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Labor Provisions in Preferential Trade Agreements: Are They a Source of Uncertainty?

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Abstract

In recent work, trade policy uncertainty (TPU) has been identified as a factor that negatively affects the export performance of countries by decreasing the entry of firms. In this paper, I address the question of whether the enforceability of non-trade related provisions in Preferential Trade Agreements (PTAs) that depend on firms' decisions have as a consequence raising uncertainty. In the model, firms can decide whether to commit to labor standards. Not doing so increases the probability of losing industry-specific preferences, an externality for the whole industry. I identify a situation in which two countries have received two different levels of enforceability and scope of labor provisions in PTAs with the US and test whether their entry into force eliminated uncertainty. Although I do not find evidence of differential uncertainty, I find that in Peru, the country with the allegedly highest enforceability level, uncertainty was not eliminated. Moreover, I find weak evidence that sectors that are negatively affected are those facing a higher threat.

1 Introduction

One of the main objectives of Preferential Trade Agreements (PTAs) has been to secure market access between their members by credibly lowering trade barriers (Limão, 2016). In fact, examples of PTAs that were dissolved are extremely rare.[1] Moreover, with the proliferation of PTAs in the last two decades, these agreements have become more complex and multidimensional in terms of the policy areas that they cover.[2] In this paper, I address a potential implication of this increase in complexity

[1] One example of a dissolved reciprocal PTA is the East African Common Market in 1977.

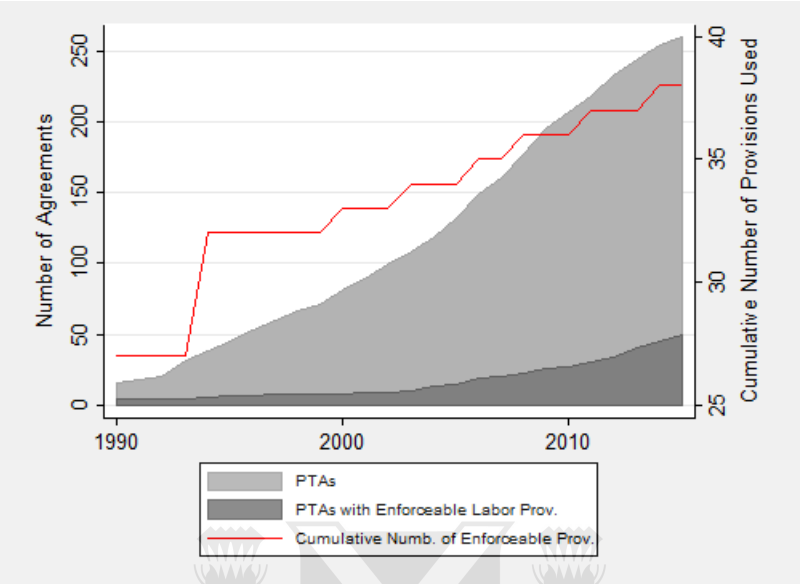
[2] For example, whereas 100% of the PTAs covers the reduction of tariffs, also 79% covers innovation provisions, 76% capital market provisions and 58% labor market provisions (World Trade Report, 2011).

by asking what may be the consequences of making non-trade related provisions enforceable at the cost of the market access obtained. The specific setting I address is one in which preferences of an industry to access a foreign market depends on decisions of individual firms in the exporting country. This conditionality generates an externality through an increase in uncertainty for the whole industry that potentially decreases exports. Specifically, I look at PTAs with enforceable labor provisions, which have increased in absolute terms in the last decade. Figure 1 illustrates the facts mentioned so far: the fast increase in the number of PTAs, the increase in the complexity of agreements by means of the cumulative number of enforceable provisions outside of the World Trade Organization (WTO) mandate, and the absolute increase in PTAs with enforceable labor provisions of the last decade.

I apply the model to a situation in which one developing country allegedly received more enforceable labor provisions in comparison to another one under reciprocal PTAs with the US. Given that these countries were part of the General System of Preferences (GSP) offered by the US, some degree of uncertainty before the PTAs entered into force be expected. I find that before the agreement these countries faced TPU. More importantly, I find that the country with more enforceable labor provisions continues to face preference uncertainty once the PTA is in place. I also find that uncertainty is removed after the PTA for the country with the weaker labor provisions. Although I cannot rule out that uncertainty was the same before and after the agreement, I find weak evidence that in sectors that represent a higher threat there exists a differential uncertainty with more enforceable provisions. This is in line to the sector-specific suspension of benefits included in PTAs and not present under the GSP.

I base the theoretical approach on Handley and Limão (2015) and Handley and Limão (2017). In the first paper, heterogeneous firms take dynamic decisions about entering to foreign markets based on the probability of losing preferential access to them. Therefore, a firm uses the available information about the distribution of potential tariffs if a trade policy shock occurs and compares the flow of expected discounted profits to the sunk cost of entry. If that value is larger than the value of waiting, the firm enters. In Handley and Limão (2017), HL henceforth, they introduce to the model an additional choice for firms, which is the possibility of reducing marginal costs by paying an additional sunk cost once they enter. My contribution is to modify this setting to condition the probability distribution of future tariffs to the decision to comply with some sort of legally required standards of individual firms. Under the conditions presented in the model, the probability of losing tariffs is endogenous and depends on the share of firms that complies with standards. Therefore, individual firm decisions

Figure 1: Cumulative Number of PTAs and Enforceable non-WTO Provisions.



Source: Self-elaboration based on data of Hofmann, Osnago and Ruta (2016). WTO: World Trade Organization

generate an industry-wide externality that affects exports both through the extensive and intensive margin. The interrelation of firm decisions in the exporting country with the probability of a trade policy shock in the importing country allows me to study the theoretical implications of including enforceable labor provisions into PTAs.

There are two main considerations when interpreting the predictions of the model. First, firms have measure zero and take other firms' actions as given. Therefore, their decisions about upgrading standards depend only on the expected profit gain and the sunk cost of the investment. This means that their decisions are always incentive compatible. Second, the incentives of the exporting government are not explicitly modeled. There are two instances in which they could play an active role. One of them is when including provisions in the agreement, which probably involves bargaining with the foreign country. The model thus captures a situation in which the importing country has all the bargaining power, an assumption that is reasonable when large developed countries negotiate with small developing countries. The other instance is once the agreement is in place by forcing exporting firms to comply with the standards. PTAs establish that when a dispute is started and a report is issued by a panel of experts, the central government of the country complained against has a certain time to eliminate the source of dispute and potentially paying a compensation. Therefore, it may have incentives to domestically force standards before a claim is started. I do not explicitly include the role of the government, although I include an appendix that shows that the externality may not be

eliminated if verifying the violation is costly.

As in the recent TPU literature, the model generates an augmented gravity equation that includes an uncertainty factor. In this paper, this factor nonlinearly depends on both the share of firms that comply with the required provisions and the probability of the foreign government starting an investigation. Therefore, when all firms comply or the PTA does not include enforceable provisions, the uncertainty factor vanishes. The number of firms serving the foreign country is also predicted to depend on the uncertainty factor. As a consequence, these equations can be used to study empirical settings in which the uncertainty factor varies across countries and sectors.

The situation captured in the theory can be related to how these processes could be working today based on the agreements that are in place. An example of them is the General System of Preferences (GSP), which is a non-reciprocal preference scheme granted by developed countries to developing countries that are conditioned on the complying of different provisions.[3] Although many of them can be defined at the country level and are related to legislation and common practices, others can be directly linked to firm level decisions. One example of them are labor standards that depend on firm investments or hiring practices. Given that firms' investment and hiring decisions are optimal in a setting without this conditionality, introducing standards makes firms to trade-off both against the potential gain of complying and how their individual decisions may affect the outcome.

In reciprocal PTAs between developing and developed countries, the inclusion of labor provisions that are enforceable has the same feature, although the process is clearer and the penalty can be sector-specific. I focus on the case of PTAs signed by the US. In these agreements, labor standards has been more of a concern than in PTAs signed by other developed countries (Horn et al., 2010). In fact, 35% of the agreements that have enforceable labor provisions have the US as member in 2012, a share that is 6% in the total number of agreements.[4] Under PTAs the US has with developing countries that include enforceable labor provisions, a claim can be presented to the US Department of Labor (DOL) arguing that some firms or a sector of a PTA partner is not committing to labor standards included in the PTA. If the claim is accepted, the DOL undertakes an investigation and produces a report. The US Trade Representative (USTR) then decides whether to prosecute or not. In most cases, these presentations have been made by US unions or union-related organizations (for instance, the AFL-CIO).[5] The process under which this prosecution takes place and the potential penalties vary

[3] In the case of the US's GSP, eleven countries have been suspended due to non-compliance.

[4] Self-calculations based on the Content of Deep Trade Agreements dataset constructed by Hofmann, Osnago and Ruta (2016) and available in the World Bank webpage.

[5] Unions have been effective in promoting better working conditions in other environments like OSHA. See Weil (1992).

across agreements. The model that I present in this paper is concerned with penalties that include the risk of losing preferences.

