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Reputation Matters: Spillover Effects in the Enforcement of US SPS Measures

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Reputation Matters:

Spillover Effects in the Enforcement of US SPS Measures

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Abstract: This paper uses a novel dataset on US food import refusals to show that reputation is an important factor in the enforcement of sanitary and phyto-sanitary (SPS) measures. The strongest reputation effect comes from a country's own history of compliance in relation to a particular product. The odds of at least one import refusal in the current year increase by over 300% if there was a refusal in the preceding year, after controlling for other factors. However, the data are also suggestive of the existence of two sets of spillovers. First, import refusals are less likely if there is an established history of compliance in relation to other goods in the same sector. Second, an established history of compliance in relation to the same product by neighboring countries also helps reduce the number of import refusals. These findings have important policy implications for exporters of agricultural products, particularly in middle-income countries. In particular, they highlight the importance of a comprehensive approach to upgrading standards systems, focusing on sectors rather than individual products, as well as the possible benefits that can come from regional cooperation in building SPS compliance capacity.

JEL Codes: F13; F15; O24.

Keywords: Product standards; SPS measures; Import refusals; Developing countries.

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1 Introduction

Non-tariff measures have become progressively more important trade policy instruments as applied tariff rates have fallen across the world in recent years. From a development perspective, technical regulations and product standards are a particularly important type of non-tariff measure because they highlight the fact that the favorable market access accorded under duty and quota-free preferential schemes remains conditional on compliance with regulations in areas such as consumer safety. Previous research shows that product standards and technical regulations in the large, developed markets can have two contradictory sets of effects for developing country exporters. On the one hand, the costs of compliance—retooling, product re-design, testing, and certification—can be substantial enough to keep many small and medium enterprises out of international markets, thereby affecting the pattern of international specialization (e.g., Essaji, 2008). But at the same time, foreign standards can also provide the impetus for firms and sectors to upgrade production technologies and realize beneficial productivity gains (e.g., Maertens and Swinnen, 2009). The question of which types of standards tend to promote which set of effects is clearly of vital policy importance to developing country exporters. The issue of how best to direct technical assistance resources so as to support the upgrading of standards systems and development of compliance mechanisms in developing countries is also an important part of broader Aid for Trade discussions.

Most previous work on standards and technical regulations has focused on the rules themselves, rather than their design and application or enforcement through specific at-the-border mechanisms. There are a number of recent exceptions, however. Karov et al. (2009) focus on identifying the trade impacts of US phyto-sanitary regulations at the product-country level by analyzing the effects of treatment requirements and grants of new market access. Similarly, Alberini et al. (2005) examine implementation of the FDA's seafood HACCP program using a dataset of plant inspections. Neither paper, however, deals with the food import refusals mechanism that is the focus of the present paper. Buzby et al. (2008) and

Buzby and Roberts (2010) analyze similar data on US import refusals to that used in the present paper, but only provide descriptive statistics. Baylis et al. (2009) is the first paper to investigate US import refusals empirically. In order to test whether import refusal decisions are biased, and what are the reasons for it, they look at a set of potential factors triggering refusals. They find that contrary to prior expectations, countries with experience in exporting products to the US are actually subject to relatively more refusals, thereby suggesting some degree of "stickiness" in the refusal determination process. Their findings also suggest that refusals are influenced by political pressure.

Related work has also been conducted on European food standards. Baylis et al. (2010) use data on EU import alerts—closely related to refusals[2]—in a gravity model to show that they tend to decrease trade.[3] However, they do not examine the determinants of import refusals, and in particular the potential for reputation effects, which is the focus of our paper. Baylis et al. (2011) use information on EU notifications and find that increased use of notifications is linked with a decreased level of protection through tariffs. They also see that European countries that would intuitively be demanders of protection tend to be at the origin of more notifications than their EU partners. Finally, the first stage of the empirical approach taken by Cadot et al. (2009), which tests whether import alerts contribute to increase trade costs and thus supplier concentration, uses EU import alerts as the dependent variable, but the cross-sectional setting of their regressions means that they are unable to account for reputation effects of the type we are interested in here.

In this paper, we use newly collected data to focus on one important example of the de facto implementation of product standards: refusal of entry into the US market for imported foods on safety

[2] The terminology for the European and US systems differs. US alerts designate particularly sensitive categories of products for which pre-determined automatic refusal will apply (we discuss this further below). Under the EU system, alerts encompass both market notifications for products that are already circulating in the European market (alert and information notifications) and border rejections.

[3] It is unclear whether Baylis et al. (2010) use only border rejections in their work or the total number of rejections and notifications. Presumably we believe this is the latter as in Cadot et al. (2009).

grounds. The advantage of looking at measures such as import refusals is that they are implemented on a country- and product-specific basis, rather than being the same de jure for all exporters. Most standards and regulations are effectively most-favored nation (MFN) measures, which makes it difficult to identify their effects on exporters by exploiting cross-country variation in outcome measures, such as trade flows. Focusing on a country- and product-specific measure, such as import refusals, provides a potentially much richer source of data in which identification can be based on cross-country as well as cross-product and through-time variation.

In addition to exploiting new data on US import refusals, this paper makes a number of contributions to the existing literature. First, we provide some of the first explicit evidence of reputation effects in the enforcement of sanitary and phyto-sanitary (SPS) measures. Specifically, we show that even after controlling for the size of import flows and other factors, a history of compliance is associated with fewer current import refusals. Second, we show that it is not just reputation for a particular product that matters, but sector-wide reputation (i.e., there are cross-product spillovers in enforcement): a product tends to suffer from more import refusals if closely related products are also subject to refusals. Third, we investigate, and find evidence to support, the hypothesis that the reputation of neighboring countries also matters for SPS enforcement. Our results suggest that imports are more likely to be refused if the same product from neighboring countries has also been subject to refusals. We interpret this finding as evidence in favor of geographical spillovers in enforcement of refusals.

To our knowledge, the three reputation effects we are investigating have not been explicitly considered before in the literature. Baylis et al. (2009) use similar data to ours to analyze the determinants of US import refusals over the period 1998-2004. Their core hypotheses are that: countries with greater experience exporting food to the US experience fewer refusals (the “learning curve” effect); and import refusals are subject to political pressure (the “standards for sale” effect; cf. Grossman and Helpman, 1984 for the case of tariffs). The data indeed support the second hypothesis: standard political economy measures such as the level of lobbying activity, decreases in US employment, and anti-dumping actions are significantly associated with a higher number of refusals. However, the authors find that the data do not support their first hypothesis: more recent exporters actually face fewer refusals than established ones, even after controlling for export volumes. They speculate that this result may be due to a direct reputation effect, namely that enforcement resources tend to be concentrated on past violators. They do not pursue the point, but it is one that we take up here, using a different empirical specification that can better identify the effect, which we find to be highly significant. This paper therefore develops the intuition in Baylis et al. (2009) in relation to individual reputation effects, but also extends it to include the possibility of reputational spillovers from related products and sectors.

