is on the rise (Disdier *et al.*, 2008). They are employed for different purposes, which sometimes are protectionist (Yue & Beghin, 2009); Nimenya *et al.,* 2012), and sometimes to correct information asymmetries and market failures (Disdier *et al.*, 2014).

Literature underlines that the limited resources in developing countries have constrained them to fully benefit of the opportunities generated by multilateral agreements, given their lack of capacity to comply with standards and controls (Michalopoulos, 1999). Considering that the EU is a major importer of agro-food products from developing countries, this paper explores some of the influencing factors on food standard enforcement in the EU and focuses on their effects on agro-food trade with the main suppliers to the European market, with focus on Mediterranean exporters. In fact, the EU has largely dominated the agricultural trade relations of Mediterranean countries, including the EU's Mediterranean Partner Countries (MPCs) and Turkey. The region is the origin of about 7 per cent of EU imports, but for vegetables this share is close to 40 per cent and for fruits it is about 20 per cent. The implementation of NTMs on EU agro-food imports has received some attention in the trade literature (García-Martinez *et al.*, 2006), with certain focus on Mediterranean exports to the EU by assessing the welfare effects of their elimination (Kavallari *et al.*, 2013) or the analysis of specific trade policy instruments (Garcia-Alvarez-Coque *et al.*, 2009 and 2010; Cioffi e*t al.*, 2011; Santeramo *et al.*, 2014). From a different perspective, Tudela-Marco *et al.* (2014) study the policy substitution between tarfiffs and NTMS in some MPCs.

Food standards on trade have various roles, which are considered such as barriers to trade but also as catalyst (Chevassus-Lozza *et al.*, 2008). A point to stress is that EU food notifications can be the result of specific food health concerns, what is in line with the aim of correcting market failures. However, we wonder to what extent current notifications are influenced by the past history of food notifications. In short, the question emerges on the possible rationale behind the food notifications, which can be the result of the management of specific risks and of the "reputation" of the product or the country of origin.

We test the hypothesis that the history of notifications on problems leading to NTMs, significantly influences EU behavior on actual notifications. One hypothesis for this lies in the concept of reputation, which could explain why one product's notifications in one year may affect the probability of future notifications. Besides, such effects may appear at product, sector and country level. Jouanjean *et al.* (2012) looked at import refusals providing a first evidence of how reputation affects the enforcement of SPS measures by the US. We turn the analysis to the EU, using a more comprehensive definition of notifications on food standards. Food standard enforcement by the EU has received some attention in recent studies, as a determinant of trade (Baylis *et al.*, 2010). Jaud *et al.* (2013) explored the determinants of food standard enforcement but did not consider the reputation effects as explanatory variables.

This paper explains the impact of a group of variables on EU food controls, expressed as notifications on imports on which safety hazards are detected. Product notifications issued by EU member states are registered by the EU border authorities to enforce food safety policy and included in the Rapid Alert System for Food and Feed (RASFF)[i], a database that has not been used extensively in trade literature to link the EU food notifications with trade restraints. In fact, to our knowledge, it is only used in the aforementioned paper by Jaud *et al.* (2013). There are two main methodological challenges that could explain why the use of RASFF database has been limited. The first one is the need to link RASFF data with trade data expressed in terms of a recognized nomenclature such as the Harmonized System (HS).[ii] To overcome this challenge, this research has involved the design of an algorithm to transform RASFF data into food alerts and notifications classified by HS Code.[iii] A second methodological challenge stems from the numerous observations with zero values in this type of datasets. To deal with this, we employed a set of different panel count models. As shown below, literature stresses that the panel count modelling approach has several advantages over individual time series and cross sectional models.