I identify a situation in which two countries received two levels of enforceability and scope of labor provisions in PTAs signed with the US. In 2009, Costa Rica accessed CAFTA, an agreement between US and Central American countries in force for most of them since 2006.[6] In addition, the US-Peru FTA entered into force in the same year. Due to US internal political reasons, the template of the labor chapter of PTAs signed by this country changed in 2007 with the goal of increasing enforceability and scope of standards in future agreements. As a consequence, Peru obtained the modified provisions and Costa Rica kept those in CAFTA (Bolle, 2016).

I employ the gravity equation derived from the model to test if uncertainty remained after the agreements entered into force. In addition, I test whether there was a differential uncertainty due to the change of provisions in the case of Peru. To do so, I exploit both country and sectoral variation in the uncertainty factor constructed by using preferential and MFN tariffs. In line with the theory, I find that uncertainty was not eliminated in the case of Peru. Furthermore, I do not find evidence of uncertainty for Costa Rica after CAFTA-DR. This means that either labor provisions in CAFTA are not enforceable or required standards do not involve an additional investment for firms. Results are in general robust to alternative base years and specifications. The estimates are imprecise so I am not able to reject a change in uncertainty before and after the agreements enter into force and neither I find a differential effect of uncertainty in the case of Peru when the FTA is in place.[7]

Given that US unions present most of the claims of labor standards violations, I explore the sectoral variation in unionization in the US to test whether highly unionized industries in the US impose a higher threat of losing preferences. I find evidence of a differential impact of uncertainty in the case of Peru for highly unionized sectors. Although this result is not robust to some of the exercises for which the country level coefficients are, it provides support for the theory to investigate further. In the case of Costa Rica, there is no evidence of uncertainty even in highly unionized sectors as we would expect with non-enforceable provisions.

This paper is mainly related to the literature of TPU. In addition to Handley and Limão (2015) and the extension in HL, this paper relates to other studies that apply this setting and empirically study

[6] Costa Rica had delayed accession due to a referendum conducted in 2007.

[7] A potential factor for this feature is the timing of events. When these agreements entered into force the Global Trade Collapse (GTC) was taking place, which was a decline of world trade of 12%, the largest since the Great Depression (Carballo et al., 2017). Although it has been argued that the some of the effects of GTC lasted to the end of 2010, we cannot discard structural changes that may be affecting results in this paper.

different situations with TPU. One example is Handley (2014) where the author examines the empirical implications of tariff binding commitments on trade and export entry. The theoretical setting is the one used in this paper which in turn it is based on Dixit (1989), a paper where entry and exit decision of firms is modeled under uncertainty over future conditions. Sala et al. (2010) provided a theoretical model with similar insights in which lower tariff bounds provide extra market access, especially in high risk markets. Carballo et al. (2017) study how TPU and economic uncertainty interact and whether PTAs provide insurance against uncertainty for foreign firms. They find that demand uncertainty was magnified by TPU, but once threats does not materialize, it helps to a fast recovery. This paper has a joint underlying stochastic process based on income and policy, which is novel to this literature. In the results I present, I control for product-specific demand shocks to reduce the risk of capturing demand uncertainty instead of TPU. Finally, Hakobyan (2014) studies whether the temporal expiration of the GSP program in 2011 had an impact on exporters to the US finding that it had a negative effect which was increasing in the preferential margin. Although this paper does not present a theoretical model, it empirically shows how the GSP program has an idiosyncratic component of uncertainty. This is in line with the results I find before the PTAs enter into force.

The paper also relates to the literature of deep PTAs and increasing integration through agreements between countries. The concern about the increasing scope of PTAs is stated in Horn et al. (2010). In that paper, they analyze what type of provisions the EU and US PTAs include in relation to the WTO mandate. They note that current discussions in PTAs negotiation may serve as a preparation for setting tomorrow's multilateral agenda. In light of this, my paper addresses a specific concern about making non-trade related provisions enforceable. Traditionally, it has been found that agreements that involve a higher level of integration in terms of the shared policies had a larger effect on exports (Limão 2016). In fact, although with different timing, the effect is present both in the intensive and extensive margin (Baier et al., 2014). In terms of the definitions in Limão (2016), the level of integration my paper is about is not in terms of depth but in terms of breadth. The breadth of a PTA can be conceptualized as a policy within a PTA that covers other markets and indirectly affect trade as in the case of labor provisions.

Using the dataset constructed by Horn et al. (2010) and eventually extended by Orefice and Rocha (2011) and Hofmann et al. (2016), some papers estimate the effect of the number of enforceable provisions on different measures of integration. In general, these papers find that deeper agreements

increase integration measured as FDI, production network trade or value added.[8] These papers provide reduced form evidence using a broad measure of depth that cannot capture the heterogeneity of these provisions. My paper studies a specific case for a specific setting and explicitly addresses one mechanism that may reduce the potential positive effects of deeper integration.

There is a broad literature studying the effect of labor standards and labor conditions on trade. These papers are in general cross-country analysis that use different measures of labor conditions to study how they affect trade and results depend on which variables are used and how trade is measured.[9] In my paper, the mechanism under which labor standards affect aggregate trade is very specific. In the absence of an agreement, firms optimally choose the technology that is associated with a specific level of standards. I address the case of labor standards that are costly and generate a productivity boost. For example, adequating a plant in terms of safety and health conditions and modifying the hiring process to avoid taste discrimination.[10] When an agreement that conditions preferential access on the adoption of specific standards is put in place, those firms not committing generate an industry-wide externality. It is this externality what would cause trade to be lower than the same PTA without the standards.

The paper is organized as follows. Section 2 presents the model, section 3 presents an empirical application, strategy and results. Section 4 concludes and outlines future extensions.

2 Model

The model I present in this section modifies the partial equilibrium model in HL by linking the firm decision of upgrading its labor standards to the probability of getting high tariffs once a trade policy shock occurs. The reason for this link is to provide the model the feature of capturing externalities in the complying of standards. When preferential access is given and linked to provisions that include the possibility of suspensions, the action of individual firms can harm others if a dispute is triggered.

In this setting I interpret the model as an exporting country in which firms are dynamically deciding whether to enter to a foreign country. Time is discrete, so within each period there is a static setting

[8] See Orefice and Rocha (2011), Osnago et al. (2016).

[9] For instance, Bonnal (2010) studies whether labor standards affect international trade by using the rate of work injuries and strikes and finds that are negatively related to the exports to GDP ratio, concluding that poor labor conditions negatively affects export. Samy and Dehejia (2008) estimate a gravity estimation and find mixed evidence depending on which indicator they use for labor conditions, and Dehejia and Samy (2008) employ a Heckscher-Ohlin framework to find that in trade within the EU standards actually increase export performance.

[10] Another channel may be improved managerial practices. In Bloom et al. (2013), an improvement of this practices that imply fixed costs has been shown to increase productivity. Among these practices, the authors list human resources changes that could be associated to better conditions.

in which incumbents and entering firms sell their varieties to consumers that have love of variety.

2.1 Static Environment

At each period there is an active pool of firms that produce differentiated varieties of a good and serve a foreign country. Consumers in this market consume a fixed share of their income on an homogeneous good and on a CES aggregation of the differentiated goods. There is no technology of borrowing so consumers maximize their utility within each period. This yields the standard isoelastic demand $q_v = EP^{\sigma-1}p_v^{-\sigma}$ for each variety v , where $\sigma > 1$ is the elasticity of substitution across varieties, E is total income, and P is the CES price index over the available varieties. I will treat E and P as exogenous parameters focusing only on the partial equilibrium effects of uncertainty.

Firms use labor as the only factor of production. The productivity is normalized to one in the homogeneous good sector, which is assumed to be perfectly competitive. As a result, wages are normalized to one. I assume that income is sufficiently large such that there is always positive consumption of both goods. In the differentiated sector firms are heterogeneous in their productivity. I assume that this sector is monopolistically competitive, which yields the standard pricing rule $p_v = d\tau c_v \sigma/(1-\sigma)$ for the importing country, where τ is tariffs and d is the transport cost. As a result, the profit function is equal to:

$$\pi(\tau, c_v) = a\tau^{-\sigma}c_v^{1-\sigma} \tag{1}$$

where $a \equiv \sigma^{-\sigma}(\sigma-1)^{\sigma-1}P^{\sigma-1}d^{1-\sigma}E$ is a parameter that summarizes demand conditions in the foreign country and transport costs.

2.2 Dynamic Setting

At each period, firms decide whether to enter or not to a foreign market. On the one hand, there are incumbent firms that already entered and survived from the previous period at a rate β. On the other hand, there are firms that have to pay a sunk cost K if they want to access the market. In steady state, the fraction $(1-\beta)$ that exited in the previous period re-enter and the rest do not.

The first scenario considered is a setting with deterministic tariffs. Given that firms can be ordered in terms of their productivity, there will be a firm that is indifferent between entering the market and paying the sunk cost. Based on this, we can derive the deterministic cut-off under which firms enter:

$$c^D = \left[\frac{a\tau^{-\sigma}}{(1-\beta)K}\right]^{\frac{1}{\sigma-1}} \tag{2}$$

Therefore, firms with marginal costs lower than c^D always enter and firms in the interval $[c^D, c_M]$ do not, where $1/c_M$ is the lower bound of the distribution of productivities.