The paper proceeds as follows. In the next section, we provide an outline of the US import refusals regime. Based on that description, Section 3 presents our dataset, focusing on the new import refusals data. We present some preliminary analysis that supports our hypotheses using descriptive statistical techniques, then proceed to develop a fully-specified econometric model of import refusals. Section 4 presents and discusses the results from our model, and conducts robustness checks. Section 5 concludes with a discussion of policy implications, and avenues for further research.

2 The US Import Refusals Regime

To gain admission to the US market, imported foods must meet SPS requirements applying to the product and country of origin. Broadly speaking, SPS measures are aimed at safeguarding the US market from both sanitary risks (the cause of food-borne human illnesses and animal diseases) and phyto-sanitary risks (vectors of transmission of plant pests and diseases).

Phyto-sanitary standards mean for fresh fruits and vegetables that they must be free of pests and diseases when entering the US. Exporters must meet a complex set of regulations, compiled in the Fresh Fruit and Vegetables Import Requirements (FAVIR) online database. Compliance with these regulations is overseen and administered by the US Department of Agriculture's Animal and Plant Health Inspection Service (APHIS).[4]

In this paper we focus on US sanitary measures. Food products can be the source of numerous food-borne illnesses (due to pathogens, toxins, and chemicals). All food products must be unadulterated (not bear or contain any poisonous or deleterious substances), be fit for consumption, and not contaminated or decaying, in order to be allowed for consumption in the U.S. At the federal level, there are three agencies involved in the oversight of food and food ingredients safety: the US Department of Agriculture's Food Safety and Inspection Service (FSIS), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA). FSIS ensures the safety of imported meats, poultry, and processed egg products. FDA covers all other products. EPA licenses pesticide products and monitors pesticide residues in products.

The FDA enforces the Federal Food, Drug and Cosmetics Act (FD&C) as well as other laws designed to protect consumer health, welfare, and safety. Under Sec. 801 of FD&C, products are subject to inspection when imported. Imported food products are expected to meet the same standards as domestic products, i.e. they must be pure, wholesome, safe to eat, and produced under sanitary conditions. Food imports must also contain informative and truthful labeling in English.[5]

Another important requirement is that since 1997, producers must follow FDA's good agricultural practices (GAP) for the control and management of microbial food safety. Likewise, since 1995 fish products imports must meet hazard analysis and critical control point (HACCP) standards, as must

[4] For an overview of the US fruit and vegetable protection system, see Jouanjean et al. (2011).
[5] http://www.fda.gov/ForIndustry/ImportProgram/ImportProgramOverview/default.htm

domestic producers. Other measures applying to seafood include traceability requirements such as the identity preservation system for molluscans, and labeling of origin and method of production (wild harvest or farm raised).

Other programs concerning food products in general are also in place such as the acidified and low acid canned foods regulations. Acidified and Low Acid Canned Foods must be manufactured in accordance with FDA regulations. Food canning establishments must also register with the FDA.

All the measures described above are defined on the principle of national treatment: importers and domestic producers are subject to exactly the same requirements. There is however a significant difference in de facto treatment between domestic goods and imported products with respect to food safety: the Act allows for refusal of imported FDA-regulated products for "appearing" to be adulterated or misbranded. The law is interpreted in a broad sense as allowing the FDA to make admissibility decisions based not only on physical evidence such as examination, facility inspection, or laboratory results, but also based on historical data, information from other sources (e.g. about a disease outbreak), labeling, and any other evidence.[6] Factors such as reputation can clearly come into play in this decision. In other words, if there is a suspicion that a product from a given origin will not meet FDA standards, it can be detained. Therefore the standard of proof for determination of refusal for food import products is much less strict than for domestic products, which must be based on an actual violation. Therefore we can form the hypothesis that refusals may be partly path-dependent (as noted by Baylis et al., 2009) since past histories of violation from similar products and origins are criteria that may be used to decide whether there is a suspicion of adulteration or misbranding, which can in turn justify a refusal.

[6] Presentation by Domenic Veneziano, Director, FDA Division of Import Operations at the Food & Agriculture Border Gateway Summit January 16, 2008. http://www.michigan.gov/documents/mda/FDA_importproc_224440_7.pdf accessed 22 November 2011.

Baylis et al. (2009) explain that this looser requirement may be motivated by the fact that the FDA has less easy access to means of verification for imported products: for instance, until the 2011 Food Safety Modernization Act, the FDA had no extra-territorial jurisdiction and was not able to inspect foreign plants or to require third party certifications. Therefore, until 2011, the FDA had to rely primarily on resource intensive port-of-entry inspections.[7] The rapid increase in imports of FDA-regulated goods, from six million shipments a decade ago to 24 million in 2011, ultimately motivated a risk-based approach to inspections at the border, which helps optimize the staff and equipment resources needed for the physical inspection of products and facilitate trade by limiting the costs in lost time and spoiled products for the exporter (U.S. Food and Drug Administration, 2011).

Under the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, the FDA issued regulations in December 2003 requiring two things: 1) that food facilities (including foreign) are registered with the FDA; and 2) FDA be given advanced notice of shipments of imported food. The information required for prior notice varies, based on the type of entry, mode of transportation for entry, and whether the food is in its natural state. Upon reviewing the notice, the FDA can decide to release the product, request additional information or documents, request physical examination of the product, or recommend detention of the product. Detention means that in the absence of petition or reconditioning of the goods from the exporter, the product will not be released into US territory and will either be re-exported or destroyed within approximately 90 days.

Physical examination entails verification of labeling, of the container integrity, sampling, and verification, and leads to either a recommendation of release or detention. According to the literature,

[7] Until the 2011 Food Safety Modernization Act, the FDA's primary tools for product safety and quality have been inspections at production facilities and ports of entry. The large increase in imports has outrun FDA resources and the inspection rate dropped from 8% in 1992 to less than 2% in 2011 (U.S. Food and Drug Administration, 2011; U.S. Congress of the U.S., 2011; Schmit, 2007; and U.S. GAO, 2001). Because of this rapid increase in FDA-regulated imports, the FDA acknowledges that resource constraints are its chief concern.

about 1-2% of all food shipments are subject to physical examination by FDA, and a fraction of these are subject to sampling (Buzby et al., 2009; Baylis et al., 2009).

The FDA relies on a system of alerts for particularly sensitive categories of products in order to help it save and allocate inspection resources. Alerts are issued when the FDA determines that there is a particular risk associated with a product, producer/exporter, country or region of origin. In most circumstances, alerts determine that firms and products identified are subject to detention without physical examination (DWPE). In this case, the FDA automatically detains the concerned products until it is demonstrated that the violation has been remedied. Therefore the burden of proof falls on the importer or shipper, or the manufacturer/grower of the product. As noted by Baylis *et al.* (2009) alerts are strikingly rarely changed: three quarters of alerts in place in 2009 had been in place for more than 10 years, and a significant portion of them (one quarter of all alerts) for more than 20 years.