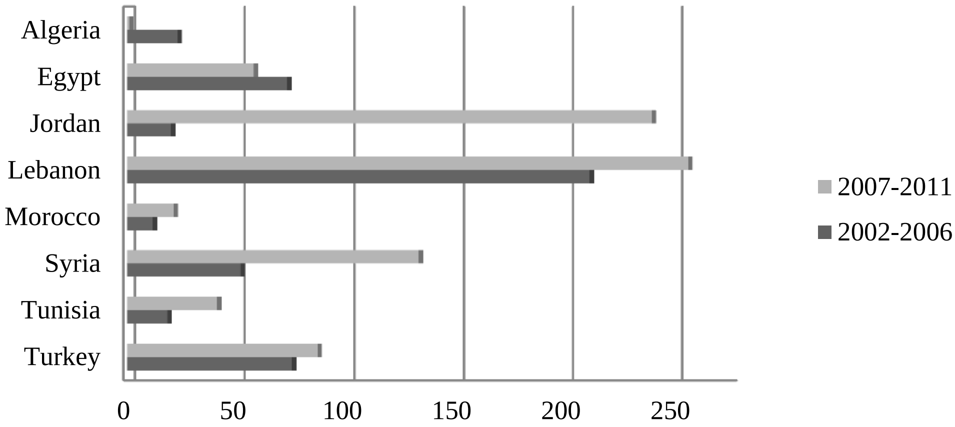
The paper is organized as follows. In the next section, we introduce the concept of reputation in food standard enforcement, and set the hypotheses of this paper. Then, the third section presents the methodology used in our empirical analysis and the way reputation is considered in the model, also indicating the specific treatment applied to include Mediterranean Partner Countries (MPCs) and specific products. The fourth section shows the results and discussion of the empirical application. Finally, the paper ends with some concluding remarks.

2. Reputation Effects And Hypotheses

The analysis of NTMs' effects on agro-food trade constitutes the mainstream of the literature, often using gravity models (see some instances in Otsuki *et al.*, 2001; Wilson & Otsuki, 2004; Anders & Caswell, 2009). Maertens and Swinnen (2009) suggested that foreign standards can push up the production quality and help firms to realize beneficial productivity gain. NTMs can also be welfare-improving as they provide to consumers further information and decrease the impact of the asymmetric information problem (Beghin & Bureau, 2001; Movchan, 1999; Disdier *et al.*, 2008; Disdier *et al.*, 2014).

The EU is an attractive destination for the exports from emerging countries, given the relevant size of its agro-food demand, and specifically for MPCs due to the historical trade relations and the geographical proximity. Concerning compliance of food standards, the EU Member States take the responsibility of controlling food safety risks at the border. According to Henson and Jaffee (2008), the implementation of European food safety standards seriously challenges agro-food exports of developing economies. For example, testing the compliance of a product with the EU standards involves costs at the expense of the exporter (Hoeckman & Nicita, 2008; Gonzalez *et al.*, 2011). Notifications registered by the EU and included in the RASFF can be classified in four types. First type, *Alert notifications,* correspond to food that presents a serious health risk and requires rapid action. Second type, *Border rejections,* is related to food that has been tested and rejected at the external borders of the EU when a health risk has been found. Third type, *Information notifications,* is used when a risk has been identified about food or feed placed on the market, but the other members do not have to take rapid action. Finally, any information related to food and feed safety, which has not been communicated as an alert or an information notification, but which is judged interesting for the control authorities, is transmitted to the members under the heading *'News'*.

Based on RASFF database, Grazia *et al.* (2009) and Garcia-Alvarez-Coque *et al.* (forthcoming) provide with analyses of the frequency of EU food notifications on MPCs' exports. The latter paper focuses on notifications imposed by a set of major EU importers concerning MPCs as origin countries. Figure 1 shows the notifications applied by EU authorities relative to the trade value of imports from Algeria, Egypt, Jordan, Lebanon, Morocco, Syria Tunisia and Turkey between 2002 and 2011.



Note: [b] Chapters from 01 to 22 at HS2.

Figure 1. Ratio of Notifications Applied By EU on Agro-Food[b] Mpcs Exports per Billion Euro of Traded Value

It can be observed in Figure 1 that the number of notifications per import value is increasing in recent years in all the MPCs considered, except for Algeria and Egypt. Then, if that trend continues, a further increase in notifications could be expected in the following years. The observed increment can be probably attributed to the rise in notifications for products found to be unsuitable for consumption, but also, due to the increment of controls related to regulations and standards which impose reinforced checks for a list of products originated outside the EU. As highlighted in every RASFF annual report, Turkey is one of the countries –overall in the world, not only in the MPCs group- with highest number of notifications (see RASFF 2012).

In addition, the RASFF reports highlight that some products can be considered more sensitive in terms of food safety than others. Seafood and fruits and vegetables seem to be the most sensitive compared to other exported products based on the large number of notifications registered (RASFF, 2012).

The high number of notifications leads to consider a different strand to gravity models in the analysis of the trade effect of NTMs. This is the "reputation effect" analysis. In fact, it can be argued that a higher number of registered notifications on a country exports to a certain destination market can affect the way the system of notifications considers future exports. Then, the concept of reputation is defined as the impact of previous border notifications on current ones. To our best knowledge, there is only one study in the literature that has focused on the effect of reputation on developing countries exports' (Jouanjean *et al.*, 2012) and this has been applied to the US food imports. Another article (Baylis *et al.* 2010) considered EU fish imports and explored whether SPS measures were influenced by trade protection but without testing past behavior on food border controls.

