Market access & food standards insights from the implementation of US sanitary and phytosanitary regulation

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Market Access & Food Standards

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There it is, the moment that probably all PhD students are anxiously waiting for, the time to write acknowledgments. This is at such point that I realize that writing such piece is not as straightforward as it might seem. Some are very talented at this kind of exercise and always find the right words and metaphors. I don't believe I have this type of skills and thinking back about those years of study, I realize that there is no simple way of organizing this. Looking backwards, so many persons and events have contributed to the achievement of such special project that is a PhD thesis.

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General Introduction

The question of developing countries market access to developed market for agricultural and food products focused for a long time on efforts to reduce traditional barriers to trade, including tariffs and quantitative restrictions. The progressive liberalization of world trade through preferential schemes and successive rounds of General Agreement on Tariffs and Trade (GATT) negotiations and in particular under the Uruguay Round Agreement on Agriculture and the World Trade Organization (WTO), has created opportunities for developing countries to access developed country markets more easily for both traditional and non-traditional agricultural products. Moreover, high-income countries' consumers increasing demand for year-round access to fresh products and diversified diets provided strong grounds for the development of new market opportunities for developing countries. Yet, in conjunction with the surge of agricultural and food products imports from developing countries, the last two decades witnessed an enhanced awareness of food safety issues in developed countries. Non-tariff measures (NTMs) flourished with the aim, conceptually at least, to satisfy a certain level of quality and safety of agricultural products. Thus, as liberalization of tariffs and quantitative restrictions on trade in agriculture and food product had progressed, attention increasingly focused on the more nuanced and complex issue of non-tariff measures and standards in general and their potential impact on developing countries access to developed markets. Therefore, it has been soon acknowledged that tariffs, if part of the problem, were only the top of the iceberg and that other obstacles could prevent enhanced performance of many developing countries exports to developed countries markets, supporting the idea that more than single tariff reduction was necessary for developing countries to take advantage of market access opportunities.

The question of standards is not new. Discussions in the GATT about the necessity to clarify rules dealing with sanitary and phytosanitary measures arose as far as in 1974 and the baseline of the

SPS agreement had already been discussed in earlier commitments under the Tokyo Round Agreement on technical barriers to trade (TBT). But it is not until the Uruguay Round that an agreement on SPS measures was concluded. If the agreement provided a forum of discussion and negotiations around SPS measures, it was often expressed that developing countries lacked the resources to effectively exploit the opportunities provided by this agreement.

Thereby, even if the debate at the WTO still focuses very much on tariff peaks, tariff escalation, preference erosion, and subsidized agricultural production and exports from Organization for Economic Co-operation and Development (OECD) countries, the focus of the debate in "trade and development" for a translated from traditional trade policy tools impact on developing countries access to developed countries markets to the capacity of developing countries to sustainably take advantage of new market opportunities. The acknowledgement that many developing countries lack the necessary economic and institutional environment spurred the WTO Aid for Trade initiative under which technical assistance and capacity building became a key component of the Doha round of negotiations. Under this initiative, additional Official Development Assistance from bilateral, regional and multilateral donors is directed to the support of trade-related capacity building from beneficiary countries.

The effect of standards on the capacity for developing countries to access developed countries' markets agricultural and food products has become a vivid research theme that until now provided mixed results. The issue is also particularly complex since it not only concerns public and but also private regulations.

Great attention has been given by economist and policy makers to the identification, measurement and economic implications of NTMs from an importing or and exporting country perspective. Many papers highlight the potential or effective trade restriction impact of standards and SPS measures (e.g. Disdier, Fontagné and Mimouni 2007) whether because they provide grounds for imports bans or imply prohibitive compliance costs to suppliers therefore leading them to specialize away from sectors presenting heavier regulatory burdens (e.gEssaji, 2008). It is often argued that standards – increasingly dominate the world's food trading system and are mainly imposed by high-income countries – offset the gains from trade liberalization. Therefore, SPS measures are often identified as a major factor influencing the ability of developing countries to exploit export opportunities for agricultural and food products in developed country markets (Hanson and Loader, 2001). However, a growing set of literature highlights the complexity of the intricacies behind standards. A first set of papers shows that more nuanced should be given to the debate in particular when analyzing the effect of standards harmonization or when introducing consumers' preferences in the balance of gains and losses (e.g. Moenius, 2006; Munasib and Devesh, 2011). Other papers emphasize that medium to long term effects should be taken into consideration. It is undeniable that the growing set of public and private regulations exert increased pressure on developing countries' producers to transform their processes in order to be eligible to export. But in the medium run, they can also stimulate and enable competitiveness (e.g. Maertens and Swinnen, 2006 or Jaffee, Henson and Rios 2011).The question of which types of standards tend to promote which set of effects is therefore 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.

This PhD thesis contributes to this debate over standards as barriers or catalysts to trade and provides evidence of the impact of standards on developing countries' capacity to gain and sustain markets access in food produce. Because of the complex and very much heterogeneous nature of NTMs, various methodologies have been developed, from direct approaches using very specific database such as Otsuki, Wilson and Sewadeh (2001) to indirect measurement using approaches such as the "*Phi*-ness" of trade (Head and Ries, 2001, Baldwin et al., 2003, Head and Mayer, 2004, Chen and Novy, 2011). The analysis in this PhD adopts a direct approach to the measurement of food related standards using two unique data sets.

By disentangling productivity from quality sorting in horticultural exports, the first paper investigates the impact of food safety standards and consumers' preference for quality on developing countries' capacity to export high care and differentiated agricultural products (HCAs). Using a unique database on US import refusals from 1998 to 2008, the empirical analysis shows that a shock to reputation has a downgrading effect, reducing the capacity to participate and benefit from trade in HCAs. The occurrence of at least one refusal in the current year reduces HS 6-digit average unit export price by over 8% and the long-run propensity suggests a 25% cut.

Using an extended version of the previous dataset, the second paper shows that reputation is an important factor in the enforcement of sanitary and phytosanitary (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.

The third paper analyzes the ins and outs of U.S. phytosanitary regulation. Upon phytosanitary grounds, the U.S. Department of Agriculture applies a positive approach to foreign fresh fruits and vegetables (FF&V) access to the U.S. domestic market. Using a unique database gathering all FF&V market access to U.S. continental market from 1994 to 2006, the empirical analysis shows that the regulatory framework of phytosanitary regulation is captured by interest groups. Organized sectors are therefore more resilient to new foreign market access than non-organized sectors. Moreover, controlling for other factors, the analysis shows that lower-middle income and low income countries are respectively less likely to have access to U.S. domestic market and less likely to take advantage of open trade lines.

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Chapter I

Standards, Reputation and Trade: Evidence from US Horticultural Import Refusals

Abstract[1]

By disentangling productivity from quality sorting in horticultural exports, this paper investigates the impact of food safety standards and consumers' preference for quality on developing countries' capacity to export high care and differentiated agricultural products (HCAs). Using a unique database on US import refusals, the empirical analysis shows that a shock to reputation has a downgrading effect, reducing the capacity to participate and benefit from trade in HCAs. The occurrence of at least one refusal in the current year reduces HS 6-digit average unit export price by over 8% and the long-run propensity suggests a 25% cut.

JEL: F13 – O13 – Q17

Keywords: SPS – Standards – Agricultural Trade – Quality-sorting – Reputation

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1 Introduction

In the debate over trade liberalization and development, part of the discussions about developing countries' agricultural exports to developed countries markets switched from tariffs issues to the building of effective export capacities.

Since the 1980s, there has been an increasing interest in the promotion for the production of non-traditional agricultural exports[2] (NTAEs) in developing countries. On the one hand, governments and international development agencies advocate they would be a profitable alternative in the context of deteriorating international markets for traditional exports. On the other hand, the increasing demand for year-round access to horticultural products in developed countries provided strong grounds for supporting the development of such new market opportunities. Yet in conjunction with the surge of such high-value or differentiated agricultural and food products (hereafter HVAs) imports from developing countries, the last two decades have witnessed an enhanced awareness of food safety issues in developed countries. Non-tariff barriers flourished with the aim, conceptually at least, to satisfy a certain level of quality and safety of agricultural products. This growing set of public and private regulations exerted increased pressure on developing countries' producers to transform their processes in order to be eligible to export.[3]

The impact of SPS measures and private standards or codes of practices is still unclear. Their effects on the capacity for developing countries to access developed countries' markets for HVAs is a vivid research theme that until now provided mixed results. One of the central concerns is about the capacity for developing countries and in particular for their smallholders to develop and sustain exports in such context of increasingly stringent standards. Yet, while some advocates that food safety standards undeniably hamper exporting abilities (Otsuki, Wilson and Sewadeh, 2001), others present evidence that they can also stimulate and enable competitiveness (Jaffee, 2005; Maertens and Swinnen, 2009). While standards may be an impediment to trade and development for producers in developing countries, they could also serve as a "catalyst for realizing pro-poor export-led growth in

[2]In opposition to traditional agricultural export crops like coffee or bananas.

[3] We make use of both terms producer and firm and use them as identical terms.

developing countries" (Maertens and Swinnen, 2006) and present an opportunity for exporters to "decommodify".

Empirical evidence is still limited and this paper contributes to this debate. By disentangling the drivers of trade in horticultural products, it presents evidence supporting the two following statements: First, the demand for high-value agricultural products and in particular high care and differentiated agricultural products (hereafter HCAs) in developed countries and more recently in some emerging countries created an opportunity for exporters to exit crowded and less profitable commodity markets and to enter alternative systems of product valorization. This argument tends to support the view that standards can act as a catalyst. Second, this paper also provides evidence that low capacity to produce quality as well as shocks to reputation reduce the opportunity and benefice to trade in HCAs.

One crucial aspect of the paper is to provide grounds for the fact that agricultural products are becoming much like industrial products in the way that consumers are looking for quality, safety as well as differentiated products. In other words, agricultural and food markets evolve from productivity-based toward quality-based competition. As such, this paper is a contribution to the recent literature on the relationship between quality and trade. Its novelty lies in emphasizing a reputation effect on the capacity to export HCAs. This notion is discussed in the second section. In the third section I develop a new framework that endogenizes various quality parameters in a Melitz (2003) setting: it integrates heterogeneity in the capacity of exporting countries to produce quality and in consumers' preference for quality. Many studies analyze the effect of new SPS measures on predicted trade flows with an ex-ante approach (Otsuki Wilson and Sewadeh, 2001). Yet, too few studies adopt an ex-post analysis posture. They were at the time impossible because of the lack of comprehensive data on the implementation of SPS measures in world trade.[4] The last section of the

[4]Disdier, A-C, L. Fontagné and M. Mimouni (2007), were able to conduct a study on the effect of Non Tariff Measures (NTBs) relying on WTO members' notifications of SPS and Technical Barriers to Trade (TBTs). However, it has frequently been underlined that WTO members only have the obligation to notify changes to SPS measures since 1995. Thus WTO notifications are a good tool in order to consider changes in exporting countries SPS environment, but they cannot be used as a strict proxy for an actual barrier level. Also, studies pinpoint the high level of aggregation of such a database and above all the lack of information concerning many important bilateral restrictions.

paper fills this void. Using a new database on US import refusals, it provides evidence about the effect of a shock to reputation on average horticultural f.o.b. export price.

2 The notions of quality and reputation in horticultural trade

This section presents evidence about the importance of considering heterogeneity in quality when analyzing trade in horticulture in the one hand and on the reputation impact of exporting non-compliant horticultural products on the other. The analysis of US case stories supports the relevance of the use of import refusals data as a proxy for a reputation shock in the empirical analysis developed in the last section of this paper.

2.1 The notion of quality

Various foods scares and related events triggered the strengthening of public regulation in developed countries. But, in addressing consumers concerns on quality and food safety, the private sector also found a way to differentiate their products and to compete in quality-defined markets. Therefore, along with public regulation, the private sector developed codes of practices (US market) and certifications (EU market) that are usually far more burdensome. As a consequence, new institutional arrangements were necessary; food retailers reduced their reliance on brokers or terminal markets and increasingly sourced directly from producers. This gave producers the opportunity to enter different systems of product valorization. If trade in fruits and vegetables is usually referred to as trade in HVAs, yet “the implied dichotomy between low- and high-value markets presents an unduly simplistic picture of the market choices” (Jaffee, Henson and Rios, 2011). There is still much heterogeneity in requirement between and within importing countries along various distribution channels and market segments. In this line, Jaffee and Masakure (2005) emphasize this heterogeneity between and within EU countries according to consumers’ preferences but also to patterns of fresh product purchases and distribution. For example, high-end supermarket chains in the United Kingdom generally require high standards and food safety compliance – in particular when considering the growing importance of pre-packs and other high care products. But other horticultural segments in the country are governed by very different standards. Ethnic, food services and restaurant supply chains' predominant consideration remains price and continuity. As for the US, even though supermarket chains tend to follow the same path as EU retailers, the supply of horticulture products in bulk through brokers is still widely used (Hanson and Blandon, 2009).

Therefore, as stated in Jaffee, Henson and Rios (2011), this evolution provided exporters with a convenient mean to differentiate their product in otherwise crowded commodity markets. The reduction in transport costs due to new transportation technologies (Coyle, Hall and Ballenger 2001) and the subsequent increase in competition even more stimulated the development of new strategies among suppliers. The case of Kenyan horticulture exporters is a very famous example (Jaffee and Masakure, 2005). In the late 1980's, only 10% of the Kenyan French bean production was sold directly to supermarket chains in Europe. The rest was sold in bulk through wholesale markets or distributors. With the increase in competition in the European market because of the diversification of supplying origins and the subsequent downward pressure on wholesale prices, sales of loose products became marginally profitable. This prompts the pursuit of product innovation and quality as an adaptation to new market conditions. During the 1990's, even though export quantities did not increase much, export value grew along with the proportion of products directly exported to supermarkets. According to Jaffee and Masakure (2005), this shift of strategy toward value-added processing and packaging allowed for a three-fold increase of Kenya's export value, from 1000 US$ per ton in the early 1990s to 3000 US$ per ton. Even though trade in bulk still represents an important component of Kenyan exports in order to cover their costs, this provides further evidence of the opportunities offered by consumers' increasing demand for HCAs and their willingness to pay a premium. According to Jaffee and Hanson (2004), "rising private sector and public standards have posed challenges to the Kenyan fresh produce industry, yet at the same time they have also thrown a 'life line' to the industry". Peru is another well-known example, often cited as a "Standard Success Story". Even though the country benefits from favorable conditions for the production of winter vegetables for north hemisphere high-income countries, prohibitive transport costs prevented any price competition with other suppliers. Thus they adopted a high-quality strategy and implemented national standards in line with international norms that not only allowed them to become competitive in such markets but also generated increased "client loyalty" (Jaffee and Henson 2004). Indeed, such strategy reduced the risk of trade disruptions due to erratic and irregular quality.

Those arguments, used as baseline justification of the analysis developed in this paper, support the hypotheses that not only preference for quality but also reputation are determinants of the pattern of horticultural exports. To highlight this, I firstly assume that horticultural products can be defined according to two levels of quality, roughly relying on this differentiation between bulk/commodity exports – for which a buyer/consumer's prime concern is set on price – and HCAs – for which a buyer's prime concern is set on safety, reliability and value-added attributes. Secondly, I introduce a reputation parameter – defined in the following section – that impacts the importers' valuation of the quality of the exporting country's whole sector, whether firms export in bulk or HCAs.

2.2 The notion of reputation

The enhanced awareness of food safety issues changed the relationship between exporters and importers. Studies on food scares and crises clearly highlighted the spillovers of such events on the whole sector. For example, Jaud, Cadot and Suwa-Eisenmann (2010) link food scares and supplier concentration in the EU market. Using a new database quite similar in structure to the one used in this paper for the US, they show that EU agro-food imports are vulnerable to food safety alerts and that they are more concentrated on a few suppliers for "risky products".

Many case studies stress the impact of non-compliance of few products shipments on the overall export sector. In Peru, cooperation between the public and private sector was spurred on by a food safety outbreak that occurred in Spain in 1997 and traced back to Peruvian canned asparagus. According to Jaffee and Hanson (2004), European consumers were left with unfavorable impression causing Peruvian asparagus sales to slump. An even closer example was the E-coli outbreak that occurred in Germany in spring 2011. German government claimed that cucumbers produced in a Spanish organic farm were the source of the outbreak. Even though this information was rapidly acknowledged to be erroneous, consumers' suspicion spreads to the whole Spanish fresh vegetables sector, which suffered tremendous losses in a few weeks.

It would be expected that trade in HCAs would reduce the risks of trade disruption due to quality, food safety or disease issues. However, case stories support the assumption that the effect of a crisis might not be firm specific but rather that there are spillovers effects to the whole sector. Therefore, it is assumed that consumers' perception of a product quality relates to food scares history between two trading countries. The definition of reputation used in this paper draws from Tirole (1996) who defines collective reputation as an aggregate of individual reputations. Thereby, consumers use past behaviors of groups' members to predict the individual future behavior. As such, reputation is assumed to impact export value in various ways. First, there is path dependency between the potential histories of food safety crises associated to one country's exports. Second, even though one firm produces compliant products, it is the collective reputation of the sector that influences consumers' rating of the product.

2.3 FDA inspections, import refusals and reputation.

Usually, the US Food and Drug Administration (FDA) inspects 1% of food import shipments at the port of entry (Buzby, Unnevehr and Roberts, 2008). But if a product or an exporter (country or firm) repeatedly violates US regulations or poses risks in terms of SPS issues, the FDA raises the level of surveillance, creating an "alert" and implementing an "Automatic Detention" (AD) or a "Detention Without Physical Evidence" (DWPE) system. Thereby, the surveillance of products is increased by compulsory detention and the burden of proof that the shipment is compliant is transferred to the exporter. This system of AD and DWPE has first been implemented in the late 1980s. This period witnessed simultaneously an increase in imports of horticultural products in the US market and rising food safety concerns on the part of US consumers and authorities. Thus, aside from detentions due to different pest outbreaks, the increasing attentiveness to food safety and in particular to pesticide residues led to the implementation of AD and alerts for various countries and products for which many violations had been observed.

The occurrence of an alert creates delays and new risks for the importer distribution chain. Under DWPE, exporters that are able to send products complying with the US legislation five times in a row (re)gain access without automatic detention. Still, they continue to be submitted to a higher level of potential controls. This sequence of controls illustrates the importance of earnestness in order to ensure a continuous capacity to export over time. As Baylis, Martens and Nogueira (2009) point out, the limited resources of the FDA lead inspections to be path dependent, by continuously focusing on products and/or producers that encountered problems in the past. Along this line, Buzby, Unnevehr and Roberts (2008) confirmed the existence a strong correlation between refusals and FDA alerts. FDA inspections, and as a consequence refusals, are clearly biased against exporters or countries holding a record of non-compliant food exports.

In order to test the effect of a shock to reputation, this paper makes use of a new dataset built upon information on FDA import refusals. Our hypothesis is that the existence of an import alert due to a history of non-compliance of products from a given country has a bad reputation effect on every exporter of this specific product from that country. Remarkably, customs authorities do not recognize private certifications, thus the probability for one exporter to be detained by customs authorities – all other things equal – is the same whether the firm exports HCAs or not. This higher probability for shipments to be controlled and detained has an impact on the reliability of exporters and thus on their reputation. The following case studies provide further evidence supporting the relevance of the use of import refusals data as a proxy for reputation shock in the empirical analysis.

2.4 Evidence from Guatemalan exports to the US.

Different case studies in Central America and the Caribbean's have emphasized the effects of such path dependency on trade flows and the risk of market disruption. Guatemalan snow peas exports are a famous example. The introduction of NTAEs in Guatemala brought new production technologies and new demands of aesthetic and grade qualities that necessitated in such tropical climates an intensive use of chemical inputs. At first, these aesthetic requirements, as a "search" attribute of quality, did not present specific information asymmetry issues. Guatemala rapidly became first provider to the US, but from the end of the 1980s, the massive use of pesticides resulted in frequent shipment detention and refusals. As a result, the FDA issued in 1992 a countrywide alert for pesticide residues on Guatemalan imports. Guatemala didn't endure the same market disruption as the Dominican Republic, confronted to the same issue, and through time managed to stay among top exporters. Nonetheless, recurrent refusals and the inability to properly address this concern have been highly detrimental to the country's relative competitive position. First, exporters suffered immediate losses: as reported by Thrupp (1995), in the early 1990s, 27.3 % of NTAEs shipments sampled from Guatemala were detained. Between 1990 and 1994, the detentions of 3,081 Guatemalan's shipments due to pesticide residues resulted in a loss of a total of US$17,686,000. But producers also suffered longer-term consequences. Guatemala is still today under countrywide alerts with DWPE. While it managed to recover its leading place as snow peas exporters to the US in quantity, all these issues have decreased Guatemalan reputation and competitiveness in the US market compared to its two rivals, Mexico and more recently Peru. Between 2000 and 2006, average export unit price ranked from 0.50 US$/kg to 0.70 US$/kg for Guatemala, compared an average export unit price of 1.20$/kg to 1.90$/kg for Mexico and Peru.[5] Producers in both latter countries sell their production directly to the food distribution chain whereas 80% of Guatemalan snow peas are sold through brokers for half price (Hanson and Blandon, 2007). Quite surprisingly, a survey (Julian, 2003) among US snow pea's market stakeholders emphasized that Guatemalan smallholder production, compared to large estate production in Mexico or in California, was much better matched with US consumers demand. But the same survey also highlighted that because of the risks associated with automatic detentions, some US importers were no longer directly importing snow peas from Guatemala but rather buying them to brokers, once snow peas had cleared customs.

In Guatemala, major shippers managed to get off automatic detention. Yet recurrent import refusals from small and/or inexperienced exports, in particular during prices spikes, continue to fuel Guatemalan bad reputation. One last surprising consequence was export diversion by some of the most efficient exporters in Guatemala toward the European Union market. They felt the European

[5]NBER trade database, Authors' own calculation.

market was more secure, transparent (one GlobalGAP certification rather than multiple retailer specific codes of practices) and that it better valued their production[6].

In the following, the identification of the determinants of average horticultural export prices highlights the mechanisms behind this reputation effect.

3 Quality and reputation matters: theoretical framework

New trade models of firm heterogeneity confirm the importance of differences in producers' productivities. Across-firm productivity levels explain a significant proportion of the variance of trade flows. The Melitz (2003) model and its extension by Helpman, Melitz and Rubinstein (2008) and Chaney (2008) is now widely accepted. The model introduces fixed and variable export costs in a framework of asymmetric countries and firm heterogeneity with Pareto-distributed firm productivity. The cut-off condition on the incentive to export defines a productivity threshold above which producers should be able to export to distant markets. In this framework, f.o.b.[7] export prices are inversely related to distance and to the difficulty to enter one's market, generally revealed by fixed costs of entry.

However, Schott (2004) highlighted the inconsistency of new trade theory models and their expected inverse relationship between price and producer productivity. His study of US imports presents a strong relationship between GDP per capita and average export unit value within products at the HS10 level. Hummels and Klenow (2005) confirm this prediction and show that richer countries export more units at higher prices to a given market. These results are consistent with the observation that higher income countries produce goods of higher quality. Both papers underline the importance of other exporting country characteristics and correlate increase in unit value with the exporter's relative endowment of physical and human capital. Focusing on the demand side, Hallak (2006) finds that richer countries tend to benefit from higher demand for imports from countries producing high-quality goods. In order to explain these observations, studies following the Melitz (2003) benchmark model offer specific deviations and include a quality factor of trade. Johnson

[6]Author's own exporter survey in Guatemalan; November December 2009.

[7] Free on Board

(2009), Baldwin and Harrigan (2009) and Crozet, Head and Mayer (2009) test a quality-sorting hypothesis on various sectors and confirm the inconsistency of price behavior with the benchmark models. These papers theoretically and empirically demonstrate the importance of taking quality into consideration when explaining bilateral trade flows in specific sectors, although most of them did not provide clear-cut disentangled impacts between quality-sorting on the one hand and productivity-sorting on the other.