Alerts appear to be decided on similar legal basis to refusals, e.g. the standard of "appearance". According to the FDA, alerts are triggered by historical violations at the following levels: commodities; manufacturers/shippers; growers; importers; geographic area; and countries of origin.[8] Sources of information come from FDA's own field offices, but also foreign inspections and evidence from other countries.

3 Methodology and Data

As the above discussion demonstrates, US border authorities exercise broad discretions when implementing the import refusals regime. As previously noted by Baylis et al. (2009), and as suggested by the FDA itself, there is a strong possibility of path dependence: the authorities might look at historical

[8] Presentation by Domenic Veneziano, Director, FDA Division of Import Operations at the Food & Agriculture Border Gateway Summit January 16, 2008. http://www.michigan.gov/documents/mda/FDA_importproc_224440_7.pdf accessed 22 November 2011.

patterns of compliance in allocating scarce enforcement resources, leading to a correlation between past and present import refusals, even after controlling for other factors. We refer to this as the “own reputation” effect. In addition, the structure of the US import refusals system is suggestive of two other effects that might be in operation. One is a “sector reputation” effect, by which we mean the possibility that import refusals for a particular product are associated with past import refusals affecting closely related products. The second is a “neighbor reputation” effect, namely the possibility that import refusals affecting a given product from one country might be more likely if neighboring exporters of the same product have a history of non-compliance. In the remainder of this section, we outline the data and model we will use to test for the existence of all three effects.

3.1 US Import Refusals Data

This paper uses a new dataset of US import refusals for the period 1998-2008. It extends the data used in Jouanjean (2011), and covers HS chapters 3 (fish and crustaceans), 7 (vegetables), 8 (fruits), 9 (coffee, tea, mate, and spices), 16 (preparations of meat, fish, and crustaceans), and 20 (preparations of vegetables, fruits, and nuts). The reason for focusing on these sectors is that they correspond to FDA Industry Codes 16 (fishery and seafood products), 20-22 (fruit and fruit products), and 24-25 (vegetables and vegetable products). Refusals in these sectors accounted for over 50% of all FDA import violations over the 1998-2004 period (Buzby et al., 2008). We are therefore confident that by focusing on these three sectors, we are capturing an important part of overall import refusal activity in the US. This subsection describes the US import refusals regime in more detail, focusing on the way in which the data used here were collected.

Since 1998, the FDA has implemented an automatic system governing the admission process for FDA-regulated shipments of foreign-origin products presented for entry into the US. The system, known as the “Operational and Administrative System for Import Support” or OASIS, is designed to simplify operations and reduce the time taken for clearance of shipments. It classifies imported items into different risk categories by tracking historical data on shipments that were previously refused admission into the US. Again, this process is suggestive of path dependence and reputation effects of the type that are the focus of this paper.

The FDA makes refusals information public in their Import Refusal Report (IRR), which is generated from OASIS data. Reports provide information on the manufacturer's name and country of origin, as well as the dates and motives for the refusal. To gain access to historical refusals data, we submitted a Freedom of Information Act request in September 2009, which the FDA satisfied by supplying data in May 2010.

Product codes supplied by the exporter allow for a very specific definition of the transformation process the imported product has undergone (raw, dried, and pasteurized etc.) and it is usually precise enough to define a straightforward correspondence with the HS classification. The only part of the correspondence in which additional issues arise involves the FDA process code relating to "packaged food" under which exporters/importers tend to regroup various types of products that sometimes should have been coded otherwise. Thus, more careful handling was necessary. First, according to product subclasses providing information on containers, we make the straightforward assumption that products in metal and glass containers are transformed, and thus fall into HS Chapter 16 for "fish and fishery products", and HS Chapter 20 for "fruit and fruit products", and "vegetables and vegetable products". Second, for containers of different materials, we analyzed product description data in which the FDA agent filled in a precise definition of the product. We also verified the information about refused products on companies' websites.

3.2 Other Data

In addition to the novel dataset on FDA import refusals discussed in the previous subsection, we use standard data sources for the remaining variables used in our analysis (Table 1). We source trade data from UN-Comtrade, accessed via the World Bank's WITS platform. We use US import data for 1998-2008 at the HS four-digit level, including all exporting countries. In light of the high quality of US import data, we replace all missing values with zero to indicate that no trade took place for the given exporter-product-year combination. We only include trade data for which we have corresponding refusals data, namely HS chapters 3, 7, 8, 9, 16, and 20 from which we exclude nuts and meat preparations since those products belong to other FDA industry codes not analyzed in this paper. In addition to trade data to control for imports, we source per capita GDP data in PPP terms from the World Development Indicators. Finally, we include US effectively applied import tariffs as an additional explanatory variable. These data are sourced from UNCTAD's TRAINS database via the World Bank's WITS platform. Since many missing values are returned, we use the world average by product-year combination when data on effectively applied import tariffs are unavailable on a bilateral basis.

3.3 Preliminary Analysis

Before moving to a fully-specified econometric model, it is useful to examine some simple correlations in the data to see whether they support our three hypotheses, namely the own reputation effect, the sector reputation effect, and the neighbor reputation effect. As outlined above, we expect to see positive associations between, on the one hand, the number of refusals for a given country-product-year combination, and, on the other, the number of refusals affecting that country-product combination in the previous year (own reputation), the number of refusals affecting related products—those in the same HS2 chapter—from the same country in the previous year (sector reputation), and the number of refusals affecting the same product from related countries—the five geographically closest to the exporter—in the previous year (neighbor reputation). For ease of presentation we convert the variables to logarithms to reduce dispersion.

In all three cases (Figures 1-3), the data provide support for our propositions. The positive association is strongest, as would be expected, in the case of own reputation (Figure 1). Although the correlations in Figures 2 and 3, which capture reputational spillover effects, are weaker, they are nonetheless positive and 1% statistically significant. In terms of slope coefficients, the stronger gradient of the line of best fit in Figure 3 than in Figure 2 provides some preliminary evidence that neighbor reputation may be quantitatively more important than sector reputation.

Of course, the graphical analysis we have presented is based on simple correlations only. It does not take account of intervening influences. To address this issue more fully, the next subsection develops an econometric model, for which we report estimation results in the next section.

3.4 Empirical Model

As discussed above, we are primarily interested in assessing the impact of reputation effects in the enforcement of US SPS regulations through import refusals. We use two dependent variables. The first, $RefusalsDum_{ikt}$, is a dummy variable equal to unity if a country-HS four-digit product-year combination has at least one import refusal. The second, $Refusals_{ikt}$, is a count of the number of import refusals affecting a particular exporter-product-year combination. We use similar sets of independent variables in both cases, but estimate the first model using a conditional fixed effects logit estimator, and the second using a negative binomial estimator.