We aim to explore the hypothesis that sellers' reputation –which is built on past history of notifications- affects decisions on EU current notifications. It is important to note that reputation can be the result of the image that past safety concerns can create on the imported product. But it can also be the result of a real warning on product's attributes that enhances controls and notification, in particular when the exporters do not have time to react and fix the problem immediately. It may happen since modifying the production process can take even several years to make a product suitable for EU standards.

In this paper, we draw on the reputation effects introduced by in Jouanjean *et al.* (2012), but we apply it to safety notifications including products, sectors and regions that are exposed to a higher likelihood of being more and more notified by the importer. More specifically:

- *Product reputation* means the existence of a correlation between the number of notifications for a given product from a country in a certain year (hereinafter "product-country-year") and the number of notifications affecting the product from the same country in previous years. To check the extent past history of notifications affect the present, we consider lagged variables of product notifications up to three years.
- *Sector reputation* means that a correlation exists between the number of notifications affecting a given product-country-year and the number of notifications affecting products from the same sector (defined as those in the same HS2 chapter)-country in the previous year.
- *Region reputation* means a correlation between the number of notifications affecting a given product-country-year and the total number of notifications affecting the products-country combinations in the previous year belonging to a particular region, in our case, the Mediterranean partner countries and Turkey.

We assume that the three previous effects are positive, so the past history of notifications at the product, sector and country levels, enhance current notifications. We label such effects as hypotheses H1, H2 and H3, respectively. They mean that at each year (t), the EU authorities may implement NTMs based on updated criteria on risk assessment, but also influenced by the past, considering product, sector and exporter effects where the influence of one-year-lagged variables is tested. We consider that product safety concerns could persist on several years due to the adjustment process discussed above, so product reputation is also built upon notifications at years t-2 and t-3. We also expand the geographical coverage by considering a reputation effect for the MPCs considered as a region. Besides, additional hypotheses regarding the compliance of food standards are explored:

- H4: Countries with more experience exporting food to the EU tend to present fewer notifications. This would be caused by the general learning-by-doing effect that appears in trade liberalization literature. In particular, for MPCs, this hypothesis would hold due to the traditional trade flows and the history of trade agreements with the EU.
- H5: Import notifications are related to GDP per capita. We take GDP per capita as a measure of economic development and capacity of the exporting country to face NTMs. We expect the more developed the country is, the number of notifications is fewer.
- H6: A positive relationship exists between the number of notifications and the import value from selected countries in the previous year. We expect that larger imports would involve a higher number of notifications.
- H7: Some sectors can be more affected by food notifications than others. In particular, we wonder if Mediterranean products such as fruits, vegetables, and their preparations (respectively HS chapters 08, 07 and 20) are favored or discriminated by the application of food safety measures at the EU border.

3. Data And Methodology

Our empirical analysis of used data from RASFF selects notifications registered by the EU on shipments from the 20 top developing agricultural exporters to the EU. These notifications belong to the period between 2000 and 2012. In addition to the selected top exporters, all MPCs were considered.[iv]. Thus, eight MPCs were included in the sample: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Syria, Tunisia and Turkey. As we aim at studying the specific case of Mediterranean countries, a "region" reputation effect was also tested for this group.

We gathered the RASFF notifications of agro-food products in the period; then we classified these notifications according to the product (at the four-digit HS level), sector, country and region with an algorithm. Besides, every notification was classified under one chapter between HS 01 and HS23 to allow considering the sector reputation. Moreover, the notifications database was extended to allow for economic variables, e.g. import value and GDP per capita. After all this process, the database constitutes of 5,421 observations representing the number of notifications registered by the EU during the period between 2000 and 2012, for 20 exporters to the EU. All variables used for the analysis are summarized in Table 1.

Table 1.Description of Independent Variables.

Variable	Description	Min.	Max.	Mean	Std. dev
$N_{ij(t-1)}$	Notifications of product (i) from country (j) in lagged year (t-1)	0	170	1.807	7.238
$N_{Ij(t-1)}$	Notifications of sector (I) from country (j) in lagged year (t-1)	0	268	9.384	25.670
$N_{iJ(t-1)}$	Notifications of allproducts (i) from country (j) in laggedyear (t-1)	0	375	75.1	82.780
$Imports_{ij(t-1)}$	Log import in thousand Euros of product (i) from country (j) in lagged year (t-1)	0	1335.342	30.313	84.031
$LnGDPpc_{jt}$	Ln per capita GDP of country (j) in year (t)	6.089	10.350	8.075	0.9064

Note: To simplify the rest of variables has been omitted for reasons of space.
Source: Authors' calculations.