It is usually assumed that agricultural trade, presented as commodity trade, tends to follow productivity sorting patterns (Johnson, 2009). In other words, we should observe an inverse relationship between mill price and distance between trade partners. My hypothesis in this paper is that it is not necessarily the case when it comes to horticultural products. One of the core contentions of this paper is to demonstrate that usual productivity-sorting model is not solely sufficient to explain average unit export prices in horticulture. Thereby, it proposes and tests an in-between model combining productivity and quality-sorting, better suited to capture the duality in the determinants of horticultural exports.

This next section develops this in-between solution compared to the usual literature and introduces both features of productivity and quality-sorting in a model based on firm heterogeneity with Pareto-distributed firms' productivity. This section of the paper follows the Melitz (2003) framework augmented by Eaton, Kortum and Kramarz (forthcoming), Baldwin and Harrigan (2009), Johnson (2009), and Crozet, Head and Mayer (2009). Within a constant elasticity of substitution (CES) framework I adopt a similar method adding a quality parameter that allows for consumers to maximize their utility according to a quality-adjusted price. As aforementioned, it is considered in this paper that horticultural products can broadly be grouped into two categories: commodity products and HCAs. Thus, innovation of this paper lies in a first step in the introduction of two key features. First, in a productivity-sorting setting, it allows for a quality differentiation by the most productive firms. Second, consumers from different countries have heterogeneous preferences for quality.

3.1 Productivity vs. quality sorting models

Most quality-adjusted models switch from a productivity-sorting to a quality-sorting setting by hypothesizing that producing quality is costly. Heterogeneity in productivity is therefore replaced by heterogeneity in quality. Thus, one of the difficulties raised by quality-sorting models is to define a relationship between firm's productivity and quality without loosing the possibility of comparison with the original Melitz (2003) productivity-sorting model. These models relate quality and productivity through a power function of the type

$$q = c^{\theta} \tag{1}$$

with$q$ the quality parameter, c firms' factor requirement and $\theta \geq 1$. Kugler and Verhoogen (2008) studying unit values of inputs of Colombian manufacturing plants provide direct empirical support for such a relationship between quality and cost showing that higher cost inputs are associated with higher quality outputs. The general setting then usually defines a quality-adjusted price $\tilde{p} = {}^{p}/_{q}$ and a quality adjusted demand $\tilde{x} = xq$. With this, the difficulty lies in the definition of the power parameterθ . The model developed in this section does not depart from these hypotheses. I innovate by endogenizing the power parameter, making this relationship idiosyncratic to the dyadic relationship between the exporting and importing country.

The consequence of defining quality as in equation (1) is that, depending on the value of the power parameter, all exporting firms are assumed to export under either productivity-sorting or quality-sorting. Baldwin and Harrigan (2009) define this power parameter as the elasticity connecting quality and factor requirements. Thus, setting $\theta = 0$ reduces the model to the standard Melitz (2003) productivity-sorting model. If $0 < \theta < 1$, the quality-adjusted price increases with costs and thus with unit price, rendering undesirable for producers to resort to a quality strategy. Within this range ofθ , productivity-sorting is more relevant in explaining trade flows export prices. It is only when $\theta > 1$ that the quality-adjusted price negatively relate to unit price. In other words, the more factor requirement is needed to produce one unit of product, the higher the quality and the lower the quality-adjusted price. The relationship hence integrates consumers' quality-adjusted demand: based on a firm's factor requirement, consumers regard some varieties as superior to others in terms of quality if and only if $\theta > 1$. Thus, quality-sorting models fully reverse the relationship between variable costs and price: the more difficult the access to one country's market, the higher both quality and average export prices are. Therefore, firms are sorted according to quality with the higher firm's factor requirement representing the higher quality. As in Baldwin and Harrigan (2009), in quality-sorting settings, firm heterogeneity is thus Pareto-distributed over factor requirements instead of productivity.

Johnson (2009) builds a framework allowing for close identification of the sign of the correlation between quality-adjusted price and observed unit price among various sectors. He systematically detects if the dynamic of these exporting sectors either matches with a productivity-sorting or a quality-sorting setting. Borrowing from John Sutton's terminology, he proposes to link firms' factor requirements to their "capability" defined by the ratio of quality to costs. This "capability" can be compared to a quality-adjusted factor requirement and firms' heterogeneity does not rely on their factor requirement anymore, but on their capacity to transform variable costs into quality. Thus firm's quality is a constant elasticity function of their capability. His methodology makes it possible to identify empirically if the power parameter governing the relationship between quality and capability is $\theta > 1$ or $\theta < 1$, indicating if exports are following productivity or quality-sorting. His results are of tremendous interest for various reasons: he builds and tests a theoretical framework that clearly supports the rejection of the homogeneous quality formulation of the standard heterogeneous firms' models but also he clearly states the existence of both productivity and quality-sorting throughout the various sectors he is studying. Unfortunately, his results are not of any support concerning the agricultural sector since Johnson (2009) discarded non-manufacturing trade of his sample "on the ground that monopolistic competition models ought to be best suited to understand trade in differentiated manufactures".

Even though this complete inversion of the relationship fits much better with average observed export prices in many sectors, I argue that it still does not allow for considering the full reality of sectors such as the horticultural export sector. In the model I suggest an in-between solution that would better fit the horticultural sector and would allow highlighting the effect of a bad reputation on export prices. Instead of a continuous relationship between quality and productivity, I consider the existence of one single homogenous level of quality. Horticultural products can be differentiated according to the type of market chain through which they enter the importing country. Thus, in order to make the model description more straightforward, I refer from now on to productivity and quality products. Productivity products relate to commodities, sold for example to intermediaries or more specifically to brokers in the US. Quality products relate to HCAs products, directly imported by retailers. To put it differently, the firm has an opportunity to differentiate its products in HCAs and HCAs are homogenous in quality.

As usual in the literature, I assume quality products to be costlier and that the cost of producing quality is a power function of a firm's factor requirement. The model introduces a quality threshold, idiosyncratic to the dyad, defined over the lower productivity level necessary to profitably export quality products. In other words, it is the level of productivity at which it becomes profitable for one exporter to export quality products to one country according to its consumers' preference for quality. I also endogenize the power parameter relating quality to productivity θ_i, defined over $[0, +\infty[$, and make it specific to the exporting country. This parameter characterizes the capacity $1/\theta_i$ of the exporting country to produce quality. As a consequence, the level of productivity necessary profitably produce quality depends on this capacity: it is be much easier to produce horticultural product fulfilling basic quality requirements in France than in Guatemala. Also, the endogenization of the preference for quality parameter to the importing country enables products from the same sector within the same exporting country to be exported under various regimes according to the country of destination. Accordingly, I expect more quality products to be exported to high-income countries when productivity products better fit exports toward developing countries.

I define c the physical factor requirement necessary to produce one unit of productivity product and c_q the physical factor requirement necessary to produce one unit of quality product so that:

$$c_q = c^{(1+\theta_i)} \tag{2}$$

Firms are heterogeneous in their level of productivity that then defines, according to the targeted market, if it is profitable to export either productivity or quality products. I assume here that each firm with a level of productivity higher than the quality threshold automatically switches to quality products.

3.2 The setting: disentangling productivity and quality sorting

3.2.1 The consumer's problem

I consider a world of *C* countries indexed by *i*, varying in size and location, in which consumers maximize a CES utility across a continuum of varieties over the set *V* available in country *i*.

I assume consumers/buyers are able to recognize "quality" from "productivity" products. Heterogeneity among consumers of various countries relies on the intensity of their preference for quality q_i. Like in Eaton, Kortum and Kramarz (2008), I introduce the term α_i representing an endogenous shock to the quality parameter in country *i*. This shock has a downgrading effect on the quality parameter, in other words it represents the effect of a bad reputation on consumers' valuation of quality. For productivity products, the quality term becomes $\alpha_i q_i = 1$. The consumer maximizes utility according to a quality-adjusted demand $\tilde{x}_i(v) = \alpha_i q_i x_i(v)$, such that:

$$U_i = \left[\int_{v \in V_i} [\tilde{x}_i(v)]^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{3}$$

The parameter σ is the elasticity of substitution across products and as usual, it is the same across countries.[8] Given the budget constraint of country *i*where the income Y_i equals to expenditure $Y_i = w_i L_i$, with L_i, the consumers' supply of labor to firms and w_i their wage, the quality-adjusted demand for the variety *v* becomes:

$$\tilde{x}_i(v) = \tilde{p}_i(v)^{-\sigma} \tilde{P}_i^{\sigma-1} Y_i \tag{4}$$

[8]Melitz and Ottaviano (2008) relaxed this hypothesis by developing a model in which each firm faces a linear demand. This model allows for mark-up variations across firms and destination markets. Their conclusions will be discussed further in this paper.

where $\tilde{p}_i(v) = \frac{p_i(v)}{\alpha_i q_i}$ is the quality-adjusted price and $\tilde{P}_i = \left(\int_{v \in V_i} [\tilde{p}_i(v)]^{1-\sigma} dv\right)^{\frac{1}{1-\sigma}}$ the quality-adjusted price index. This allows defining a physical demand[9] quite similar to Johnson (2009) with:

$$x_i(v) = [\alpha_i q_i]^{\sigma-1} p_i(v)^{-\sigma} \tilde{P}_i^{\sigma-1} Y_i \tag{5}$$

3.2.2 The producer's problem

As usual in the literature, a Dixit-Stiglitz framework of monopolistic competition characterizes the supply-side of the model so that a single firm produces each variety and there is free entry into the industry. Firms are heterogeneous in their productivity in the sense that marginal cost varies across firms. Firms from *i* incur fixed costs f_{ij} of selling to market *j*. Firms' productivity is Pareto distributed, with the distribution function $g(\varphi)$ over $(\varphi_0, +\infty)$ and a continuous cumulative distribution $G(\varphi)$. Operating profits of a country *i*'s firm producing variety *v* and selling to *j* is classically expressed as:

$$\pi_{ij}(v) = \frac{R_{ij}(v)}{\sigma} - f_{ij} \tag{6}$$

Assuming a continuum of firms and a reasonable number of them allows for the disappearance of strategic interactions. Thus, when maximizing their profits, firms charge a mill price with a constant mark-up over marginal costs: $p_i(v) = \left[\sigma/(\sigma-1)\right] w_i c$. The country specific factor cost is w_i and $c = 1/\varphi$ is the firm's specific factor requirement, or the inverse of its productivity, needed to produce one unit of the variety *v*. If a firm from *i*seeks to sell its products to consumers in *j*, those consumers bear an additional transport cost τ_{ij} defined in a Samuelson's iceberg costs fashion. Therefore, consumers price becomes:

$$p_i(v) = \left[\sigma/(\sigma-1)\right] \tau_{ij} w_i c$$

[9] Usual productivity-sorting demand is expressed as: $x_i(v) = \frac{(p_i(v))^{-\sigma}}{P_i^{1-\sigma}} Y_i$

According to (2), the quality product mill price is $p_i(v) = \left[\sigma/(\sigma - 1)\right] w_i c^{(1+\theta_i)}$. Thus the capacity of a given firm to produce quality depends on the interaction of three parameters:

- The firm's productivity $\varphi = 1/c$: the higher a firm's productivity, the more likely it produces quality products.
- The country's capacity to produce quality $1/\theta_i$: the higher this capacity, the lower the additional costs of producing quality.
- The intensity of consumers' preference for quality q_i: the more one country's consumers find utility in consuming quality products, the more firms are prompt to switch to a quality strategy. The higher the shock on the quality parameter, the lower $\alpha_i q_i$.

Thus the quality threshold is reflected by the upper limit level of factor requirement $\bar{c}$ for which it is profitable to switch to a quality strategy. This threshold corresponds to the specific productivity level for which $p_i(v) = \tilde{p}_i(v)$ implying $\alpha_i q_i = \bar{c}^{\theta_i}$. This allows to define a quality-adjusted price such that:

$$\tilde{p}_i(v) = \left[\sigma/(\sigma - 1)\right] w_i \tilde{c} \tag{7}$$

where $\tilde{c} = \dfrac{c^{(1+\theta_i)}}{\bar{c}^{\theta_i}}$ represents the quality-adjusted factor requirement. It can be highlighted that $\tilde{c} > c$ if $c > \bar{c}$ and $\tilde{c} < c$ if $c < \bar{c}$. Every firm with a factor requirement $c \leq \bar{c}$ has a quality-adjusted price $\tilde{p}_i(v) < p_i(v)$ and thus finds an advantage in switching from productivity to quality products.

I consider that fixed cost is the same whether the firm decides to produce under quality or productivity strategy.[10] I assume that $f_{ii} = 0$. A firm exports to country *j* if and only if $\pi_{ij} \geq 0$ with firm's revenues from selling to country *j* such as: [11]

[10]Making fixed costs differ whether producing quality or productivity products complicatesunnecessarily the model without yielding more interesting results for the purpose of this paper.

[11]Productivity sorting firm's revenues are expressed as $R_{ij}(v) = \dfrac{(\tau_{ij} w_i c)^{1-\sigma}}{\left(\left(1 - \frac{1}{\sigma}\right) P_j\right)^{1-\sigma}} Y_j$

$$R_{ij}(v) = p_{ij}(v)x_j(v) = (\tau_{ij}p_i(v))^{1-\sigma}[\alpha_{ij}q_j]^{\sigma-1}P_j^{\sigma-1}Y_j \quad (8)$$

Thus, the condition for one firm of country $i$to export to country j is $\frac{R_{ij}(v)}{\sigma} \geq f_{ij}$, implying the following cut-off condition:

$$\varphi_{ij} = A\frac{\tau_{ij}w_i}{P_j}\left(\frac{f_{ij}}{Y_j}\right)^{\frac{1}{\sigma-1}} \quad \text{with}A\text{, a set of parameters} \quad (9)$$

The cut-off condition for a firm to export productivity products is the same as in the benchmark productivity-sorting model. If $c_{ij} > \bar{c}$ then $\tilde{c}_{ij} > c_{ij}$, at the cut-off, firms do not find any advantage in producing under a quality strategy. Under this condition, the existence of the quality strategy does not increase the number of firms able to export to j. Firms from $i$are only able to export to j if their productivity is at least $\varphi_{ij} = 1/c_{ij}$. A specificity of this model lies in the extreme case where all firms from i export under quality-sorting; that is where $c_{ij} < \bar{c}_{ij}$ and $\tilde{c}_{ij} < c_{ij}$. Therefore, around the cut-off, some firms that would not have been able to export to j under productivity-sorting are now able to export under quality-sorting. In other words, the possibility to switch to quality production can enable firms with a factor requirement c such that $\tilde{c}_{ij} < \tilde{c} < c_{ij} < c < \bar{c}_{ij}$ to export to j. For convenience, I focus on a benchmark case for which $c_{ij} > \bar{c}_{ij}$ implying that both productivity and quality products are exported. Other cases are extreme situations. In our benchmark situation – all other things equal – the number of exporting firms to one country are constant and only depend of the entry threshold. As a result of (8), $R_{ij} \neq 0$ if and only if $c \leq c_{ij}$. If $c_0 > c_{ij}$only a subset N_{ij}, hence representing N_{ij} varieties, of the N_i producing firms in country i are able to export to country j. The productivity of those N_{ij} exporting firms is defined over $[\varphi_{ij}, +\infty[$.

3.2.3 Expected average unit export f.o.b. price

Trade data only provide information on the average unit export f.o.b. price of products at the HS 6-digit level. Therefore I am looking for an expression of the expected unit export f.o.b price of all varieties exported by i to j.

According to the productivity-sorting setting, the expected unit export f.o.b price depends solely on the expected productivity level conditional on firms exporting to i.[12] Thus, under this setting, the expected unit export f.o.b. price of exports from i to j is given by:

$$E(p_{ij}|\pi_{ij} \geq 0) = \bar{p}_{ij} = \left(\frac{\sigma}{\sigma-1}\right)\frac{w_i}{E(\varphi|\pi_{ij} \geq 0)} \text{ with } \sigma > 1$$

This becomes:

$$E(p_{ij}|\pi_{ij} \geq 0) = \varepsilon \frac{P_j Y_j^{\frac{1}{\sigma-1}}}{\tau_{ij} f_{ij}^{\frac{1}{\sigma-1}}} \quad \text{with } \varepsilon \text{ a set of parameters} \qquad (10)$$

In the Productivity-Quality-Reputation (PRQ) setting, expected unit export f.o.b. price also depends on the proportion of firms exporting productivity or quality products to this market. Thus, the expected price conditional on exporting from i to j is defined as:

$$E(p_{ij}|\pi_{ij} \geq 0) = \left({}^{\sigma}/_{\sigma-1}\right) w_i V_{ij} \qquad \text{with } V_{ij} = (V_{ijp} + V_{ijq}) \quad (11)$$

As in Helpman, Melitz and Rubinstein (2008), V_{ijp} and V_{ijq} are two monotonic functions of the proportion of exporters respectively exporting under a productivity or quality strategy to country j, $G(c)$.

$$V_{ijp} = \begin{cases} \frac{1}{1-G(\bar{c}_{ij})} \int_{\bar{c}_{ij}}^{c_{ij}} c \, dG(c), & \text{for } c_{ij} > c > \bar{c}_{ij} \\ 0, & \text{Otherwise} \end{cases} \qquad (12)$$

As already mentioned, I do not consider extreme cases for which firms from one country only export productivity or quality products to a specific market, implying a different number of exporting firms to market j. Nevertheless, it is possible to identify that the benchmark situation lies between those two extremes, within a framework considering a constant number of exporting firms. The two extreme values of this benchmark situation for V_{ij} are: $V_{ijp,max}$ for which all firms with a factor requirement

[12] Productivity-sorting expected productivity is expressed as:

$$E(\varphi|\pi_{ij} \geq 0) = \frac{1}{1-G(\varphi_{ij})}\int_{\varphi_{ij}}^{+\infty} \varphi g(\varphi)\, d\varphi = \left(\frac{\kappa}{\kappa+1}\right)\varphi_{ij}$$ with κ the Pareto distribution parameter.

$c < c_{ij}$ export under productivity-sorting; and $V_{ijq,max}$ for which all firms export under quality-sorting.

$$V_{ijp,max} = \frac{1}{1 - G(c_{ij})}\int_0^{c_{ij}} c\ dG(c) = \frac{\kappa}{\kappa + 1}c_{ij}$$

and

$$V_{ijp,max} = \frac{1}{1 - G(c_{ij})}\int_0^{c_{ij}} c^{(\theta_i+1)} dG(c) = \frac{\kappa}{\theta_i + \kappa + 1}c_{ij}^{\theta+1}$$

with κ the Pareto distribution parameter.

According to our assumption, we have $V_{ijp,max} < V_{ij} < V_{ijq,max}$.

The assumption in this paper is that the proportion of firms producing quality products varies positively with the capacity of the exporting country and with the preference for quality of the importing country. On the contrary, it is negatively impacted by a shock to consumers' preference for quality. Thus, the level of the expected price is a function of the quality threshold $\bar{c} = (\alpha_{ij}q_i)^{1/\theta_i}$. According to (12), in the benchmark scenario, the value of V_{ij} is the following:

$$V_{ij} = (V_{ijp} + V_{ijq}) = \frac{1}{1 - G(c_{ij})}\int_{\bar{c}_{ij}}^{c_{ij}} c\ dG(c) + \frac{1}{1 - G(\bar{c}_{ij})}\int_0^{\bar{c}_{ij}} c^{(\theta_i+1)} dG(c)$$

Developing this equation gives us the following value of V_{ij}, defined over the productivity cut-off condition and the quality threshold:

$$V_{ij} = \frac{\kappa}{\kappa + 1}\frac{\left(c_{ij}^{\kappa+1} - \bar{c}^{\kappa+1}\right)}{c_{ij}^{\kappa}} + \frac{\kappa}{\theta_i + \kappa + 1}\bar{c}^{\theta_i+1} \tag{13}$$

Because of the second threshold, it is not possible to obtain an empirical procedure that allows estimating parameters' elasticities. Nevertheless, parameters influencing the average f.o.b price are clearly identified allowing us to derive a reduced form of the average price equation and to identify the signs of these parameters. In order to derive such reduced form, I define V_{ij}, the expected factor requirement of exporting firms as:

$$V_{ij} = h(c_{ij}, \bar{c}_{ij}) = h(c_{ij}, \theta_i, q_j, \alpha_{ij}) \tag{14}$$

4 Empirical procedure

4.1 Average unit export f.o.b prices in the productivity sorting setting

In order to verify the first hypotheses of this paper on heterogeneity in quality, I test the workhorse model based on Melitz (2003) and its application to average f.o.b. export prices of horticultural exports. According to (10), the empirical setting of the productivity-sorting model is set forth in equation (15) where expected f.o.b price of exports $\bar{p}_{ij}$ from *i* to *j* depends positively on export market size and negatively on fixed and variable costs.

The expected average price of exports from *i* to *j*, can now be expressed in log-linear form as:

$$\ln \bar{p}_{ij} = \ln \varepsilon + p_j + \left[{}^{1}\!/_{(\sigma-1)}\right] y_j + \left[{}^{1}\!/_{(\sigma-1)}\right] \ln f_{ij} - \ln \tau_{ij} \qquad (15)$$

where lowercase variables p_j and y_j represent the natural logarithms of respective uppercase variables. As in Helpman, Melitz and Rubinstein (2008) and Johnson (2009), I parameterize the bilateral fixed and variable costs as follows. I assume that τ_{ij} (variable trade costs) is stochastic due to i.i.d. un-measured trade friction $u_{1,ij}$ which is country-pair specific. As an analogy to their definition, I define $\tau_{ij} = D_{1,ij}^{\chi} e^{-u_{1ij}}$ where $D_{1,ij}$ represents bilateral symmetric distance between *i* and *j* with $u_{ij} \approx N(0, \sigma_u^2)$. Thus I have $\ln \tau_{ij} = \chi d_{1,ij} - u_{1,ij}$. Fixed trade costs, are classically set as $\ln f_{ij} = \phi_i + \phi_j + \rho D_{2,ij} + u_{2,ij}$. This data is defined in dyadic form by interacting indicators for the exporting and importing country. I assume that fixed trade costs rely on ϕ_i and ϕ_j, respectively the exporter and importer fixed effects. $D_{2,ij}$ is a set of overlapping data that I assume decrease the fixed cost of exporting from *i* to *j* (sharing a language; a frontier; a free trade agreement, etc.), and $u_{2,ij}$ stands for the unobserved variations in trade costs. In what follows, I simplify the number of variables through the linear combination $\eta_{ij} = u_{1,ij} + u_{2,ij}$ of unobserved variations in fixed and variable costs of trade that I assume to be normally distributed, with σ_η^2 the variance of the composite error. To be thorough, all variables of the model ought to be divided by the variance of this normal distribution. I do not compute this calculation in this paper; I focus on the signs of the left hand side. Substituting those parameters back into the log-linear expression (15) yields the following expression:

$$\ln\bar{p}_{ij} = \xi_0 + \xi_i + \xi_j - \chi d_{ij} + \rho D_{2,ij} + \eta_{ij} \tag{16}$$

$\xi_i = \left[1/(\sigma - 1)\right]\phi_i$ and $\xi_j = p_j + \left[1/(\sigma - 1)\right]y_j - \left[1/(\sigma - 1)\right]\phi_j$ are respectively exporter and importer fixed effects and $\xi_0 = \ln\varepsilon$ is the constant.