As independent variables, we include three measures of reputation. The first, "own reputation", is simply the lagged dependent variable, i.e. a dummy equal to one if there was at least one refusal in the preceding year, or a count of the number of refusals affecting a given exporter-product combination in the previous year. The second, "sector reputation", is a lagged dummy equal to unity if there was at least one refusal affecting products in the same HS two-digit chapter from a given exporter, but excluding the number of refusals affecting the product in question, or a similarly defined count variable.

It is therefore a measure of the extent to which related products are subject to import refusals. The third variable, “neighbor reputation”, is a lagged dummy equal to unity if there is at least one refusal affecting the same product exported from geographically close countries, or the corresponding count variable. We define “closeness” using geodesic distance as the benchmark, i.e. the five closest countries to the exporter. If reputation effects are present in the data, we expect all three of these variables to have positive and statistically significant coefficients.

It is also important to ensure that we control for other possible influences on the number of import refusals. The lagged level of imports is an obvious control to include, since more exports should be associated with a greater number of refusals. We use import values in levels, rather than taking logarithms, to ensure that observations with zero trade are retained in the estimation sample.

We also include effectively applied tariffs as a control variable, with missing values interpolated as discussed above. The rationale for including tariffs is a political economy one. Although the import refusals regime is designed to safeguard consumer safety, it is plausible that the influence of industry lobbies might result in more refusals than simple safety concerns might dictate. If such political economy forces are at work, we would expect to see a positive correlation between tariffs and import refusals, i.e. more refusals in more heavily protected sectors.

In addition to import values and tariffs, we also control for the logarithm of the exporting country’s per capita GDP. We use this measure as a proxy for the exporter’s level of financial and technical capacity, which is an important determinant of its ability to comply with foreign standards. In subsequent regressions, we estimate using separate sub-samples for different World Bank income groups to allow for more complex income effects in the determination of import refusals.

To take account of additional country-, product-, and time-specific factors, we also include full sets of fixed effects in those three dimensions. Product fixed effects—which are specified at the HS four-digit level—are of particular importance, because they allow us to control for the inherent riskiness of particular products, which is likely to lead to a greater rate of inspections and refusals.

Bringing these points together allows us to specify our baseline models, using the two dependent variables (dummy and count):

$$(1)\ Pr(RefusalsDum_{ikt} = 1) = b_0 + \underbrace{b_1 RefusalsDum_{ikt-1}}_{Own\ Reputation} + \underbrace{b_2 RefusalsDum^{HS2}_{ikt-1}}_{Sector\ Reputation} + \underbrace{b_3 RefusalsDum^{Neighbors}_{ikt-1}}_{5\ Neighbor\ Reputation} + b_4 Imports_{ikt-1} + b_5 \log(1 + Tariff_{ikt}) + b_6 \log(GDPPC_{it}) + \sum_i f_i + \sum_k f_k + \sum_t f_t$$

$$(2)\ Refusals_{ikt} = b_0 + \underbrace{b_1 Refusals_{ikt-1}}_{Own\ Reputation} + \underbrace{b_2 Refusals^{HS2}_{ikt-1}}_{Sector\ Reputation} + \underbrace{b_3 Refusals^{Neighbors}_{ikt-1}}_{5\ Neighbor\ Reputation} + b_4 Imports_{ikt-1} + b_5 \log(1 + Tariff_{ikt}) + b_6 \log(GDPPC_{it}) + \sum_i f_i + \sum_k f_k + \sum_t f_t$$

where f indicates fixed effects in the exporter (i), product (k), and time (t) dimensions. As noted above, equation (1) is estimated as a conditional fixed effects logit model, and equation (2) is estimated as a fixed effects negative binomial model.

4 Estimation Results and Discussion

4.1 Conditional Fixed Effects Logit Results

Table 2 presents results using the dummy variable $RefusalsDum_{ikt}$ as the dependent variable. The baseline model is in column 1. Our main variables of interest, the three reputation dummies, are all positively signed and one percent statistically significant. Converting the estimated parameters to odds ratios by exponentiation suggests that the effects are also highly economically significant. For example, the odds of receiving at least one import refusal in a given year increase by about 340% if there was at least one refusal in the previous year, after controlling for other factors. As expected, the other two reputation effects are weaker, but still highly significant. An import refusal affecting other products in the same HS two-digit chapter increases the odds of a refusal by 62%, and an import refusal affecting the same product exported by neighboring countries increases the odds of a refusal by 110%. These results clearly suggest that reputation matters in the enforcement of US SPS regulations through the import refusals system, and that it is not just a country's reputation for a particular product that matters, but its track record with similar products, and even the track record of neighboring countries.

Turning to the control variables, we also find signs and magnitudes that accord with intuition, and parameters that are one percent statistically significant in all but one case. As expected, a higher level of imports is associated with a greater probability of suffering at least one refusal. Interestingly, the tariff rate is also positively associated with the probability of refusal: US authorities are more likely to issue refusals affecting products that are relatively strongly protected as opposed to those with lower tariff rates. This finding could be consistent with the influence of political economy forces in the implementation of US SPS measures through the refusals system. Although further work would be necessary to confirm that this is the case, the association we have found here is nonetheless striking. Finally, the coefficient on per capita income is negative, which is in line with expectations: richer countries with presumably more developed SPS infrastructure are less likely to suffer import refusals. However, the effect is not statistically significant. The influence of country income on refusal behavior is something we discuss in more detail below.

The remaining columns of Table 2 use alternative specifications to ensure that our initial results are robust. In columns 2 and 3, we change the definition of "neighboring" countries to be respectively the three closest countries and the overall closest countries. As can be seen from the table, our finding on the important of neighborhood reputation is robust to the first change, but the neighborhood reputation variable becomes statistically insignificant in the final case. What matters from a reputational point of view is therefore a country's geographical region in broad terms, not just the behavior of its closest neighbor.

As an additional check, column 4 of Table 2 limits the sample to those partner country-product combinations for which at least some trade is observed during the sample period. The rationale behind this limitation is that the refusals regime only affects actual or potential exporters,[9] but the sample used for the baseline model includes a large number of data points where no trade is taking place. In any case, little turns on this sampling issue in practice. Column 4 shows that even though the sample size is reduced by about 45% due to this restriction, the estimated coefficients remain very close to the baseline in sign, significance, and magnitude.

