Product Regulation or Protectionism?

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Abstract

Product regulation has become a principal means of intervention in international trade. There is a debate, however, on its intent. Gründler and Hillman (2021) propose that half of regulatory restrictions on imports may protect producers, when formally the regulations are intended to protect consumers. The idea that regulation might protect producers rather than consumers goes back to Peltzman (1976) for regulation of price and appears as a political trade-off in choice of a tariff in Hillman (1982). We provide a theoretical analysis that underpins the puzzle in intent of regulatory restrictions on imports, allowing for ex-ante or ex-post inspection by the regulator (before or after the product is purchased). Our results suggest that under certain circumstances all firms, even importers, prefer ex-ante inspection, which is surprising, given that ex-ante inspection discriminates importers. We also show that ex-ante inspection may be harmful for public safety, because it harms local producers' incentive to make effort, and therefore must be complemented by ex-post inspection.

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1 Introduction

We explore two policies of product regulation that differ in the timing they are implemented: before or after the product is distributed in the market (ex-ante and ex-post regulation). We focus on two questions: First, who favors product regulation policies, and, specifically, is there always a conflict of interests between local producers and importers? Second, does ex-ante regulation (by itself) always achieve its declared goal of promoting the public safety in the equilibrium? In the sequel, we argue that the answer to both questions is NO, based on the results of our theoretical model.

Experience goods, like food and drugs, are under safety regulation in many countries. As their quality is typically realized after consumption, it is difficult for consumers to detect impaired products and avoid potential damages ex-ante. For example, home appliances may malfunction and cause damages, and automobile defects may expose passengers to injurious crashes. Another example is medical errors, which are perceived as the third leading cause of death in the US, after heart disease and cancer. The role of the regulator in these cases is to alleviate safety hazards and ensure the safety of products and services. Therefore, product regulation may promote trade by providing consumers some reassurance that the products are safe to consume (see a review by Cassing and Hillman, 2019).

However, there is a vast literature on protectionism through ex-ante inspection policies. That is, product regulation may be used to protest domestic producers against import of competing products (see Peltzman (1976); Hillman, 1982; Hillman and Ursprung, 1988; Grossman and Helpman, 1994; for a survey see Ethier and Hillman, 2018). For example, in the 70's Japan imposed phyto-sanitary restrictions on import of apples. The American officials then claimed that these regulations were protectionist and unfair to importers (see Hoekman and Kostecki, 2009, p. 251). Grazia et al. (2012) illustrate the use of sanitary standards to exclude developing countries from the market. The rising awareness for this potential fallacy has led to the implementation of international trade rules aimed at alleviating protectionism. As the World Trade Organization (WTO) website states,[1] one of its goals is to ensure "that strict health and safety regulations are not being used as an excuse for protecting domestic producers".

Recently, Gründler and Hillman (2021) stress the potential severity of protectionism in product regulation, arguing that half of regulatory restrictions on imports may protect producers. Our WTO data seems to be consistent with this impression, suggesting that corrupt countries have more regulatory restrictions. Using the Corruption Perception Index (CPI) and the Sanitary and Phyto-sanitary standards (SPS regulatory restrictions on import) in the years 2010-2018, we show that countries perceived as more corrupt have more restrictions on import. Specifically, CPI lies in the range of 1-10, where 1 denotes the most corrupt country and 10 denotes the least corrupt country. We find that a reduction of 1 in the level of CPI is associated with an increase of 0.3 in the number of SPS regulations in a country. This correlation is significant and robust to many controls and favors the argument that at least part of the restrictions on import are a result of protectionism [2]. See an extended discussion on these empirical regularities in the Appendix.

We focus on two main policies that the government may implement to ensure product safety. The first policy is *ex-post inspection*, engaged after the product is distributed and the damage is realized. When the inspection reveals that the damage is caused by the producer, the producer is penalized. The second policy involves testing products before they are distributed in the market (*ex-ante inspection*). The ex-ante inspection policy is typically discriminating, entailing extra costs on importers, who must store their goods until the regulator confirms they can be distributed. Accordingly, high frequency of ex-ante inspections may deter importers from entering the market, boosting the sales of local producers. Therefore, this policy may serve as a protectionist policy in favor of local producers dressed as a concern for public safety (see Hoekman and Kostecki, 2009, p.250). Nevertheless, we argue

[1] https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm4_e.htm

[2] We control for country income group, GNI per capita, interaction of CPI and GNI, country and year fixed effects, country linear time trend and tariff variables, as a substitute protectionist policy.

that the ex-ante inspection may actually harm the public safety, inducing local producers to reduce the effort they expend in the safety of their products, which raises the need for a complementary policy.