Suppose N_{ijt} are independent count data observations of notifications in product "*i*" imported from country "*j*" at year "*t*" on the integers $N_{ijt} = 0, 1, 2, \ldots$ with a count data distribution $f\ (N_{ijt}\ |\mu)$ with an unknown parameter μ. The following empirical model gives the expected notification count:

$$E[N_{ijt}|\mu] = exp\{\beta_0 + \sum_L(\beta_1 + \beta'_1 Z_M)N_{ijt-L} + (\beta_2 + \beta'_2 Z_M)N_{Ijt-1} + (\beta_3 + \beta'_3 Z_M)N_{Jt-1} + (\beta_4 + \beta'_4 Z_M)Imports_{ijt-1} + (\beta_5 + \beta'_5 Z_M)\ln GDPpc_{jt} + other\ fixed\ effects\} \quad (1)$$

Where $E\ [N_{ijt}|\mu]$ is the mean of the count of food notifications conditional on the matrix of explanatory variables, which are detailed in Table 1 and summarized as follows:

N_{ijt-L} are the product notifications, where *i* products are represented at four-digit HS level, for year t-L, where L = 1, 2 and 3; N_{Ijt-1} are the sector notifications, where HS sectors are represented at two digits, I = 1, ….., 23, covering agricultural products; N_{Jt-1} are the total exporting country's notifications, with J corresponding to each of the countries indicated above; imports ($Imports_{ijt-1}$)are defined in terms of value and GDP per capita is expressed in log terms. To take account for risks associated to specific sectors a fixed effect is included for every trade chapter at the two-digit level of the HS. We also explicitly tested the differential effects on counts for exporters belonging to the Mediterranean region by including a dummy variable Z_M that takes a value 1 when the corresponding import flow is originated in a MPC; this dummy can help to validate if there is a fixed effect for MPCs. Besides, the interaction coefficients *ß'h*, h = 1,…,6, measure the specific change in product, sector, country reputations, import and GDP per capita effects due to an export originated in a MPC.

As for the data generating process $f(N_{ijt}|\mu)$, the Poisson distribution could be useful as the dependent variable is discrete and notifications are non-negative integers. But it is worth noting that the average count of notifications (1.807) presents a high variance on the order of 7.238. Moreover, all explanatory variables presented in Table 1 show a lower mean than their variances. This confirms the presence of over-dispersion phenomenon in the data.

Hence, following Cameron and Trivedi (2013), we considered that the Poisson distribution for counting data poses limitations to deal with over-dispersed data sets, as is the case of the dataset used in this paper. Cameron and Trivedi (2013) and Zeileis *et al.* (2008) suggest using count models such as the Negative Binomial (NB) distribution.

An additional problem appears in our case because of the existence of a large number of zeros in the notification counting. Although both the Poisson model and the NB regression models can, unlike the log-normal model, technically deal with zeros, they are not well suited to handle the situation in which the number of observed zeros exceeds the number of zeros predicted by the model. The most important problem caused by excessive zeros in the data stems from the fact that two different processes can produce zero notifications, which is a problem that frequently appears in gravity trade models and it is normally solved with count models (see a recent application in Dal Bianco *et al.*, 2015).

The first process is the full compliance of an export to the EU food control, which is reflected by inexistence of food notifications. The second process is the absence of exports to the EU, what can be due to structural factors depending on resources, distances, preferences and specialization. In this case, food notifications do not appear because the probability of trade is zero, and notification cannot apply to the corresponding product and partner. The possibility of such double process leads to test a ZINB model (Greene, 1994) that considers the existence of two latent groups within the sample of exporting countries: a group having strictly zero counts and a group having a non-zero probability of having counts other than zero. Therefore, the estimation process of the ZINB contains two parts. The first part includes a probit regression of the probability that there is not any count of food notifications at all. The second part contains a NB analysis of the notification count for the group that has a non-zero probability of trade.