Finally, column 5 uses a distributed lag model to examine the possibility that reputation effects are more persistent over time than the baseline model allows for by only using one lag. We consider three lags of each of the reputation variables, and find that they are positively signed and one percent statistically significant in all but two cases (the second and third lags of the sector reputation dummy). As might be expected, these results suggest that reputation is sticky, in the sense that it changes only slowly over

[9] For some sectors in our sample, this number is also a good proxy for the set of countries allowed access to the US market under the SPS regime.

time. Converting the parameters to odds ratios again suggests that an import refusal three years ago increases the odds of a refusal in the current period by 107%. The corresponding numbers are smaller for neighborhood reputation (22%) but is still economically significant.

To provide some further detail on the baseline results, Table 3 presents regression results for sub-samples limited by World Bank geographical region. Moving across the table, it is clear that for all regions except Sub-Saharan Africa, own reputation is a significant determinant of the likelihood of an import refusal: the coefficient is positively signed and at least 5% statistically significant. Comparing the magnitude of the coefficient across specifications suggests that the effect is particularly strong for Latin America and the Caribbean, which is an important exporter of agricultural products to the USA.

Similarly, the sector reputation effect also has a positive and statistically significant coefficient in all regions except Sub-Saharan Africa. In this case, however, the effect is strongest in the South Asia region. By contrast, results for the neighbor reputation variable are more mixed. The coefficient is only positive and statistically significant for four of the six regions: Europe and Central Asia, Latin America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa.

Table 4 expands on these results by considering samples limited to individual World Bank income groups. The own reputation variable has a positive and statistically significant coefficient in all three regressions, but its magnitude is much larger in the case of high- and middle-income countries (columns 1-2) than in that of low-income countries (column 3). By contrast, the sector reputation variable only has a statistically significant coefficient for high- and middle-income countries, and the effect is noticeably stronger in the latter case. In line with this result, neighborhood reputation has a statistically significant coefficient in all three regressions, but its magnitude is much stronger for low- and particularly middle-income countries than for high-income countries.

Together, these results tend to suggest that the reputation effects we have identified may act as a particularly significant barrier to market access for middle-income countries—exactly the group that contains a number of important agricultural exporters, such as Brazil and South Africa. One possibility is that trade flows from low income countries are too small to attract the attention of the refusals system, and it is only once some threshold is passed that reputation begins to play a significant role in the issuance of refusals. Overall, the lack of significance of the reputation variables for low income countries and Sub-Saharan Africa does not come as too much of a surprise. Exports to the US from countries belonging to those groups are highly irregular, which affects the significance of the own reputation and neighbor reputation variables, and are concentrated on a small subset of food products, which affects the sector reputation variable. In any case, our results clearly demonstrate that enforcement of the US SPS regime through import refusals can have important development policy implications, a point that has previously been noted in the literature on standards and trade, where differential impacts by country income group have also been identified (e.g., Disdier et al., 2008).

To provide further detail on our results, Table 5 provides separate estimations for each HS 2-digit sector, excluding sector 9 (coffee, tea, mate, and spices) due to too few observations. The own reputation effect has a positive and statistically significant coefficient in all but one regression (preparations of meat, fish, and crustaceans). The neighborhood reputation coefficient is positive and 1% statistically significant in all regressions. Comparing magnitudes across the columns in Table 5 suggests that the own reputation effect is particularly important in vegetables, as well as fruits and nuts, and fish and crustaceans. The neighborhood reputation effect is particularly strong, by contrast, in fruits, preparations of meat, fish, and crustaceans, and preparations of vegetables and fruits. In terms of the control variables, the value of imports has a positive coefficient in all regressions, which is statistically significant in three cases. The relationship between tariffs and refusals is similarly positive and statistically significant in two cases. There is only one case in which per capita income has a statistically significant coefficient, and it is negative, as expected.

The only result that needs significant explanation in Table 5 relates to the sector reputation variables. Contrary to expectations, they have coefficients that are negative and statistically significant. The reason for this undoubtedly lies in the structure of the regressions. By limiting each one to a single two digit sector, the sector reputation variable becomes very closely correlated with the country fixed effects: it is only to the extent that the sector reputation dummy varies over time that it can be separately identified. Since, as we have noted above, there is considerable persistence in the reputation variables, it is likely that this correlation drives the unexpected results we observe on this variable.

4.2 Fixed Effects Negative Binomial Results

The regression results discussed in the previous section were all based on a conditional fixed effects logit model in which the dependent variable is a dummy equal to unity in the case of at least one import refusal for a given exporter-product-year combination. In this section, we use a different dependent variable, namely a count of the number of import refusals per exporter-product-year combination. This approach allows us to introduce more nuance into the dependent variable, and ensure that our results are robust to this alternative measure.

Table 6 presents results using equation (2) estimated as a negative binomial regression, which we prefer to the Poisson estimator due to likely over-dispersion in the data. Each column corresponds to a similar logit model in Table 2. Results between the two sets of specifications are very similar in qualitative terms. In all five models in Table 5, the coefficient on own reputation is positive and statistically significant at the one percent level. The same is true of the sector reputation and neighborhood reputation coefficients, including in the last case all the five and three country definitions of neighborhood, but not the nearest neighbor definition. It makes very little difference whether all trade relationships are included in the sample (column 1), or only those with some positive trade during the sample period (column 4). When a distributed lag specification is used (column 5), we again find substantial evidence that reputation is sticky: the coefficients on all variables except the second and third lags of sector reputation and the third lag of neighborhood reputation are positive and at least five percent statistically significant.

Among the control variables, results are in line with those from the logit models. Import value has the expected positive and statistically significant coefficient in all cases. The same is true of tariffs, which supports the potential political economy dynamic referred to above. Per capita income again has the expected negative coefficient, but it is not statistically significant.

We can use the estimated coefficients from the negative binomial model to give a more detailed quantitative interpretation to our results. For example, the coefficient on own reputation implies that one additional import refusal in the preceding year is associated with an increase of about five percent in the number of refusals for the current year. The effects for sector reputation and neighborhood reputation are weaker, but still economically significant, at 0.4% and 1.2% respectively. These findings reinforce the conclusions of the logit model, in which we also found that it is primarily own reputation that matters for the probability of suffering at least one import refusal, but that neighborhood reputation and, to a lesser extent, sector reputation also matter.

5 Conclusion

This paper has produced some of the first direct evidence and quantification that reputation effects matter in the enforcement of US SPS measures through the import refusals system. Specifically, countries with a history of compliance tend to experience fewer refusals, even after controlling for other factors.

As modern border controls, including SPS ones, increasingly rely on risk-based approaches (Widdowson and Holloway, 2011), one should expect certain categories of exports to build a higher risk profile than others and thus be subject to higher levels of controls and thus detection of non-compliance. Risk-based methods are, however, not very transparent in the methodology they use—presumably to avoid circumventing tactics by traders—and may create unnecessary uncertainty for traders. A natural candidate determinant for shipments presenting a higher risk of non-compliance is past history of compliance, which our research shows is indeed the case.