Another important result suggests that not only local producers but also importers may favor an ex-ante inspection policy. The reason is that despite its discriminating nature, this policy shifts the economy into a higher price equilibrium, similarly to price coordination. Specifically, importers benefit from ex-ante inspection policy when their number is relatively large.

In some of the related literature on quality standards there is a market for low-quality products in the equilibrium. That is, consumers buy low-quality products for a lower price (see Ronnen, 1991 and Valletti, 2000). Our model, however, focuses on safety regulation, where low-quality products are considered unsafe. As such, consumers would prefer not to purchase them if they had perfect information, similar to Hörner (2002). The reason consumers may still purchase unsafe products is that they cannot identify them ex-ante.

Shavell (1984) considers safety ex-ante regulation vs. ex-post liability, which resembles our ex-ante vs. ex-post inspection policies. In his model, the main goal is to minimize the expected sum of safety care costs and harm by accidents. D'Antoni and Tabbach (2019) provide an analysis of how complementary use of ex-ante and ex-post activity reduces safety accidents in an efficient way. See also Potrafke (2010) for the ideological considerations in the decision of market deregulation. Hatsor and Jelnov (2020) consider a regime with a policy of ex-post inspection by the regulator and complementary lawsuits by consumers. They show that an inefficient and non-transparent regulator may crowd-out consumer lawsuits, paradoxically harming the public safety. Similarly, in this article the implicit goal of the regulator is public safety. Nevertheless, ex-ante inspection may serve as a protectionist policy, which harms the product safety, unless combined with ex-post inspection.

To summarize, our contribution to the literature of protectionism is by providing a theoretical model that underpins the puzzle in intent of regulatory restrictions. We derive the implications of product regulation on the players in the market, showing that in certain cases the interests of local producers and importers may coincide. Specifically, not only local producers but also importers may be better off with the ex-ante inspection policy, while consumers pay a price. Second, our results suggest that the ex-ante inspection policy is inefficient in the equilibrium in the sense that it may not achieve its declared goal of promoting the product safety. Being protectionist, or in favor of local producers, it deters local producers from making effort, and thereby harms the product safety. Thus, the ex-ante inspection, though may have a large lobby of both local producers and importers, must be compensated by a complementary policy of ex-post inspection in order to restore the incentives of local producers and ensure that the products are safe.

The remainder of the paper is structured as follows. Section 2 introduces the model. In Section 3 we present the theoretical results. Section 4 concludes.

2 The Model

The product in our model has two types. Type ($\hat{D}$) is safe for consumption, whereas type (D) is damaged (impaired or unsafe) and thus prohibited for distribution in the market.

There is a continuum of consumers, each one purchases one or zero units of the product. When consumers purchase a damaged product (D) their disutility is $-V$, $V > 0$. Thus, if consumers had perfect information about products, and could observe whether a product is unsafe (D), they would never purchase unsafe products. In other words, there is a demand for the product only if it is publicly known as safe ($\hat{D}$). In this case, consumers' utility is given by tU, $U > 0$, where taste of consumers for the product, t, is heterogeneous across consumers and uniformly distributed on $[0, 1]$. Accordingly, consumers purchase a safe product if they sufficiently enjoy the product, or when their utility tU is larger than the price P, $t > \frac{P}{U}$.

Then, it is easy to verify that the demand for safe products is given by

$$P = U(1 - Q), \tag{1}$$

where Q is the quantity of safe products in the market.

The product is produced by identical local firms from a set L and by identical importers from a set I using the same technology. We focus on interior solutions, where there is a positive number of local producers in the market, $|L| > 0$, each one produces a positive quantity of $Q_j > 0$; and a positive number of importers, $|I| > 0$, with each one producing a positive quantity of $Q_i > 0$. Correspondingly, the total quantity in the market is given by $Q = |L|Q_j + |I|Q_i$. We assume a large number of producers. That is, we focus on short-run symmetric perfect competition equilibrium, where the number of firms in the market is given and each firm does not affect the price.

Each producer decides whether to make effort in production (e) or not ($\hat{e}$). Her decision is considered private information. The cost of effort of an importer that produces Q_i units of the product is given by $c_I Q_i^2$, where $c_I > 0$. For a local producer, the cost of effort of producing Q_j units of the product is given by $c_L Q_j^2$, where $c_L > 0$ and the production cost function is similar for local producers and importers, $c_L = c_I$.

We assume that effort guarantees safety. That is, if the local producer/importer expends effort, then its product is of type $\hat{D}$ (safe) with probability 1. However, choosing $\hat{e}$ (no effort) yields type $\hat{D}$ (safe) products with probability β, $0 < \beta < 1$, and D (unsafe) products with probability $1 - \beta$. Therefore, when a consumer encounters an unsafe product ex-post, and consequently suffers damage, then it is certain to conclude that the firm did not expend effort ($\hat{e}$) ex-ante. We consider no fixed costs.