The decision process of firms is different if tariffs are uncertain. In this case firms compare the expected value of profits of entering to the expected value of waiting. Assume that tariffs can be in different states and they are currently at s. Then, the expected value of exporting of a firm with marginal cost c is:

$$\Pi_e(\tau_s, c) = \pi(\tau_s, c) + \beta E\Pi_e(\tau', c) \tag{3}$$

where τ' is a random variable and the expectation is taken over its distribution.

Firms that have not entered will compare the expected discounted value of profits minus the sunk cost of entry to waiting to the next period. The following equation is their value function:

$$\Pi(\tau_s, c) = \max\{\Pi_e(\tau_s, c) - K, \beta E\Pi(\tau', c)\} \tag{4}$$

Note that the value of waiting can be either positive or zero.[11] Then, the marginal firm derives no value of waiting and defines the following entry condition:

$$\Pi(\tau_s, c^U) = \Pi_e(\tau_s, c^U) - K \tag{5}$$

To derive the cost cut-off, we have to introduce structure to the stochastic process of tariffs. Assume that tariffs can either be in a high, intermediate or low state. In the low state, preferences are unconditional (e.g. PTA without labor provisions); in the intermediate state preferences are conditioned to the complying of some sort of legal provision (e.g. GSP or PTA with enforceable labor standards); and in the high state there are not preferences (e.g. MFN so $\tau_{MFN} > \tau_{PTA}$).

I assume that the trade policy is in the intermediate state and with probability γ there is a trade policy shock. Furthermore, if a trade policy shock occurs, tariffs shift to a high state with probability λ and to a low state with probability $1-\lambda$.[12] Therefore, we have the following transition matrix:

[11] Define $V(\tau_s, c) \equiv \Pi(\tau_s, c) - (\Pi_e(\tau_s, c) - K)$ and then we have $V(\tau_s, c) = \max\{0, \beta E_s V_s(\tau', c) - \pi(\tau_s, c) + K(1-\beta)\}$.

[12] I assume that both high and low are absorbing states.

$$\begin{bmatrix} 1 & 0 & 0 \\ (1-\lambda)\gamma & (1-\gamma) & \lambda\gamma \\ 0 & 0 & 1 \end{bmatrix} \tag{6}$$

In HL, it is shown that the cut-off under uncertainty is multiplicative with respect to the cut-off under certainty by a factor lower than one:

$$c^U = c^D U(\omega, \gamma, \lambda) \tag{7}$$

$$U(\omega, \gamma, \lambda) = [\frac{1 + \gamma\lambda\frac{\beta}{1-\beta}\omega}{1 + \gamma\lambda\frac{\beta}{1-\beta}}]^{\frac{1}{\sigma-1}} \tag{8}$$

where $\omega = (\frac{\tau_{MFN}}{\tau_i})^{-\sigma} < 1$ is the ratio of profits in the high state to profits in the intermediate state.

2.3 Labor Standards

I assume that there are two technologies associated with two levels of labor standards. Firms can use the technology that is intrinsic to the firm or can choose to use a technology associated to better labor standards. The upgrade involves paying an extra sunk cost K_s and a decrease in the marginal cost by a factor $z < 1$. This setting can capture improving standards such as better labor conditions through higher health and safety standards.[13] Alternatively, it could capture that reducing taste discrimination against a specific group of workers or reducing child labor may mean that employers have to hire workers that are more productive at a cost of having to re-organize the hiring process or search more intensively.[14]

The structure of the upgrading follows HL. I assume that firms that are serving the foreign market can decide whether to pay the additional sunk cost to improve standards. If they do so, the per-period profit function is as follows:

$$\pi(\tau, c_v) = a\tau^{-\sigma}(zc_v)^{1-\sigma} \tag{9}$$

[13] Better health and safety standards can reduce accidents and recovery time of workers (Brown et al., 1993).

[14] In this setting workers are homogeneous. However, it could be rationalized if we assume that firms are homogeneous and differ by the matching quality when they hire heterogeneous workers. If searching for a worker implies a fixed cost, then a firm that do not discriminate will hire a more productive marginal worker under reasonable general conditions. Moreover, if the supply of child labor is relatively large firms would have to incur in higher search costs.

In a deterministic setting, this yields a second cut-off for firms that decide to upgrade:

$$c_s^D = \phi c^D \tag{10}$$

where $\phi \equiv [(z^{1-\sigma} - 1)\frac{K}{K_s}]^{\frac{1}{\sigma-1}}$ is a parameter that capture the technology associated to the higher standards.

Under TPU, the decision to upgrade once the firm entered is similar to the problem of the firm before entering the market. Therefore, $c_s^U = U(\omega, \gamma, \lambda)c_s^D$ which in turn means that $c_s^U = \phi c^U$.[15] Note that there are two assumptions that condition this result. The first one is the timing. Firms are assumed to decide whether to upgrade standards once they already decided entry. The second assumption is that the gain in productivity and the sunk cost of upgrading standards are state-independent. This assumption is reasonable if we interpret this as the pure effect of upgrading rather than a demand for high quality goods (i.e. a supply side shock).

An interesting setting is one in which not all firms upgrade. Note that if the gain in productivity is high or the cost of improving standard is low all firms may upgrade yielding a ϕ greater or equal to one. Therefore, in the following derivations I assume $\phi < 1$.

2.4 Endogenous Probability of Losing Preferential Access

In this subsection I provide an interpretation for γ and λ in relation to labor standards employed by firms. In light of the inclusion of enforceable labor provisions in PTAs by developed countries, I assume that the importing country has preferences for high level of standards and therefore it conditions preferential market access to upgrading. As a result, the random process that follows trade policy is assumed to be determined by the commitment to the labor standards in the exporting country, the enforceability of the labor provisions in the trade agreement and a potential demand for having preferences revoked.

The parameter γ is assumed to be exogenous and to positively depend on the enforceability of labor provisions (κ), the demand for revoking preferences to the developing country (m) and other factors that can trigger investigations.[16] Given that it captures the probability of a trade policy shock, it is defined by the underlying decision process of the interrelation of the government and the agents

[15] The value function of a firm that is deciding whether to adopt foreign standards is $\Pi_e(\tau_s, c) = \max\{\Pi_{es}(\tau_s, zc) - K_s, \beta E_e \Pi(\tau', c)\}$ and the firm that is indifferent satisfies $\Pi_e(\tau_s, c_s^U) = z^{1-\sigma}\Pi_{es}(\tau_s, c_s^U) - K_s$.

[16] γ may also depend on factors that are not related to labor provisions (e.g. renegotiation).

that demand preferences to be revoked within the importing country.[17] I assume that violations to standards are observable but not verifiable for the government.[18] As a consequence, it weights the decision of starting the process based on how enforceable the punishment is and how complainants enter into its utility function. The more enforceable the provisions are and the more lobby or importance these agents have, the more willing the government is to start the costly process.

The parameter λ is the probability of switching to the high tariff state once the process started. I link this parameter to the share of firms in the developing country that is both exporting and not committing to the labor standards. As it is observed, claims about having standards being violated are usually done by unions in the developed country. These unions in general bring a specific case in which some sort of violation is being committed, which means that they can observe and verify violations. Then, from the government's point of view the actual probability is the share of firms that is exporting and not committing to standards. Assuming a Pareto distribution $G(c)$ with shape parameter k and upper bound c_M, this probability is defined as follows:[19]

$$\lambda = \frac{(c^U)^k(1-\phi^k)}{c_M^k} \tag{11}$$

The main theoretical implication of modeling the probability of transitioning to the worst state as in equation 11 is that the actual cut-off is not related to the deterministic cut-off as in equation 7 because now it is also acting through λ. Note that from a firm point of view, λ is given and therefore it does not take into account the effect of its decision. This is a result derived from each firm having measure zero and therefore not impacting this parameter individually (i.e. firms are not playing a game).

The firm decision of upgrading standards generate an industry-wide externality since λ is part of the information set of all firms and at the same time it is defined by firms' actions. From the firm's point of view, the decision of upgrading is always incentive compatible since all firms will be taking

[17] In this sense, the degree of enforceability κ can be understood as the probability of starting an investigation for a given distribution of the violation of standards. In an agreement with low degree of enforceability, starting and investigation may be too costly for the government since it implies employing resources for a process that may end not punishing a valid claim.

[18] It can be argued that the government of the importing country cannot directly audit firms in the exporting country due to sovereign reasons.

[19] Using the share of firms instead of the share of other outcomes such as output, exports or labor is based on the observation that cases are about individual firms (i.e. claims do not state the importance of those firms in terms of other variables, probably because of the impossibility for external agents to verify this information). Nonetheless, it could be argued that it is easier to find larger firms defined by any of these measures. In this model, fixing outcomes to exporting firms would fix the probability to be a function of ϕ. If the entire support is used, any measure other than the share of firms would require defining domestic aggregates to avoid having a fixed probability. Therefore, I use the share of firms since it captures the main idea and mechanisms that may be playing a role.

into account only the potential profit gains when deciding whether to upgrade and not their effect on the overall probability. As a consequence, there is no incentive for any firm to deviate from its decision.[20]

At this point, it is important to note the connection between the productivity boost generated by committing to standards and the assumption of firms being measure zero. As noted by Eaton et al (2012), the assumption of a continuum of firms allows using the law of large numbers to derive convenient closed form solutions for aggregate outcomes. However, it comes at the cost of individual firms not having influence on them. Therefore, the productivity enhancing assumption about the standards allow firms' decisions to have aggregate implications through externalities. Without this assumption, firms would not commit and therefore the probability of losing preferences would be one once an investigation started. This would neglect the fact that firms may be using better labor standards for reasons other than complying with the law.[21]

To conclude this subsection, it is important to note that the government of the exporting country is not playing any role in the model. The implicit assumption is that the importing country has all the bargaining power and therefore imposes its preferences to the exporting country. This seems to be in line with PTAs signed by the US with developing countries given that the template of these agreements are generally the same. Yet the government of the exporting country can try to enforce the standards to eliminate the externality. However, enforcing these laws requires resources and therefore the externality can potentially be mitigated but still subsist. In the Appendix I provide a potential modification of the model to show this.