The following panel econometric test introduces a time dimension. Some variables, such as income, become time-dependent. Hence, some variables can be transformed as $\xi_j = p_j - \left[1/(\sigma - 1)\right]\phi_j$. The log-linearized expected average price equation becomes:

$$\ln\bar{p}_{ij} = \xi_0 + \xi_i + \xi_j + \left[1/(\sigma - 1)\right]y_{jt} - \chi d_{1,ij} + \rho D_{2,ij} + \eta_{ijt} \tag{17}$$

4.2 Average unit export f.o.b prices in the productivity-quality-reputation (PQR) setting

According to (12) I derive a reduced form of the average price equation. The cut-off condition c_{ij} is defined over the same parameters as in the benchmark model but the expected unit export price now also depends on the quality threshold. I have assumed that this threshold increases with the preference for quality of the importing country and with the capacity of the exporting country and decrease with a shock to the preference for quality, idiosyncratic to the dyad. This allows us to define the following estimation equation:

$$\ln\bar{p}_{ij} = \gamma_0 + \gamma_1 p_j + \gamma_2 y_j + \gamma_3 \ln f_{ij} + \gamma_4 \ln\tau_{ij} + f(\theta_i, q_j, \alpha_{ij}) \tag{18}$$

I define $\frac{1}{\theta_i} = Y_{pc,i}^{\beta_1} e^{\delta_{1,i}}$ and $q_j = Y_{pc,j}^{\beta_2} e^{\delta_{2,j}}$ where $Y_{pc,i}$ and $Y_{pc,j}$ represent respectively the exporting and importing country GDP per capita with the unobserved quality parameters represented by $\delta_1 \approx N\left(0, \sigma_{\delta_1}^2\right)$ and $\delta_2 \approx N\left(0, \sigma_{\delta_2}^2\right)$. Thus I have $\ln\frac{1}{\theta_i} = \beta_1 y_{pc,i} + \delta_{1,i}$ and $\ln q = \beta_2 y_{pc,j} + \delta_{2,j}$.

The shock to consumers' preference is defined as a function of the occurrence of custom refusals. Thus I define $\alpha_{ij} = S_{ij}^{\beta_3} e^{\delta_{3,ij}}$ with $\delta_3 \approx N\left(0, \sigma_{\delta_3}^2\right)$. Thus, $\ln\alpha_{ij} = \beta_3 s_{ij} + \delta_{3,ij}$. I expect β_1 and β_2 to be positive and β_3 to be negative. Substituting those parameters back into the log-linear expression of the expected export f.o.b. price yields the following expression:

$$\ln \overline{p}_{ijt} = \psi_0 + \psi_i + \psi_j + \beta_1 y_{pc,i} + \beta_2 y_{pc,j} + \beta_3 s_{ij} + \beta_4 d_{1,ij} + \beta_5 D_{2,ij} + \delta_{1,i} + \delta_{2,j} \quad (19)$$

With ψ_0 the constant and ψ_i and ψ_j respectively the exporter and importer fixed effects.

In what follows, I test reputation on panel data, introducing a time dimension. The average price equation with the introduction of time can be presented as the following:

$$\ln \overline{p}_{ijt} = \psi_0 + \psi_i + \psi_j + \beta_1 y_{pc,it} + \beta_2 y_{pc,jt} + \beta_3 s_{ijt} + \beta_4 d_{1,ij} + \beta_5 D_{2,ij} + \beta_6 y_{jt} + \delta_{1,it} + \delta_{2,} \quad (20)$$

Our dataset allows us to test for the effect of reputation on horticultural imports only in the US. In such a context, country fixed-effects are de facto dyadic given that all our exports are directed to the same country. In order to take care of this symmetry problem, I define a "Competitiveness" parameter C_{ij} in analogy with the "Attractiveness" parameter used by Crozet, Head, and Mayer (2009). This parameter collects all non time-dependent determinants of exports.

$$\ln C_{ij} = \psi_0 + \psi_i + \psi_j + \beta_4 d_{1,ij} + \beta_5 D_{2,ij} + \eta_{ij} \quad (21)$$

Replacing (21) in (20) yields the following estimation equation:

$$\ln \overline{p}_{ijt} = \ln C_{ij} + \beta_1 y_{pc,it} + \beta_2 y_{pc,jt} + \beta_3 s_{ijt} + \beta_6 y_{jt} + \delta_{1,it} + \delta_{2,jt} + \delta_{3,ijt} \quad (22)$$

In the econometric test, $\ln C_{ij}$ corresponds to an exporter fixed effect, since the importing country is invariant.

4.3 Accounting for the average export price of horticultural products

I use CEPII BACI[13] trade data at the HS 6-digit level from 1998 to 2007. It reconciles bilateral trade flows reported by exporter (f.o.b) and importer (c.i.f) in the UN-COMTRADE trade database. This dataset not only includes trade in quantity but also the equivalent trade value. With this, I compute the average unit f.o.b. price. This calculation and the comparison are made easier since I only consider horticultural trade, which is systematically reported in kilograms. The analysis of

[13] CEPII Centre d'études prospectives et d'informations internationales - BACI (Base pour l'Analyse du Commerce International) International Trade Database at the Product Level

average unit prices presents outliers corresponding to very small trade flows. As Baldwin and Harrigan (2009), I eliminate trade flows of less than 500kg to make sure results are not influenced by noisy and economically unimportant observations. BACI is the only database providing consistent unit-values at the world and product level, so it is particularly well suited to analyzing international trade prices (Gaulier and Zignago, 2009).[14]The dataset covers 10 years, 221 countries and 102 products including fresh, frozen and dried fruits and vegetables from HS Chapters 07 and 08.

The classic variables of distance and GDP were respectively retrieved from the CEPII database and from WDI's World Bank online website. GDP per capita, also gathered from WDI, are computed as a proxy for the exporting country's capacity to produce quality as well as the intensity of consumers' preference for quality in the importing country.

I use a new dataset compiled from FDA data on import refusals to simulate a shock α_{ij} to the valuation of quality parameter on the US market. The FDA makes refusals information public in their Import Refusal Report (IRR). To gain access to historical refusals data, a Freedom of Information request has been submitted in September 2009, which the FDA satisfied by supplying data in May 2010. The FDA uses its own product codification. Thus, a correspondence mapping FDA codes to the Harmonized System at the 6-digit level was built so as to relate import refusals to reported trade flows and unit prices. Since this dataset only covers trade with the US, the effect of this shock is tested on a panel covering 11 years, 102 products and 141 exporting countries to the US.

4.3.1 Productivity sorting

I first test the productivity-sorting model using equation (17). The average unit export f.o.b price doesn't verify the productivity-sorting assumption. While a negative relationship is expected in a productivity-sorting framework, estimation results presented in table 1 display a positive relationship between average unit f.o.b export prices and distance. Since distance is positively related to average unit price, it is not surprising that sharing a frontier has a negative impact. Sharing a

[14]As in Baldwin and Harrigan (2009), I remove traded quantities inferior to 500 kg. Analysis of the data provides evidence that low trade levels usually present very high unit prices. These values are expected to bias considerably our results. The test gathers observed positive trade values since I am only interested in unit prices.

common language is also negatively, although not significantly, related to average unit prices, but having a history of colonial ties has a positive impact on prices. This supports the rejection of the hypothesis of homogenous quality among firms within the horticultural sector. Thus a comprehensive heterogeneous firm trade model applied to the horticultural sector should also include space for a heterogeneous quality setting. Those results support the assumption that horticultural products are much like industrial products when it comes to sorting out.

4.3.2 Evidence on the importance of quality

I first test the empirical setting (20) on the same database used in the previous productivity-sorting test. Comprehensive data on reputation are only available for US imports but it is still possible to test for the quality and capacity parameters in a multiple importer setting before turning to the more restricted database. As already mentioned, this setting is a reduced form thus I focus my attention on coefficient variations and signs rather than on their size.

As expected, both GDPs per capita are positively related to average export f.o.b. unit prices as well as distance (table 2). More surprising is the negative coefficient for importer GDP. Melitz and Ottaviano (2008) as well as Baldwin and Harrigan (2009) have already highlighted such results. The former highlight that the size of the market – for which GDP is used as a proxy – affects the toughness of competition to which firms respond through a variation in their mark-ups. This implies that aggregate productivity and average mark-ups respond to the size of the market and that mark-ups are decreasing in the number of competitors and with the export threshold of the market of destination. Baldwin and Harrigan (2009) give one other explanation within their "Quality Heterogeneity Firms and Trade" model. They consider that as export market size increases, more low quality firms find it profitable to enter. Those low quality firms (here firms producing productivity products) have a lower mill price. As a consequence, average export f.o.b. price in larger markets are lower. Both assumptions may well explain those results.

These observations and the results obtained are comforting regarding the ability of the model to disentangle the effect of quality and productivity on observed average export prices. On the one hand, I observe the effect of market size that tends to decrease the average export price either through more competition or on the contrary allowing for lower quality products to enter the market. On the other, high-income markets have a high preference for quality, enabling exporting firms to profitably switch to quality products. Also, results confirm the importance of producer's capacity to produce quality on the mix or proportion of productivity and quality products.

4.3.3 Reputation impact: evidence from the US

In a second step, I test the reputation effect on the US average import price. One might suspect that import refusals are related to GDP per capita. A simple correlation highlights the very little relation between those two variables. This confirms the relevance of refusals as a good proxy for shocks on the quality valuation parameter.

I first create a dummy variable equal to one if there has been at least one refusal for each exporter/product/year. Refusals counts are endogenous to import levels. If every country has the same probability of having one shipment refused, larger trade flows would result in a higher number of refusals. Thus a direct use of refusals count is not likely to capture the expected reputation effect. It would inform us on the impact of the addition of one refusal on average export price rather than the impact of the existence of refusals. Moreover, controlling for imports in the regression is problematic since they are highly correlated with other variables used in this specification (e.g. GDP and GDP per capita). Still, using dummy variable risks to overweight marginal refusals. Thus, refusals count are used later on in robustness checks.

As expected, average f.o.b unit prices are positively related with exporters' GDP per capita and negatively related to the existence of at least one refusal (table 3). All other things equal, the occurrence of at least one refusal in the current year reduces average unit export price by 8.26%. This confirms the hypothesis on the effect of a shock to the quality parameter – in other words to reputation – on the capacity to export quality. Moreover, I observe that the introduction of this parameter slightly increases in magnitude the coefficient on exporter's GDP per capita on unit prices, further highlighting the impact of exporter's capacity to produce quality on average unit export price.

One could expect refusals to have a lagged influence on prices. I test the same equation using one to five years lagged refusal dummies.[15] Lagging refusals also suppresses the co-temporality of the data and possible endogeneity issues. Observed coefficients are increasing with the length of the lag. This suggests a long-term effect of refusals that echoes the importance of the earnestness highlighted in this paper. Our database covers 10 years. Making further lags implies reducing the panel data to four or less years resulting in too few observations for results to be reliable. However, tests show that from 5 years lags, the effect of the occurrence of refusals seems to become less significant. To confirm this, a finite distributed lag model of order five is implemented. The results present a negative sign for all lags with two years and three years lags that are one percent statistically significant. The estimated long-run propensity is equal to -0.3, corresponding to a reduction by over 25% of the average unit export price given the occurrence of at least one refusal each and every year for the past five years. Using the simple rearrangement as suggested in Wooldridge (2003), the long-run propensity is found to be one percent statistically significant with a standard error for which the *t* statistic is about -3.96.

We go further into this intuition with a new set of variables based on the history of occurrence of refusals. The first variable is built as the count of years with an occurrence of at least one refusal over the five years prior to the observation. In a second stage I build another set of dummies each representing the five possible values of the latter variable. For example, an observation in 2006, if there was an occurrence of at least one refusal for this specific country/product both in 2003 and 2005, the dummy "two year with refusals>0 the past five years" would be set equal to one. Other variables such as "four year with refusals>0 the past five years" would be equal to zero. Table 4 presents the results of the econometric specification using those variables as proxies for the reputation effect. Results clearly highlight the impact of recurrent refusals: the longer the history of refusals, the more downgrading impact on average export prices.

In order to verify the reliability of the use of a refusal dummy, I test the empirical setting using the log of the refusal count, replacing zeros in refusals by 0.001. Second, as aforementioned, one

[15] Agricultural products are characterized by their seasonality, thus by a discontinuous time: one year represents one period during which a reputation shock can occur.

could question the causality between the number of refusals and export quantities. The same empirical setting is tested using an import-weighted count of refusals. This last setting has to be taken with caution because of previously mentioned caveats. Both results, presented in table 5, confirm the results obtained with the refusal dummy. Finally, the same setting was also tested using a probit. The indicator variable T_{ijt} is defined equal to one if the observed average price of a specific product exported from *i*to *j*, $\bar{p}_{ijt}$, is lower than the average export price of all exporters of this product to *j*, $Pr(T_{ijt} = 1|\bar{p}_{ijt} < \bar{p}_{jt})$. Results are consistent with the OLS.

These results confirm the intuition of the importance of quality as well as shocks to reputation in the analysis of horticultural trade flows.

5 Conclusion

Following previous work on the role of productivity in explaining how producers of industrial goods react to exposure to international trade, this paper provides evidence that heterogeneous quality is also a determinant of the capacity to export horticultural products. The paper goes a step further by showing that preference for quality provides a way to create the conditions for increased and more profitable market access. Accordingly, a negative reputation shock conveys a downgrading effect, reducing the ability for countries to export quality products. Exporting a mix of compliant and non-compliant products can reduce the opportunity and benefice to trade in HCAs. Analyzing the effect over time, this paper highlights the importance of the exporters' earnestness.

On a policy-oriented level, those results give further credential and support to the current aid for trade agenda in agriculture. Particularly, the agenda calls for innovative initiatives to better inform and support producers in complying with standards so as to more easily differentiate production toward HCAs. In some areas of Madagascar as well as in countries of Central America, the strong involvement of the private sector in securing safe and stable supply of horticultural products has been decisive in the development of the sector and allowed for a sensible improvement of producers' conditions.[16]

[16]Bart, M., L. Randrianarisonand J.F.M. Swinnen, (2006)

This paper also highlights the importance of the implementation of public/private partnerships in particular in the setting and harmonization of domestic and international standards. Such initiatives already proved to be successful in various countries. In Guatemala, the Guatemalan Exporters Association in cooperation with various domestic and international public institutions greatly facilitated both the development and the sustainability of Guatemalan's high-quality exports through capacity building, knowledge transfer and international visibility of the sector. In Peru, the food safety outbreak on asparagus underlined that one careless exporter could disrupt markets. As a consequence, the public and private sector in Peru understood that all stakeholders in the export chain needed to be involved in joint actions to prevent future problems. Accordingly, they implemented an important program of standards harmonization that is now the mainstay of the country's success in HCAs exports.

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7 Tables

Table 1: Productivity-sorting setting - Test on average export unit price (f.o.b)

Depvar: Average Unit Price	OLS (1)	OLS (2)
GDP Importer	0.187***	
	[0.0491]	
Distance	0.101***	0.102***
	[0.0134]	[0.0126]
Contiguity	-0.114***	-0.113***
	[0.0327]	[0.0314]
Common Language	-0.0253	-0.0381
	[0.0269]	[0.0259]
Colony	0.162***	0.168***
	[0.0317]	[0.0310]
Constant	-4.847***	3.204
	[0.959]	
Observations	648,423	658,978
R-squared	0.298	0.339
Fixed effects	Year, product, exporter and importer	Product-year, Exporter-year and Importer-year

Notes: ***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the exporter-importer level.

Table 2: PRQ setting without reputation - Test on average export unit price (f.o.b)

Depvar: Average Unit Price	OLS
	(1)
GDP Importer	-0.801***
	[0.171]
GDP per capita Importer	0.983***
	[0.164]
GDP per capita Exporter	0.273***
	[0.0461]
Distance	0.1000***
	[0.0135]
Contiguity	-0.113***
	[0.0329]
Common Language	-0.0269
	[0.0270]
Colony	0.162***
	[0.0318]
Constant	8.823***
	[2.873]
Observations	645,001
R-squared	0,3

Notes: ***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Regression is inclusive of year, product, exporter and importer fixed-effects. Robust standard error is clustered at the exporter-importer level.

Table 3: PRQ setting - Test on average export unit price (f.o.b)

Depvar: Average Unit Price	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP per cap Exporter	0.317**	0.321**	0.323**	0.323**	0.323**	0.323**	0.323**	0.331**
	[0.129]	[0.129]	[0.129]	[0.129]	[0.129]	[0.129]	[0.129]	[0.129]
Refusal Dummy		-0.0862**						-0.0219
		[0.0343]						[0.0292]
Refusal Dummy 1 year lag			-0.0887***					-0.0188
			[0.0340]					[0.0275]
Refusal Dummy 2 years lag				-0.134***				-0.0826***
				[0.0319]				[0.0259]
Refusal Dummy 3 years lag					-0.130***			-0.0678***
					[0.0320]			[0.0244]
Refusal Dummy 4 years lag						-0.114***		-0.0319
						[0.0363]		[0.0281]
Refusal Dummy 5 years lag							-0.161***	-0.0843*
							[0.0517]	[0.0478]
Constant	0.702	-3.312**	-3.329**	-3.336**	-3.345**	-3.331**	-3.337**	-3.436**
	[0.902]	[1.375]	[1.374]	[1.374]	[1.373]	[1.375]	[1.374]	[1.375]
Observations	9,354	9,354	9,354	9,354	9,354	9,354	9,354	9,354
R-squared	0.448	0.449	0.449	0.449	0.449	0.449	0.449	0.450
Number of years (2003-2007)	5	5	5	5	5	5	5	

Notes: ***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Each regression is inclusive of year, product and exporter fixed-effects. Robust standard errors are cluster at the product-exporter level.

Table 4: PRQ setting with reputation effect in time - Test on average export unit price (f.o.b)

Depvar: Average Unit Price	OLS (1)	OLS (2)
GDP per capita Exporter	0.331**	0.329**
	[0.129]	[0.129]
Number of years with refusals the past 5 years	-0.0577***	
	[0.0142]	
Dummy=1 if 1 year with refusals>0 the 5 years previous to the observation		-0.109***
		[0.0388]
Dummy=1 if 2 year with refusals>0 the 5 years previous to the observation		-0.0925*
		[0.0513]
Dummy=1 if 3 year with refusals>0 the 5 years previous to the observation		-0.179***
		[0.0505]
Dummy=1 if 4 year with refusals>0 the 5 years previous to the observation		-0.216***
		[0.0643]
Dummy=1 if 5 year with refusals>0 the 5 years previous to the observation		-0.264***
		[0.0953]
Constant	-3.436**	-3.422**
	[1.374]	[1.375]
Observations	9,354	9,354
R-squared	0.450	0.450
Number of years (2003-2007)	5	5

Notes: ***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Each regression is inclusive of year, product and exporter fixed-effects. Robust standard errors are cluster at the product-exporter level.

Table 5: PRQ setting - Test on average export unit price (f.o.b)

Depvar: Average Unit Price	OLS (1)	OLS (2)
GDP per capita Exporter	0.241***	0.241***
	[0.0536]	[0.0536]
Number of refusals	-0.00138***	
	[0.000532]	
Weighted number of refusals		-0.00118*
		[0.000609]
Constant	-3.819***	-3.806***
	[0.589]	[0.589]
Observations	17,813	17,813
R-squared	0.415	0.415

Notes: ***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Each regression is inclusive of year, product and exporter fixed-effects. Robust standard errors are cluster at the product-exporter level.

Table 6: PRQ setting- Probit on average export unit price (f.o.b). <all exporters average export unit price (f.o.b)

Depvar: T=1 if the exporter's average unit price is lower than all exporters average unit price.	Probit
GDP per capita Exporter	-0.258***
	[0.0865]
Refusal dummy	0.245***
	[0.0526]
Constant	1.889**
	[0.743]
Observations	17,870

Notes: ***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Each regression is inclusive of year, product and exporter fixed-effects. Robust standard errors are clustered at the product-exporter level.

Chapter II

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

Abstract[17]

This paper uses a unique 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.

This work was done in co-author with Jean-Christophe Maur, Senior Economist, World Bank and Ben Shepherd, Principal, Developing Trade Consultants.

[17]The authors are grateful to Olivier Cadot for helpful comments and suggestions on a previous draft. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not represent the view of the World Bank, its Executive Directors, or the countries they represent.

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. One reason is the lack of accessible and comprehensive data. In terms of development, focusing on the rules themselves rather than their enforcement somehow misses the target. Assessing the existence and the level of stringency of standards is of course an important matter when analyzing constraints faced by exporters. However, the challenge is also to appraise and analyze exporting countries' compliance capacity. As highlighted by Henson and Olale (2011), there is in principle numerous compliance indicators available, however, those are often incomplete and/or not publicly available. Therefore, there has been very little systematic analysis across countries and time based on such indicators. There are a number of recent exceptions, however. Karov et al. (2009) focus on identifying the trade impacts of US phytosanitary 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. Another set of papers uses import rejection data, in general from the European Union or the United States, in order to study food safety compliance in international trade (Ababouch, Gandini and Ryder, 2005; Allshouse*et al*, 2008; Buzby and Regmi, 2009; Buzby*et al*. 2008)

In this paper, we make use of a unique database on US refusals of imported consignments of food on safety grounds to focus on one important example of the de facto implementation of product standards. 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.

The potential impacts of import refusals on trade as well as evaluations of losses have been highlighted in various papers. Some have tried to evaluate the value of losses due to import refusals. Results vary greatly between analysis and according to methodologies. On the one hand, deriving losses using reported volumes of refused consignments multiplied by the average unit cost inferred from trade data, the value of rejections appears relatively small (Ababouch, Gandini and Ryder, 2005; Diaz, Jaffee and Rioz, 2008; UNIDO, 2011). On the other hand, based on expert opinions of the proportion of a range of agri-food exports subject to import refusals, Jaffee and Henson (2004) put the order of magnitude of the value of losses in the billions of dollars in 2000-2001. But if, as suggested by the first set of analysis, the value of losses is small relative to trade flows, import refusals also have other indirect impacts on trade. Baylis et al. (2010) use data on EU import alerts—closely related to refusals[18]—in a gravity model to show that they tend to decrease trade.[19] The first stage of the empirical approach taken by Jaud, Cadot and Suwa-Eisenmann (2009), which tests whether EU import alerts contribute to increase trade costs and thus supplier concentration. But the cross-sectional setting of their regressions means that they are unable to account for any effects over time. Frequent import refusals are not only costly for exporters but they can also have an adverse effect on supplier's reputation and even on the country of origin as a whole, with customers unwilling to incur costs associated with unreliable and irregular supply. Jouanjean (forthcoming) shows that, controlling for other factors, the occurrence of import refusals have a downgrading impact on countries' average export price.

Import refusals data intuitively appear as good tool for the analysis of trade related compliance performance of developing countries over time. They are usually product and country specific and are assembled on a systematic basis by many industrialized countries. However, a first caveat related to the use of such data for assessing one country's food exports compliance capacity is that they are only available for countries effectively exporting products. But Henson and Olale (2011) highlight this is not the only issue and that import refusals are in fact a very imperfect indicator of exporting countries' compliance capacity. Even though they acknowledge that import refusals are one of the best available data, they also insist on the fact that refusals not only depend on the exporting country compliance capacity relative to the importing country's regulation but they are also influenced by the efforts and attentions of border officials in the importing country, which may vary in a non-random manner across time, products, exporting firms and/or country of origin. They suggest that this bias can relate for example to, administrative priorities in the importing country or according to historical rejection rates etc. Henson

[18]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.

[19] 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 Jaud, Cadot and Suwa-Eisenmann et al. (2009).

and Olale (2011) even suggest that, "conceivably, enhancements in compliance performance could be accompanied by (but not related to) increases in levels of rejections."

The intuition of the existence of such bias was already tackled by Baylis, Nogueira, and Pace (2010) and Baylis, Martens and Nogueira (2009). The first paper uses information on EU notifications and finds 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. Baylis et al. (2009) are making one of the first empirical investigation of the determinants of US import refusals. Their analysis highlights a set of factors that can, according to their assumption, potentially trigger refusals. Their findings suggest that refusals are influenced by political pressure (the "standards for sale" effect; cf. Grossman and Helpman, 1984 for the case of tariffs). But more intriguing, they also find that contrary to prior expectations (the "learning curve" effect), countries with experience in exporting products to the US are actually subject to relatively more refusals – or more recent exporters face fewer refusals than established ones, even after controlling for export volumes – thereby suggesting some degree of "stickiness" in the refusal determination process. 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.