The regulator R in our model has an essential role in promoting product safety using two potential policy tools. The first, ex-ante regulation (or inspection), is used before the products are distributed in the market. Specifically, for each producer there is an exogenous probability P_a that its products are tested by the regulator. If a firm's unsafe (type D) products are tested, then the firm is banned from the market and the distribution of its products is not allowed. Otherwise, if its products are safe or they were not tested ex-ante, then the firm obtains permission to distribute its products in the market.

The ex-ante inspection is a protectionist, or discriminating policy, being costly only for importers I. Importers pay a storage cost, $d > 0$, while their containers are delayed in ports for inspection. Therefore, the expected inspection cost of Q_i units for an importer is $P_a d Q_i^2$.

The second policy tool used by the regulator involves ex-post inspection. Ex-post inspection is a result of the following: A producer (a local producer or an importer) made no effort and produced unsafe products. These unsafe products were not tested, and therefore were distributed in the market. The customers who purchased these products suffer damage, and therefore receive an ex-post compensation of $f \geq 0$ from the producer with probability γ. The parameter γ reflects the *efficiency or enforcement level of the ex-post inspection process*. Accordingly, the expected compensation paid by a producer that makes no effort is $(1-\beta)\gamma f$.

We make two additional assumptions. First, if firms are indifferent between making effort or not (e and $\hat{e}$), they choose to make effort, e. Second, if firms choose not to expend effort ($\hat{e}$), then the expected consumers' utility is negative, $\beta U + (1-\beta)(\gamma f - V) < 0$. In other words, the disutility from an unsafe product is sufficiently large, $V > \beta U/(1-\beta) + \gamma f$. In this case, when firms choose $\hat{e}$, we obtain a corner solution with zero demand for the product and zero profits.

We assume that the regulator is interested in maintaining product safety. In other words, the regulator chooses policy tools $(P_a, f(P_a))$ on the product safety constraint, where all firms make effort, e, and the product safety is guaranteed. Thus, in the equilibrium the market exists. Formally, the 'product safety constraint' is defined as pairs of $(P_a, f(P_a))$ where for each level of P_a, $\hat{f}(P_a)$ is the minimal level of expected compensation required to ensure product safety in the market.

Then, the regulator maximizes its objective function, given that the product safety constraint holds (focusing on interior solutions).

Let the *domestic welfare, or the regulator's objective function* (RW) be a weighted sum of the total consumer surplus and the aggregate profits of local producers:

$$RW = \omega_c CS + \omega_p \sum_{i=1}^{|L|} \pi_L(Q_j), \tag{2}$$

where CS is *the total surplus of consumers*, $\pi_L(Q_j)$ is the profit of local producer i, and ω_c and ω_p are the weights on consumers' and local producers' surplus, respectively, where $\omega_c + \omega_p = 1$. The ratio of weights in the regulator's welfare function, $\frac{\omega_p}{\omega_c}$, measures the relative importance of local producers in the eyes of the regulator, which may be interpreted as its level of corruption. We define a regulator who attributes identical weights on local producers and consumers, $\omega_p = \omega_c$, as an uncorrupt regulator. Unbalanced weights in favor of local producers, $\omega_p > \omega_c$, may suggest that the regulator is corrupt, assuming that local producers lobby for their interests. On the product safety constraint, consumers who purchase the product have a surplus of $tU - P$. Since only consumers with $t \in [\frac{P}{U}, 1]$ buy the product, then consumers' surplus (CS) is given by

$$CS = \frac{(U - P)Q}{2}. \tag{3}$$

Next, we examine the implications of the policy chosen by the regulator, $(P_a, f(P_a))$, protectionist or not, on the players in the market, consumers and producers.

3 Results

Recall that we focus on symmetric perfect competition equilibria. Recall also that the regulator R commits to a probability of ex-ante inspection of each unit of the product (P_a)

before entering the market, and the equilibrium satisfies the product safety constraint (all producers choose (e)). In the sequel, we analyze how the policy chosen by the regulator affects producers and consumers.

It is not surprising that local producers benefit from an increase in the probability of ex-ante inspection, P_a. The reason is that this policy is discriminating against importers in the sense that only importers bear a storage cost during the ex-ante inspection, $P_a dQ_i^2$. As a result, the market share of local producers increases at the expense of importers. It is easy to verify that when $P_a > 0$ the profits of local producers are always larger than the profits of importers, $\pi_L(Q_j) = (1 + \frac{dP_a}{c_I})\pi_I(Q_i) > \pi_I(Q_i)$ (see Appendix, equation (9)). However, despite their rising storage cost, importers may be better off as well by an increase in the probability of ex-ante inspection. The reason is that the market shifts into a higher price equilibrium. The rise in price increases their profits when the number of importers is sufficiently large (thus the market share of each importer is relatively small). That is, consumers have high utility from the (safe) product and the technology is sufficiently efficient (low marginal cost).[3] Therefore, both local producers and importers may favor the protectionist policy, ex-ante inspection.