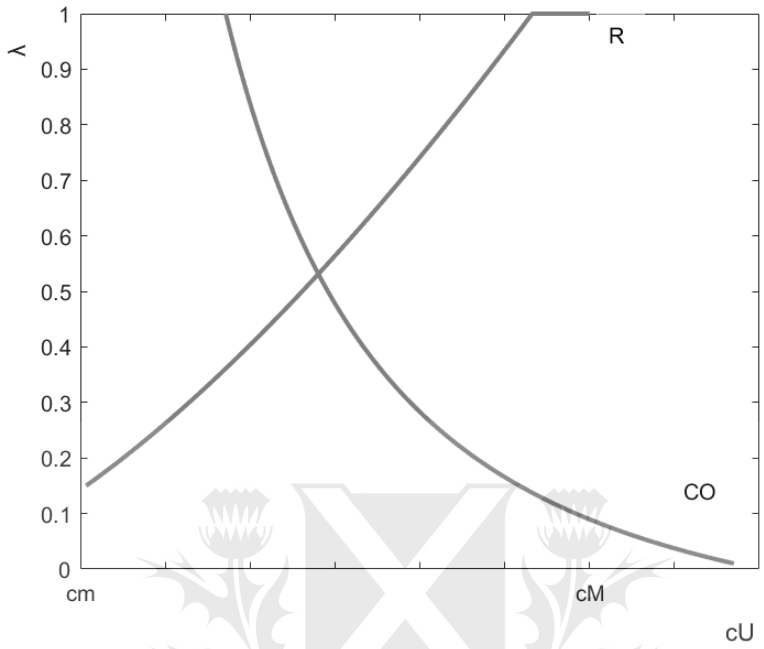
2.5 Equilibrium

Equations 7 and 11 define the endogenous variables λ and c^U at the industry level as a function of technological parameters, distributional parameters, and provision-related parameters like ϕ,κ and m. Note that $d\lambda/dc^U$ is positive in equation 11 and $dc^U/d\lambda$ is negative in equation 7, so these curves

[20] In a setting with a discrete number of firms we could have firms playing a game where truthful revelation may not be always the optimal decision. Furthermore, the degree of internalization of their decision should depend on the concentration of the industry given that in more concentrated industries larger firms will have more to lose if there is a large number of small non-complying firms. In such setting it may be optimal to tax firms that do not comply. I leave this extension for potential future research.

[21] As mentioned above, a potential solution is to explicitly introduce firms with positive measure. In that case, complying would have a positive effect on profits through a lower probability of losing preferences even if complying does not increase productivity. Eaton et al (2012) provide a potential modeling technique by assuming that there is a discrete number of firms for which technology follows a Poisson distribution with the parameter determined by a random variable that follows a Pareto distribution. Solving this model analytically is complex since it requires having the complete realization of technologies rather than the distribution. Furthermore, it requires imposing a specific ordering structure in terms of the dynamic game to avoid multiple equilibria given that each firm will strategically decide whether to comply.

Figure 2: Equilibrium



cross once and therefore there is a unique equilibrium under a configuration of parameters that assures existence.[22] Figure 2 shows how the equilibrium is determined.

2.6 Comparative Statics

2.6.1 Increase in the Scope of Labor Standards

To capture changes in the required labor standards, we can perform comparative statics on the parameter ϕ. For a given gain in productivity, this parameter captures how costly achieving the level of standards required by the PTA is.[23] Therefore, two different ϕ's can be interpreted as two different levels of standards that require different investments for firms.

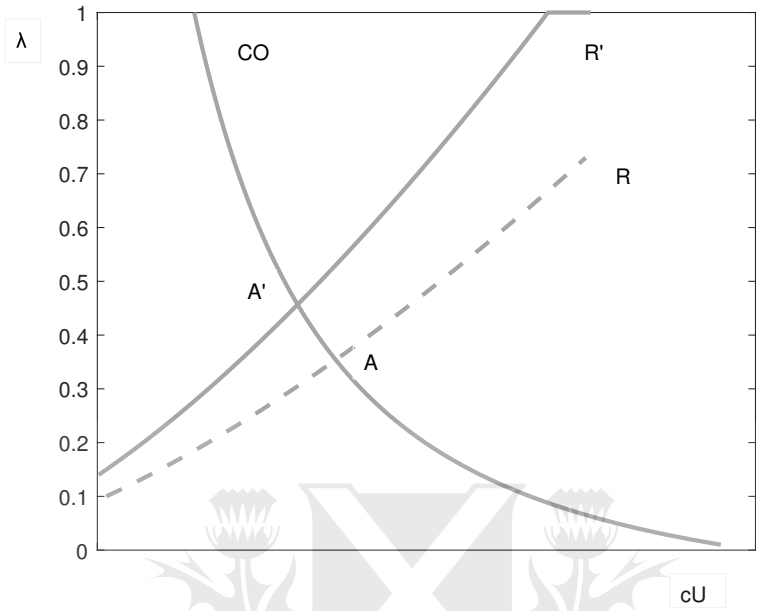
The externality generated by firm decisions' is closely related to the parameter ϕ. A decrease in this parameter means that less firms are committing, which increases the size of the measure of firms that is affecting the whole industry. Figure 3 shows the case in which the scope of standards increases and thus ϕ decreases by comparing the equilibrium points A and A'.

The decrease in ϕ has the direct effect of increasing λ since the probability of a firm being exporting

[22] Given that λ is in the unit interval by construction, the cut-off equation (CO) might cross the revision equation (R) in a value larger than one, therefore at values of c^U for which $\lambda > 1$, the valid expression for the revision equation is one.

[23] This statement is true even for non-fixed gain in productivity as long as the acquisition of required standards negatively relates to z.

Figure 3: The Effect of Increasing the Scope of Standards



and not committing increases. However, this variable depends on c^U which implies that there is also an indirect effect coming from how firms react under the different probability of losing preferences. An increase in λ causes firms that are in the margin to exit, which in turn are the less productive and hence more prone to not commit to the required standards. This feedbacks into λ making the total effect lower than the direct effect.

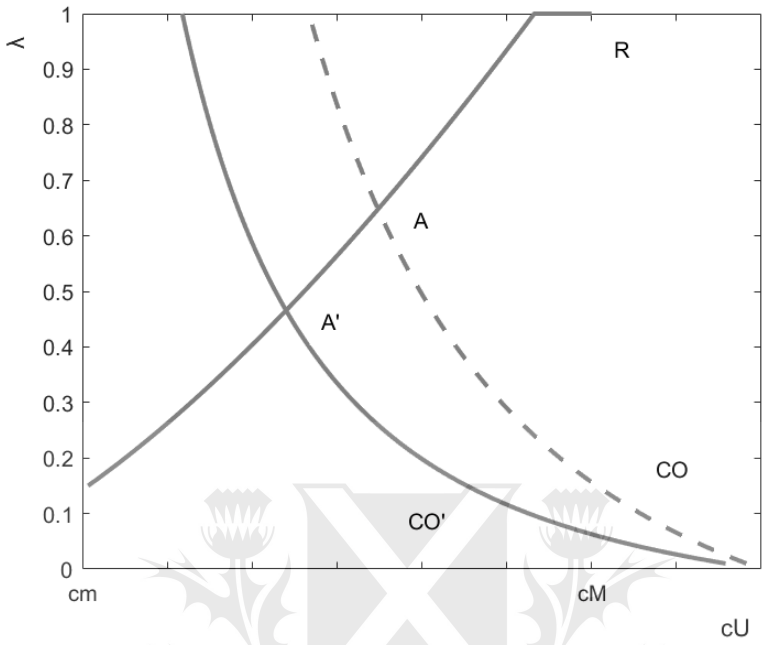
There are two assumptions that are driving this result. One of them is firms sorting into committing based on their productivity and the other one is the Pareto distribution. This last assumption is not problematic given that this distribution has been shown to mimic well empirical distribution of firm sizes. The first assumption is probably more restrictive, although intuitive for standards like plant safety conditions.

2.6.2 Increase in the Enforceability of Standards

In this model, an increase in the enforceability of standards is a change that is related to the importing country. For example, clauses within the agreement that change prosecution procedures or limit prosecutorial discretion making easier to apply the provisions. Note that this has an effect even without changing the required standards. [24]

[24] When standards are negotiated, this may not be true since the enforceability is a result of the preferences of each government and their bargaining power.