Thereby, according to those previous analyses, if the fact that a consignment is being refused once inspected depends only on its compliance, it is likely that the number and rate of inspection of a product from a specific country depends on other factors. Looking at import refusals data, it is relatively straightforward to assume that the larger the volumes imported, the more important the number of inspections. The same holds for the rate of inspection for products, which is higher for products known for their relative riskiness. Nonetheless, other determinants seem to influence rates of inspections. This paper intends to emphasize one specific set of determinants of the occurrence of import refusals and focuses on providing evidence that reputation matters.

The definition of reputation used in this paper draws from Tirole (1996) who defines collective reputation as an aggregate of individual reputations. Thereby, past behaviors of groups' members are used to predict individual future behavior. The following paper suggests testing the assumption of a collective reputation effect at the country, regions and sector level. Therefore even though compliance is defined at the firm's' scale, it is the collective reputation of a country-product that matters. In this paper, we not only consider the effect of individual (country-product) reputation[20] but we extend the definition of collective reputation to include the possibility of reputational spillovers from related sectors and neighboring countries.

Therefore, this paper intends to test the assumption that reputation has an impact on consignments rates of inspection and as a consequence – controlling for other factors – that reputation is determinant of the occurrence of import refusals. Thereby, looking at US import refusals as an indicator of compliance capacity is biased by the fact that reputation matters and refusals should be taken as an imperfect indicator of compliance if we don't correct for biases in the rates of inspection. If such bias occurs, it would appear difficult to recover from a bad reputation: once it is established, a single rogue exporter can fuel a bad reputation. Among other effects, such bias in the implementation of the regulation can potentially undermine and have damaging impact on exporters' incentives to investing in building their SPS capacity. Hence, this paper intends to assess to what extent the process of inspection and as a consequence refusals relate to reputation, proxied by the history of rejections, at the product, country and sector level.

In addition to exploiting unique 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

[20] This paper makes use of country-product level that is subsequently called "individual level".

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.

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 food safety requirements applying to the product and country of origin. Broadly speaking, food safety measures are aimed at safeguarding the US market from both sanitary risks. 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.[21] 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 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.[22] 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. This supports the hypothesis that refusals may be partly path-dependent (as noted by Baylis et al., 2009) since past histories

[21] http://www.fda.gov/ForIndustry/ImportProgram/ImportProgramOverview/default.htm

[22] 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.

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. 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.[23] 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, about 1-2% of all food shipments are subject to physical

[23] 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.

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.[24] Sources of information come from FDA’s own field offices, but also foreign inspections and evidence from other countries. The following econometric analysis introduces a series of fixed effects. Therefore, the fact that those alerts are stable over time enables ruling out their effect in the subsequent analysis.

3 Methodology and Data

As the above discussion demonstrates, US border authorities exercise broad discretions when implementing the import refusals regime. As previously noted and as suggested by the FDA itself, there is a strong possibility of path dependence: the authorities might look at historical patterns of compliance in allocating scarce enforcement resources, leading to a correlation between past and present import refusals,

[24] 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.

even after controlling for other factors. We refer to this as the "own reputation" effect at the country-product level. In addition, the structure of the US import refusal 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.

The FDA makes refusals information public in their Import Refusal Report (IRR). Reports provide information on the manufacturer's name and country of origin, as well as the dates and motives for the consignment 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 4-digit 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. We have therefore been able to recode FDA import refusals for 46 HS 4-digit products from 225 exporting countries to the US between 1998 and 2008.

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 food safety regulations through import refusals. The count of observed import refusals is assumed to depend on the amount of intended traded goods equal to actual trade flows plus refused shipments, the average compliance of the goods and the rate of inspection. The rate of inspection is assumed to depend on the FDA natural rate of inspection of import consignments adjusted by various factors including reputation and other non-observed product, country and year fixed effects

We define two dependent variables that will enable using similar sets of independent variables to estimate on the one hand a model using a conditional fixed effects logit estimator and on the other a model using negative binomial estimator. 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 country-product-year combination.

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 were 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.

As highlighted by UNIDO (2011), refused consignments represent small amounts compared with effectively traded goods. Therefore, the level of imports seems as a good proxy for intended trade flows. As aforementioned, more exports should be associated with a greater number of refusals. We use lagged imports because of possible endogeneity issues and 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.

The logarithm of the exporting country's per capita GDP is used as a proxy for the exporter's compliance capacity. 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):

$b_3 RefusalsDum_{ikt-1}{}^{\uparrow}$

(2) $Refusals_{\downarrow}ikt = b_{\downarrow}0 + \underbrace{(b_{\downarrow}1\ Refusals_{\downarrow}(ikt-1))}_{}(Own\ Reputation) + \underbrace{(b_{\downarrow}2\ Refusals_{\downarrow}(ikt-1)^{\uparrow}HS2)}_{}(Se$

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,[25] 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 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 are 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

[25] 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.

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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7 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)
$\underbrace{RefusalsDum^{HS2}_{ikt-1}}_{Sector\ Reputation}$	0.484***	0.497***	0.511***	0.419***	0.357***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\underbrace{RefusalsDum^{HS2}_{ikt-2}}_{Sector\ Reputation}$					0.084
					(0.250)
$\underbrace{RefusalsDum^{HS2}_{ikt-3}}_{Sector\ Reputation}$					-0.044
					(0.542)
$\underbrace{RefusalsDum^{Neighbors}_{ikt-1}}_{5\ Neighbor\ Reputation}$	0.744***			0.650***	0.507***
	(0.000)			(0.000)	(0.000)
$\underbrace{RefusalsDum^{Neighbors}_{ikt-2}}_{5\ Neighbor\ Reputation}$					0.307***
					(0.000)
$\underbrace{RefusalsDum^{Neighbors}_{ikt-3}}_{5\ Neighbor\ Reputation}$					0.199***
					(0.009)
$\underbrace{RefusalsDum^{Neighbors}_{ikt-1}}_{3\ Neighbor\ Reputation}$		0.729***			
		(0.000)			
$\underbrace{RefusalsDum^{Neighbors}_{ikt-1}}_{1\ Neighbor\ Reputation}$			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)
$\underbrace{RefusalsDum^{HS2}_{ikt-1}}_{Sector\ Reputation}$	0.678***	0.688***	0.325**	0.526**	0.964***	0.340
	(0.006)	(0.002)	(0.041)	(0.033)	(0.000)	(0.370)
$\underbrace{RefusalsDum^{Neighbors}_{ikt-1}}_{5\ Neighbor\ Reputation}$	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)
$\underbrace{RefusalsDum^{HS2}_{ikt-1}}_{Sector\ Reputation}$	-0.426***	-0.573***	-0.560***	-0.638***	-0.268**
	(0.002)	(0.001)	(0.000)	(0.005)	(0.033)
$\underbrace{RefusalsDum^{Neighbors}_{ikt-1}}_{5\ Neighbor\ Reputation}$	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 $\mathbf{RefusalsDum}_{ikt}$ 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)	(2)	(3)	(4)	(5)
	Baseline	Neighborhood 3	Neighborhood 1	Imports > 0	Lags
$\underbrace{Refusals_{ikt-1}}_{Own\ Reputation}$	0.048***	0.048***	0.058***	0.047***	0.037***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\underbrace{Refusals_{ikt-2}}_{Own\ Reputation}$					0.012***
					(0.000)
$\underbrace{Refusals_{ikt-3}}_{Own\ Reputation}$					0.012***
					(0.000)
$\underbrace{Refusals^{HS2}_{ikt-1}}_{Sector\ Reputation}$	0.004***	0.004***	0.004***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\underbrace{Refusals^{HS2}_{ikt-2}}_{Sector\ Reputation}$					-0.001
					(0.567)
$\underbrace{Refusals^{HS2}_{ikt-3}}_{Sector\ Reputation}$					0.001
					(0.135)
$\underbrace{Refusals^{Neighbors}_{ikt-1}}_{5\ Neighbor\ Reputation}$	0.012***			0.011***	0.009***
	(0.000)			(0.000)	(0.000)
$\underbrace{Refusals^{Neighbors}_{ikt-2}}_{5\ Neighbor\ Reputation}$					0.006**
					(0.032)
$\underbrace{Refusals^{Neighbors}_{ikt-3}}_{5\ Neighbor\ Reputation}$					-0.002
					(0.410)
$\underbrace{Refusals^{Neighbors}_{ikt-1}}_{3\ Neighbor\ Reputation}$		0.014***			
		(0.000)			
$\underbrace{Refusals^{Neighbors}_{ikt-1}}_{1\ Neighbor\ Reputation}$			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.

8 Figures

Figure 1: Current vs. lagged import refusals.

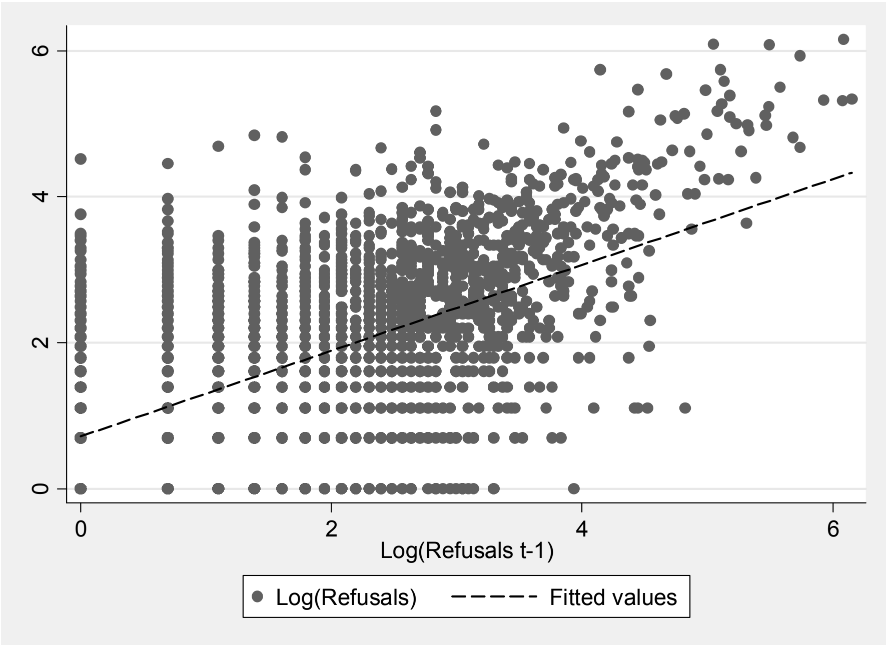


Figure 2: Refusals versus lagged refusals affecting similar products (same HS2 group).

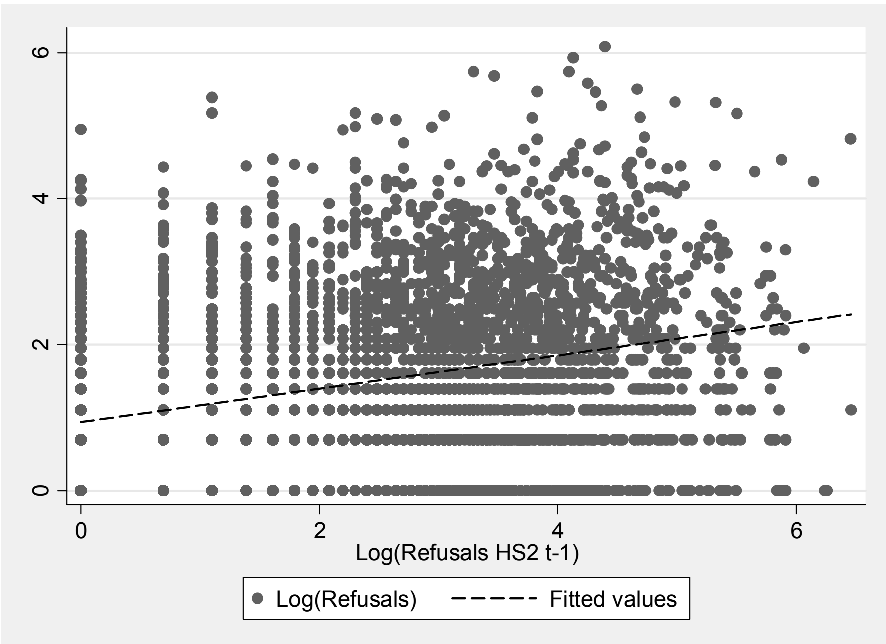
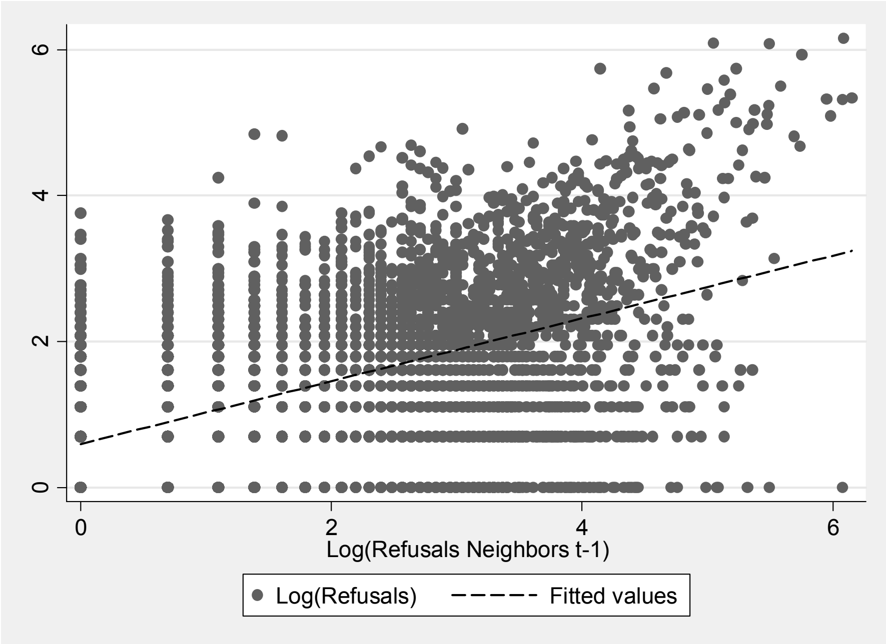


Figure 3: Refusals vs. lagged refusals affecting the five closest countries.



Chapter III

Is Fresh Fruits and Vegetables Market Access for Sale in the US?

The Ins and Outs of U.S. FF&V Market Access Regulation

Abstract

Upon phytosanitary grounds, the U.S. Department of Agriculture applies a positive approach to foreign Fresh Fruits and Vegetables (FF&V) access to the U.S. domestic market. This paper analyzes the ins and outs of this U.S. regulation. Using a unique database gathering all FF&V market access to U.S. continental market from 1994 to 2006, the empirical analysis shows that the regulatory framework of phytosanitary regulation is captured by interest groups. Organized sectors are therefore more resilient to new foreign market access than non-organized sectors. Moreover, controlling for other factors, the analysis shows that lower-middle income and low income countries are respectively less likely to have access to U.S. domestic market and less likely to take advantage of open trade lines.

JEL Codes: F13; F15; O24 ; Q17

Keywords: Phytosanitary regulation –Lobby – Developing countries – Agricultural trade

1 Introduction

When discussing the question of market access, tariffs remain very much the central concern for agricultural products. Sure enough, meeting Sanitary and Phytosanitary (SPS) requirements is also frequently an object of consideration, but negotiations within the WTO and over preferential agreements still focus on the easiest measurable barriers: tariffs.

SPS measures are complex, often product-and-process-specific and non-transparent, therefore difficult to grasp for non-specialists, including trade policy makers and analysts. Besides SPS are not necessarily designed to prevent trade but rather to meet legitimate health and plant protection objectives, which complicate the task of disentangling acceptable regulatory objectives from possible protectionist ones.

The regulatory objective of SPS measures is roughly two-fold: protecting humans on the one hand and protecting plants from pests on the other. Each objective requires different sets of measures. Probably because human health concerns resonate more in the public policy debate than other concerns the debate over SPS measures as non-trade barriers has mainly focused on the food safety content of those measures, especially when "new" imports from developing countries are concerned (e.g. Otsuki, Sewadeh and Wilson, 2001). This focus easily overshadows the phytosanitary or plant health content of SPS measures, their much larger heterogeneity and the impact in terms of market access. But this other element of SPS measures should no be forgotten when analyzing developing countries market access and capacities to develop and sustain high value agricultural exports. A survey among Guatemalan exporters[1] of non-traditional agricultural exports[2] showed that they were much more afraid of pest's outbreaks resulting in export bans in the U.S. than of import refusals from the Food and Drug Administration (FDA) upon food safety parameters.

[1]Conducted by the Author in November – December 2009

[2]As opposed to traditional exports such as Bananas and Sugar. This expression if often used to talk about new high value agricultural exports, mostly horticultural products.

Various case studies have highlighted the trade restriction effect of US fresh fruits and vegetables (FF&V) import regulation (Calvin, Krissoff and Foster, 2008; Peterson and Orden, 2008). Very few papers conducted ex-post empirical assessment of the impact of U.S. SPS regulation (Jouanjean*Forthcoming;*Jouanjean, Maur and Shepherd, 2012; Karov, Roberts, Grant and Peterson 2009). Yet, no papers have analyzed the determinants of the implementation of the regulation, would it be from the U.S. or from exporting countries' point of view. This lack of analysis is most certainly the consequence of the lack of comprehensive and reliable data.

One of the novelties of this paper lies in the use of a new US fresh fruits and vegetables market access database from 1994 to 2011, allowing for an in-depth analysis of the determinants behind U.S. FF&V market access. The intuition behind this analysis is that, in much the same way that the lowering of tariffs "revealed all the snags and stumps of non-tariff barriers that still have to be cleared away" (Baldwin, (1970)), the SPS agreement and its implementation over time revealed the nuts and bolts behind phytosanitary regulation, including its political economy content. The first section describes U.S. phytosanitary regulation and underlines its complexity and specificities. Then, it presents case stories illustrating the capture of the regulatory process by interest groups. Next sections offer an analysis of the determinants of U.S. FF&V market access. First, it looks at the effect of domestic producers interest groups on US FF&V market access. The determinants of the implementation of U.S. phytosanitary regulation are therefore analyzed through the lenses of endogenous trade policy literature. The empirical analysis confirms there is *market access for sale* in the U.S. FF&V sector. Then, the paper analyzes whether there is an asymmetry in the implementation of U.S. phytosanitary regulation, biased against developing countries. The empirical analysis shows that lower-middle-income countries pertain to the group that suffers the most from U.S. regulation. But if the odds of market access for low-income countries seem to be relatively higher than for lower-middle-income countries, they are unable to effectively take advantage of it.

2 U.S. regulation on importation of Fresh Fruits and Vegetables

Within the USDA, the Animal and Plant Health Inspection Service (APHIS) and its Plant Protection and Quarantine (PPQ) program is in charge of protecting U.S. agriculture and plants against the entry of foreign pests and diseases.[1] As such, APHIS administrates and regulates – including prohibiting – market access for fresh fruits and vegetables imports to the U.S. and its territories. APHIS mission statement is: "APHIS builds and maintains a world-class system that safeguards the health of animals, plants and ecosystems in the United States and fosters safe agricultural trade worldwide, resulting in abundant and affordable agricultural products for U.S. consumers and the rest of the world".[2] In other words, APHIS has the responsibility to prohibit entry into the U.S. of food and agricultural products that contains pests or diseases that may affect domestic animals and plants.

Two major reforms have modified the eligibility process in 1992 and 2007. The objective of those revisions was to improve transparency in the decision making both for domestic and international publics but also to make the process more consistent with GATT and WTO agreements (Box 1). However, the general approach to product eligibility for importation in the US was left unchanged and improvements have related essentially to the legal framework and process.[3]

[1]Under the terms of the Plant Quarantine Act of 1912.

[2]APHIS Strategic Direction Simplified, 07/26/2007.

[3]Both reforms are described in further sections

Box 1. The WTO Framework

Discussion in the GATT about the necessity to clarify rules dealing with Sanitary and Phytosanitary measures arose as far as in 1974 as the baseline of the SPS agreement had already been discussed in earlier commitments under the Tokyo Round Agreement on Technical Barriers to Trade.

It is not until the Uruguay Round that an agreement on SPS measures is concluded. The agreement provides a framework that maintains the right to governments to provide the level of plant and human health protection deemed appropriate based on accurate scientific evidence and risk assessment.

The WTO has often been criticized for overreaching its original mission and interfering with national sovereignty. The outcome of this tension is agreements that allow for flexible interpretation by member countries. Thus, within the SPS agreement, WTO Members retain many degrees of freedom when choosing their food security and plant health protection policies.

The SPS agreement recognizes three relevant international standard-setting organizations – the FAO Codex Alimentarius Commission (Codex) for food safety issues, the International Plant Protection Convention (IPPC) for plant health matters and the International Office of Epizootics (OIE) for animal health measures. The WTO urges Member Countries to harmonize their standards with those promoted by the three organizations.

However, to date national requirements remain highly heterogeneous among WTO Member countries. When national standards are lower than international one – as often the case among developing but also in several developed countries – the country can decide to use international rather than national standards. If domestic standards are stricter, a scientific justification can be required in order to prove that international standards are not sufficient to provide an appropriate level of protection.

The SPS agreement also states that government should select the less trade restrictive measures. Two very important provisions of the SPS agreement supporting this are: the recognition that Pest Free Areas do not necessarily match a country's frontiers; and the equivalence between alternative measures providing the same level of protection. This has forced importing countries to revise their regulation and allowed to solve many long-term market access disputes (example, the Hass avocado dispute described in section D)

In order to improve transparency governments are required to notify every change in their SPS measures and requirements affecting trade. Yet many changes are not notified to the WTO. Roberts and Krissoff (2004) suggest two reasons for this: i) a narrow interpretation of the WTO mandate as an obligation to notify only SPS measures that restrict trade; and ii) that some countries consider it unnecessary to notify the WTO of a regulation that affects only the exports of one trading partner that is already aware of the measure through official bilateral channels. For this reason no comprehensive database of SPS measures exists.

FF&V entry eligibility is regulated by the issuance of "Foreign Quarantine Notices".[1] Accordingly the US uses a "positive" approach to the regulation of FF&V imports. In short all products from all countries are prohibited entry into the U.S. except if explicitly allowed by a regulation (Box 2). By contrast the European Union uses a "negative" approach: the EU forbids imports of selected products from specific countries based on identified phytosanitary issues. For some others it requires phytosanitary certificates issued by National Plant Pest Organization (NPPO) declaring the imported product to be free of quarantine pests. The EU protection system relies mostly

[1] Code of Federal Regulation, Title 7 Chapter III Animal and Plant Health Inspection Services, Department of Agriculture, Part 319 Foreign Quarantine Notices. (7 CFR Parts 319)

on **plant-health checks that** are a complete examination or an examination of samples before entry in the EU. Less stringent checks are implemented when guarantees are provided. The main difference is therefore that imports of FF&V in the EU don't need to go through a pre-approval process, as they must do in the U.S.

Box 2. APHIS' views on the concept of "prohibition"

APHIS's answers to public hearings comments in the Federal Register following the Proposed rule for the 2007 Revision of Fruits and Vegetables Import Regulations:

"*One commenter stated that the proposed changes did nothing to address the fact that APHIS' regulations continue to prohibit the importation of fruits and vegetables for which no import request has been made, or for which an import request has been made but an assessment of quarantine risk has not yet been completed. The commenter stated that this ''a priori'' prohibition on the importation of fresh fruits or vegetables into the United States is inconsistent with the APHIS' obligations under the WTO's Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), as they are not based on an assessment of risks or scientific principles, nor maintained with sufficient scientific evidence.*

We believe it is appropriate to make a distinction between commodities that are ''prohibited'' and disciplined by Article 5 of the SPS Agreement, and commodities that are ''not yet approved'' or ''pending evaluation'' and disciplined by Annex C of the SPS Agreement. Articles that are prohibited have been evaluated and prohibition is the measure that has been determined to be appropriate. This status may be changed based on new information and a re-evaluation using pest risk analysis. Likewise, pest risk analysis is used to evaluate the risk associated with a request for a new commodity not previously evaluated. It is true that our regulations do not make the distinction between:

(1) commodities that have been evaluated and prohibited,

(2) commodities that are not currently allowed importation but that are undergoing risk evaluation, and

(3) commodities that are not allowed importation and for which no request for risk evaluation exists.