Nevertheless, an increase in P_a is not a Pareto improvement. Consumers are worse off by the price increase, and the damage to consumer surplus is larger than the benefit for local producers. Therefore, in case the regulator assigns equal weights to producers and consumers ($\omega_c = \omega_p$), the domestic welfare decreases in P_a.

Proposition 1. The effect of ex-ante inspection on the players in the market

(a) The surplus of local producers increases in P_a.

(b) The consumer surplus decreases in P_a.

(c) The domestic welfare decreases in P_a for $\omega_c = \omega_p$, .

(d) There is n' such that for $\frac{|I|}{|L|} > n'$, the surplus of importers increases in P_a.

[3] Salop and Scheffman (1983) and Maloney and McCormick (1982) show that firms may be better off by increasing production cost and by regulatory restrictions.

Recall that the regulator may combine ex-ante inspection with ex-post inspection, $(P_a, f(P_a))$, to guarantee the product safety in the equilibrium. Next, we characterize how these policy tools intertwine to guarantee that firms choose to make effort (e). That is, we derive in Proposition 2 and Figure 3.1 the effective combinations of ex-ante and ex-post inspection on the product safety constraint.

First, it is important to note that ex-ante inspection is not necessary to achieve product safety in the market, because it can be sufficiently substituted by ex-post inspection. In the absence of ex-ante inspection, $P_a = 0$, then both local producers and importers make effort (e) when the expected compensation ($(1-\beta)\gamma f$, paid ex-post by a producer for an unsafe unit) is sufficiently high. Note that in the case of no protectionism, there no difference between a local producer and an importer. They use the same technology and bear the same marginal cost. Thus, the same expected compensation is needed to ensure that they make effort and produce safe products.

Second, we analyze the trade-off between ex-ante and ex-post inspection on the product safety constraint. An increase in the probability of ex-ante inspection, P_a, induces importers to make effort in order to avoid being banned from the market. Thus, it is not surprising that in the case of importers, the higher the probability of ex-ante inspection, P_a, the lower the expected (ex-post) compensation required to prompt their effort. In other words, for importers, ex-ante inspection and ex-post inspection are substitutes.

This logic, however, does not necessarily apply for local producers. For local producers the ex-ante and ex-post inspection policies may be complementary. Unlike importers, local producers do not bear a storage cost when ex-ante inspection takes place. Consequently, an increase in the probability of ex-ante inspection, P_a, increases their market share in the equilibrium at the expense of importers, which reduces their incentive to make effort and paradoxically harms the product safety. In other words, ceteris paribus, increasing the probability of ex-ante inspection guarantees the effort of importers, but not the effort of local producers. Thus, for each level of $P_a > 0$, the expected ex-post compensations sufficient to ensure the effort of local producers are always larger than those of importers on the product safety constraint.

Proposition 2. The ex-post inspection required to ensure the product safety satisfies:

1. Substitutability for importers: There is $\bar{f}(P_a)$ weakly decreasing in P_a, such that for $(1-\beta)\gamma f > \bar{f}(P_a)$, importers choose (e).

2. There is $\hat{f}(P_a) > \bar{f}(P_a)$ such that for $(1-\beta)\gamma f > \hat{f}(P_a)$, local producers choose (e).

3. $f > \hat{f}(P_a)$ guarantees that all producers in the market choose (e). In particular, there is f' such that for $f > f'$ and $P_a = 0$ all firms choose (e).

These results generally imply that protectionist policies may harm the incentive of local producers to make effort and without additional means may harm the product safety. To satisfy the product safety constraint, a more prevalent use in protectionist policies must be combined with complementary policies. This ensures that not only importers but also local producers make effort, hence all products in the market are safe.

The regulator ensures the product safety in the market by selecting a pair of inspection policies $(P_a, \hat{f}(P_a))$ on the product safety constraint. It is important to note, however, that in the equilibrium, firms are never required to compensate consumers ex-post, because the products are always safe. Thus, while the probability of ex-ante inspection (P_a) affects the surplus of the players in the market, and thereby the regulator's objective function, the level of the (ex-post) compensation $(1-\beta)\gamma f$ has no effect on the regulator's objective function in the equilibrium.