Then a zero-inflated model with extra proportion of zeros p is defined by the following probability density function:

$$Prob\ (N = \ N_{ijkt}|\mu) \tag{2}$$

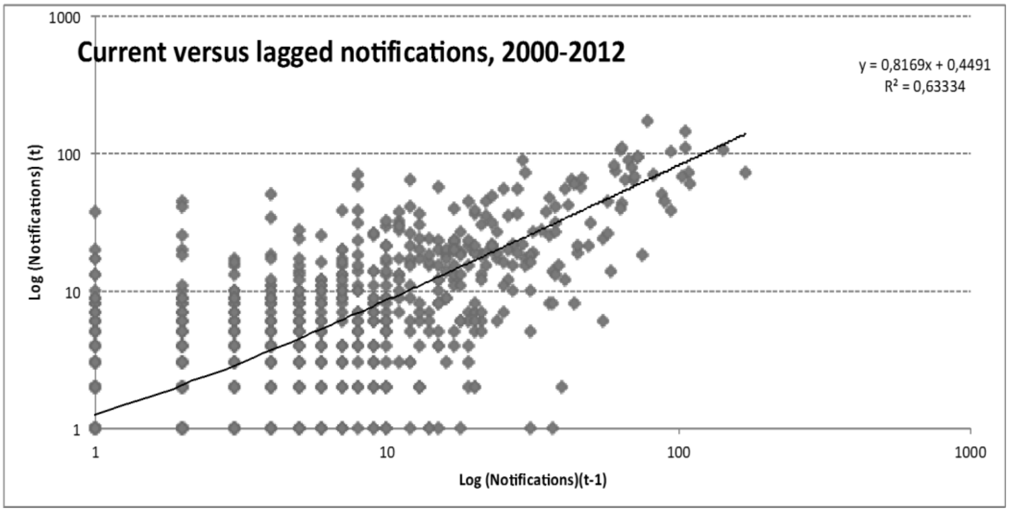
where we consider a negative binomial distribution for $f\ (N_{ijt}|\mu)$. The present contribution has included, in the probit part, variables that influence the probability of appearance of no counts: product, sector and country reputations at years t-L, where L = 1, 2 and 3; and a dummy variable *t.1* that takes a value of one when there was import of the corresponding product in year t-1. This last variable is assumed to affect the probability of zero counts but remains uncorrelated with the number of notifications at year t. Maximum likelihood estimation of the parameters of the ZINB model is documented in Cameron and Trivedi (2010).

With these three possible models (Poisson, NB and ZINB), we carried out the estimations using R code. Their results are presented in the next section.

4. Results and Discussion

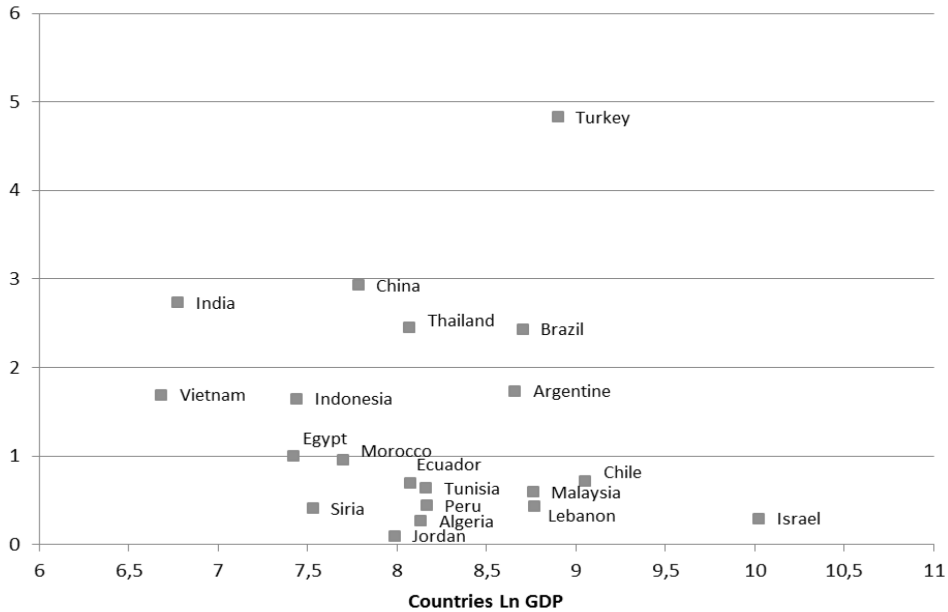
As an initial exploratory analysis, a correlation chart was made showing the influence of lagged notifications on the current ones for the same product in Figure 2. It seems to support H1, so that reputation matters in EU border controls. These results would be consistent to what was found by Jouanjean et al (2012) for the US import refusals.