Figure 4: The Effect of Increasing the Enforceability



In the model, increasing the enforceability means increasing κ, which by assumption increases γ.[25] An increase in γ has the direct effect of increasing the expected time spent under high tariffs and therefore decreases c^U. Firms that exit due to this change has lower productivity which means that in this case there is also an ameliorating effect through the decrease in λ. In Figure 4 it can be shown how from the initial equilibrium A the system moves to a equilibrium A' with lower entry and a higher share of firms that commit.

This comparative statics can be compared to the original HL model. In that model the R curve is horizontal given that λ does not depend on the cost cutoff. Therefore, a given change in γ affects entry at a greater extent. The reason is the absence of the endogenous mechanism under which low productivity firms exit reducing the relative number of non-complying firms.

Finally, it is important to note the different implications between increasing the enforceability and increasing the scope of labor provisions. In the first case, the resulting probability of firms not committing to standards is lower. Increasing the enforceability of provisions makes firms with lower standards to exit, decreasing the chance that the government will find a specific claim to be a violation. On the contrary, when the scope of provisions is increased, firms need to make a larger relative investment to comply and therefore a larger share of firms will not do so.

[25] In this setting, an analogous result is obtained by increasing m, e.g. increasing the lobby power of unions.

2.7 Gravity Equation

The structure of the model allows to derive a gravity equation with an extra term that captures the effect of TPU on exports as in HL. However, the difference is that with endogenous probability of losing preferences, the uncertainty factor is not independent of the deterministic cut-off. Through this factor, λ and c^U have an additional effect on exports. Total exports of a sector are:[26]

$$R = a\bar{N}[\int_0^{\phi c^U} (zc)^{1-\sigma} dG(c) + \int_{\phi c^U}^{c^U} c^{1-\sigma} dG(c)] \tag{12}$$

Assuming that $k > \sigma - 1$ and taking logs, we get:

$$\ln R = (k - \sigma + 1) \ln U(\lambda, c^U; \gamma, \phi, a) - \frac{\sigma k}{\sigma - 1} \ln \tau - k \ln d + k \ln P + \frac{k}{\sigma - 1} \ln E +$$

$$\ln \bar{N} + \ln(\phi^k \frac{K_s}{K} + 1) + \ln(\frac{k}{c_M^k (k - \sigma - 1)}) - \frac{1}{\sigma - 1} \ln(1 - \beta) K + k \ln(\frac{\sigma - 1}{\sigma}) \tag{13}$$

On the one hand, labor standards have two different effects on exports. First, they are assumed to increase productivity, an effect captured by $\ln(\phi^k \frac{K_s}{K} + 1)$. Second, they affect the uncertainty factor $\ln U(\lambda, c^U; \gamma, \phi, a)$. On the other hand, the enforceability of provisions only affects exports through the uncertainty factor, given that it is assumed to be determined within the developed country.

In terms of the number of firms, standards have only an effect through uncertainty.

$$N = G(c^U)\bar{N} \tag{14}$$

where $\bar{N}$ is the total number of firms that serve the domestic market. Taking logs and rearranging, we get:

$$\ln N = k \ln U(\lambda, c^U; \gamma, \phi, a) - \frac{\sigma k}{\sigma - 1} \ln \tau - k \ln d + k \ln P + \frac{k}{\sigma - 1} \ln E +$$

$$\ln \bar{N} - \frac{1}{\sigma - 1} \ln(1 - \beta) K + k \ln(\frac{\sigma - 1}{\sigma}) - k \ln c_M \tag{15}$$

The intuition behind the effect of standards is straightforward: Given that the decision of firms of committing to standards generates an industry externality, the effect necessarily has to have an ex-

[26] Note that the uncertainty factor does not have a closed form solution given that c^U depends on other parameters of the model such as P, E and K, and λ depends on k, ϕ and c_M.

tensive margin effect through the probability of losing preferences. A marginal firm under low cost of upgrading may not re-enter when hit by a death shock if new standards imply a higher cost. This is not because this firm would have upgraded but because less firms that are relatively more productive upgrade and therefore the probability λ increases making the value of entry negative.

3 Empirical Application

In this section I apply the model to a situation in which two countries allegedly received different levels of enforceability and scope of labor provisions. In order to do so, I provide the institutional details first and then I show how the gravity equation derived in the theoretical section can be empirically used by employing a large set of fixed effects and proper control groups.

3.1 Institutional Setting

I apply the previous model to a specific setting in which labor provisions within the FTA signed by the US changed for political reasons. In 2009, Costa Rica accessed CAFTA-DR after a referendum that took place in 2007.[27] Costa Rica had delayed the application due to the political decision of conditioning its accession to a referendum. After about 52% of the voters approved the accession, the agreement entered into force in 2009. The labor chapter of this agreement was the template that the US had been used for other agreements signed in the first half of the decade. At the same time, the FTA signed by Peru and the US in 2006 also entered into forced. This agreement incorporated a change in the labor chapter with the intention of increasing the enforceability and scope of the labor provisions. The reason behind this change has been argued to be the Democrats winning the midterm election of 2006.[28] It was in a Bipartisan Trade Deal (BTD) in 2007 between the Bush Administration and this Party when they settled some changes in the templates of FTAs, being the changes to the labor chapter the first one mentioned and the only one in which a change in the enforceability is mentioned. Some authors that analyzed the enforceability of this type of provisions have also identified the provisions in the US-Peru FTA as superior in terms of enforceability and scope to those in CAFTA-DR.[29] In

[27] CAFTA-DR is a free trade agreement signed by the US, five Central American countries and the Dominican Republic that entered into force in 2006 for most of them.

[28] For example, The American Society of International Law in https://www.asil.org/insights/volume/11/issue/15/bush-administration-and-democrats-reach-bipartisan-deal-trade-policy

[29] Bolle (2016) divides the enforceability of labor provisions in US agreements in four groups and puts the FTA with Peru in the group of more enforceable provisions. She lists four main points: 1) fully enforceable commitment to not lowering labor standards, 2) fully adoption of ILO Labor Standards, 3) limitations on prosecutorial discretion (e.g. countries cannot defend failure to enforce laws due to resource limitations), and 4) same dispute settlements than other FTA obligations (previous agreements included strong limitations in comparison to commercial procedures). Kamata

Table 1: Timing of Events

Year	Costa Rica	Peru
2006	CAFTA enters into Force	Beginning of negotiations
2007	Referendum	Change in labor chapter
2009	Enters into CAFTA	Entry into force

Table 1 I summarize the timing of events. An example of how the enforceability can be increased are the new limitations to prosecutorial discretions, in which countries cannot defend failure to enforce laws due to resource limitations. On the other hand, including labor obligations in the same dispute settlement than commercial obligations open the possibility of the suspensions of benefits due to not commitment to the ILO labor standards. This can be understood as an increase in the scope given that the suspension is directly associated to the action of firms.

Before the agreements, these countries had access to duty-free preferences to the US in a large share of tariff lines as part of GSP and regional programs, the US schemes that provide non-reciprocal preferences to developing countries. [30][31] Those programs also have as a condition satisfying basic labor rights such as internationally recognized worker rights, worst cases of child labor and proper labor conditions. In fact, eleven countries have been temporarily suspended from this program for this reason in the past.[32] This means that uncertainty before the FTAs could also be assumed to be a factor. An agreement that secures preferences should reduce uncertainty as the literature has shown. On the contrary, an agreement that does not secure preferences by conditioning market access to the individual behavior of firms may keep an uncertainty component.

The timing of events is unfortunate given that in 2009 trade sharply declined with respect to 2008 in the so-called Great Trade Collapse (GTC). Therefore, it is important to understand how the GTC could affect the results. The theoretical section provides a derivation in which the elasticity of exports with respect to the potential profit loss in a case of an increase of tariffs depends on the probability of trade policy shocks. One potential problem is potential bias from the profit loss interacting with other variables that are not taken into account (e.g. demand uncertainty). In addition, it is important

(2014) also groups FTAs in terms of the enforceability of labor provisions but looks at 200 agreements, including also those not signed by the US. He divides agreements in six groups, putting CAFTA-DR in the second group in terms of enforceability and scope and those agreements that had the change in the labor chapter template in the most enforceable group.

[30]Costa Rica had access to the Caribbean Basin Initiative (CBI) and Peru to the Andean Trade Preference Act (ATPA).

[31]The US's GSP gives duty free access in approximately 51% of the dutiable MFN tariff lines in the 2004-2014. In 2014, countries in the CBI had access to 80% of duty free tariff lines and other regional programs had similar shares. See Ornelas (2016).

[32]The program also has specific uncertainty given that it has to be renewed annually and depends directly form the US President, who has the power of excluding countries or products any given year. As a matter of fact, the program has been allowed to expire many times and retroactively activated afterwards.

to acknowledge compositional effects when comparing two countries (one of the countries may export products that are relatively more uncertain in terms of the demand).

The literature has enumerated many reasons behind the GTC. For example, the decline in durable investment efficiency (Eaton et al., 2017), input-output linkages (Bems et al., 2011), inventory adjustments (Alessandria et al., 2011) and economic uncertainty (Novy and Taylor, 2014). The interrelation between trade policy uncertainty and demand uncertainty is explicitly studied in terms of US exports in Carballo et al. (2017). They find that the contribution of the extensive margin was sizable and that exports to non-PTA countries have been differentially impacted. Importantly, they find that these differentials were eliminated after 2010. Although I am studying US imports rather than exports, I use this date as a reference point when checking the robustness of results.