Figure 3.1 calibrates the minimal ex-post compensations, $\bar{f}(P_a)$ and $\hat{f}(P_A)$, required to assure that importers and local producers make effort, respectively, for each level of P_a. Accordingly, the levels of $\hat{f}(P_a)$ define the product safety constraint, assuring that all producers make effort and all products are safe. For the calibration, we use the parameters $c_I = 0.5$,$d = 2$,$U = 1$, $\gamma = \beta = 0.5$, $|I| = 90$ and $|L| = 5$. In Figure 3.1, we illustrate

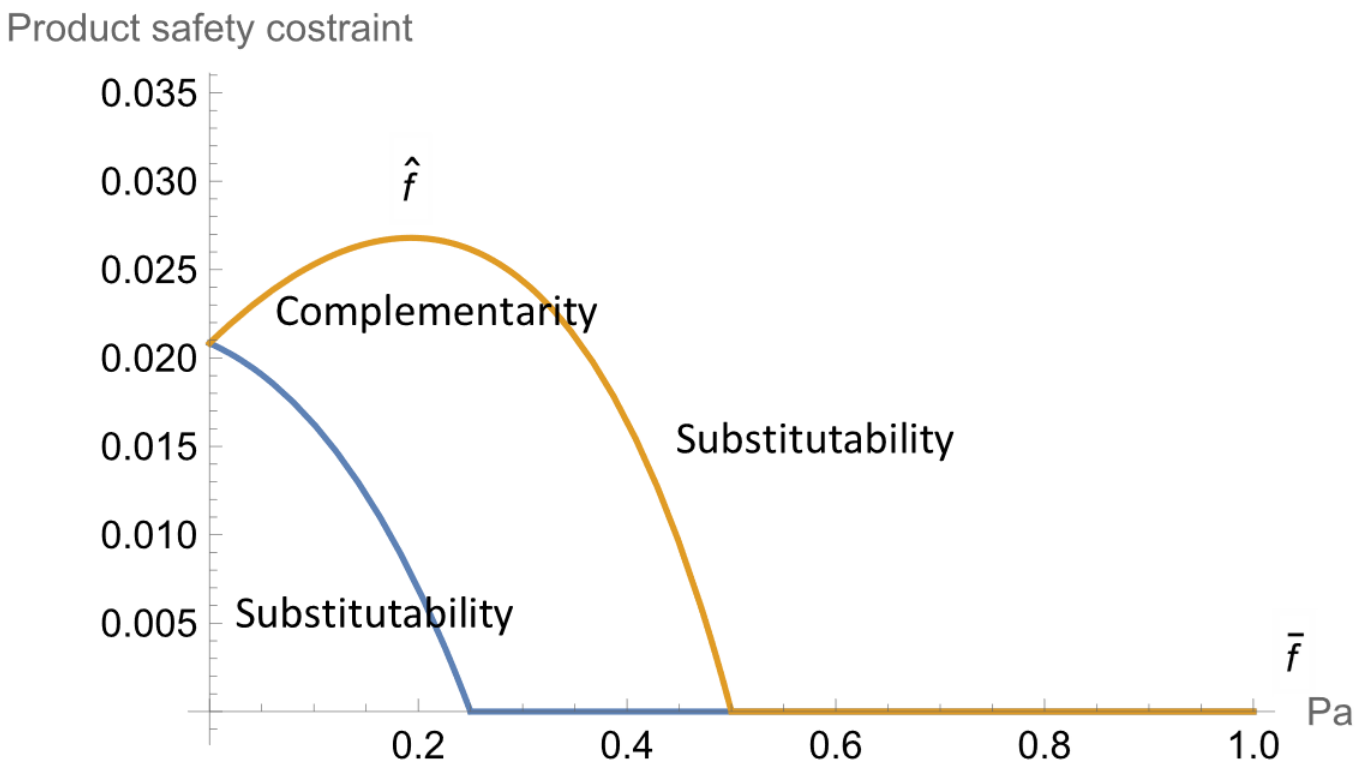

Figure 3.1: Product safety constraints

that while ex-ante and ex-post inspection are always substitutes for importers, they may be complementary for local producers. Accordingly, $\hat{f}(P_a)$ is increasing in some area on the product safety constraint, indicating that ex-post inspection is complementary to ex-ante inspection.

The regulator's choice of inspection policies $(P_a, \hat{f}(P_a))$ satisfies the product safety constraint and also maximizes its welfare function, the domestic welfare (a weighted sum of consumers' and local producers' surplus, see Eq.3). Recall that according to proposition 1, when the probability of ex-ante inspection (P_a) increases, consumers are worse off more than local producers are better off. Then, given f', if the regulator assigns equal weights to consumers and local producers, or if a higher weight is given to consumers, $\omega_p \leq \omega_c$, then no ex-ante inspection is performed. However, if the regulator sufficiently prefers surplus of local producers (due to lobbying or even corruption activities), $\omega_p = 1$, then ex-ante inspection is performed with certainty.