In addition, and more surprisingly, countries with a history of compliance in related products also tend to experience fewer current refusals, as do countries whose neighbors have an established history of compliance. We interpret these last two effects as evidence of reputational spillovers in the enforcement of SPS rules.

Although more research is clearly needed in a number of areas—more on this below—some important policy implications would seem to follow from our findings. First, exporters of agricultural products seeking to break into the US market need to focus on building SPS capacity so as to become reliable sources. It is not sufficient to export a mix of compliant and non-compliant goods: reputation matters, and the presence of the latter will make it harder to get the former into the market as well. Consistency and reliability of production are therefore key issues in the development of SPS capacity in agricultural exporters, and particularly in middle-income countries that have the potential to be significant competitors for US production.

Since we capture our effects at the product and country level, our findings also have implications for the need for producers and exporters wishing to sell in the US market to organize themselves in order to enforce sanitary compliance: indeed if one rogue exporter triggers a refusal, the risks of subsequent future refusals on others increases. More generally, this finding is in line with the observation that SPS measures tend to require strong sectoral organization on the part of the exporters (see also Jouanjean et al., 2011).

Second, our results strongly suggest that a comprehensive approach to SPS compliance is likely to be more effective than a piecemeal one. Although it might seem sensible to concentrate limited SPS capacity building resources on a small number of products that are individually important, such an approach neglects the importance of the sectoral spillover effects evident in our data. Building capacity across the sector as a whole can have important benefits for individual products.

Similarly, the likelihood that regional reputation matters for SPS enforcement also has important policy implications. Regional approaches to the development of standards systems are becoming more common for many reasons, such as the ability for small, poor countries to pool technical and financial resources (Maur and Shepherd, 2011). Our findings suggest an additional reason for encouraging regional standards cooperation: geographical spillovers mean that compliance by a country's neighbors can help it achieve more effective market access.

Currently, there is only a very small literature examining SPS measures at the level of enforcement mechanisms, such as alerts or import refusals. Further work in this area has the potential to bring significant insights into the workings of product standards more generally, and in particular their effects on developing country exporters. Baylis et al. (2009) make a first attempt to assess the trade impacts of import refusals. Extending their work to take account of the types of reputation spillover effects we have identified here could be a fruitful avenue for future research. Our own work highlights the need to treat import refusals as endogenous in gravity model settings, which is an important dimension in which the robustness of previous assessments needs to be established. Similarly, Baylis et al. (2009) provide some initial evidence suggesting that political economy forces may be relevant in determining the application of SPS measures. Since almost nothing is known about the political economy determinants of product standards (c.f. Kono, 2006), this too would be an interesting research question to pursue using data similar to those we have used here.

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Tables

Table 1: Data and sources.

Variable	Description	Year	Source
$GDPPC_{it}$	Per capita GDP of country i in year t (in PPP terms).	1998-2008.	World Development Indicators.
$Imports_{ikt}$	Imports of product k from country i in year t, in quantity terms (not value).	1998-2008.	UN Comtrade via WITS.
$Refusals_{ikt}$	Number of import refusals affecting product k exported from country i in year t.	1998-2008.	Authors.
$RefusalsDum_{ikt}$	Dummy variable equal to unity if $Refusals_{ikt} \geq 1$.	1998-2008.	Authors.
$Refusals_{ikt}^{HS2}$	Number of import refusals affecting products other than product k in the same HS two-digit sector, from country i in year t.	1998-2008.	Authors.
$RefusalsDum_{ikt}^{HS2}$	Dummy variable equal to unity if $Refusals_{ikt}^{HS2} \geq 1$.	1998-2008.	Authors.
$Refusals_{ikt}^{Neighbors}$	Number of import refusals affecting product k exported by country i's neighboring countries in year t. Neighboring countries are defined alternately as the five closest neighbors, the three closest neighbors, and the closest neighbor.	1998-2008.	Authors.
$RefusalsDum_{ikt}^{Neighbors}$	Dummy variable equal to unity if $Refusals_{ikt}^{Neighbors} \geq 1$.	1998-2008.	Authors.
$Tariff_{ikt}$	Effectively applied US tariff on product k from country i in year t.	1998-2008.	UNCTAD Trains via WITS.

Table 2: Logit regression results.

	(1) Baseline	(2) Neighborhood 3	(3) Neighborhood 1	(4) Imports > 0	(5) Lags
$\underbrace{RefusalsDum_{ikt-1}}_{Own\ Reputation}$	1.478***	1.354***	1.729***	1.455***	1.145***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\underbrace{RefusalsDum_{ikt-2}}_{Own\ Reputation}$					0.725***
					(0.000)
$\underbrace{RefusalsDum_{ikt-3}}_{Own\ Reputation}$					0.726***
					(0.000)
$\underbrace{RefusalsDum_{ikt-1}^{HS2}}_{Sector\ Reputation}$	0.484***	0.497***	0.511***	0.419***	0.357***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\underbrace{RefusalsDum_{ikt-2}^{HS2}}_{Sector\ Reputation}$					0.084
					(0.250)
$\underbrace{RefusalsDum_{ikt-3}^{HS2}}_{Sector\ Reputation}$					-0.044
					(0.542)
$\underbrace{RefusalsDum_{ikt-1}^{Neighbors}}_{5\ Neighbor\ Reputation}$	0.744***			0.650***	0.507***
	(0.000)			(0.000)	(0.000)
$\underbrace{RefusalsDum_{ikt-2}^{Neighbors}}_{5\ Neighbor\ Reputation}$					0.307***
					(0.000)
$\underbrace{RefusalsDum_{ikt-3}^{Neighbors}}_{5\ Neighbor\ Reputation}$					0.199***
					(0.009)
$\underbrace{RefusalsDum_{ikt-1}^{Neighbors}}_{3\ Neighbor\ Reputation}$		0.729***			

		(0.000)			
$\underbrace{RefusalsDum_{ikt-1}^{Neighbors}}_{1\ Neighbor\ Reputation}$			0.231		
			(0.232)		
$Imports_{ikt-1}$	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\log(1+Tariff_{ikt})$	4.016***	4.190***	4.317***	3.833***	3.374***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.004)
$\log(GDPPC_{it})$	-0.062	-0.097	-0.092	-0.015	-0.117
	(0.822)	(0.723)	(0.727)	(0.956)	(0.720)
Pseudo-R2	0.476	0.474	0.472	0.387	0.496
Observations	54760	54760	54760	29839	54760

*The dependent variable is $RefusalsDum_{ikt}$ and estimation is by conditional fixed effects logit in all cases. All models include fixed effects by partner country, HS four-digit product, and year. Prob. values based on robust standard errors corrected for clustering by partner country are in parentheses. Statistical significance is indicated by * (10%), ** (5%), and *** (1%).*

Table 3: Logit regression results by World Bank region.