Figure 3 shows the effect of development levels (measured in terms of GDP per capita) on present notifications (H5). It illustrates a negative relationship between the two variables, hence suggesting that countries with higher GDP per capita tend to have lower notifications.



Source: Authors' calculations.

Figure 2. Product Reputation. Exploratory Correlation Analysis of One-Year Lagged and Current Notifications.



Source: Authors' calculations.

Figure 3. Relationship Between the Single Average of Notifications and Their GDP per Capita.

Turning now to the count data models' estimates, Table 2 presents the results of the estimation. At first sight, the poor general performance of the Poisson model fits with the findings of the literature regarding its lack of validity with over dispersed data. It can also be seen through the significantly higher log-Likelihood rate and AIC and BIC indicators compared to the other models tested.

For the NB and ZINB models, the model selection indicators AIC and BIC apparently favor the selection of the ZINB model against the NB version. However, the Vuong test, suitable to compare both kinds of models (Vuong, 1989), indicates that the NB model provides a better fit to the data than the ZINB model. If we depict the different counts of observed notifications and of those predicted by both models (Figure 4) we find that the NB model predicts a percentage of different counts that it is closer to the observed curve than the ZINB model. So we could accept as well the adequacy of the NB model. As model comparison criteria do not lead to unequivocal conclusions, we will make reference to both models' results in the next paragraphs.

Coefficients in Table 2 can be interpreted as the marginal effects of increasing the levels on the right hand side of equation (1). For covariates expressed in levels, coefficients mean the percent change in the food notification count for product i from country j, due to a change in one unit of the studied covariate. When the covariate is expressed in log terms, such as it happens with GDP per capita, the coefficient is an elasticity measuring the percent change in the food notification count related to one per cent change in the explanatory variable. Fixed effects and constant provide the food notifications given by the exponential of the studied fixed effect or constant. In addition, in this exercise we can see how the general levels of the different covariates may increase or decrease by measuring the coefficients of interaction variables with a dummy that refers to the region of MPCs.

Table 2.Statistical Models: Estimated Parameters and Models' Fit Indicators.

	Poisson	NB	ZIM
(Intercept)	-0.493 (0.078)***	-0.931 (0.146)***	-0.203 (0.151)
$N_{ij(t-1)}$	0.019 (0.001)***	0.121 (0.007)***	0.070 (0.008)***
$N_{ij(t-2)}$	0.010 (0.001)***	0.026 (0.007)***	0.015 (0.007)*
$N_{ij(t-3)}$	0.009 (0.001)***	0.024 (0.007)***	0.018 (0.006)**
Med	-0.795 (0.101)***	-0.199 (0.199)	-0.045 (0.197)
$N_{Ij(t-1)}$	-0.003 (0.001)***	-0.002 (0.002)	-0.002 (0.002)
$N_{iJ(t-1)}$	0.003 (0.000)***	0.004 (0.000)***	0.003 (0.000)***
$LogGDPpc_{jt}$	-0.003 (0.000)***	-0.002 (0.001)***	-0.002 (0.001)**
$Imports_{ij(t-1)}$	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)**
$N_{ij(t-1)}$: Med	0.000 (0.001)	-0.051 (0.013)***	-0.025 (0.014)
$N_{ij(t-2)}$: Med	-0.009 (0.002)***	-0.004 (0.015)	-0.004 (0.013)
$N_{ij(t-3)}$: Med	-0.002 (0.001)	-0.001 (0.013)	-0.005 (0.012)
$N_{Ij(t-1)}$: Med	0.009 (0.001)***	0.005 (0.003)	0.004 (0.002)
$N_{iJ(t-1)}$:Med	-0.00120 (0.00041)**	-0.00131 (0.00093)	-0.00043 (0.00092)
$LnGDPpc_{jt}$: Med	0.00414 (0.00082)***	0.00096 (0.00163)	0.00001 (0.00174)
$Imports_{ij(t-1)}$: Med	0.00010 (0.00002)***	0.00005 (0.00005)	0.00000 (0.00009)
f_I	Yes	yes	yes
Zero model: (Intercept)			0.354 (0.148)*
t.1			0.035 (0.163)
t.2			-0.086 (0.168)
t.3			-0.125 (0.177)
$N_{ij(t-1)}$			-0.700 (0.087)***
$N_{Ij(t-1)}$			-0.001 (0.002)
$N_{iJ(t-1)}$			0.000 (0.000)
Num. obs.	4248	4248	4248
AIC	22356.814	11681.858	11382.277
BIC	22579.212	11910.609	
Log Likelihood	-11143.407	-5804.929	-5648.138
Deviance	17652.719	3352.890	
Overdispersion (α)	9.2347***		
Vuong Test	-21.3989***(NB > ZIM)		