Proposition 3. The regulator's choice of ex-ante ex-post inspection policies, $(P_a, \hat{f}(P_a))$
(a) If $\omega_p \leq \omega_c$, then RW is maximized for $(0, f')$.
(b) If $\omega_p > \omega_c > 0$ and ω_p is sufficiently large, then RW is maximized for $(1, \hat{f}(1))$.

4 Conclusion

Our model maps the cases where a protectionist policy, ex-ante inspection, is favorable for both local producers and importers. Specifically, the interests of local producers and importers coincide when the number of importers is sufficiently large or when the profit margin is sufficiently large. In this case, importers benefit from the price increase more than the burden of their storage cost.

Should we expect, then, to observe importers lobbying ex-ante inspection in real-life? Probably not. In practice, when the number of importers is high, it is difficult for them to coordinate lobbying activities. Moreover, assuming that their motives may seem unreliable to the regulator, they may count on local producers to lobby ex-ante inspection policy for them. We would expect, however, that given the assumptions of our model, importers will not protest against lobbying efforts of local producers when they meet their interests.

Additionally, our results suggest that in the equilibrium protectionist policies that favor local producers may be harmful for their incentive to make effort, and as such are harmful for product safety. This raises the need for complementary policies to ensure product safety. Specifically, the expected ex-post compensation must increase in order to satisfy the product safety constraint. More generally, this result implies that protectionist policies, besides being harmful for consumers, may have further negative implications. While not in the model, the need for complementary policies may impose supplemental expenses on the regulator, which is another inefficient burden on the consumers.

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Appendix

Empirical regularities

If local producers have an incentive to lobby for ex-ante restrictions on trade, their lobbying is expected to gain more fruits in countries with high level of corruption. We demonstrate this stylized fact using publicly available data for the years 2010-2018. Our two variables of interest are the following. First, the number of SPS (sanitary and phyto-sanitary) standards (also called 'SPS regulation') in different countries, as reported by the World Trade Organization.[4] Second, we use the Corruption Perception Index (CPI) data. The CPI ranges between 0-100, where 100 denotes the lowest level of corruption. We conjecture that the correlation between SPS regulation and CPI is negative, or in more corrupt countries there is more room for lobbying in favor of SPS regulations.

In Figure 4.1, we plot SPS regulation as a function of CPI for four groups of countries: low-income countries, lower-middle income countries, upper-middle income countries, and high-income countries (as defined by the World Bank) for the year 2018. The impression from Figure 4.1, particularly from three lower groups of income, seems that SPS decreases in CPI, consistent with our hypothesis. That is, as a country is less corrupt, its number of SPS restrictions declines. However, this may not be the case in high-income countries. We repeated the same exercise for each year 2012-2017 and obtained similar results.