	(1) East Asia & Pacific	(2) Europe & Central Asia	(3) Latin America & Caribbean	(4) Middle East & North Africa	(5) South Asia	(6) Sub-Saharan Africa
$\underbrace{RefusalsDum_{ikt-1}}_{Own\ Reputation}$	0.988***	0.684**	1.514***	1.266***	0.904***	0.355
	(0.000)	(0.019)	(0.000)	(0.000)	(0.009)	(0.268)
$\underbrace{RefusalsDum_{ikt-1}^{HS2}}_{Sector\ Reputation}$	0.678***	0.688***	0.325**	0.526**	0.964***	0.340
	(0.006)	(0.002)	(0.041)	(0.033)	(0.000)	(0.370)
$\underbrace{RefusalsDum_{ikt-1}^{Neighbors}}_{5\ Neighbor\ Reputation}$	0.157	0.848***	0.484***	0.554**	-0.368	0.660*
	(0.539)	(0.001)	(0.001)	(0.017)	(0.588)	(0.056)
$Imports_{ikt-1}$	0.000***	0.000	0.000***	0.000	0.000***	0.000***
	(0.000)	(0.449)	(0.001)	(0.161)	(0.000)	(0.008)
$\log(1 + Tariff_{ikt})$	6.251***	-0.924	-6.647*	13.209***	4.591	-6.645
	(0.000)	(0.767)	(0.054)	(0.000)	(0.170)	(0.362)
$\log(GDPPC_{it})$	-0.441	1.394	0.335	1.846	-3.417*	-3.046*
	(0.470)	(0.205)	(0.627)	(0.349)	(0.060)	(0.093)
Pseudo-R2	0.659	0.443	0.428	0.404	0.498	0.332
Observations	4092	3564	10725	2310	1612	6534

*The dependent variable is $RefusalsDum_{ikt}$ and estimation is by conditional fixed effects logit in all cases. All models include fixed effects by partner country, HS four-digit product, and year. Prob. values based on robust standard errors corrected for clustering by partner country are in parentheses. Statistical significance is indicated by * (10%), ** (5%), and *** (1%).*

Table 4: Logit regression results by World Bank income group.

	(1) High Income	(2) Middle Income	(3) Low Income
$\underbrace{RefusalsDum_{ikt-1}}_{Own\ Reputation}$	1.474***	1.431***	0.947***
	(0.000)	(0.000)	(0.000)
$\underbrace{RefusalsDum_{ikt-1}^{HS2}}_{Sector\ Reputation}$	0.393***	0.528***	-0.068
	(0.004)	(0.000)	(0.807)
$\underbrace{RefusalsDum_{ikt-1}^{Neighbors}}_{5\ Neighbor\ Reputation}$	0.416***	0.865***	0.769***
	(0.000)	(0.000)	(0.007)
$Imports_{ikt-1}$	0.000	0.000***	0.000***
	(0.284)	(0.000)	(0.001)
$\log(1 + Tariff_{ikt})$	2.520	4.889**	4.348***
	(0.254)	(0.022)	(0.004)
$\log(GDPPC_{it})$	-0.305	0.309	-3.297***
	(0.607)	(0.446)	(0.002)
Pseudo-R2	0.447	0.478	0.514
Observations	16224	28600	6664

*The dependent variable is $RefusalsDum_{ikt}$ and estimation is by conditional fixed effects logit in all cases. All models include fixed effects by partner country, HS four-digit product, and year. Prob. values based on robust standard errors corrected for clustering by partner country are in parentheses. Statistical significance is indicated by * (10%), ** (5%), and *** (1%).*

Table 5: Logit regression results by HS 2-digit sector.

	(1) Fish & Crustaceans	(2) Vegetables	(3) Fruits	(4) Preparations of Fish & Crustaceans	(5) Preparations of Vegetables & Fruits
$\underbrace{RefusalsDum_{ikt-1}}_{Own\ Reputation}$	1.300***	1.586***	1.399***	0.199	0.761***
	(0.000)	(0.000)	(0.000)	(0.304)	(0.000)
$\underbrace{RefusalsDum_{ikt-1}^{HS2}}_{Sector\ Reputation}$	-0.426***	-0.573***	-0.560***	-0.638***	-0.268**
	(0.002)	(0.001)	(0.000)	(0.005)	(0.033)
$\underbrace{RefusalsDum_{ikt-1}^{Neighbors}}_{5\ Neighbor\ Reputation}$	0.470***	0.540***	0.635***	0.660***	0.610***
	(0.003)	(0.004)	(0.004)	(0.002)	(0.000)
$Imports_{ikt-1}$	0.000	0.000*	0.000***	0.000	0.000**
	(0.175)	(0.091)	(0.002)	(0.340)	(0.024)
$\log(1 + Tariff_{ikt})$	-0.644	5.375**	7.537***	-4.281	-0.047
	(0.943)	(0.031)	(0.000)	(0.492)	(0.977)
$\log(GDPPC_{it})$	-0.526	-1.049*	0.790	-0.245	0.420
	(0.409)	(0.071)	(0.243)	(0.853)	(0.510)
Pseudo-R2	0.423	0.402	0.400	0.395	0.422
Observations	5055	9659	8420	1826	9009

*The dependent variable is $RefusalsDum_{ikt}$ and estimation is by conditional fixed effects logit in all cases. All models include fixed effects by partner country, HS four-digit product, and year. Prob. values based on robust standard errors corrected for clustering by partner country are in parentheses. Statistical significance is indicated by * (10%), ** (5%), and *** (1%).*

Table 6: Negative binomial regression results.

	(1) Baseline	(2) Neighborhood 3	(3) Neighborhood 1	(4) Imports > 0	(5) Lags
$\underbrace{Refusals_{ikt-1}}_{Own\ Reputation}$	0.048*** (0.000)	0.048*** (0.000)	0.058*** (0.000)	0.047*** (0.000)	0.037*** (0.000)
$\underbrace{Refusals_{ikt-2}}_{Own\ Reputation}$					0.012*** (0.000)
$\underbrace{Refusals_{ikt-3}}_{Own\ Reputation}$					0.012*** (0.000)
$\underbrace{Refusals_{ikt-1}^{HS2}}_{Sector\ Reputation}$	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.003*** (0.000)	0.004*** (0.000)
$\underbrace{Refusals_{ikt-2}^{HS2}}_{Sector\ Reputation}$					-0.001 (0.567)
$\underbrace{Refusals_{ikt-3}^{HS2}}_{Sector\ Reputation}$					0.001 (0.135)
$\underbrace{Refusals_{ikt-1}^{Neighbors}}_{5\ Neighbor\ Reputation}$	0.012*** (0.000)			0.011*** (0.000)	0.009*** (0.000)
$\underbrace{Refusals_{ikt-2}^{Neighbors}}_{5\ Neighbor\ Reputation}$					0.006** (0.032)
$\underbrace{Refusals_{ikt-3}^{Neighbors}}_{5\ Neighbor\ Reputation}$					-0.002 (0.410)
$\underbrace{Refusals_{ikt-1}^{Neighbors}}_{3\ Neighbor\ Reputation}$		0.014***			