Given the multiple possible explanations, a conclusive resolution of potential interactions will not be possible within this model. However, it is important to note that given that I analyze a single importing country, demand differentials across countries will not be the problem. In fact, I will take into account industry-specific demand shocks that may be correlated to the profit loss measure (e.g. substitution of suppliers to PTA countries in sectors with higher MFN tariffs). As said, compositional effects in terms of products supplied may be an issue. Bems et al. (2011) show that the strongest decline was in final goods and also in durable goods (possible due to credit constraints given that the recession originated in the financial market), and therefore if economic uncertainty and trade policy uncertainty interact, it can be explicitly taken care of in terms of the sample estimated.

3.2 Empirical Strategy

In the theoretical part I showed how the model predicts a gravity equation. To estimate this equation and identify the coefficients that can be mapped to different levels of trade policy shocks, I linearly approximate the uncertainty factor around $(\gamma, c^D) = (0, \overline{c^D})$, where the last term is arbitrary fixed given that does not have an effect when $\gamma = 0$ other than through the demand and trade cost channels. The resulting equation is as follows:

$$\ln R_{iVt} = b(\gamma_{it}, \phi_{it})_\omega (1 - \omega_{iVt}) + b_\tau \ln \tau_{iVt} + b_d \ln d_{iVt} + \delta_{iV} + \delta_{ist} + \delta_{Vt} + \varepsilon_{iVt} \tag{16}$$

where R_{iVt} refers to exports to the US from country i of industry V at year t, δ_{iV} is a exporter-industry fixed effect, δ_{Vt} is a industry-year fixed effect, δ_{ist} is a exporter-section-year fixed effect, and

ε_{iVt} is an idiosyncratic error.[33] The coefficient of interest is $b(\gamma_{it}, \phi_{it})_\omega = -\frac{\beta}{1-\beta}\frac{k-\sigma+1}{\sigma-1}G(\overline{c^D})(1-\phi_{it}^k)\gamma_{it}$, which is negative as expected (i.e. an increase in the potential profit loss reduces exports to the US). Note that the coefficient can vary across countries if parameters like the probability of a death shock and the shape parameter are not constant. Therefore, an identifying assumption is that these parameters are fixed and non-random.[34] On the contrary, the elasticity of substitution and the fixed demand shifters summarized in $\overline{c^D}$ are common across countries given that are defined by the importing country. Importantly, note that a significant coefficient would mean that both γ_{it} is different from zero (enforceable labor provisions) and ϕ_{it} is lower than one (a positive share of firms not applying the required provisions) for all it. This means that non-enforceable provisions ($\gamma_{it} = 0$) and perfect complying ($\phi_{it} = 1$) would yield a nonsignificant coefficient if within the estimated sample all countries face no TPU. The variation that will be used to identify this coefficient comes from the profit loss measure $(1 - \omega_{iVt})$[35].

The coefficients $b_\tau = -\frac{\sigma k}{\sigma-1}$ and $b_d = -k$ are also negative as expected. Given the high correlation between the uncertainty measure and tariffs, I exploit the model to construct a trade cost variable $T_{iVt} = \tau_{iVt}^{\frac{\sigma}{\sigma-1}} d_{iVt}$. The three sets of fixed effects δ_{iV}, δ_{ist} and δ_{Vt} capture the remaining terms in the gravity equation. The identifying assumption is that there is a broader sector (the section) that encompasses industries in terms of their characteristics, capturing features like the exporter-specific sunk cost of entry, the first order effect of upgrading standards and time-varying demand changes embodied in prices and expenditure of the US. Also, it is assumed that the potential number of entrants is constant.

A concern is that Costa Rica and Peru may have faced different levels of uncertainty before the FTAs entered into force. Therefore I estimate equation 16 for the period 2003-2005 and also include the rest of GSP countries to test whether these countries had also differential uncertainty with respect to the pool of GSP beneficiaries.

To compare Costa Rica and Peru before and after accessing the FTAs, I subsequently estimate equation 16 in differences. The reason is to focus on the base and post period in a differences-in-differences setting that allows two treated groups and variable coefficients. Therefore, I estimate the following equation:

[33] The term "section" refers to a group of industries with similar characteristics (e.g. one of the 21 sections in the Harmonized System - HS - or a 2-digits HS code)

[34] Randomness in these parameters would introduce an interaction with the profit loss that would enter into the error term, making the results inconsistent.

[35] I assume $\sigma = 3$ as in HL

$$\Delta \ln R_{iV} = b(\gamma_{i1}, \phi_{i1})_{\omega 1}(1 - \omega_{iV1}) - b(\gamma_{i0}, \phi_{i0})_{\omega 0}(1 - \omega_{iV0}) + b_T \Delta \ln T_{iV} + \delta'_{is} + \delta'_V + \Delta\varepsilon_{iV} \quad (17)$$

An agreement that effectively eliminates uncertainty would yield $b(\gamma_{i1}, \phi_{i1})_{\omega 1} = 0$, whereas it is expected that before the agreement enters into force the base coefficient is positive ($-b(\gamma_{i0}, \phi_{i0})_{\omega 0} > 0$). As mentioned before, the GTC is a special source of concern for this period. As such, effectively controlling differential demand shocks is key to get consistent estimations of the coefficients. To do so I estimate the equation for Costa Rica and Peru plus countries that face less uncertainty when exporting to the US such as MFN countries. These exporters are members of the WTO, a multilateral agreement that did not had any credible threat directly related to losing preferences. This means that the uncertainty variable can be assumed to take the value of zero for the control group ($\omega_{iVt} = (\frac{\tau_{MFN,Vt}}{\tau_{MFN,Vt}})^{-\sigma}$, so $1 - \omega_{iVt} = 0$). This extensive control group allows me to have extra variation within each HS6 to properly address potential omitted variable bias without including additional uncertainty interaction terms (e.g. demand shocks originated in the GTC). Finally, another reason for not using an alternative control group is the potential multicollinearity that would introduce including additional interactions of the profit loss measure (i.e. using GSP countries would require the profit loss measure to be different from zero for all countries). The uncertainty variable does not have meaningful variation across countries within an industry when a sample that has duty free access is used. [36]

The decision of controlling for a very narrow definition of industry comes at a cost. Capturing the effect on the extensive margin becomes more complicated with the data I use in this version of the paper. The number of varieties is associated to number of firms, but with data at the product level the only possible measure is the number of 10-digits HS codes within each industry. On the one hand, this variable has a strong industry specific component that will not vary over time and countries if each individual HS10 is been already exported by a firm (i.e. it is censored). This component will be picked up by the industry fixed effect. On the other hand, in HL it is noted that under some regularity conditions between the count of products and the number of varieties the coefficients can be interpreted up to a factor (where this factor is assumed to be constant across industries). However, in their setting they do not use an industry-specific set of fixed effects and therefore they have extra variation.

[36] For a given industry, a set of countries that have duty-free access face a constant $\omega_{iVt} = \tau^{-\sigma}_{MFN,Vt}$ for both the control and treatment groups.

3.3 Data

I use US import data at HS10 level available in NBER which is collected and made available by Schott (2008). This dataset includes import values, country of origin, year and NAICS codes. This last information is useful to match the industry-level unionization data updated annually in Hirsch and Macpherson (2003).

Tariff data is from TRAINS and WTO-IDB, which make available the MFN and applied tariff at the HS6 level. I use this data to construct the uncertainty measure and the ad-valorem tariffs.

In Table 2 I present the descriptive statistics for the variables used in the baseline regressions that compare Costa Rica with Peru and include MFN countries as control group. Variables are in changes where the base year is 2007, a year before the Great Recession, and when both Peru and Costa Rica were not part of the reciprocal agreement with the US. The first thing to note is the highly imprecise values of the mean of export and variety growth (means are not significantly different from zero).[37] Second, tariffs decreased for both countries in this period as expected. Peruvian tariffs decreased at a greater extent, which may indicate either that the regional US scheme had more coverage in the case of Costa Rica or that Peru specializes in goods with higher tariffs. In any case, this is not a problem if the elasticity of trade with respect to uncertainty is not highly non-linear around $\gamma = 0$. The uncertainty factor before the agreement is lower than after the agreement, also a result that is expected with relatively constant MFN tariffs. In the case of MFN countries the uncertainty factor is always zero given that their applied tariffs are the MFN tariffs.

3.4 Results

In Table 3 I evaluate if Peru and Costa Rica had differential uncertainty with respect to the pool of GSP countries by estimating Equation 16 and test different specifications. Estimates are stable and show no significant differential uncertainty on exports for these two countries. Furthermore, uncertainty in Costa Rica is not statistically different than in Peru for this period.

In Table 4 I present the baseline results for both exports and number of varieties. I use 2007 as the base period and 2012 as the final period. The reason for using 2007 is that for both countries the uncertainty about future labor standards cannot be assumed to be low due to both the referendum and the change in the template. The reason for using 2012 is two-fold. First, it is comparable to what it

[37] Costa Rica had a specific process that may have shaped this statistics over this time. Exports in 2012-2007 grew 186% in part due to the opening of an Intel plant. This means that most of the growth comes from a few HS6 codes and many subsidiaries switched from exporting to selling domestically.