We recognize that our regulatory terminology is not the same as that used in the SPS Agreement; however, regardless of the terminology, APHIS only allows new imports of fruits and vegetables following the completion of a risk analysis that enables us to determine that the pest risks posed by the commodity are known, and that the risks can and will be mitigated. We believe that this policy is entirely consistent with the SPS Agreement."

Source: Federal Register Vol. 72, No. 137, Wednesday, July 18, 2007, Rules and Regulations.

A first change in the way the U.S. handles public transparency of their plant health measures occurred in 1987 and was effectively applied in 1992. Before that, it was not necessary for APHIS to list all new FF&V being granted access to the US market. After determination of eligibility under the regulations in § 319.56-2e, APHIS was simply issuing permits and the list of products admissible as well as the measures required were recorded in the APHIS FF&V import manuals.

In 1992 the new rules mandated to record every new eligible FF&V directly in the regulation. The underlying rationale was that the regulation prohibited importation into the US unless explicitly mentioned in the law. However, it rapidly appeared that the regulation framework was not adapted to handle the new scheme, especially with the rising number of requests for FF&V market access to the U.S. Over time the regulation became increasingly complex and marred by many redundancies. Also, the rulemaking process was particularly burdensome and the whole process could take 18 month to 3 years on average.[1] If this is an average, some export requests have endured decades of negotiations. This was the case for Chinese request to exports fragrant pears to the U.S. According to Karp (2006), Chinese officials issued a first request in 1993 and the USDA only granted approval in December 2005 after repeated visits by Department of Agriculture scientists and revisions of mandated measures. In general, various exporters have highlighted the particularly long process behind market access to the U.S. Even the European Communities highlighted at the WTO SPS committee in March 2011 they were experiencing very lengthy decision-making procedures when trying to export some plant products to the U.S.[2] Section 2.4 provides more detailed example of two famous case stories.

Because of the complexity of the implementation of this regulation, a second revision of the rule was proposed and adopted in 2007. Broadly, the objective of the Q56 2007 revision of fresh fruits and vegetables imports was to avoid the burdensome rulemaking procedure for those products for which relatively straightforward and acknowledged phytosanitary measures are sufficient for entry in the U.S. Section 2.3.1 explores in more detail the new requirements.

2.1 Negotiating access to the U.S. market

The decision to accept imports of a new product from a specific country relies on a risk basis approach. A request of eligibility to entry of a new FF&V must first be submitted to APHIS by the exporting country's NPPO. Then, as is required by the WTO SPS agreement and in order to base the final decision on a scientific justification, APHIS PPQ conducts a Pest Risk Analysis (PRA). An "Appropriate Level of Protection" is defined according to this PRA. The objective of the procedure is to identify if any mitigation measures are necessary, applicable and efficient enough to minimize the risk of entry of any quarantine pests in the U.S.

[1] Federal Register/Vol. 71, No. 81 / Thursday, April 26, 2006 / Proposed Rules

[2] WTO SPS committee (2011)

Box 3. Definitions

Pathway: Any means that allows the entry or spread of a pest [FAO, 1990; revised FAO, 1995]

Pest: Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products [FAO, 1990; revised FAO,1995; IPPC, 1997]

Pest Risk Analysis: The process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it [FAO, 1995; revised IPPC, 1997]

Pest Risk Assessment (for quarantine pests): Evaluation of the probability of the introduction and spread of a pest and of the associated potential economic consequences [FAO, 1995; revised ISPM Pub. No. 11, 2001]

Pest risk management (for quarantine pests): Evaluation and selection of options to reduce the risk of introduction and spread of a pest [FAO, 1995; revised ISPM Pub. No. 11, 2001]

Treatment: Officially authorized procedure for the killing or removal of pests or rendering pests infertile [FAO, 1990, revised FAO, 1995; ISPM Pub. N° 15, 2002]

Source: Food and Agriculture Organisation (FAO), International Standards for Phytosanitary measures (ISPM).

The first step in the PRA relies on the identification of pests and pathways (see Box 3). APHIS PPQ produces a Pest Status Report that identifies all pests present in the production area from which the country wishes to export. A comprehensive pest list is required from the country's NPPO proposing the new product for import. According to Miller (2006), countries don't always provide complete lists of pests. Therefore, APHIS agents must make their own research, which isone cause of delays in the process and sometime of conflicts with the applicant country (see Box 4).

Box 4. Pest Risk Analysis: The Experience of Chinese Apples

An exchange between Chinese and U.S. representatives at the WTO SPS committee on the status of Chinese request to exporting apples to the U.S. was reported as the following:

"In October 2008, China reported that it had submitted an application for the export of apples to the United States in 1998, with the necessary technical materials for a pest risk analysis. However, the process of pest risk analysis had been delayed for more than ten years with the claim of repeated technical problems. This had seriously impeded the export of Chinese apples. Chinese apples had similar production areas, disease and pest occurrences, and regulations as pears in China. The United States allowed the importation of pears based on a risk assessment. This showed that there should not be any quarantine problem for Chinese apples to be exported to the United States."

"The United States reported that since 2004, it had sought to finalize the list of apple pests of China. However, more scientific information was needed from the Chinese authorities to know whether some pests occurred in areas of China where apple production was concentrated."

Source: Specific Trade Concerns, Issues not Considered in 2010, WTO SPS committee, G/SPS/GEN/204/Rev.11/Add.2, 1 March 2011

PPQ then verifies if each and every pest present in the production area satisfies the *criteria for quarantine pest status.*[1] The PRA will evaluate the occurrence of the pest on the product, if it is likely to follow the import pathway and will estimate the impact of an accidental introduction into the U.S.

If no pest meets the *quarantine pest status* criteria, the product can be imported without the requirement of any mitigation measure. It will only be submitted to inspection and to requirements of general applicability[2] – or "universal requirements"[3]– at the port of entry. Nevertheless, a phytosanitary certificate from the NPPO of the country of origin is often required, stating that the specific production area is free of quarantine pests that might be related to this product or production region. According to the 1992-2007 regulation, products getting access at this stage are added to the Code of Federal Regulation (7 CFR Ch. III, paragraph 319.56.2t) into a partial list[4] of products having access to the US without any additional requirements.

If any pest meets *quarantine pest status* criteria, APHIS PPQ pursues with a Pest Risk Management (PRM) analysis. The objective of the PRM is to define if any mitigation measure exist, their level of efficiency and feasibility as well as the impact if the pest was to be accidentally introduced in the U.S. According to this, the APHIS PPQ proposes a mitigation plan. However, if there is no satisfactory solution according to APHIS PPQ and/or guaranties that the country will follow properly the mitigation plan, access to the U.S. market is denied.

There are various levels of complexity of mitigation measures. The most common measure is the requirement of specific treatments (table 1). Those treatments have to be applied before the product is exported or sometimes at port of entry if the necessary facilities exist (ex: irradiation facilities for Indian mangoes). Another method is the recourse to "systems approach" that we discuss in the following section. Following the WTO SPS agreement APHIS should determine the SPS measure providing the necessary protection with the minimum negative impact on trade. At the end of

[1] *"Is it a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled."* USDA, SPS online, "An Introduction to Risk Assessment" http://www.aphis.usda.gov/is/sps/mod3/5guidpl.html

[2] Until 2007, paragraph 319.56-6 more generally §§316.56 through §§ 319.56-2 and §§ 319.56-3 through 319.56-8. From 2008, paragraph 319-56-3 and more specifically 319-56-3(d)

[3] Federal Register, 2006

[4] Products have been added to those lists only since 1992. Even though the USDA progressively added products that had obtained "oral permits" before that date, there can still be missing products.

the PRA process, if an efficient mitigation procedure has been identified or if the PRA shows that no mitigation measures are necessary, APHIS initiates the rulemaking process for the registration of the proposed FF&V in the regulation.

The conduct of a Pest Risk Assessment is costly and requires high-level expertise and resources. Even though political and economic analysis focus more often on food safety regulations, some developing countries officials have also highlighted the difficulty to effectively and efficiently implement a PRA (Box 6).If the difficulty to gain access to the U.S. market for FF&V seemed to be acknowledged, it is therefore surprising to observe very few cases of dispute at the WTO, apart from notices of trade concerns at the WTO SPS committee. One explanation is certainly the complexity and costs of implementation behind the implementation of risk assessments as well as the various interpretations of the SPS agreement and domestic SPS measures.

Box 6. Capacity constraints for developing countries to conduct a Pest Risk Assessment

In a presentation to the International Plant Health Risk Analysis Workshop in 2005, the Director of the Plant Protection and Regulatory Services Directorate of the Ghanaian Ministry of Food and Agriculture highlighted the difficulties Ghana was encountering when implementing PRA, either in the context of new foreign market access but also when protecting its own agriculture of imported pests:

- weak human and equipment resources resulting in incomplete pest records;
- poor and unreliable data generation;
- difficulties to implement surveillance as well as having access to adequate resources of information (ICT);
- limited expertise and capacities for export inspection and certification;
- limited research support by government;
- out-dated phytosanitary legislation and inappropriate regulatory frameworks.

A second intervention from the Inter-African Phytosanitary Council extended the analysis to ECOWAS and reached the same conclusions. APHIS and Ghanaian authorities have closely collaborated during the PRA process, resulting in new market accesses to the U.S. in 2007: Ghana was one of the first countries to benefit from the new APHIS notice-based approach for okra, eggplant and pepper.

Other African countries benefited from such initiatives through the *African Growth and Opportunity Act* (AGOA) allowing them to gain access to the U.S. market for various products.[1] However, capacity building in this domain seems essential to the sustainability of Ghanaian efforts to diversify their export base toward high value products.

The complexity and costs of implementation of risk assessments as well as the various interpretations of the SPS agreement and of domestic SPS measures are also certainly one explanation of the very few observed cases of dispute at the WTO.

Source: IPPC, 2005, International Plant Health Risk Analysis Workshop

2.2 Facilitating Access? Systems Approach and Cooperation Agreements

Two specific measures proposed in the entry regime described so far merit closer attention: the system approach and cooperation agreements. Both measures have become more frequently used as less trade distortive measures since the implementation of the SPS agreement. Though, they require strong commitments and resources from exporters.

2.2.1 Systems Approach

The systems approach offers an alternative to traditional risk mitigation measures such as the single post-harvest treatment of products. By combining various risk management measures, it can enable market access when the traditional single treatments don't provide the required level of protection from quarantine pests. The term was first used to describe the approach used to reduce pest risks associated with the importation of avocadoes from Mexico (Miller, 1995) but the practice goes back to the late 1960s.According to the FAO's International Standard for Phytosanitory Measures (2002) a systems approach is "the integration of different pest risk management measures, at least two of which act independently, and which cumulatively achieve the appropriate level of phytosanitary protection". In addition to the traditional post-harvest measures, processes incorporated into systems approach include insect trapping and control, growing and packing requirements, geographic limitations, etc. In principle, systems approaches are cumulative. They use independent measures of risk reduction rather than a single one, thus they are more effective at reducing the probability of pest infestation to an acceptable level (National Plant Board, 2002: table 3). An example of a systems approach is the one applied to Mexico's avocados exported to the U.S. (CFR 319.56-2ff): they must meet a nine-requirement list that includes trapping, orchard certification, limited production area (Michoacan), trace-back labeling, pre-harvest orchard surveys for all pests, orchard sanitation, post-harvest safeguards, fruit cutting and inspection at the packinghouse, port-of-arrival inspection, and preclearance activities.[1]The basic motivation behind the implementation of systems approach is to

[1] See also Schenewerk (2004) for a discussion of the systems approach for citrus from Argentina.

offer additional tools in the fight against imported pests by combining mitigation and risk-based approaches.

Several factors have promulgated this new approach (National Plant Board, 2002).In particular, within the SPS agreement framework, simple prohibition became a less tenable option and risk-based approaches had to be considered instead. Therefore, systems approaches can in theory facilitate market access by offering alternative methods to exporters that would otherwise be refused access to the U.S. market. In 2010, over 30 paragraphs in the Code of Federal Regulation were dedicated to various products for which at least one country had access to the U.S. market upon implementation of mitigation measure relating to a systems approach. According to Schenewerk (2004), the use of systems approach is not popular among U.S. domestic industry, which disputes its scientific relevance and capacity to protect from foreign pest invasion. Intuitively, systems approaches are more geared towards countries that have the capacity to put in place sophisticated value chain type of controls, hence toward (upper) middle-income countries rather than lower income countries. The list of countries/products for which additional requirements of the systems approach kind are necessary confirms this intuition.

Box 7: System approach - List of products/exporters for which additional requirements to the general and notice-based measures are necessary according to the 2007 reform.

§ 319.56-20 Apples and pears from Australia (including Tasmania) and New Zealand.
§ 319.56-21 Okra from certain countries.
§ 319.56-22 Apples and pears from certain countries in Europe.
§ 319.56-23 Apricots, nectarines, peaches, plumcot, and plums from Chile.
§ 319.56-24 Lettuce and peppers from Israel.
§ 319.56-25 Papayas from Central America and Brazil.
§ 319.56-26 Melon and watermelon from certain countries in South America.
§ 319.56-27 Fuji variety apples from Japan and the Republic of Korea.
§ 319.56-28 Tomatoes from certain countries.
§ 319.56-29 Ya variety pears from China.
§ 319.56-30 Haas avocados from Michoacan, Mexico.
§ 319.56-31 Peppers from Spain.
§ 319.56-32 Peppers from New Zealand.
§ 319.56-33 Mangoes from the Philippines.
§ 319.56-34 Clementines from Spain.
§ 319.56-35 Persimmons from the Republic of Korea.
§ 319.56-36 Watermelon, squash, cucumber, and oriental melon from the Republic of Korea.
§ 319.56-37 Grapes from the Republic of Korea.
§ 319.56-38 Citrus from Chile.
§ 319.56-39 Fragrant pears from China.
§ 319.56-40 Peppers from certain Central American countries.
§ 319.56-41 Citrus from Peru.
§ 319.56-42 Peppers from the Republic of Korea.
§ 319.56-43 Baby corn and baby carrots from Zambia.
§ 319.56-44 Untreated grapefruit, sweet oranges, and tangerines from Mexico for processing.
§ 319.56-45 Shelled garden peas from Kenya.
§ 319.56-46 Mangoes from India.
§ 319.56-47 Certain fruits from Thailand.
§ 319.56-48 Conditions governing the entry of baby squash and baby courgettes from Zambia.
§ 319.56-49 Eggplant from Israel.
§ 319.56-50Haas avocados from Peru.

Source: Code of Federal Regulation (2011)

2.2.2 Cooperation agreements and Commodity Preclearance Program (CPP)

Preclearance consists in ensuring that exports meet the criteria of admission to the U.S. market before shipment. Therefore, screening and treatment of fruits and vegetable exports are performed by APHIS agents in the exporting country. Like systems approaches, preclearance of commodities in the country of origin have been in use, albeit on a limited basis for a while. Preclearance is both seen as a means to mitigate pest risks in countries that lack the technical capacity to have eradication programs (National Plant Board, 2002) but also to speed up the export process as problems can be tackled at the source. Before any preclearance program can be implemented, APHIS and the exporter (the foreign government or producer) must agree to a “Cooperative Service Agreement”, renewed every year, establishing the terms and conditions that must be met prior to the implementation of a CPP. The preclearance program operates on the basis of full recovery of APHIS' costs (including APHIS personnel costs). Therefore the country of origin or the private export group is required to provide funds in advance (annually) under a trust fund agreement.[1].

Preclearance programs are presented as a facilitating measure, and indeed they can be voluntary. For instance, Jamaica initiated a preclearance program in 1984. From 1984-1995, the program has been co-sponsored by the Ministry of Agriculture and Fisheries in conjunction with the United States Agency for International Development (USAID). Then, the Jamaica Exporters' Association (JEA) took over for the period 1995-2001 and since April 2001, the Ministry has independently funded the program. In 2011, Jamaica had a list of 52 horticultural commodities with a preclearance program. According to a list posted on their website, in 2004 APHIS had voluntary preclearance programs in place in 16 countries.[2]However, preclearance programs and consequently trust fund agreements are also mandated for certain exports. Table 2 and 3 presents a list of voluntary and mandatory preclearance programs.

Implementing a preclearance program is a complex procedure which approval is closely monitored by APHIS from the official exporting country proposal stage onwards.[3] Preclearance includes notably the construction of a dedicated treatment facility that must operate according to APHIS specifications, and requirements regarding the location and accessibility of the facility. Preclearance programs seem fairly costly. However, this is not sufficient to conclude that this contravenes the WTO SPS agreement, according to which such measures should be the least trade restrictive measure assuring the required level of plant safety. If preclearance can be described as a way to create and facilitate trade, the corollary is that countries' capacity to enter and implement a cooperation agreement with APHIS for preclearance becomes a determinant of market access to the U.S. One can easily figure – as various African countries officials already mentioned for PRA – that budget constraints in some countries or the lack of support by the government to the development of

[1]USDA, 2002.*Commodity Preclearance Program Management Guidelines.*

[2]According to a list (revised 29 April 2004) posted on their website. No more up to date voluntary list available.

[3]USDA, 2002.*Commodity Preclearance Program Management Guidelines.*

agricultural exports would be an impediment to the implementation of preclearance measures (see Box 8).[1]

It is interesting to observe that European countries are pooling resources and adopt a regional approach to preclearance programs. Flower bulbs preclearance are all covered by the Netherlands. Applying such regional approach in developing countries could be a way of reducing preclearance costs, depending on regional transport and trade facilitating infrastructures that could be prohibitive to this approach.

Box 8: Prohibitive costs of preclearance programs.

APHIS's answers to public hearings comments in the Federal Register following the Proposed rule on Importation of Mangoes From India:

"*The third comment was from a representative of the NPPO of India. The commenter asked that APHIS work with the NPPO of India to reduce the cost of the trust fund required by the regulations to pay for the cost of preclearance activities. APHIS acknowledges, and has considered, India's concerns about the cost of the preclearance program and we will work with the NPPO to explore ways to minimize costs.*"

2.3 The specificities of U.S. decision-making procedures

2.3.1 From a Rulemaking to a Notice-and-comment process, the Q56 2007 reform

A key objective of the Q56 2007 reform was to expedite the process of APHIS rulings for products determined by the PRA to be safely imported subject to one or more of the following phytosanitary measure: universal requirements,[2] a certified origin from a pest free area, a treatment for pest(s) in accordance with part 305 of the regulation,[3] and a phytosanitary certificate from the country's

[1]The running cost (i.e. not including establishment of the treatment facility) of inspection for Mangoes from the Philippines in 2007 is quoted to amount to over $142,000 in the Filipino press. The article continues: "The quoted fees for the services of these USDA/APHIS inspectors usually cover a period of five months. According to Dr. HernaniGolez, technical consultant to BPI, the fees pay for the stay of a two- or three-man inspection team in Manila who are billeted at five-star hotels as requested by the USDA, including meals. The inspection team assesses the mangoes brought in to the three VHT facilities at the Food Terminal Inc. in Taguig. The Philippines also hosts inspection teams from Japan and Korea, although Golez said, "these do not cost as much (as the USDA fees)…that's why the mango exporters have no difficulty paying for those." He said Korean inspectors, for example, are billeted in three-star hotels, compared to their US counterparts". http://www.gmanews.tv/story/32476/US-importers-look-to-less-costly-RP-mangoes

[2]Federal Register, 2006

[3]Which lists the approved phytosanitary treatments.

NPPO.[1] Thus the principal measure proposed by the Q56 reform was, for those products, to replace the "formal rulemaking" process in place so far by an "informal rulemaking" also called notice-based approach.

According to the *Administrative Procedure Act* agencies have the possibility to propose new regulations under both a formal and an informal rulemaking power.[2] Through informal rulemaking, the agency provides a "notice of proposed rulemaking" in the *Federal Register,* followed by an opportunity for written comments by interested persons.[3] The difference between formal and informal rulemaking – commonly called notice-and-comments rulemaking – mainly relies on the setting of public hearings as well as more elaborate record keeping for the former.[4]

Under the new regulation, standalone rulemaking is now reserved to products for which more specific requirements are necessary. The rule specifies all conditions to be met: from the definition of a specific pest free area to the need for preclearance programs and the creation of a trust fund agreement, packing requirements etc. i.e. all measures relative to the implementation of a system approach. Thus, only products requiring complex phytosanitary measures would continue to require specific rulemaking leading to the registration of the product's mandatory mitigation measures in the regulation. Under this new approach, it was deemed that transparency would be preserved by the publication of notices in the Federal Register advising the public of the findings of pest risk analyses and offering the opportunity to comment on those analyses prior to authorizing any imports.

As a consequence of this change, APHIS completely reorganized the 319.56 "Foreign Quarantine Notices" regulation.[5] From 1992 to 2007, products being granted access to the US without any additional requirements than the universal requirements were added to the Code of Federal

[1] Federal Register, Vol. 71 .o. 81/ Thursday, April 27, 2006

[2] Henning (1984)

[3] A period of 60 days is considered in the case of notice of importation of a new FF&V

[4] In other words, it prescribes adversarial hearing or trial-type procedures. Then judiciary reviews the final proposed rule to ensure the agency's factual conclusions are supported by "substantial evidence".

[5] Federal Register / Vol. 71, No. 81 / Thursday, April 27, 2006 / Proposed Rules and Federal Register / Vol. 72, No. 137 / Wednesday, July 18, 2007 / Rules and Regulations

Regulation in paragraph 319.56-2t into a partial list.[1] Products for which a simple treatment was required in addition to the universal requirements were added in paragraph 319.56-2x. Products eligible for imports under both those paragraphs were usually grouped together in periodic amendments entitled "Importation of Fruits and Vegetables".[2]If the mitigation measure were to be more complex, a special paragraph would be written in the Code of Federal regulation,[3] including all conditions: from the definition of a specific pest free area to the creation of a Trust Fund Agreement, packing requirements etc. i.e. all measures relative to the implementation of a system approach.

Since the 2007 reform, products subject to the new notice based approach are not anymore listed in the Code of Federal Regulation and therefore §§ 319.56-2t and 319.56-2x have been removed.[4] The list of these products is now only available in the PPQ's "Fresh Fruit and Vegetable Import Manual" and on-line in the Fruits and Vegetables Import Requirements (FAVIR) database. As for products subject to specific provisions, they are the only ones listed in the regulation: under § 319.56-13 or under §§ 319.56-20 to 319-56-50 (see box 7).[5]

2.3.2 Regulatory impact assessment

Every APHIS proposed rule about the importation of new FF&V is subject, as all regulations are, to a regulatory impact assessment as specified by the 1993 *Executive Order 12866* and the 1980 *Regulatory Flexibility Act*. Thus all proposed rule about the importation of new FF&V includes a paragraph entitled "Executive Order 12866 and Regulatory Flexibility Act".

The *Executive Order*, also called *Regulatory Planning and Review*, requires the agency to provide cost and benefit assessments of the new proposed regulation. The proposed rule is determined to be a "significant regulatory action" if the annual effect on the economy is expected to be of US$

[1]Products have been added to those lists only since 1992. Even though the USDA progressively added products that had obtained "oral permits" before that date, there can still be missing products.

[2]Example: Federal Register / Vol. 68, No. 122 / Wednesday, June 25, 2003 / Rules and Regulations

[3]The 2007 Code of Federal Regulation registered those products under paragraphs 319.56-2e to 319.56-2ss (except 319.56-2t and 319.56-2x as seen earlier).

[4]Since the 2008 CFR.

[5]Note that over a dozen of products that were subject to specific provisions have also been removed from the list as the provisions described measures that are covered by the notice-based procedure (e.g. subject to a simple mitigation measure such as treatment upon entry).