Note: ZINB consist of two parts. The first part is a negative binomial regression of probability. The second contains a probit regression of the probability. ***p< 0.001, **p < 0.01, *p < 0.05. Standard errors are provided in brackets. For overdispersion, the alpha value is displayed, for the Vuong test the z-score.
Source: Authors' calculations. All models are estimated using R-language

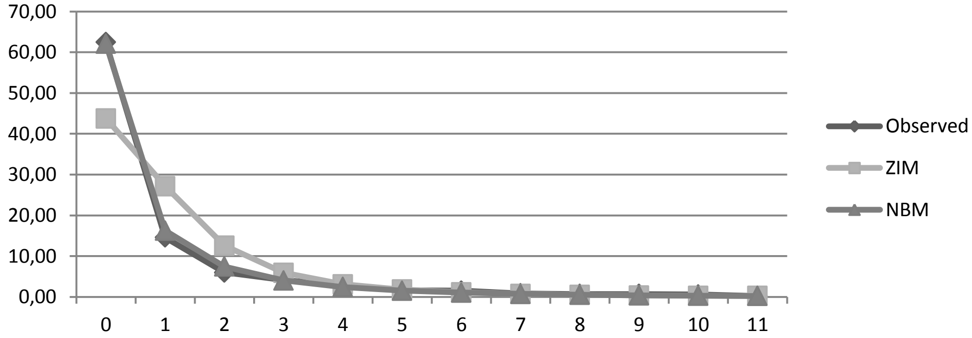
Our empirical results show that the coefficients of the variables $N_{ij(t-L)}$ (L=1, 2, 3) are significant and they have the expected positive sign in both the NB and ZINB models. These results confirm H1, so that the past history of notifications issued at the EU borders affects the number of notifications for same product-country in the next year. It is worth to stress the higher value for value for L =1. This could indicate an incomplete reaction of exporters to food safety issues or that control authorities tend to keep strong monitoring in the years following a food problem. More specifically, for t-1 the results indicate that the increase in one unit in lagged notifications $N_{ij(t-1)}$ would increase the number of expected notifications N_{ijt} by 12% in the NB model and 7% in the ZINB model. However, product reputation effects decrease significanty with time, and one unit change in $N_{ij(t-2)}$ and and $N_{ij(t-3)}$increase notifications in t by 2.6% and 2.4%, respectively in the NB model.

As for H2 (sector reputation), the corresponding coefficients were not found significant, suggesting that the notion of collective reputation applied to a sector *I* has no influence on the food notifications for the product *i* belonging to that sector in the next year.

Confirming H3, the impact of the country reputation was found to be statiscally significant and positive, although small in value. Thus, the registred notifications in year t applied to the products are affected by the collective reputation of the exporter involved in the trade flow, so one food notification in country *J* adds to the product notification count 0.4% (NB) and 0.3% (ZINB).

As regards to the level of development of partner countries tested in H5, regressions show that GDP influences the number of notifications. Indeed, the GDP appears statiscally significant at 1% (NB model) and 5% (ZINB model) which means that the EU rejections depend on exporter's characteritics correlated with GDP per capita of the countries (infrastructure, human capital, etc). This finding is consistent with the descriptive analysis depicted in Figure 3 and also in line with our expectations in H5. The GDP per capita has a negative coefficient in both NB and ZINB version (with elasticity of -0.2 in both models). The level of development of national standards infrastructure is relevant to the determination of import notifications. It is due to the higher quality of exported products in more developed countries and the better adoption of new technologies. It is not surprising that countries with higher GDP accomplish more successfully the required standards by the EU.

Regarding the lagged import value (H6), this has a positive and 1% statistically significant coefficient. This finding suggests that import value is a relevant determinant of the total number of food notifications. The positive coefficient of this variable means that the increase of imports from an exporter, independently of its history of compliance with EU standards, is accompanied by a stricter control in the borders. This could suggest a EU protectionist behavior, as it is normal that when import value increases, though it is normal that the border controls become more intensive and tend to increase their frequency as imports increase, generating an increase in food notifications.



Source: Authors' calculations.