[4] https://i-tip.wto.org/goods/Forms/MemberView.aspx?mode=modifyaction=search

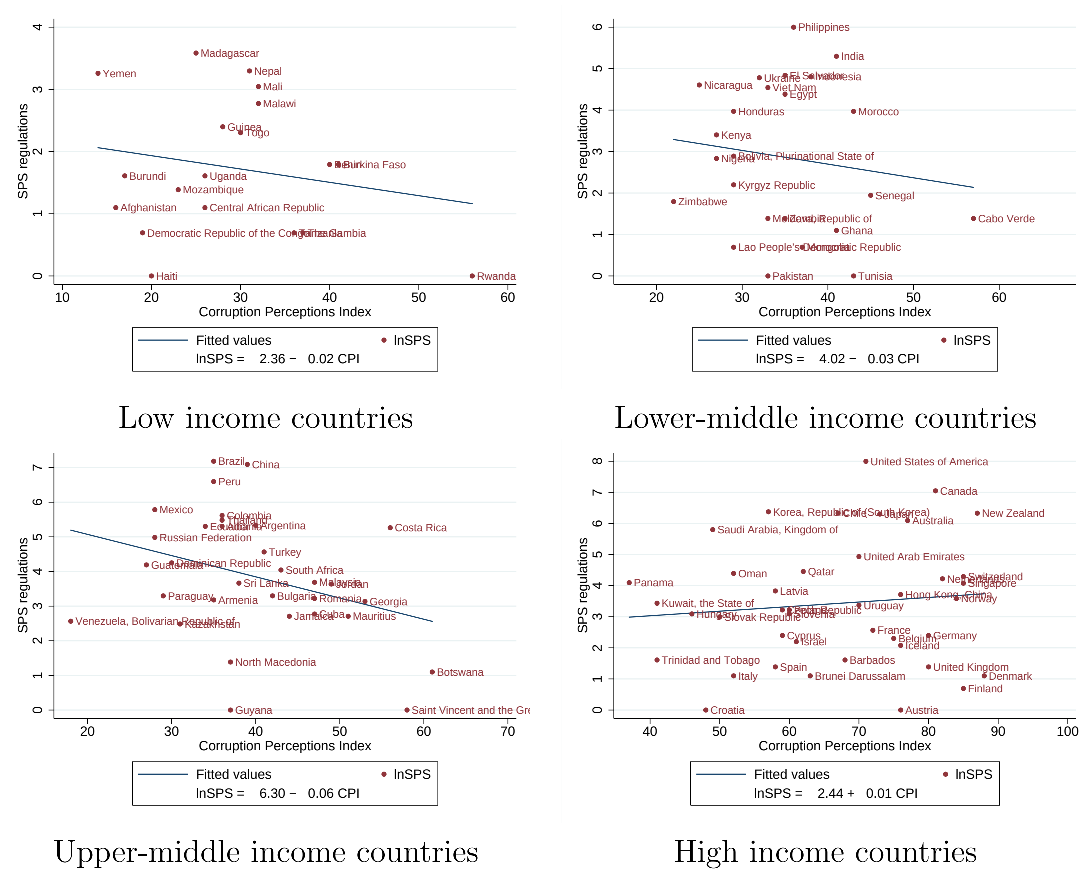

Figure 4.1: SPS by income groups

Next, we estimate a linear model to measure the effect of CPI on SPS regulation at the country level in the years 2010-2018, controlling for the level of GNI per capita, country income group (4 income groups defined by the world bank), and the interaction of $CPI{*}GNI$. Standard errors are clustered at the country level. We start from this basic model at column (1) of Table 1. The CPI coefficient is negative and significant as we expected. That is, a more corrupt country has more SPS regulations. Specifically, a reduction of 1 percent in the level of CPI is associated with an increase of 0.3 in the number of SPS regulations. The results are robust to adding country fixed effects, year fixed effects (separately or jointly), or country specific linear time trend in columns (2)-(5), respectively. The coefficient of interest remains negative and significant at roughly -0.03.

Note that in line with Figure 4.1, the effect of country income group is positive and significant in the basic model, reflecting the larger number of regulations in higher income group countries (see the larger range of y-axis for higher income groups there). However, this effect is probably captured by country fixed effects and becomes insignificant when we add country fixed effects. Therefore, it is not reported in the regression results.

As a robustness check, in Table 2 we take the basic model with country and year fixed effects and add alternatively six control variables. It is widely accepted that standards like SPS regulations and tariff barriers are substitute protectionist policies. Thus, to control for the effect of tariffs, we use three general tariff variables ($AVERAGE$, $DUTIES15$ and $DUTYFREE$), available in 'the World Tariff Profiles of the World Trade Organization'. Additionally, since our model is highly relevant to the food market, we also control for tariffs on agriculture products ($AGRIAVERAGE$, $AGRIDUTIES15$ and $AGRIDUTYFREE$). The results in Table 2 seem to be robust to the inclusion of tariff barriers. In all 6 specifications, the coefficient of interest, about -0.028, is negative and significant and in the same range as in Table 1.

Proofs

Proof of proposition 1. Each firm maximizes its profits, and by our assumption of perfect competition, its marginal cost equals the market price P.
Namely, for a local producer, $i \in I$,

$$P = 2Q_i(c_I + dP_a) \tag{4}$$

and for an importer, $j \in L$,

$$P = 2Q_j c_I. \tag{5}$$

Substituting equations (4) and (5) in the demand function, equation (1), and recall that the total quantity in the market is given by $Q = |L|Q_j + |I|Q_i$, we obtain the quantity of each

Table 1: Impact of Corruption on the level of regulation

	(1)	(2)	(3)	(4)	(5)
Corruption Index	-0.034*	-0.030*	-0.034*	-0.031**	-0.030**
	(0.0170)	(0.0129)	(0.0171)	(0.0116)	(0.0113)
Country FEs	No	Yes	No	Yes	Yes
Year FEs	No	No	Yes	Yes	No
Country time trend	No	No	No	No	Yes
Observations	733	733	733	733	733

* Significant at 5%.

** Significant at 1%.

Note: Standard errors are clustered at the country level.

Country time trend stand for country-specific linear time trend.

Table 2: Impact of Corruption on the level of regulation, control for tariff barriers

	(1)	(2)	(3)	(4)	(5)	(6)
Corruption Index	-0.027*	-0.027*	-0.028*	-0.028*	-0.028*	-0.027*
	(0.0134)	(0.0134)	(0.0134)	(0.0135)	(0.0136)	(0.0134)
AVERAGE	Yes	No	No	No	No	No
DUTIES15	No	Yes	No	No	No	No
DUTYFREE	No	No	Yes	No	No	No
AGRIAVERAGE	No	No	No	Yes	No	No
AGRIDUTIES15	No	No	No	No	Yes	No
AGRIDUTYFREE	No	No	No	No	No	Yes
Observations	576	576	576	575	575	575

* Significant at 5%.