Table 2: Descriptive Statistics

	Costa Rica			Peru			MFN		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Exports (log Δ)	-0.229	-0.250	-0.119	0.072	0.217	0.319	-0.169	-0.029	0.015
	1.892	2.106	2.262	1.447	1.623	1.611	1.573	1.656	1.732
Varieties (log Δ)	0.016	0.021	-0.008	0.031	0.040	0.039	-0.023	-0.005	0.004
	0.442	0.437	0.509	0.424	0.444	0.460	0.354	0.365	0.386
Tariffs (Δ)	-0.019	-0.015	-0.017	-0.035	-0.036	-0.034	0.000	0.000	0.000
	0.054	0.042	0.053	0.057	0.056	0.057	0.007	0.017	0.009
Uncertainty ($t1$)	0.103	0.097	0.097	0.133	0.136	0.131	0.000	0.000	0.000
	0.115	0.112	0.115	0.126	0.128	0.125	-	-	-
Uncertainty ($t0$)	0.062	0.062	0.061	0.048	0.050	0.049	0.000	0.000	0.000
	0.075	0.077	0.075	0.074	0.076	0.075	-	-	-
Transport Costs (Δ)	0.003	0.002	-0.009	-0.014	-0.024	-0.029	-0.001	-0.002	-0.005
	0.148	0.118	0.102	0.114	0.125	0.134	0.106	0.112	0.109
N	573	574	547	770	768	755	52987	53208	52567

Base Year: 2007. Exports, number of varieties, ad-valorem tariffs and transport costs: $\ln X_t - \ln X_{t-1}$. Uncertainty variable: $(1-(\tau_{MFN,t}/\tau_{i,t})^{-\sigma})$, where $\tau_{i,t}$ is the applied tariff at t and $\tau_{MDN,i}$ is the MFN tariff ($\sigma = 3$).

Table 3: Pre-FTA Uncertainty. Exports (log).

	(1)	(2)	(3)	(4)	(5)	(6)
Uncertainty * CR	-2.792	-2.781	-2.722	-2.358	-2.498	-2.047
	(1.848)	(1.773)	(1.845)	(1.797)	(1.912)	(2.346)
Uncertainty * PE	1.424	1.660	0.047	1.746	2.081	0.790
	(2.462)	(2.466)	(2.884)	(2.868)	(2.843)	(3.021)
Uncertainty	-1.848***	-1.643***	-2.838**	-1.475***	-2.351**	-2.797**
	(0.481)	(0.492)	(1.139)	(0.510)	(1.188)	(1.385)
TC (log)	-2.942***	-2.975***	-3.016***	-2.982***	-3.019***	-3.062***
	(0.105)	(0.105)	(0.108)	(0.108)	(0.110)	(0.115)
Country-HS6 F.E.	Y	Y	Y	Y	Y	Y
Country-Year F.E.	Y	Y	Y	N	N	N
Section-Year F.E.	Y	N	N	N	N	N
HS2-Year F.E.	N	Y	N	Y	N	N
HS6-Year F.E.	N	N	Y	N	Y	Y
Country-Section-Year F.E.	N	N	N	Y	Y	N
Country-HS2-Year F.E.	N	N	N	N	N	Y
N	63,794	63,794	61,034	63,215	60,431	58,708
R-Squared	0.914	0.915	0.930	0.919	0.934	0.938

Robust standard errors in parenthesis. Sample: GSP countries excluding LDC (least developing countries) beneficiaries. 2003-2005.

has been done in the literature in terms of comparing five-year intervals. Second, in a different setting Carballo et al. (2017) conclude that differential impacts of the GTC are seen up to the last quarter of 2010. Therefore, choosing 2012 may be a proper year to be at a safe distance of the worst part of the GTC.

For each variable two specifications are estimated. In all of them HS6 fixed effects are included to control for US demand shocks. The country-broad sector fixed effect used are the 21 sections defined in the HS code and the 2-digits HS (96 sectors).[38] Results for exports show that in the first two cases the pre-FTA uncertainty coefficient is positive and significant as expected. Furthermore, the post-FTA uncertainty remains significant in the Peru case whereas it is not in the Costa Rica case.[39] However, I cannot reject a decrease in uncertainty after the FTA for any country. This is a constant feature along the results that can attributed to the large size of the standard errors.[40][41] Nonetheless, we can statistically conclude that there is evidence of uncertainty after agreements that hypothetically secure preferences in the case of Peru. In light of the model, it means both $\gamma > 0$ and $\phi < 1$.

In the case of the number of varieties, the coefficient for pre-FTA is not significant. As it was mentioned, the non-significance may be the consequence of absorbing all the variation with the HS6 fixed effect.[42] Given that this is a feature of the potential variability of the dependent variable I will restrict the analysis to total exports.

One possibility is that the result is specific to the 2007-2012 period. Hence, in table 5 I try different time periods. When 2006 is used as a base year, the results are almost identical to the baseline case. The pre-FTA coefficient is positive and significant as expected, and Peru continues to have a significant coefficient after the FTA. When both 2006 and 2007 are compared to 2010 and 2011 results are not the same. In these two years, residual demand uncertainty from the GTC may still be interacting with trade policy uncertainty. In fact, both Costa Rica and Peru have negative coefficients when 2010 is used. When 2011 is used as the final year of the variation, the result is much weaker although still suggests a more significant result for Peru.

If the measure used for uncertainty is correlated to demand shocks in the US, the variable will be picking this correlation and the conclusions that can be drawn from the estimations will be misleading.

[38] The average number of industries per sector in the first case is 234 and in the second 51.

[39] These results are robust to using $\sigma = 2$ and $\sigma = 4$.

[40] In Handley and Limão (2015) the authors seem to face the same issue. When the post-accession to the EU uncertainty is included, the standard errors substantially increase and the coefficients are almost surely not significantly different from each other.

[41] The estimations are robust to standard variance inflation factor indices for multicollinearity.

[42] When a panel regression is estimated with the years 2007 and 2012 and only country-HS6 fixed effects are included, the adjusted R-squared is larger in the case in which the number of varieties is the dependent variable in comparison to exports. This continues to be the case when alternative extra fixed effects are included.

Table 4: Alternative Specifications.

	Exports (log Δ)		Number of Varieties (log Δ)	
	(1)	(2)	(3)	(4)
Uncertainty * CR	-1.875	-1.609	0.230	0.618
	(1.228)	(1.673)	(0.341)	(0.390)
Uncertainty * PE	-2.258***	-2.973***	-0.245	-0.474*
	(0.732)	(0.967)	(0.209)	(0.261)
Pre-Uncertainty	2.205**	2.193*	0.223	0.171
	(0.971)	(1.228)	(0.281)	(0.319)
TC (log Δ)	-4.111***	-4.132***	-0.123***	-0.125***
	(0.101)	(0.103)	(0.018)	(0.018)
Country-HS2 F.E.	N	Y	N	Y
Country-Section F.E.	Y	N	Y	N
HS6 F.E.	Y	Y	Y	Y
N	53,404	52,978	53,404	52,978
R-Squared	0.241	0.279	0.209	0.250
CR test	0.786	0.699	0.173	0.039
PE test	0.951	0.469	0.930	0.294

Robust standard errors in parenthesis. Sample: MFN countries, CR and PE. Base year: 2007. Importing country: US.

Table 5: Alternative Time Periods. Export Change (log). .

	Base Year: 2006			Base Year: 2007		
	(1)	(2)	(3)	(4)	(5)	(6)
	2010	2011	2012	2010	2011	2012
Uncertainty * CR	-4.188***	-2.549	-2.189	-3.446**	-2.451*	-1.609
	(1.374)	(1.706)	(1.612)	(1.464)	(1.473)	(1.673)
Uncertainty * PE	-1.961**	-2.103**	-2.658***	-2.720***	-1.997**	-2.973***
	(0.878)	(0.935)	(0.956)	(0.780)	(0.876)	(0.967)
Pre-Uncertainty	2.000*	1.825	2.208*	3.192***	1.784	2.193*
	(1.033)	(1.209)	(1.149)	(1.066)	(1.114)	(1.228)
TC (log Δ)	-3.716***	-3.998***	-4.068***	-3.815***	-3.899***	-4.132***
	(0.114)	(0.108)	(0.114)	(0.102)	(0.101)	(0.103)
Country-HS2 F.E.	Y	Y	Y	Y	Y	Y
HS6 F.E.	Y	Y	Y	Y	Y	Y
N	52,575	51,122	52,318	53,446	52,027	52,978
R-Squared	0.267	0.280	0.283	0.249	0.261	0.279

Robust standard errors in parenthesis. Sample: MFN countries, CR and PE. Importing country: US.

Therefore, I estimate a placebo in which I replace exports of the treated countries to those in similar positions. In the case of Costa Rica, I use exports from the rest of the CAFTA countries in which the FTA entered into forced in 2006.[43] If the effect picked in the baseline regression corresponds to TPU, we should not see any result either for pre and nor for post 2009. In the case of Peru, I use Chile. The US and Chile have a FTA since 2004, and therefore we should not expect signs of uncertainty over this period. More importantly, the correlation between the uncertainty variable for Peru should not be correlated to Chilean exports to the US if the results are not explained by a demand shock. In column (1) of Table 6 it is shown that none of the coefficient are significant, which means that there is no evidence of correlation between demand shocks and the uncertainty measure. In column (2) the baseline is estimated to show that the baseline results hold for this restricted sample.