Figure 4.Different Counts of Observed Notifications and Those Predicted by Both Models

After these general findings, it is time to look at the differential effect for MPCs as analysed in H4 and H7. First of all, as we considered sectoral fixed effects as covariates - whose parameters are not shown in the Table 2 for space reasons- we found a significant a positive coefficient for HS chapters 03 (fish product) and 02 (meat products) indicating a higher propensity to issue notifications for these two chapters. Also, we found a significative negative coefficient for HS chapters 15 (animal and vegetable oils), 18 (cocoa) and 22 (beverages), with the opposite meaning. Among these cases, chapters 03 and 15 are of export interest for MPCs. However, the parameters for HS chapters 07, 08 and 20, which include vegetables and fruits and their preparations, did not result significant in the models estimated. Hence, we did not find a sector bias against of favouring these products of crucial interest for Mediterranean exporters to the EU.

As for the interaction variables including the MPC regional effect, they were not found to be significant in neither the NB nor the ZINB model for country reputation, import level and log GDP per capita suggesting the absence of a Mediterranan bias with respect to how the characteristics of the exporting country and its exports affect the propensity of the EU to release food notifications. This is supported by the non-significancy of the Mediterranean fixed effect parameter. Mediterranean interactions with product notifications lagged on year were found significant in the NB model, with negative sign. It suggests that the marginal percent effect of increasing in one unit the notification count from a MPC would reduce the average expected count of notifications for products concerned by 5.1%. Mediterranean countries' sector reputation were not found significant in either the NB and ZINB models.

5. Concluding Remarks

This study aims at assessing if the reputation effects can affect the implementation of NTMs, considering RASFF notifications at the EU border. While notifications are influenced by specific SPS and TBT problems, however, it may happen that past notifications have an influence on present restrictiveness of NTMs. Four types of reputation effects were considered, namely product, sector, country and region reputations.

Our empirical findings suggest that the EU notifications are affected firstly by the own reputation of a product and the country reputation, with relatively stronger effect of the reputation built at the product level. Nevertheless, reputation of a product does not affect in the sector level. Notifications are also affected by the import value suggesting a possible protectionist behavior. Implementation of NTMs by the EU vary according the per capita GDP of the exporter, suggesting that investment in infrastructure and human capacities favor the integration of agro-exporting firms in the global value chains to comply with EU requirements regarding the quality of imported products.

These results suggest that, apart from specific problems related to given products, it is worth noting that product and country reputation affect strongly the notification count. Thus, export quality policies have to be built at a country or wider level. It is strongly recommended to involve the developing country stakeholders in NTMs-setting process through international organizations and bilateral discussions to get more harmonization between European standards and their agro-food suppliers, including partnership agreements between the EU and developing countries. Our findings give a strong base that reputation builds on across-the-board efforts to improve quality compliance in one zone or sector, beyond the problems of a specific product.

Our results show that there is no sign of an anti or pro Mediterranean bias in the way food safety policy is implemented at the EU borders. This does not mean that the Mediterranean countries are out of the RASFF system and actually they are affected by the implementation of EU safety standards as occurs in other partners in the world. Instead, what is reflected in our models is that there is no sign of protectionist behaviour by the EU against Mediterranean exporters, even when their export specialization competes with Southern European production, namely on fruits, vegetables and its preparations. On the other hand, historical partnership and the geographical proximity could reflect in a better treatment as might be suggested by the coefficient of the NB for the Mediterranean product reputation.

This research also presents some qualifications that call for further investigation. First, although we have shown that history matters in the food safety controls, these could be influenced by an adjustment of the export strategy of the affected suppliers, which could counteract controls by moving their exports (even those of worse quality) to other destinations. Second, the distribution of notifications between types of alerts or hazards would let us know about the learning effect or adjustment strategy by product/sector and country. Finally, specific country case studies could be undertaken by including separate variables for specific exporters, for which the used methodology is valid.

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[i]The Rapid Alert System for Food and Feed was created by the European Commission (EC) to ensure transparency for consumers and business operators. It is used to enhance food safety and to provide the control authorities with an effective tool of exchange of information. Available at http://ec.europa.eu/food/food/rapidalert/index_en.htm. It is worth also to stress non-EU European Economic Area members' notifications also are registered in RASFF. Hereinafter, for the sake of simplicity, we will consider all them as EU notifications.

[ii]The HS system is an internationally standardized nomenclature for the description, classification and coding of goods. It is developed and maintained by the World Customs Organization (WCO).

[iii]The algorithm is based on an iterative and validated process of words recognition carried out in a spreadsheet program.

[iv]With the exception of Palestine, due to the lack of reliable data.