100 million or more; if it is considered to adversely and significantly affect a sector of the economy; if it has effects on other agencies regulations. In such cases, a detailed regulatory impact analysis will be required that must be approved by the White House Office of Management and Budget before the regulation can take effect.

The *Regulatory Flexibility Act* requires federal agencies to consider the impact of regulations on small entities in developing the proposed and final regulations. If a proposed rule is expected to have a significant economic impact on a substantial number of small entities, an initial regulatory flexibility analysis must be prepared. Such analysis must identify regulatory options that would lessen the economic effect on those small entities.

The analysis found in this specific paragraph “Executive Order 12866 and Regulatory Flexibility Act” usually states the level of U.S. domestic production of the product proposed for importation. It also provides a general analysis about the applying exporting country’s production and its rank as a world exporter. Finally, it analyses the expected impact in terms of U.S. domestic price and the level of competition this new exporter would represent for U.S domestic producers. To our knowledge, no regulation concerning imports of FF&V has ever been determined to be a “significant regulatory action”.

As can be seen in box 8, domestic competitors can interpret regulatory assessments as an invitation to petition on the basis of injurious impact to the local industry. This is an area of concern for exporters to the US, offering an alley to influence the decision process.

Box 9. Regulatory review: An opportunity for rent capture?

APHIS's answers to public hearings comments in the Federal Register following the Proposed rule on the importation of six new products from Thailand:

"Several commenters were concerned that the importation of litchi, longan, mango, mangosteen, pineapple, and rambutan from Thailand would have adverse economic effects on domestic producers of those fruits. The comments we received focused on adverse effects on producers in the States of Florida and Hawaii. […]

Our discussion of the markets for which domestic tropical fruit is produced may not have been clear in the proposed rule. Specifically, our reference to production for the local market needs to be clarified. As the commenters stated, these fruits are destined primarily for specialty stores— ethnic grocery stores and gourmet grocery stores. They have not been produced in commercial quantities for widespread distribution to mainstream grocery stores. We have amended the economic analysis in this final rule to reflect this. As a signatory to the IPPC, the United States has agreed not to prescribe or adopt phytosanitary measures concerning the importation of plants, plant products, and other regulated articles unless such measures are made necessary by phytosanitary considerations and are technically justified. Protecting domestic tropical fruit producers from foreign competition does not constitute a technical justification. We believe that the mitigations in this final rule will adequately address the risk posed by the importation of these six tropical fruits from Thailand."

Source: Federal Register /Vol. 72, No. 119 /Thursday, June 21, 2007 /Rules and Regulations

Specific trade concerns raised in April 2008 by the Brazilian representative at the WTO SPS committee about the U.S. *Regulatory process economic analysis* requirement

"In April 2008, Brazil indicated that before an import permit final rule was approved, the US regulatory process required not only a health risk assessment but also economic analysis of the imported product. This longstanding Brazilian concern had previously been discussed bilaterally but remained unresolved despite the establishment of a bilateral committee. The analysis was done to see if there would be damage to small US businesses, however it was unclear what happened when an economic impact was detected. This time-consuming step resulted in delays in the final assessment, which caused economic losses to the exporting Member. Brazil considered that this requirement was not in compliance with Article 5 of the SPS Agreement, according to which only certain economic factors were to be considered in risk assessments. These did not include the analysis of possible economic harm that could be caused by the imported goods. Brazil requested the United States to eliminate this economic analysis requirement.

The United States noted that Brazil's concerns appeared to be based on misperceptions. The US Administrative Procedures Act of 1946 established the regulatory process for all regulations. This included public participation in the rule-making process, but ensured the scientific basis of final decisions. Many stakeholders had requested that the process be expedited. The relevant US agencies made every effort to expedite the process, but were required to comply with the legislation. The economic analysis provided important information on the likely impact of a proposed regulatory change. But SPS measures were not determined on the basis of the economic analysis – this was simply a part of the internal transparency requirements."

Source: Specific Trade Concerns, Issues not Considered in 2010, WTO SPS committee,G/SPS/GEN/204/Rev.11/Add.2, 1 March 2011

2.4 The capture of the regulatory process by special interest: two case stories

Mexican Haas avocado and Argentina's citrus are two famous case stories about the capture of the regulatory process by special interest supporting a further analysis of the U.S. determinants of market access.

2.4.1 Haas avocado from Mexico

The Hass avocado is a very well known case study of a longstanding dispute between the U.S and Mexico upon phytosanitary ban. Studies such as Roberts and Orden (1997), Lamb (2006) and Orden and Peterson (2008a) made a documented analysis of the political economy of the controversy over Hass avocado imports. Others have evaluated the economic impact of the various regulations that step by step lifted restrictions over Mexican Hass avocados: Romano (1997), Orden, Narrod and Glauber (2001), Carman, Lee and Sexton (2006) as well as Peterson and Orden (2008b).

Mexico along with the U.S. is one of the largest producers of Hass avocado. From 1914 to 1997, a U.S. quarantine prohibited entry of Mexican Haas avocado into the United States due to the prevalence of quarantine pests. From the 70s, the export ban had unsuccessfully been revised twice. Renewed discussions were facilitated by NAFTA negotiation in 1991 and the outcome in 1997 was a first access to nineteen Northeastern states and the District of Columbia during a four month period – November through February –under strict phytosanitary requirements. Various amendments have since then progressively extended export and production areas as well as the importation period. Finally, in 2004, Mexico was granted a year round access into forty-seven states and finally to all U.S. states in 2007.

Mentioned authors agree that resistance from domestic producers to allowing entry into the US market was a factor explaining why it took so long to secure Mexican Hass avocados' market access to the U.S. Lamb (2006) highlights various factors that together facilitate rent seeking in agriculture: organization of lobbies facilitated by producer groups; asymmetry in trade dispute for developing countries facing complex SPS regulations; benefice from protectionism to a handful of producers compared to costs spread across all consumers. His paper presents evidence that the rent-seeking behavior of Californian avocado growers is a key factor in explaining the longstanding trade restrictions on Mexican Haas avocado. It is also clear that the Hass avocado dispute settlement was made possible by the SPS agreement provision supporting the recognition that Pest Free Areas do not necessarily match a country's frontiers. Orden and Peterson (2008) concluded that opening of U.S.

market access had required the conjunction of economic and political circumstances as well as strong commitments and persistence from Mexican authorities and exporters' association.[1]

2.4.2 Citrus from Argentina

The second case study concerns market access to the U.S for Citrus products from Argentina. This is still an on-going discussion and less political and economic analysis are available on this case. Moreover they are usually APHIS related. However they all make references and use the same approach as studies cited before on the Mexican avocado case study. Indeed, both those cases present similarities in the relative importance of the production with however a limited geographic production area and relatively few trading partners in the U.S. We refer here to McLean M. (2004), Stewart and Schenewerk (2004), Corroraton, Orden and Peterson (2011) and Thornsbury and Romano (2007). This last document provides an extremely detailed historical analysis of the dispute and of the role of various parties.

Argentina has become one of the largest world producers and exporters of lemons with a growth in lemon exports averaging 10 percent annually.[2] The entry of citrus from Argentina into the U.S. has been banned since 1967, based on concerns over the potential infestation of quarantine pests – mainly citrus canker and Mediterranean fruit flies– in historical Argentina's citrus production area. Perspective of trade liberalization from regional agreements supported the initiative of investors to develop citrus production in a pest free area for exports to the U.S. and Europe. Since the 90s, the government of Argentina has been negotiating market access to the U.S. for lemons and in 1993 it requested access for entry of various citrus products from this specific pest free area. APHIS initiated the pre-clearance process from 1994 and discovered that various other quarantine pests were present in the production area. The conclusion of this preliminary analysis was that Argentina's would be denied access to the U.S. unless pest free areas and treatment could be approved for those quarantines pests.

[1]Opening of the U.S. market has required science (evidence of limited risk), opportunity (substantially higher prices in the U.S. market), traceability (to approved orchards), persistence (of the Mexican exporting association), and joint political will (under the NAFTA umbrella).

[2]Cororaton et al 2011.

The U.S required more scientific evidence that Argentina's authorities considered costly and unnecessary. According to Thornsbury et al. (2007) the discussions became political with the involvement of the EU that at that time was considering imports of citrus from Argentina from pest free orchard. It highlighted one fundamental difference between both countries' approaches: the U.S. only recognizes pest free areas at the region scale when the EU follows protocols based on pest free orchards. Argentina's growers finally took the initiative to solve this issue by creating a scientifically strong regional phytosanitary organization. Moreover, to overcome U.S. concerns about institutional uncertainties at the national level, Argentina invested in the creation of a new institutional umbrella for all SPS issues. Therefore, Argentina made a great effort to accommodate U.S. scientific requirement and provided the requisite scientific evidence to APHIS in 1996. Accordingly, APHIS implemented a new PRA in 1997. Its conclusions were that the likelihood of pest introduction would be reduced to negligible if a system approach was applied, which allowed for the publication of a proposed rule for the importation of citrus from Argentina in the Federal register in 1998. As usual, the rulemaking process required the consideration of public comments and the implementation of hearings. The comment period required extensions and instead of the usual 60 days, the process of public comments was increased to 180 days. APHIS received 332 comments including 63 comments received at the public hearings.[1] Only 62 of those comments were in favor of the rule. Other comments were questioning the validity of APHIS risk assessment and the efficiency of mitigation measures. Finally, after a long regulatory process[2] APHIS published a final rule authorizing imports of citrus from Argentina in thirty-five U.S. states June 15th 2000. Argentina immediately started exporting to the U.S. However, this didn't stop opposition. Growers and associations challenged the final rule in various lawsuits questioning the reliability of APHIS's PRA. Opposition was embodied at the political level by Californian Senator Boxer who requested an independent peer review of APHIS's PRA. Meanwhile, Argentina continued to export citrus to the U.S. during the two following years and took

[1]"*Comments were from foreign and domestic producers, handlers, packers, and processors of citrus fruit; Members of the U.S. Congress and elected representatives of State and local governments; State plant protection officials and officials from Argentine's national plant protection organization, the ServicioNacional de Sanidad y Calidad Agroalimentaria (SENASA); and representatives of the U.S. Citrus Science Council (USCSC), a group formed specifically to respond to the proposed rule*". Federal Register / Vol. 65, No. 116 / Thursday, June 15, 2000 / Rules and Regulations

[2]WTO Committee on SPS measures, 2011: "In November 1999, Argentina expressed concerns regarding the postponement of US measures dealing with imports of citrus fruit from north-western Argentina."

positions to allow imports from California into their market. However, Argentina expressed concerns about those lawsuits to the WTO SPS committee.[1]Because of the constant opposition, APHIS continued to closely monitor production in Argentina and did not discover any irregularities or violations of regulatory requirements. However, in May 2001, the court ruled against APHIS invalidating their PRA. As a consequence, Argentina's citrus exports to the U.S. were suspended. During the following years, various incidents caused tensions. Finally, in 2007, APHIS published a notice in the Federal register[2] announcing the availability of a Draft Pest Risk Assessment for Lemons from Argentina. So far, no new proposed rule has been issued in the Federal Register and U.S. and Argentina continue negotiating.

According to Cororaton et al (2011) discussions between the U.S. and Argentina were focusing on two concerns: The reliability and accuracy of pest risk assessment and mitigation measures. Analyzing further those concerns, Thornsbury et al. (2007) clearly state that scientific debate is likely to be more contentious and sustained in cases where political stakes are greater. They further highlight the lack of relevance of the SPS agreement when coming to the political reality of its application in particular when considering the existing lack of consensus over scientific evidence on phytosanitary issues. The corollary is thus the difficulty to challenge one SPS measure according to scientific results. They also underline the importance of the credibility and confidence among implicated regulatory institutions that however do not compensate for public trust. This is for instance reflected in Steward and Schenewerk (2004) who relay the view that APHIS's use of systems approach is not allowing opportunity for domestic producers to participate in the evaluation of the planned measures (including whether it is scientifically based), and that there is no system of compensation in case of faulty risk assessment.

U.S. producers association strategies highlighted in both case studies was to systematically question the reliability of USDA's scientific conclusions. By doing so, they have successfully delayed the process of market access. Those cases stories, in addition to various countries' officials comments

[1]WTO, Committee on Sanitary and Phytosanitary Measures, 2011, Specific Trade Concerns G/SPS/GEN/204/Rev.11/Add.3
[2]Federal Register / Vol. 72, No. 155 / Monday, August 13, 2007 / Notices

previously mentioned, support our approach of analyzing both U.S. as well as exporting countries determinants of U.S. market access for FF&V.

3 Is U.S. FF&V Market access for sale?

Previous case stories as well as the analysis of the legislative process relative to export eligibility show that market access for fresh fruits and vegetables have a potentially high sensitivity to lobbies.

This section analyzes U.S. phytosanitary measures through "Interest group" lenses. Grossman and Helpman (1994) *Protection for Sale* model (hereafter GH model) is the most famous theoretical framework delivering empirically testable prediction on endogenous trade policy determinants. Even though the nature of the data used in this paper prevents a direct use of the GH model, the underlying approach still seems consistent. In the GH model, trade policy – reduced to trade taxes and subsidies – is determined by the interaction between the government and organized lobby groups. Governments trade off their personal interests with the deadweight loss imposed by protection of a sector on society: large tariffs increase domestic prices and as such create a loss for consumers but a gain for specific factors owners. Unfortunately, if it is possible to directly infer the effect of tariffs on domestic prices in the GH model, it is not possible to do the same using market access, as intended in this paper. Thus, directly testing the GH model using our data on market access would miss the target. Even if this would need to be further investigated, we can however easily figure that the fewer exporters have access to U.S. continental market, the less competition and therefore, all other things equal, the larger domestic price. If so, the main difference between tariff protection in the GH model and market access is the inexistence with the latter of redistribution of tariffs' revenues to (a large amount of) individuals in the economy. The government still maximizes a linear objective function assumed to be a weighted function of lobbying contributions and aggregate welfare. Therefore, the underlying approach of this paper draws upon this model's parameters.

One important difference with previous analysis implementing a protection for sale approach is that our empirical framework uses panel data. This allows implementing various methodologies proposed by Bertrand, Duflo and Mullainathan (2004) (hereafter BDM (2004)), in order to confirm the existence of a difference in market access between organized and non-organized sectors. In a second stage, using a time series approach, the paper looks at the dynamics of organized versus non-organized sectors over time.

3.1 The data

3.1.1 A database on U.S. market access for FF&V 1994-2011

As discussed in previous sections, all new market access since 1992 required a rulemaking or a notice-based process. Between 1992 and 2007, all new market access appeared in the federal register as well as in the Code of Federal regulation. Though, products granted permits to export to the U.S. before 1992 were not always listed in the CFR. APHIS tried to amend the regulation so as to add missing product but it still refers to the list as "partial" in the Q56 2007 reform. Hence, those lists cannot be considered comprehensive, preventing their direct use for the construction of a market access panel database. Nevertheless, the "Fresh Fruits and Vegetables Import Manual" and **FAVIR database** allows searching for currently authorized fruits and vegetables by commodity or country and provides information on general requirements for their importation.[1] Also, the U.S Government Printing Office (GPO) made all Federal Registers and Code of Federal Regulation since 1994 accessible and searchable on-line. Thanks to this, all APHIS related notices could be gathered: availability of a pest risk assessment, proposed and final rules for the importation of Fruits and Vegetables (grouped or standalone) and other amendments relative to products already eligible (change in pest free areas, treatment, areas of accessibility to the U.S. etc.). Therefore, using the information available in the FAVIR database in 2011 as our baseline, a backward-looking method is adopted to build a comprehensive database of FF&V market access to the U.S. Based on 2011 market access, I go back in time and remove products according to the date at which they became eligible according to Federal Registers. Information on products that had once been granted access to the U.S. market but that were subsequently removed was also gathered. As a consequence, those products are

[1] http://www.aphis.usda.gov/favir/info.shtml Last accessed: June 22nd 2011

not appearing in the FAVIR database and they had to be added to the database. For example: Lemons and other citrus from Argentina. However, those are very unusual situations.

Another issue is that the FAVIR database as well as Federal Register notices are not mentioning any product codification but refer to the product scientific definition. Thus, the comparison with UN-COMTRADE trade flows necessitated the recoding of all products in HS 6-digit codification. In the end, the database gathers markets access of 54 fresh fruits and vegetables for 194 countries between 1994 and 2011.

Finally, it is important to note that we limit our analysis on U.S. continental market access. Many products that are not allowed into U.S. continental are allowed for imports in U.S. territories and Hawaii and vice versa. Those market accesses have been considered irrelevant to the purpose of our analysis: first because they represent a very small share of trade flows and second because of their geographic situation, they represent very different economic environments and considerations.

3.1.2 Lobbies

As usual, information on lobbies relies on Political Action Committees (PAC) database made available by the U.S. Federal Action Commission (FEC). PAC spending data are used to measure whether a sector is organized into lobbies. Data for election cycles from 1994 to 2006 were downloaded from the FEC website. Each election cycle lasts two years, thus our database covers 1993 to 2006. The database lists each committee registered with the Federal Election Commission and their spending. Committees include federal PAC's and party committees, campaign committees for Presidential, House and Senate candidates, as well as groups or organizations who are spending money for or against candidates for federal office. I identified in this database the organizations relating to agriculture and in particular to the FF&V sector. Those organizations are of two types. The first relates to farm bureaus, cooperatives or lobby groups on FF&V at large. I don't have the necessary information to know whether those lobbies were directing their action toward any specific product at the HS 6-digit scale. Therefore, information on those PACs can only be used in empirical analysis at more aggregated levels. The second type of lobbies is much more specific and relates to a restricted set of HS 6-digit products or even sometime to one single product line. Only this set of PACs is considered in the empirical analysis.

In theory, the amount of contributions is not a variable of the GH model. A strict application of the model implies that an industry is organized if its contribution level is positive. Some papers rely however on various assumptions about contribution levels.[1]For some, it is because of the high level of aggregation of their data that occasionally lead to consider all sectors as organized (Goldberg and Maggi, 1999). Also, it is usually argued that it is not possible to know whether contributions are made exclusively to influence trade policy or if they also aim at influencing domestic supports. Therefore, they determine whether a sector has political representation or not – hence defining if $L_k = 1$ or $L_k = 0$ – according to the amount of PAC contributions. Because of the nature of the regulation and products analyzed, I rather chose to rely the main empirical analysis on the same definition as in the GH model, i.e. $L_k = 1$ if $Contributions > 0$. The reasons are the following. First, the process of market access for FF&V is initiated by a demand from an exporting country candidate. Hence, this market access is not subject to constant pressure over time and to trade negotiation rounds schedules. The length of the related legislative process provides time and the opportunity for sectors to organize in lobbies and react to new market access requests. Therefore, there is no need for lobbies to constantly solicit politicians for protection. The avocado and citrus case stories relate the creation of such specific interest groups in reaction to the threat of new market access eligibility. Moreover, as already highlighted, our data are highly desegregated with a focus on product specific rather than industry specific PACs. Thus the assumption is that such very specific sectors (HS 6-digit) will only have an incentive to organize outside usual and larger farm bureaus or cooperative with more financial power when they feel threatened and in need to highlighting their very specificity and increase their visibility. Second, Contribution amounts considered here are certainly not comparable to contributions from cotton or sugar beet growers PACs. Such sectors have a predominant importance in US farm bills and in WTO trade negotiations. Hence, they have many incentives to be politically represented from the domestic to the international scales. Fresh fruits and vegetables, defined as “specialty

[1]Goldberg and Maggi (1999); Gawande, Krishna and Robbins (2006); Gawande and Hoekman (2006)

products", were not apart of the US farm bill before the May 2008 *Food, Conservation and Energy Act* and the domestic incentives are not as clear cut as for the latter sectors. Still, contributions from FF&V related PACs possibly aimed at supporting the inclusion of their "specialty crops" in the farm bill. Nonetheless, it seems reasonable to assume that producers rather rely upon broad produce associations such as the famous *United Fresh* or other large agricultural and FF&V PACs for this issue and that HS 6-digit product-specific organizations as the ones used in the following analysis are assumed to have other purposes than the petition for domestic support. One core assumption is therefore that such specific organizations aim essentially at preventing new market entry and maintaining pressure over domestic market protection using product specific NTBs.

Alternative sets of lobbies defined according to levels of contributions will be considered for robustness checks, with the objective to allow for a more continuous representation of the intensity of lobbying activity. Thus, we first set $I_{\cdot k} = 1$ whenever a committee specific to one or various HS 6-digit products has ever registered with the Federal Election Commission. This allows defining two groups of sectors: a group of sectors that has proven to be able to organize in PACs at least once over the analyzed period and a group of sectors that never organized. Then, controlling for groups, I use a time varying lobby variable $L_{kt} = 1$ when $Contributions\ at\ time\ t > 0$. Finally the same tests are implemented using the level of contributions as a determinant of the intensity of political representation.

From 1993 to 2006, 30 PACs relating directly to fresh fruits and vegetables at the HS 6-digit level were identified. At the cycle level, two years, their total contributions range from a minimum of 760,000 US$ in 1996 to a maximum of 1,062,000 US$ in 2006. More specifically, PACs yearly contributions range from 200 US$ to 51,900 US$. Aggregating at the product line level, they range from 1,000 US$ to 90,000 US$ per year and reach 156,000 US$ for citrus fruit lobbies for the 2003-2004 election cycle. Those PACs relate to 22 HS 6-digit product lines. It is important to highlight that depending on the type of product, lobbies can either have a national or a state representation. Products with a large geographic production distribution such as potatoes, apples and pears, tend to be represented by a single national PAC. On the contrary, products such as citrus or figs, characterized by highly concentrated productions areas, tend to be represented by various local PACs linked to growers associations or cooperatives.

3.1.3 Other data

Following the GH model, import-penetration ratio defined as imports over consumption is used as one relevant covariate. Import penetration ratio is computed using data retrieved from UN-COMTRADE and FAOSTAT: consumption is computed using U.S. production data from FAOSTAT; imports and exports from UN-COMTRADE. To avoid endogeneity issues, lagged import penetration is always used. The GH model also introduces import elasticities that in our setting are imbedded in products fixed effects. A third relevant covariate is tariffs. The rationale behind is that fewer countries are likely to take steps to obtain market access to the U.S. if the sector is protected by high tariffs. Tariffs used in our empirical tests are weighted tariffs retrieved from WITS. Finally, the last element of the sector specific covariate is the number of exporters to the world computed using UN-COMTRADE data.

3.2 A simple difference-in-difference approach to the preliminary analysis of organized sectors

3.2.1 Methodology

I first estimate the difference between organized and non-organized sectors in the number of countries being officially authorized exporting to the U.S. continental market.
Formally, this means looking at the difference

$$\mathbb{E}(Y_{kt} | Lobby = 1, X_{kt}) - \mathbb{E}(Y_{kt} | Lobby = 0, X_{kt})$$

where Y_{kt} is a measure of market access for product *k* at time *t* and X_{kt} represents relevant individual controls as defined in the data section. The difference between groups is captured by the estimation of the following equation

$$y_{kt} = \delta + \alpha L_k + \beta X_{kt} + \theta_t + c_k + \varepsilon_{kt} \qquad (1)$$

where y_{kt} is the number of countries officially authorized to export product *k* to the U.S. continental market at time *t*. The variables c_k, L_k and θ_t are respectively product, organized sector group[1] and time fixed effects. Thus the dummy variable L_k is set equal to 1 if the sector has proved to be organized. ε_{ik} is the error term. The estimated average impact of organized sectors is the estimate α . As highlighted by Moulton (1990) and BDM (2004), this kind of setting is in practice subject to possibly severe serial correlation problems and spurious correlation. Not only the dependent variable can be highly positively correlated, as can be suspected in this situation, but also because of the use of aggregate regressors such as L_k that by construction don't vary over time. The consequence is the mis-measurement of the standard errors when estimating α , that in this case tends to be biased downward, leading to the over-significance of the estimated coefficients. A second issue is the very small number of groups and product in the panel: 54 products, 13 year and two groups – organized and non-organized sectors. BDM (2004) reference various methods as potential solutions to the under-statement of standard error. In particular, they suggest that randomization inference is the most successful estimation technique that moreover appears to do well with a small number of groups. In particular, it allows founding the estimation solely on the comparison of the estimated effect with the random assignment of the variable of interest, leaving aside any issues relative to the error term. The first step of this methodology is to estimate the aggregated equation, with *l* the sector group.

$$\overline{y}_{lt} = \delta + \gamma_t + \alpha L_l + \varepsilon_{lt} \qquad (2)$$

As a second step, I randomly assign the lobby status of each sector and generate a "fake" lobby variable F_k comparable to the "real" lobby variable. I assign 22 randomly chosen sectors to the "fake" organized sector group. Then, I estimate the same setting replacing the "real" lobby data by the random variable.

$$\overline{y}_{lt} = \delta + \gamma_t + \sigma F_l + \varepsilon_{lt} \qquad (3)$$

[1]For more convenience, this paper refers to sector or product alternatively.