** Significant at 1%. Note: Standard errors are clustered at the country level.

All regressions contain country- and year-fixed effects.

firm and the market price,

$$Q_i = \frac{c_I U}{(c_I + dP_a)(2c_I + U|L|) + c_I U|I|} \tag{6}$$

$$Q_j = \frac{U(c_I + dP_a)}{(c_I + dP_a)(2c_I + U|L|) + c_I U|I|} \tag{7}$$

and

$$P = \frac{2Uc_I(c_I + dP_a)}{(c_I + dP_a)(2c_I + U|L|) + c_I U|I|} \tag{8}$$

It is easy to verify from equations (6), (7), and (8) that an increase in the probability of ex-ante inspection (P_a) augments the market price; and because only importers bear the ex-ante inspection cost, the market share of local producers rises at the expense of importers. Substituting the equilibrium price and quantities, equations (6), (7) and (8), in the profit functions of importers and local producers, respectively, yields

$$\pi_I(Q_i) = PQ_i - (c_I + dP_a)Q_i^2 = \frac{U^2 c_I^2 (c_I + dP_a)}{[(c_I + dP_a)(2c_I + U|L|) + c_I U|I|]^2}$$

and

$$\pi_L(Q_j) = PQ_j - c_I Q_j^2 = \frac{U^2 c_I (c_I + dP_a)^2}{[(c_I + dP_a)(2c_I + U|L|) + c_I U|I|]^2} \tag{9}$$

$\pi_L(Q_j)$ increases in P_a.

There is n' such that for $\frac{|I|}{|L|} > n'$, $\pi_I(Q_i)$ increases in P_a.

Substituting the equilibrium price and quantities, equations (6), (7) and (8), in the consumer surplus (3), and recall that the total quantity in the market is given by $Q = |L|Q_j + |I|Q_i$, yields

$$CS = \frac{(U - P)(|L|Q_j + |I|Q_i)}{2} = \frac{U^3[c_I|I| + (c_I + dP_a)|L|]^2}{2[(c_I|I| + (c_I + dP_a)|L|)U + 2c_I(c_I + dP_a)]^2} \tag{10}$$

which decreases in P_a. □

Proof of proposition 2. An importer $i \in I$ prefers (e) if

$$\pi_I(Q_i) = PQ_i - c_I Q_i^2 - dP_a Q_i^2 \geq (1 - P_a)(P - (1-\beta)\gamma f)Q_i - dP_a Q_i^2. \tag{11}$$

Condition (11) trivially holds for $P_a = 1$ for every $f \geq 0$. Let $0 \leq P_a < 1$. By (6) and (8), (11) holds for

$$f \geq \max[0, \frac{Uc_I[c_I - 2c_I P_a - 2dP_a^2]}{(1-\beta)\gamma(1-P_a)[(c_I + dP_a)(2c_I + U|L|) + c_I U|I|]}] \equiv \bar{f}(P_a),$$

and $\bar{f}(P_a)$ weakly decreases in P_a.

Similarly, for $j \in L$, by (7) and (8), j prefers (e) for

$$f \geq \max[0, \frac{Uc_I[c_I + dP_a - 2P_a c_I - 2dP_a^2]}{(1-\beta)\gamma(1-P_a)[(c_I + dP_a)(2c_I + U|L|) + c_I U|I|]}] \equiv \hat{f}(P_a),$$

and $\hat{f}(P_a) > \bar{f}(P_a)$ fr all positive P_a. □

Proof of proposition 3. Substituting the profits of local producers and the consumer surplus, equations (9) and (10), in the domestic welfare function (2), we obtain

$$RW = \frac{\omega_c U^3 [c_I|I| + (c_I + dP_a)|L|]^2 + 2\omega_p |L| U^2 c_I (c_I + dP_a)^2}{2[(c_I + dP_a)(2c_I + U|L|) + c_I U|I|]^2} \tag{12}$$

$$\frac{\partial RW}{\partial P_a} < 0 \Leftrightarrow |L|(c_I + dP_a)(\omega_p - \omega_c) < \omega_c |I| c_I \tag{13}$$

If $\omega_p < \omega_c$, the right hand side of (13) holds, namely, RW decreases in P_a and is maximized for $P_a = 0$. If $\frac{\omega_p}{\omega_c}$ is sufficiently high, the inequality in (13) does not hold, namely, RW increases in P_a and is maximized for $P_a = 1$. □