		(0.000)			
$\underbrace{Refusals_{ikt-1}^{Neighbors}}_{1\ Neighbor\ Reputation}$			0.006		
			(0.268)		
$Imports_{ikt-1}$	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\log(1+Tariff_{ikt})$	4.792***	4.904***	4.867***	4.296***	4.633***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
$\log(GDPPC_{it})$	-0.159	-0.171	-0.145	-0.139	-0.221
	(0.695)	(0.679)	(0.720)	(0.740)	(0.604)
R2	0.042	0.040	0.038	0.043	0.016
Observations	88458	88458	88458	38131	88458

*The dependent variable is $Refusals_{ikt}$ and estimation is by fixed effects negative binomial in all cases. All models include fixed effects by partner country, HS four-digit product, and year. Prob. values based on robust standard errors corrected for clustering by partner country are in parentheses. Statistical significance is indicated by * (10%), ** (5%), and *** (1%). R2 is calculated as the square of the correlation coefficient between actual and fitted values.*

Figures

Figure 1: Current vs. lagged import refusals.

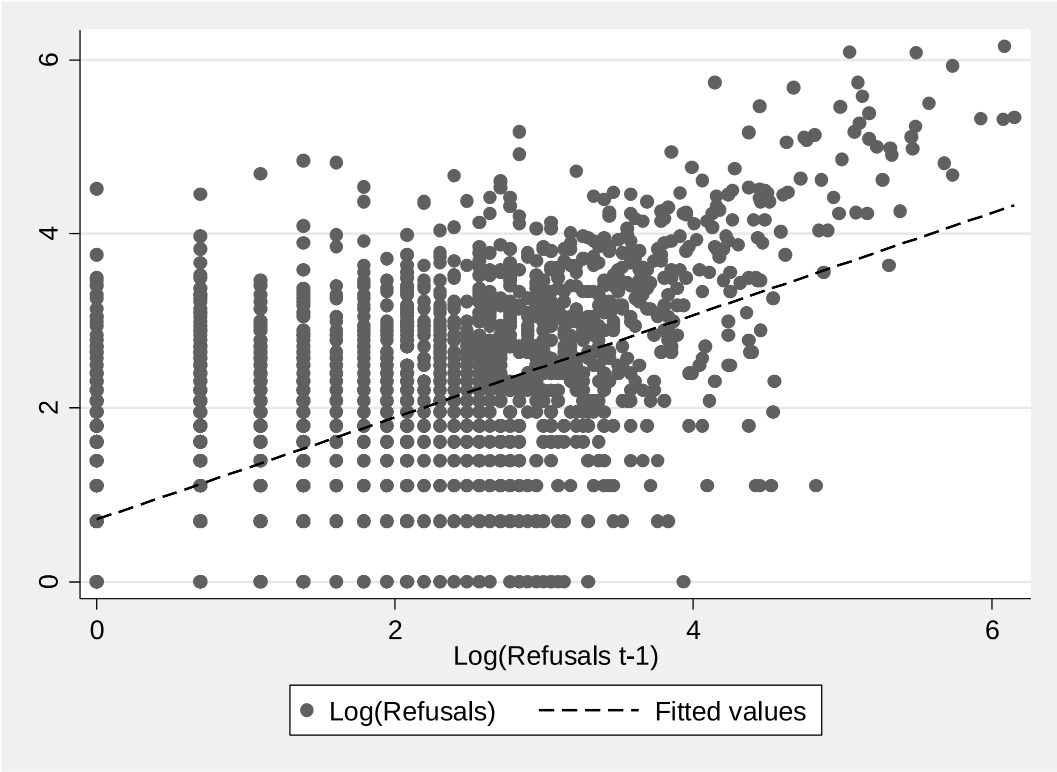

Figure 2: Refusals versus lagged refusals affecting similar products (same HS2 group).

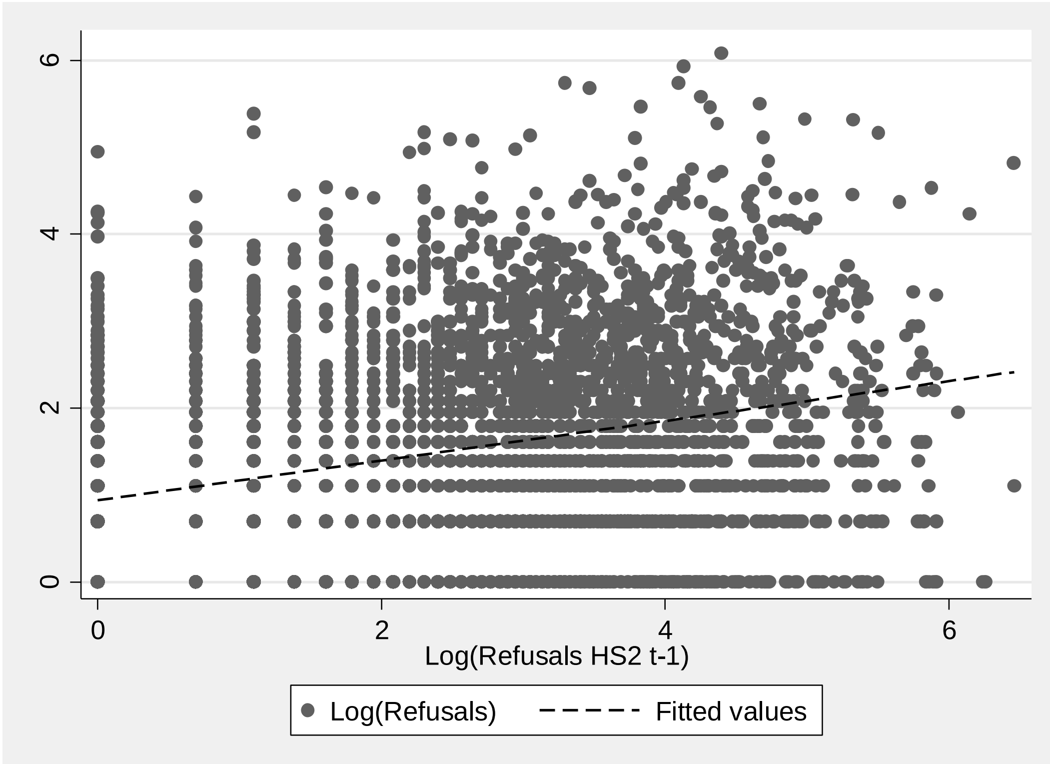

Figure 3: Refusals vs. lagged refusals affecting the five closest countries.