The repetition of this procedure a thousand times produces a distribution of $\hat{\sigma}$. Then using those estimations, I am able to form a two-tailed test that enables to check whether the relationship is purely spurious.

As a robustness check I implement a second methodology suggested in BDM (2004), ignoring the time series component in the estimation when computing the standard error. I first regress y_{kt} on the lobby group dummy, the covariates X_{kt} and year dummies using a negative binomial regression. Then, BDM (2004) suggest regressing predicted residuals on a before and after treatment dummy. This paper doesn't test a treatment effect *strictosensu*, thus, the before and after treatment dummy is replaced by the lobby group dummy.

Two characteristics of the data used in this analysis prevent the proper use of a first differencing test. First, the data used are count data and the occurrence of zeros is important to the analysis. This prevents the use of logs in the first differencing regression as would be required when using the difference of average market access over time as a dependent variable. Second, some market accesses have been removed over time, therefore, differenced data present negative values, preventing the use of a negative binomial regression.[1]

3.2.2 Preliminary results on the difference between organized and non organized sector

I first implement a simple test of equality of the means between organized and non-organized groups, with the standard *t*-test available in table 4. It shows that the average number of countries with U.S. continental market access is on average lower for organized sectors.

The result of the estimation of equation (2) is presented in table 5 and the distribution of the estimated coefficient on the random effect is presented in figure 3. The dependent variable is a count variable, therefore the equation will be estimated using a negative binomial regression, preferred to the Poisson estimator due to likely over-dispersion in the data. Setting a line at $\alpha = -0.79$, the estimated coefficient on L_k, clearly shows that we can reject the null hypothesis for α . Thus it is likely that

[1] Results of first differencing regression replacing negative values with zeros and using randomized inference are available in appendix. They are consistent with other results but less significant.

over the panel, there is a difference in market access between organized and non-organized sectors, and that on average, there is less countries having access to the U.S. domestic markets in organized sectors.

Finally, table 6 presents results using the method ignoring time series. Results are consistent with previous tests.

3.3 Different dynamics between organized and non organized sectors

While first results provide evidence that that there exist significant differences organized and non-organized sectors, this section goes further by analyzing the difference in dynamics between both groups.

3.3.1 Methodology

It is unlikely that all sectors are subject to the same and constant market access pressure over time and therefore that the effect of belonging to the organized sector group is the same over all sectors and over time. The effect of organized sectors must interact with observable variables and unobserved heterogeneity. Therefore, I implement a random trend or random growth model to take into account of product-specific time trends[1].

A first step looks at the difference in trend on the overall panel between both groups using a fixed effect approach.

$$y_{kt} = \delta + g_k t + \delta_1 L_k + \delta_2 L_k . t + \beta X_{kt} + c_k + \theta_t + \varepsilon_{klt} \qquad (4)$$

with g_k the average trend of sector *k* over the period. In addition to allowing for a product specific trend, I also allow the trend to depend on whether the sector is organized or not with the inclusion of $L_k . t$ in the model. Differencing once with $t = 1$ removes the product fixed effect c_k. Formally I estimate the following regression:

$$\Delta y_{kt} = \zeta_t + g_k + \beta \Delta X_{kt} + \delta_1 \Delta L_k + \delta_2 \Delta (L_k . t) + \Delta \varepsilon_{kt}$$

[1]Heckman and Hotz (1989)

with $\Delta y_{kt} = y_{kt} - y_{k(t=1)}$

Since the lobby variable doesn't vary over time, $\delta_1 \Delta L_l = 0$, leading to the following simplification

$$\Delta y_{kt} = \zeta_t + g_k + \beta \Delta X_{kt} + \delta_2 \Delta (L_k . t) + \Delta \varepsilon_{kt} \quad (5)$$

In a second step, I transform this regression and replace $L_k . t$ with a series of program indicators, $L1_k$, …, Lm_k where Lt_k is one if unit *k* is in the program at time $t \in [1, m]$. As aforementioned, I don't expect that pertaining to the organized group has the same effect over time over sectors. Therefore, compared to the random trend model, this approach investigates whether the effect of being in an organized sector changes over time. The new estimated regression is the following

$$y_{kt} = \delta + \theta_t + c_k + \alpha L_k + \gamma Lt_k + \beta X_{kt} + \varepsilon_{kt} \qquad (6)$$

3.3.2 Results

The first approach adopted in this section is to compare the trend between sector groups. However, it is possible that unobserved, trending factors affecting y_{kt} might also be correlated with the explanatory variables. This is also the cause of spurious regressions. Usually, this issue is taken care of by simply introducing a time trend in the regression. Yet, the first objective is precisely to compare the dependent variable average trend with the organized group's trend. To tackle this issue and preserve the possibility to observe the dependent variable time trend, I first detrend each covariate. As suggested in Wooldridge (2002), I regress each covariate on a time trend *t* and a constant and save the residuals that are used in the following regressions. To take into consideration the potential problem of grouped error terms (as the unit of observation is more detailed than the level of variation in the setting), the standard error is clustered on years and groups.

Table 7 presents the results of equation (5).Controlling for product-specific time trend, table 4 shows that the average organized sector trend tends to be lower than the average trend. This means that controlling for other factors, the growth in market access is lower for organized sectors over the period.

Table 8 presents the results of the estimated regression (6) adding one by one each independent variable. The first specification simply presents yearly average difference of being in an organized group without controlling for any other factors. If there is a difference between groups over the whole period as presented in the previous section, this difference seems to decrease in magnitude over time. Including product specific covariates as in specification (2) increases the coefficients in magnitude. Moreover coefficients are not decreasing over time anymore. This shows the importance of considering product specific factors. On average and without controlling for other non-observed product specific covariates, tariffs are negatively related to the number of countries with market access; the number of exporters to the world is positively related as well as lagged import penetration. The third specification adds the organized group fixed effect, product fixed effects and a constant. Results are significant and follow all previous analyses. As in the preceding specification, we verify that there is on average less market access for organized sectors compared to the average market access. The coefficients on the lobby-year variables $L_k . t$ present the difference between average annual market access growth for the organized sectors and the average market access growth over the whole panel. Results show that market access growth is lower for organized sectors on average over the whole period. As earlier, without controlling for other time-varying product specific factors, this difference decreases in magnitude over time. If organized sectors are still more resistant than non-organized sector, this result is suggestive of a decrease in the intensity of this resistance to market access over time. The addition of year fixed effects in the fourth specification slightly changes the results. The coefficients on the lobby-year variables now give the difference in annual market access growth of being in an organized sector compared to the average annual growth. Results stay consistent, meaning that annual growth in market access tends to be lower for organized sectors, apart for years 2003 to 2005, during which organized sectors were more likely than the average to see new exporting countries being granted access to U.S. continental market. The fifth specification adds relevant product specific covariates. Results are consistent with the fourth specification. However, the coefficient on the organized sector dummy greatly increases, suggesting that the difference in average market access between groups, when controlling for sector specific covariates, is much more important.

As aforementioned, the rationale behind the covariates used in this paper lies in the interest group literature and in particular upon the GH model. Many political economy papers, such as the ones surveyed by Rodrik (1995) use reduced form showing that protection tends to increase with import penetration, whether in the GH framework this relationship is more complex and varies between organized and non-organized sectors. Therefore, papers testing the GH model usually interact covariates with lobby groups.[1] Thus, I implement a new set of regressions based on this observation that endogenous trade policy determinants might not react the same way between organized and non-organized sectors. Table 9 presents the same specifications as in table 8 but discriminating by lobby groups (specifications 1 and 2). In a second step, I add sector specific covariates interacted with lobby groups to the baseline regression (5) in table 8 (specifications 3 and 4). The results support this intuition. Even though they are not always significant, coefficients on variables and their interacted counterpart are of opposite signs both for import penetration and tariffs. Tariffs are still not a significant explanatory variable over the whole panel but it significantly and negatively relates to market access in organized sectors. Import penetration negatively relates to market access over the whole panel but positively relates to market access for organized sectors. Finally, the number of exporters to the world positively and significantly relates to the number of countries having access to U.S. continental market. The effect on organized sector doesn't seem to be different from the effect over the whole panel.

3.4 The intensity of lobbies' action

PAC spending data are usually used in papers implementing the GH model (Among others Goldberg and Maggi, 1999; Gawande, Krishna and Robbins, 2006; Gawande and Hoekman 2006) not only to measure whether sectors are organized into lobbies but also to test the intensity of lobbies' action.To do so, LI_k is replaced in equation (6) by various time dependent variables relating to the intensity of lobbies' activity.

First, I directly use the amount of sector's PAC contributions per year. Results, presented in table 10 are consistent with previous findings and the coefficient on lobbies' contribution amounts is negative and only significant when taking into account product specific trend. The effect of

[1]Among others Goldberg and Maggi (1999) ; Gawande and Bandyopadhyay (2000); Gawande, Krishna and Robbins (2006); Gawande and Krishna (2003); Gawande and Hoekman (2006).

contribution amounts appears to be very low. Controlling for other factors, 10,000US$ of contribution reduces the occurrence of market access by only 0.003. There can be various explanations to this: First, as mentioned in the data section, this analysis considers only very specific lobbies. It is very likely that larger amounts are distributed through broader lobbies, such as fresh fruits and vegetables cooperatives etc. One other explanation refers to the GH model. In theory, the amount of contributions is not a variable of the model. A strict application of the GH model implies that an industry is organized if its contribution level is positive and does not take into account the specific amount of this contribution. Thus, contribution amounts should not have any direct impact on the outcome of lobbying activity. Finally, it is possible that the relationship is not linear. For example, we can imagine that only the very large amounts have an impact.

Therefore, as a second approach, I use a dummy variable $C_{1,kt}$ equal to 1 if a lobby in sector *k* has been active in year *t*. In other words I test occurrences of PAC contributions, whether sector *k* made a contribution in year *t*. The coefficient on $C_{1,kt}$ is centered on a negative value but not significantly different from zero. The same tests is implemented setting $C_{2,kt}$ equal to one if the lobbies in sector *k* made a total contribution of more than 25.000 US$ year *t*. The use of centiles would have been a more thorough method of discrimination. Yet, there is a strong correlation between centiles and the regularity of spending. Thus, discriminating lobbies' activity upon centiles, $C_{2,it}$ becomes constant over time. Testing on various level of contributions, I arbitrarily select 25,000 US$ as a potentially interesting threshold. Results on coefficient on $C_{2,it}$ are now negative and significant, giving credential to the assumption that – to some extent – the amount of contributions is important to the outcome of lobbying activity. Controlling for sectors' capacity to organize, lobbies of sector *k* spending more than 25,000 US$ reduces the number of exporting countries being granted market access to US domestic market by 0.014 in the current year.

It is very likely that the impact of lobbying activity lasts over time and that the occurrence of a large contribution has a lagged influence on market access. I now consider a finite distributed lag model of order 3 using $C_{2,kt}$. Results on one and two year's lags are negative but not significant, the coefficient on three years lag is positive but not significant. However, lobbies' variables are jointly significant with an *F* statistic with a *p*-value equal to zero. The difficulty to estimate lags effects is likely to be caused by a correlation between lags. Therefore, following Wooldridge (2003), I estimate the long run propensity (table 12), equal to -0.02 and five percent significant.

3.5 Exporter's determinants of U.S. market access for FF&V

The objective of this last empirical section is to test for exporting countries determinants to U.S. market access for FF&V. If previous sections present results that tend to support a *market access for sale* story of U.S determinants, this section intends to verify whether there is furthermore an asymmetry in market access for developing countries.

3.5.1 Methodology

The approach used in this section draws upon the model of international trade with heterogeneous firms developed by Melitz (2003) and augmented by Helpman, Melitz and Rubinstein (2008). In their model, a firm from a country *i* exports to market *j* if and only if its productivity is higher than a theoretically grounded cut-off, depending on country as well as country-pair specific explanatory variables. This setting explains the occurrence of zero trade flows and allows controlling for selection into trade bias when estimating the determinants of trade flows. In their empirical analysis Helpman, Melitz and Rubinstein (2008) show that the same variables traditionally used in gravity equations estimating trade flows also impact the probability that one country exports to another and that the impact goes in the same direction. Following the assumption that countries' selection into market access follows the same pattern as firm's selection into trade, this section tests whether market access is biased against developing countries.

Previously highlighted constraints to market access to the U.S. are interpreted as fixed entry cost f_{ijk} with:

$$f_{ik} = g(I_i, L_k, \chi_i, \chi_k)$$

Fixed cost is assumed to depend on the exporting country level of SPS capacity or its institutional and economic development I_i, on whether U.S. domestic sector is organized L_k and on other non-observed exporting country and product fixed costs, χ_i and χ_k.[1] The rational behind this assumption is the following. First, the U.S. FF&V market access regulation relies on active requests from applicant exporting countries. All countries do not have an incentive to request market access to the U.S. because they might not be potential exporters to this market for the same reasons firms are not potential exporters, i.e. fixed and variable costs. It is also possible that a country applied but was never granted access. Either that the process never fully engaged and/or that the exporting country was refused access to the U.S. market because it was unable to provide requested information and/or guaranties in order to initiate and fulfill the procedure. Finally, a product can present particularly sensitive SPS issues for which no other solution than the prohibition of imports was identified by U.S. authorities. Finally, as previously highlighted, lobbies' activity is likely to reduce the odds of gaining market access. The assumption is that lobbies' action increases fixed entry costs.

Drawing upon Helpman, Melitz and Rubinstein (2008) methodology, I define the indicator variable T_{ikt} equal to 1 when a country *i* has market access for product *k* at time *t* and 0 when it does not. Let θ_{ikt} be the probability that country *i* has market access for product *k* at time *t* conditional on observed variables. θ_{ikt} is estimated from the reduced form probit equation including gravity equation's traditional covariates :

$$\theta_{ikt} = \Pr(T_{ikt} = 1|\text{observed variables}) = \Phi(\gamma + \beta_1 Y_{it} + \beta_2 \tau_i + \beta_3 I_{it} + \beta_4 L_k + \varphi_i + \chi_k) \quad (7)$$

I define $\varphi_i = \xi_i + \chi_i$ with ξ_i exporters fixed effects, Y_{it} is the exporting country expenditure and τ_i variable trade costs of country *i* exporting the U.S. This setting only considers one importer and non-time varying country-pair specific variables are de facto country fixed effects.

[1] This definition of fixed-costs already considers that only one importer is considered. Thus it does not include importer specific variables since they don't vary with exporters.

3.5.2 Results

Equation (7) is estimated using previously used market access database, including 194 countries and 52 products over the period 1994-2006. This database only considers products for which there is an entry restriction to the US based on the described regulation.[1]

The estimation calls for the use of traditional gravity equations' variables such as distance and other country-pair covariates. Because of the aforementioned asymmetry issue, I replace distance by remoteness defined in this context as the GDP weighted by physical distance to the U.S. The estimated equation keeps relevant country-pair specific dummy variables such as common language and contiguity. It also includes other relevant exporter specific dummy variables such as being an island state, better isolated from various pests, being member of the WTO and as such having access to SPS committees, whether the exporter is a potential exporter to the world[2] and finally a dummy variable equal to one if the U.S. domestic sector is organized. Estimating equation (7), I_{it} is proxied by a set of dummy variables accordingly to the World Bank income groups. This setting is chosen over the direct use of GDP per capita as a proxy for I_{it} as GDP per capita is suspected to have a non-linear relationship with market access to the U.S. (figures 2 and 3). GDP and classic gravity variables were respectively retrieved from WDI's World Bank online website and from the CEPII database. WTO membership and island states variable was retrieved from Andrew Rose's website.

Table 13 presents results of the Probit estimation on two dependent variables: opened trade lines and active trade lines. The first column in table 13 presents results of the Probit estimation considering all market access and controlling whether the country is a potential exporter to the world. The second column looks at the occurrence of market access only on the subgroup of potential exporters to the world. The objective of using this second dependent variable is to identify and control for the occurrence of *fake* access, i.e. market access granted to countries that never export the product.

[1]For example, mushrooms can be exported to the U.S. by all countries. They are present in the FAVIR database and their entry is regulated by the same regulation. There is very few of such products. Apart from mushrooms, those are usually niche products.

[2]Potential exporter: if the exporter has been able to export the product at least two years over the analyzed period.

The third column reduces the sample to potential exporters to the European Union (12).[1] The rationale behind is that the European Union (E.U.) and the U.S. markets share many similarities in terms of norms, standards and consumers demand. Only, E.U. SPS regulation is based on a negative rather than a positive approach. The objective is thus to have a first look at the impact of the difference in regulation between both countries/region controlling for other factors.

The second set of regressions tests the probability of having active trade lines to the U.S. Specification (4) looks at all trade lines and countries. Specification (5) reduces the sample to potential exporters to the world only. The third regression reduces the sample to open trade lines to the U.S. and finally, the fourth controls for active exports to the E.U. The rational behind this is to control for the capacity of the exporting country to the E.U. to comply with U.S. SPS regulations.

GDP and remoteness are not significant in any tests. As expected, contiguity and common language are positive and significant in all first three tests. The coefficient on contiguity is also significant and of higher value when testing active trade lines. WTO membership is only significant and positive on active trade lines. Common official language and being an island state have a very volatile effect according to specifications and dependent variable. As in previous analysis, the fact that the U.S. domestic sector is organized reduces significantly the probability to have access to U.S. continental market. Organized sector group is not significant anymore when only looking at active trade lines to the U.S. but becomes significant again when controlling for active trade lines to the E.U. More thorough analysis comparing the E.U. and the U.S. is necessary, but this is suggestive that the U.S. regulation might be more likely to be captured by rent seeking then the E.U. regulation. Also, exporting to the E.U. is positively related with exporting to the U.S.

Results on income groups' dummies confirm the intuition about the non-linearity of GDP per capita. A number of important agricultural exporters are middle-income countries. Thus it is not surprising that in both the first regressions, upper middle-income (UMI) countries such as Brazil or South Africa have significantly more chances to have market access to the U.S compared to the

[1]Potential exporter to the EU: if the exporter has been able to export the product at least two years to the EU 12 market over the analyzed period.

baseline set on high-income (HI) countries. They are also more likely to have active trade lines. However, coefficients on UMI countries significantly change signs when reducing the sample to potential exporters to the E.U. and when testing active trade lines on U.S. market access only. More generally, reducing the sample to potential exporters to the E.U., all incomes groups seem to be less likely than HI countries to gain access to the U.S.

In the first setting using market access for all trade lines, the coefficient on the lower middle-income (LMI) dummy has a negative and significant sign in all three specifications, meaning that they are less likely to have market access to the U.S. compared to not only HI and UMI countries but also compared to LI countries in the setting considering all trade lines. Yet, the difference in likelihood of having active trade lines turns positive and exceeds UMI countries in specification (4). Thus it seems that overall, LMI countries are the most likely to export FF&V to the U.S. But controlling for being a potential exporter, they become the less likely to have open trade lines (specification 5). It appears that LMI countries is the group that suffers the most from U.S. regulation. As shown in specification (6) reducing the sample to open trade lines, LMI countries are less able to take profit of all their opened trade lines and effectively export products for which they got market access than HI countries. But this time, they make better use of their access than UMI countries that present an even lower coefficient. Thus, even though those countries tend to be the more active in exporting FF&V to the U.S. they are constraint both by their access to the U.S. market and by their capacity to take profit of this access.

Changes in the lower income (LI) countries coefficient are also rather suggestive. If the likelihood of having market access is higher – all other things equal – than for HI and even UMI countries in the first specifications, reducing the sample to potential exporters to the world completely reverses results and LI countries become the less likely of all groups to gain market access to the U.S. Reducing the sample to potential exporters to the E.U., the effects seems however smaller in magnitude. Focusing on active lines the effect becomes non-significant and centered on a negative value in the three first specifications. The effect becomes significantly negative when controlling for active exports to the E.U. Thus, controlling for other factors, if LI countries have more chances to get market access to the U.S., they are less likely to take advantage of it. It is very possible that LI countries benefited from various development initiatives that helped them be granted access to the U.S market but for products they don't appear to be able to export to the U.S. or for which they are not potential exporters at all over the analyzed period. I investigate further this in the next set of regressions using the count of trade lines by exporter as the dependent variable.

Table 14 presents regressions based on the same independent variables as in equation (7) but in a negative binomial regression on the count of trade lines by exporter. I test four different dependent variables. First, I make a count of all trade lines a country has market access for. Then, I sum up the number of open trade line for which on the one hand the country is a potential exporter to the world and on the other the country actively exports to the U.S. Finally, I test the difference between opened and active trade lines.

As in the previous settings, GDP and remoteness are not significant and WTO membership is only significant when testing the number of active trade lines. Contiguity, common language and island states dummies are also significant and of the expected signs.

Results on income group dummies confirm previous analysis. The two first specifications show that, controlling for other factors, UMI, LMI and LI have a significantly larger amount of opened trade lines to the U.S. than HI countries. Though, the value of LMI countries' coefficient is less than half the coefficient on both UMI and LI. As earlier, looking at active trade lines, the coefficient on LI countries reverses with a significant and negative coefficient. The fourth specification confirms the intuition that if LI countries have relatively higher number of market access, they are not able to take the opportunity to develop their exports. This means that fixed and variable costs – other than the cost relating to the process of getting access to the U.S. market – are still preventing those countries from exporting to the U.S. Drawing from the analysis of U.S. market access requirements, we can assume that the implementation of mandatory phytosanitary measures for exporting to the U.S. is one possible source of prohibitive costs. Still, further analysis is required to confirm this hypothesis.

4 Conclusion

This paper produces direct evidence of *market access for sale* in U.S. FF&V sector. Implemented tests, using alternatively U.S. or exporters' determinants, converge toward a significant effect of lobbying activity on the number of countries and the probability of being granted access to the U.S. continental market for specific FF&V. Yet, dynamic analysis highlights that if organized sectors are still more resilient to foreign market access, there are signs of erosion of the intensity of their resistance over the studied period. It is not possible yet to test whether the Q56 reform leveled off the effect of lobbies. Further research should investigate whether it has eroded organized sectors resilience to foreign market access but also which regulatory path is more likely to be followed according to whether the sector is organized or not.

Overall, it seems that lower-middle income countries is the group that suffers the most from U.S. regulation. Low-income countries seem to be given facilities compared to this last group in obtaining market access to the U.S. However, the comparison of exporting countries' market access with their active trade lines highlights that low-income countries are not able to take profit of their access to the U.S. market. Therefore, it appears that some other costs still hinder the development of their FF&V exports to the U.S. Although more research is needed in this area, it seems reasonable to think that some of those costs relate to the costs of implementations of phytosanitary mitigation measures.

Building trade and phytosanitary capacities can have important benefit to low and lower-income countries agricultural exports development to the U.S. The example of polled inspection capacities in the European Union for flower bulbs exports presents an interesting example of possible ways to reducing costs. An extension of the analysis comparing importing countries implementing different phytosanitary regulation, such as the European Union, could be a fruitful avenue for future research.

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6 Tables

Table 1: List of Treatments recognized by USDA APHIS

Treatment Code	Treatment
T101	Methyl Bromide Fumigation
T102	Water Treatment
T103	High Temperature Forced Air
T104	Pest Specific/Host Variable
T105	Irradiation
T106	Vapor Heat
T107	Cold Treatment
T108	Fumigation Plus Refrigeration of Fruits
T109	Cold Treatment Plus Fumigation of Fruits
T110	Quick Freeze

Source: USDA, APHIS PPQ, 2011, Treatment Manual

Table 2: Voluntary preclearance program as in 2004

Country	Commodity	Preclearance type
	Active programs	
	South America	
Argentina	Apples	Inspected
Argentina	Pears	Inspected
Argentina	Plums	Inspected
Argentina	Nectarines	Inspected
Chile	Stone fruit	Inspected and Treated
Chile	Lemons, Grapes	Treated
Chile	Kiwi, Lime	Inspected and Treated
Chile	Lime, Cherimoya	Treated
Chile	Cut Flower	Inspected
Chile	91 other commodities	Inspected
	Mexico and Central America	
Jamaica	31 Commodities	Inspected
Haiti	Mangoes	Treated
	Europe	
The Netherlands	Flower Bulbs	Inspected - Covered by The Netherlands
Belgium	Flower Bulbs	Inspected - Covered by The Netherlands
England	Flower Bulbs	Inspected - Covered by The Netherlands
Ireland	Flower Bulbs	Inspected - Covered by The Netherlands
Israel	Flower Bulbs	Inspected - Covered by The Netherlands
Scotland	Flower Bulbs	Inspected - Covered by The Netherlands
Turkey	Flower Bulbs	Inspected - Covered by The Netherlands
Spain	Lemons, Oranges	Inspected
	Pacific rim and Asia	
Australia	Cottonseed	NA
New Zealand	Apples	Inspected
New Zealand	Pears	Inspected
New Zealand	Nashi Pears	Inspected
Korea	Chestnuts	Treated
	Africa	
South Africa	Deciduous Fruit: Grapes, Apples, Nectarines, Peaches, Pears, Plums	Inspected
South Africa	Citrus fruits: Clementine, Grapefruit, Lemon, Minneola, Navel Oranges, Satsuma	Inspected
South Africa	Amaryllis bulbs	Inspected
	Inactive programs	
Ecuador	Melons	
Venezuela	Mangoes	
Colombia	Mangoes	
France	Apples	
Taiwan	Mangoes	
Australia	Apples	
Australia	Pears	
Australia	Nashi Pears	
Australia	Grapes	

Table 3: Mandatory preclearance program as in 2011

Country	Commodity	Preclearance type
	South America	
Argentina	Blueberries	Treated
Brazil	Mangoes	Treated
Chile	Clementine, Madarin, Tangerine, Orange, Grapefruit	Treated
Ecuador	Mangoes	Treated
Peru	Mangoes	Treated
Peru	Tangelo, Sweet orange, Tangerine, Mandarin, Lime	Treated
Peru	Hass Avocado	Treated
	Mexico and Central America	
Mexico	Mangoes	Treated
Costa Rica	Mangoes	Treated
Guatemala	Mangoes	Treated
Nicaragua	Mangoes	Treated
Honduras	Mangoes	Treated
	Europe	
Spain	Clementines	Treated
	Pacific rim and Asia	
Japan	Sand Pears	Inspected
Japan	Unshu Oranges	Treated
Japan	Fuji Apples	Treated
Korea	Sand Pears	Inspected
Korea	Unshu Oranges	Inspected
Philippines	Mangoes	Treated
India	Mangoes	Treated
Thailand	Litchi, Longan, Mango, Mangosteen, Pineapple, Rambutan	Treated

Table 4: Mean comparison test

	Observations	Mean	Standard error	p-value of t-test
Non-organised sectors	390	58.81	2.16	
Organised sectors	286	26.64	1.08	
Difference		32.17	2.69	.0000

Notes: Reported p-value is associated to the following test: E(Y | Non-organized sector) > E(Y | Organized sector) where Y is the count of countries with U.S. continental market access

Table 5: Test on aggregate, effect of being a potentially organized sector

Depvar: Mean number of countries with market access by lobby group by year	(1) Mean comparison test
Lobby	-0.792***
	(0.000)
Constant	4.056***
	(0.000)
Observations	26

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the lobby-year level. The regression includes year fixed effects

Table 6: Ignoring time series information, effect of being a potentially organized sector

Depvar: Pearson residual	(1) Ignoring Time Series Information
Lobby	-0.838***
	(0.000)
Observations	578

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the lobby-year level. The regression includes year and product fixed effects

Table 7: Difference in trend between organized and non organized sectors

Depvar: Differenced number of countries with market access	(1) Trend
lobbyXyear	-0.008***
	(0.000)
Weighted tariff	0.037
	(0.763)
Number of world exporters	0.576
	(0.476)
Lagged import penetration	0.244**
	(0.023)
Observations	544

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the lobby-year level. The regression includes year and product fixed effects

Table 8: Difference in trend between organized and non organized sectors - yearly

Depvar: Number of countries with market access	(1)	(2)	(3)	(4)	(5)
Lobby			-0.560***	-0.592***	-2.995***
			(0.000)	(0.000)	(0.000)
Lobby in 1995	-0.804***	-	-0.059***	-0.009***	-
	(0.000)		(0.000)	(0.000)	
Lobby in 1996	-0.804***	-0.940***	-0.059***	-0.009***	-0.026***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 1997	-0.806***	-0.985***	-0.057***	-0.011***	-0.023***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 1998	-0.801***	-1.273***	-0.050***	-0.012***	-0.033***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 1999	-0.801***	-0.943***	-0.050***	-0.012***	-0.020***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 2000	-0.795***	-0.967***	-0.045***	-0.008***	-0.015***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 2001	-0.787***	-0.898***	-0.035***	-0.002***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)
Lobby in 2002	-0.787***	-0.838***	-0.035***	-0.002***	-0.003**
	(0.000)	(0.000)	(0.000)	(0.006)	(0.020)
Lobby in 2003	-0.791***	-0.932***	-0.027***	0.006***	0.003**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.025)
Lobby in 2004	-0.786***	-0.912***	-0.024***	0.008***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 2005	-0.785***	-0.946***	-0.022***	0.010***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 2006	-0.779***	-0.965***	-0.006***	-0.006***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lobby in 2007	-0.771***	-0.935***	-	-	-
	(0.000)	(0.000)			
Weighted tariff		-0.200***			-0.008
		(0.000)			(0.196)
Number of world exporters		0.605***			0.136***
		(0.000)			(0.001)
Lagged import penetration		0.103***			0.001
		(0.000)			(0.590)
Constant			4.190	4.222***	4.095***
			(0.000)	(0.000)	(0.000)
Observations	676	578	676	676	578
			Product fixed effects	Product, year fixed effects	Product, year fixed effects

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the lobby-year level.

Table 9: Difference in trend between organized and non organized sectors – yearly, by lobby group

Depvar: Number of countries with market access	If Lobby=0 (1)	If Lobby=1 (2)	All (3)
Lobby			-3.038***
			(0.000)
Lobby in 1996			-0.047***
			(0.000)
Lobby in 1997			-0.016***
			(0.000)
Lobby in 1998			-0.043***
			(0.000)
Lobby in 1999			-0.037***
			(0.000)
Lobby in 2000			-0.028***
			(0.000)
Lobby in 2001			-0.021***
			(0.000)
Lobby in 2002			-0.011**
			(0.010)
Lobby in 2003			-0.0042
			(0.183)
Lobby in 2004			0.000
			(0.942)
Lobby in 2005			0.005**
			(0.022)
Lobby in 2006			-0.010***
			(0.000)
Weighted tariff	0.002	-0.046**	0.002
	(0.663)	(0.042)	(0.703)
Weighted tariff (x) Lobby			-0.048***
			(0.001)
Number of world exporters	0.134**	0.134	0.134**
	(0.011)	(0.221)	(0.018)
Number of world exporters (x) Lobby			0.000
			(0.997)
Lagged import penetration	0.003	-0.013	0.003*
	(0.139)	(0.131)	(0.070)
Lagged import penetration (x) Lobby			-0.016**
			(0.013)
Constant	4.558***	1.009***	4.093***
	(0.000)	(0.000)	(0.000)
Observations	341	237	578

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the lobby-year level. The regressions include year and product fixed effects

Table 10: Regressions on time dependent variables - intensity of lobbies' activities

	(1)	(2)	(3)	(4)
Depvar: Number of countries with market access	Contributions	Dummy Contribution>0	Dummy Contribution >15,000US$	Dummy Contribution >25,000US$
Lobby	-2.255*	-2.997***	-3.002***	-2.896**
	(0.058)	(0.000)	(0.000)	(0.013)
Contribution 10,000US$	-0.002*			
	(0.097)			
Weighted tariff	0.000	-0.006	-0.006	0.001
	(0.870)	(0.364)	(0.354)	(0.824)
Number of world exporters	0.039	0.117**	0.116**	0.039
	(0.134)	(0.016)	(0.016)	(0.131)
Lagged import penetration	0.002	0.003	0.003	0.002
	(0.500)	(0.197)	(0.210)	(0.524)
Dummy=1 if contribution per year-product>0		-0.007		
		(0.643)		
Dummy=1 if contribution per year-product>15,000US$"			-0.003	
			(0.579)	
Dummy=1 if contribution per year-product>25,000US$"				-0.008**
				(0.027)
Constant	1.418	4.094***	4.094***	1.391
	(0.291)	(0.000)	(0.000)	(0.303)
Observations	578	578	578	578
	Product, year fixed effects, Product specific trend	Product, year fixed effects	Product, year fixed effects	Product, year fixed effects

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the product level.

Table 11: Finite distributed lag model of order 3

Depvar: Number of countries with market access	(1) Baseline	(2) Distributed lag model
Lobby	-2.896**	-2.991***
	(0.013)	(0.000)
Dummy=1 if contribution per year-product>25,000US$	-0.008**	-0.012*
	(0.027)	(0.087)
1 year lagged dummy=1 if contribution per year-product>25,000US$		-0.009
		(0.305)
2 year lagged dummy=1 if contribution per year-product>25,000US$		-0.002
		(0.659)
3 year lagged dummy=1 if contribution per year-product>25,000US$		0.002
		(0.606)
Weighted tariff	0.001	0.002
	(0.824)	(0.719)
Number of world exporters	0.039	0.126**
	(0.131)	(0.013)
Lagged import penetration	0.002	0.003
	(0.524)	(0.257)
Constant	1.391	4.110***
	(0.303)	(0.000)
Observations	578	484

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the product level. The regressions include year and product fixed effects

Table 12: Long-run propensity, intensity of lobbies' activity

Depvar: Number of countries with market access	(1)
Lobby	-2.991***
	(0.000)
C_{kt}=1 if contribution per year-product>25,000US$	-0.021**
	(0.043)
$C_{k(t-1)} - C_{kt}$	-0.009
	(0.453)
$C_{k(t-2)} - C_{kt}$	-0.002
	(0.745)
$C_{k(t-3)} - C_{kt}$	0.002
	(0.742)
Weighted tariff	0.002
	(0.681)
Number of world exporters	0.126**
	(0.013)
Lagged import penetration	0.003**
	(0.050)
Constant	4.110***
	(0.000)
Observations	484

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the product level. The regressions include year and product fixed effects

Table 13: Probit on market access

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Open market access			Active lines			
	All lines	Potential exporters to the world only	Potential exporters to the EU only	All lines	If potential exporter to the world only	If Market Access=1 & potential exporter to the world	If potential exporter to the world and control for EU exporters
Log GDP	-0.009	-0.006	0.011	-0.196	-0.198	-0.324	-0.315
	(0.810)	(0.874)	(0.701)	(0.439)	(0.433)	(0.287)	(0.298)
Upper Middle Income	1.300***	1.611***	-0.447***	0.517*	-1.052	-1.376***	-0.110
	(0.000)	(0.000)	(0.001)	(0.063)	(0.166)	(0.002)	(0.766)
Lower Middle Income	-1.135***	-0.175**	-1.987***	0.812***	-2.107*	-0.913**	-0.398
	(0.000)	(0.025)	(0.000)	(0.010)	(0.057)	(0.011)	(0.177)
Low Income	2.238***	-2.006***	-1.418***	-0.495	-1.415	-0.458	-1.237*
	(0.000)	(0.000)	(0.000)	(0.397)	(0.148)	(0.287)	(0.064)
Log remoteness	0.002	0.005	0.022	0.015	0.013	-0.028	-0.117
	(0.960)	(0.908)	(0.486)	(0.951)	(0.958)	(0.928)	(0.695)
1 if the U.S. domestic sector is organized	-1.725***	-1.652***	-2.029***	-0.072	-0.692*	-0.302	-0.842***
	(0.000)	(0.000)	(0.001)	(0.870)	(0.074)	(0.452)	(0.007)
1 if the country is a potential exporter to the world	0.565***						
	(0.000)						
1 if the country exports to the European Union							0.976***
							(0.000)
1 if origin is a WTO member	-0.010	-0.009	-0.009	0.168***	0.168***	0.292***	0.108**
	(0.488)	(0.525)	(0.673)	(0.000)	(0.000)	(0.007)	(0.017)
1 for contiguity	1.550***	1.892***	1.945***	4.576***	3.196***	4.425***	3.515***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
1 for common official of primary language	0.255***	0.573***	-1.756***	0.313*	-1.259***	-0.586*	-0.409
	(0.000)	(0.000)	(0.000)	(0.083)	(0.000)	(0.053)	(0.114)
1 for island states	0.085	-0.548***	1.692***	0.660*	-0.064	-0.718	-0.545
	(0.271)	(0.000)	(0.000)	(0.092)	(0.656)	(0.139)	(0.219)
Constant	-0.825**	-0.944**	1.101**	-1.827	1.761	0.736	-0.640
	(0.048)	(0.011)	(0.010)	(0.292)	(0.517)	(0.740)	(0.761)
Observations	84912	79789	45809	53442	51831	18627	53442

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the exporter level. Regressions include year, product and exporter fixed effects

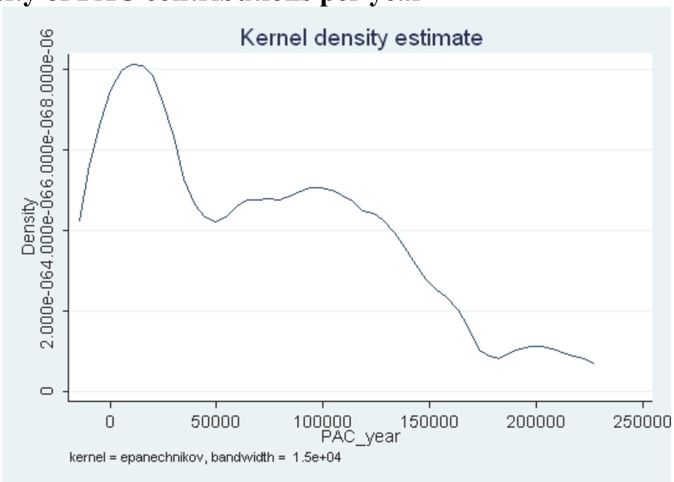
Table 14: Negative binomial, number of trade lines

Number of Trade lines	(1) All lines	(2) Potential exporters to the world only	(3) Active lines	(4) Difference between non active and active lines
Log GDP	-0.006	0.224	-0.464	0.013
	(0.752)	(0.305)	(0.332)	(0.791)
Upper Middle Income	14.763***	14.468***	13.875***	15.483***
	(0.000)	(0.000)	(0.000)	(0.000)
Lower Middle Income	6.973***	7.030***	7.913***	7.069***
	(0.000)	(0.000)	(0.000)	(0.000)
Low Income	13.699***	13.332***	-5.918***	14.504***
	(0.000)	(0.000)	(0.000)	(0.000)
Log remoteness	0.001	0.311	-0.241	-0.004
	(0.963)	(0.160)	(0.578)	(0.925)
1 if origin is GATT/WTO member	-0.006	-0.036	0.276**	-0.048
	(0.134)	(0.316)	(0.025)	(0.298)
1 for contiguity	15.513***	16.570***	17.748***	13.064***
	(0.000)	(0.000)	(0.000)	(0.000)
1 for island states	6.967***	6.786***	7.700***	7.089***
	(0.000)	(0.000)	(0.000)	(0.000)
1 for common official of primary language	14.599***	14.890***	13.441***	14.259***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-26.286***	-24.131***	-26.430***	-26.974***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	2333	2333	2333	2333

Notes: p-values in parentheses,***, ** and * respectively indicates significance at the 1%, 5% and 10% levels. Robust standard errors are clustered at the exporter level. The regressions include year and exporter fixed effects

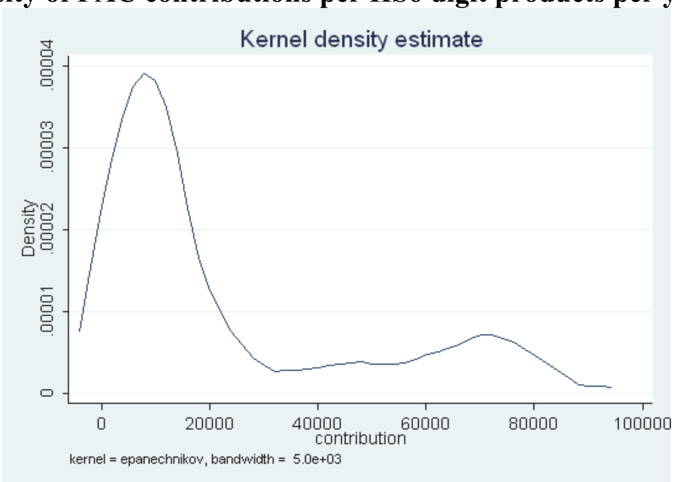
7 Figures

Figure 1: Kernel density of PAC contributions per year



Source: Federal Action Commission

Figure 2: Kernel density of PAC contributions per HS6 digit products per year



Source: Federal Action Commission

Figure 3: Random assignment of the lobby status; Coefficient distribution

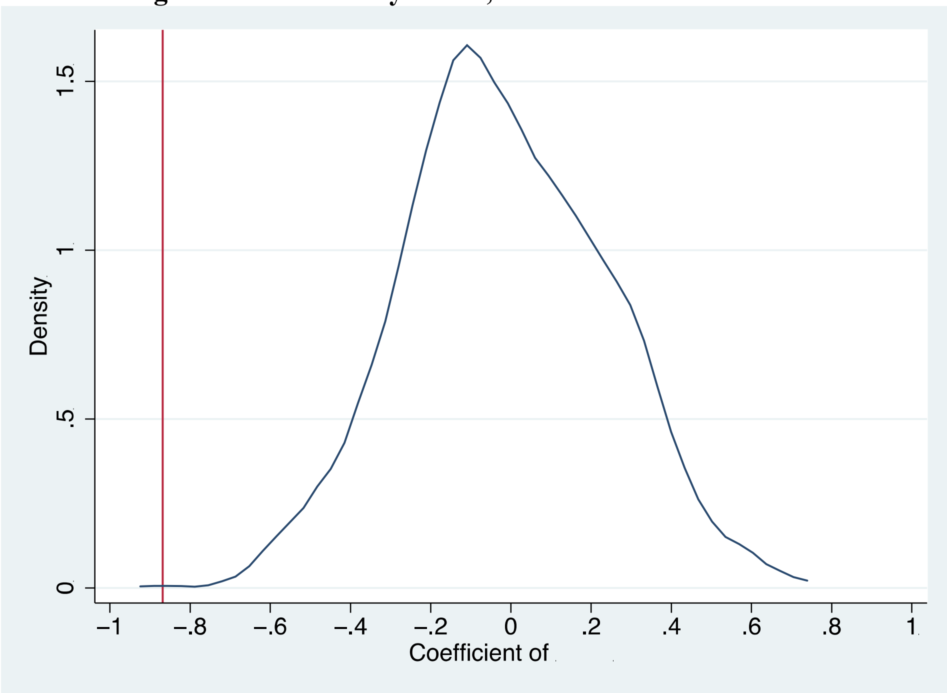


Figure 4: Scatter plot, log GDP per capita versus number of trade lines by exporter, 1994 and 2006

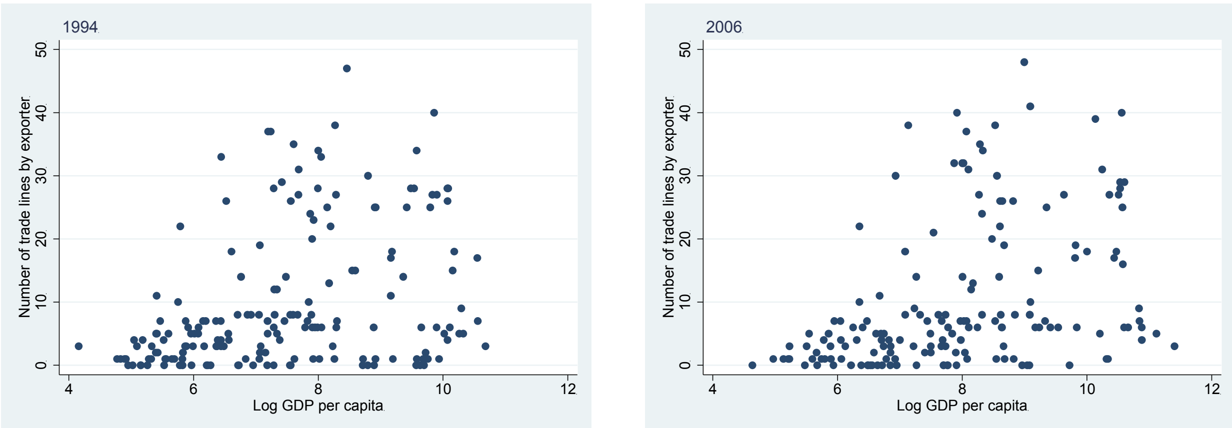
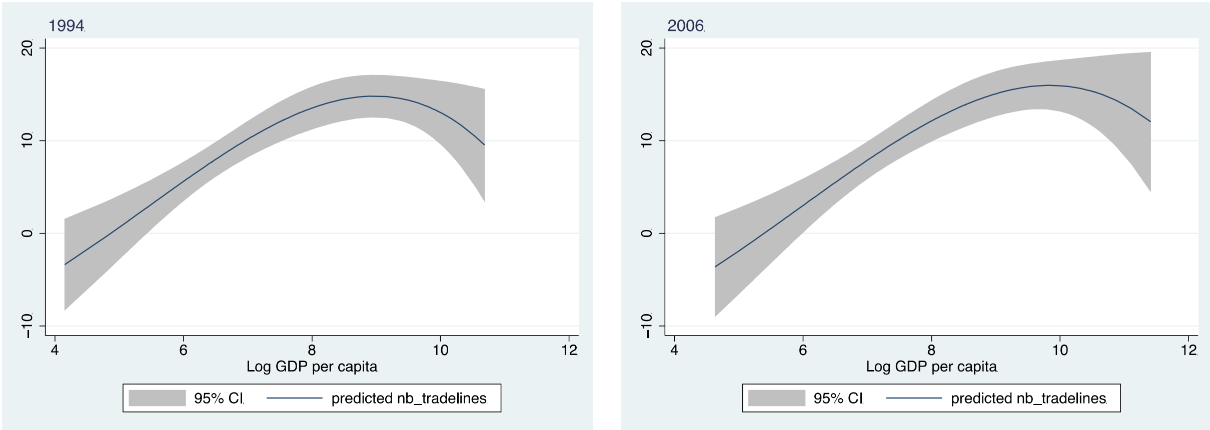


Figure 5:Fractional polynomial; log GDP per capita versus number of trade lines by exporter



8 Appendix

Figure 6: Random assignment of the lobby status; Coefficient distribution on first difference reg.