Alternatively, the uncertainty variable may be correlated to supply shocks in the exporting countries. Therefore, I follow a similar strategy and replace the importing country by the EU15, a market of similar importance for both of the countries that are treated.[44] As in the previous case, there is no evidence of correlation between potential supply shocks and the uncertainty variable, and the baseline estimation is analogous to the original estimation.[45]

Another concern is that there may be systematic trends within country-industries before the change in the agreement takes place that may be yielding the results. Therefore, I estimate a regression in which the change in exports for 2007-2012 is replaced by the change in exports for 2003-2006.[46] Results are not significant showing no evidence of pre-trends and the baseline is similar to the original estimation.

I address more explicitly the concern of the GTC in Table 7. One hypothesis stated in the literature is that purchases that may require well-functioning credit markets could have had a differential impact due to the Great Recession. If trade policy uncertainty interacts with the uncertainty generated by credit markets, capital and durable goods should have been the most affected. In column 2 of Table 7 I estimate the baseline regression but excluding these goods as defined by the Broad Economic Categories (BEC) classification. Results are robust to this sample limitation. In Bems et al. (2011) it is shown that although most of the fall in aggregate trade can be explained by intermediate goods,

[43] El Salvador, Guatemala, Honduras and Nicaragua.

[44] In this case the sample has to be restricted because the EU15 countries that were included in the regression as a control group has to be excluded.

[45] This strategy to discard spurious correlation is only effective when shocks are strictly confined to either the importer or the exporter.

[46] I use 2006 as a final year to not overlap the base of the variation in the baseline with the final year in the variation of the placebo. I do not use 2001 because of data availability. I multiply the 2003-2006 log change by 5/3 to have an average five-year change.

Table 6: Placebos. Export Change (log).

	Demand Shock		Supply Shock		Pre-trends	
	(1)	(2)	(3)	(4)	(5)	(6)
	Chile & CAFTA	Baseline	EU15	Baseline	2003-2006	Baseline
Uncertainty * CR	-1.018	-0.407	-0.865	-0.649	3.072	-0.196
	(1.210)	(1.999)	(3.575)	(3.070)	(1.992)	(1.928)
Uncertainty * PE	0.373	-2.633*	-1.943	-3.175***	1.970	-2.717**
	(1.604)	(1.483)	(1.359)	(1.113)	(1.347)	(1.055)
Pre-Uncertainty	0.745	3.201*	0.641	2.478*	-2.510	2.371*
	(1.159)	(1.893)	(1.789)	(1.486)	(1.568)	(1.330)
TC (log Δ)	-4.093***	-4.128***	1.549	-4.017***	-4.187***	-4.399***
	(0.103)	(0.104)	(1.265)	(0.167)	(0.130)	(0.129)
Country-HS2 F.E.	Y	Y	Y	Y	Y	Y
HS6 F.E.	Y	Y	Y	Y	Y	Y
N	52,317	52,317	22,308	22,308	46,001	46,001
R-Squared	0.279	0.280	0.353	0.372	0.294	0.296

Robust standard errors in parenthesis. Column (1): Sample: MFN countries, Chile and CAFTA. Uncertainty variable calculated for Peru is used in the case of Chile and for Costa Rica in the case of CAFTA. Importing country: US. Column (2): Sample: MFN countries, PE and CR. Importing country: US. Same industries used in column (1). Column (3): Sample: MFN countries, PE and CR. Importing country: EU15. Uncertainty variable calculated by using US data. Column (4): Sample: MFN countries, PE and CR. Importing country: US. Same industries used in column (3). Column (5): Sample: MFN countries, PE and CR. Importing country: US. Export variation: 2003-2006. Column (6): Sample: MFN countries, PE and CR. Importing country: US. Export variation: 2007-2012. Same industries used in column (5).

final goods fall was twice as large. Therefore, I further limited the sample in column (3) to leave only intermediate goods. The uncertainty post-FTA is still significant in the case of Peru.

The significant and non-significant results post-FTA for Peru and Costa Rica respectively may be explained by the fact that both countries export different products and thus industries that are exporting to the US in the case of Peru have differential uncertainty. If this is the case, then the uncertainty that is being captured may not be associated with the change in the template of the US-Peru FTA. When the sample is limited to industries that export to the US in both countries, the result in Peru for the post-FTA uncertainty variable is still significant. Results in Table 7 cannot assure that the significance of the coefficients is not related to the GTC or to product composition but provide supporting evidence.

The model predicts that the threat of losing preferences might have sectorial variation due to the different demand for having preferences revoked (i.e. γ_{iVt}). An example of this is the level of unionization in the US. Sectors that are relatively more unionized may have more lobby power and more resources to present claims to the US government and push investigations. Therefore, I use the level of sectoral unionization to test whether in sectors in which this variable is higher there is a differential effect through the uncertainty channel. If in the case of Costa Rica the agreement is not

Table 7: Alternative Industry Samples. Export Change (log).

	All	No Capital/Durable Goods	Intermediate Goods	Same Industries
Uncertainty * CR	-1.609	-1.259	-4.430	-1.424
	(1.673)	(1.726)	(4.541)	(1.992)
Uncertainty * PE	-2.973***	-3.136***	-4.826**	-2.500**
	(0.967)	(0.975)	(2.438)	(1.048)
Pre-Uncertainty	2.193*	2.300*	3.022	2.082
	(1.228)	(1.253)	(3.291)	(1.474)
TC (log Δ)	-4.132***	-3.921***	-4.066***	-3.698***
	(0.103)	(0.104)	(0.135)	(0.174)
Country-HS2 F.E.	Y	Y	Y	Y
HS6 F.E.	Y	Y	Y	Y
N	52,978	41,918	28,270	17,699
R-Squared	0.279	0.298	0.295	0.322

Robust standard errors in parenthesis. Sample: MFN countries, CR and PE. Importing country: US.

enforceable, the level of unionization should not be a factor affecting exporters. In Table 8 I estimate the two main specifications for two definitions of unionized sectors. In the columns (1) and (2) I define as highly unionized sectors the observations that are above the median in terms of the share of unionized workers in the US. In columns (3) and (4) I define as highly unionized sectors as those in the upper quartile. In all cases, highly unionized sectors do not have a differential effect in the case of Costa Rica as expected. In the case of Peru, there is only a differential effect when the definition used is the upper quartile, and the result is consistent to both specifications. This result suggests that the threat is a differential factor only for those sectors that are highly unionized, especially taking into account that this distribution is positively skewed.[47]

In general, there is evidence of the existence of uncertainty after the FTA enters into force in the case of Peru and of uncertainty before the FTA. Moreover, the lack of uncertainty cannot be rejected in the case of Costa Rica after the FTA enters into force. However, the noisy estimations do not allow to reject the hypothesis of differential uncertainty between countries after the FTA. Therefore, using better data may be important to identify the effect. For instance, data at the 10-digits HS level that include the number of firms may be the natural following step.

Finally, there exists the possibility that the alleged changed in the labor chapter of the FTA was not strongly perceived by firms as a threat. This interpretation would be in line with the robust but noisy findings of this section, although not with the existence of uncertainty in Peru after the FTA.

[47] The median value used in columns (1) and (2) is 7.8%, whereas the third quartile used in columns (3) and (4) is 10.4%. The maximum level of unionization is 30.3% and the mean is 9.3% for this sample.

Table 8: Level of Unionization. Export Change (log).

	Upper Half		Upper Quartile	
	(1)	(2)	(3)	(4)
Uncertainty * CR * HU	2.645	2.838	0.624	0.140
	(1.787)	(2.117)	(1.870)	(2.287)
Uncertainty * PE * HU	-1.333	-0.439	-2.229**	-2.019*
	(1.083)	(1.243)	(1.100)	(1.206)
Uncertainty * CR	-3.088**	-2.768	-2.277	-1.874
	(1.465)	(2.032)	(1.407)	(1.973)
Uncertainty * PE	-1.864**	-2.783***	-1.879**	-2.683***
	(0.758)	(0.994)	(0.753)	(0.988)
Pre-Uncertainty	2.278**	2.040	2.572**	2.572**
	(1.091)	(1.307)	(1.024)	(1.270)
TC (log Δ)	-4.110***	-4.131***	-4.111***	-4.132***
	(0.101)	(0.103)	(0.101)	(0.103)
Country-HS2 F.E.	N	Y	N	Y
Country-Section F.E.	Y	N	Y	N
HS6 F.E.	Y	Y	Y	Y
N	53,404	53,404	52,978	52,978
R-Squared	0.241	0.241	0.279	0.279

Robust standard errors in parenthesis. Sample: MFN countries, CR and PE. Base year: 2007. Importing country: US. HU: Highly unionized sectors.

4 Conclusion

In this paper, I presented a potential theoretical consequence of having preferential market access that depends on enforceable provisions when complying depends on investments made by firms. This situation is a possibility within PTAs that cover non-trade related policy areas such as labor standards. I used the framework developed in recent works to account for TPU and modified it to deal with this specific issue. If the probability of losing preferences depends on the share of firms that commit to what is required, an industry-wide externality is introduced that increases uncertainty. In the model, an increase in the scope of enforceable labor standards required reduces entry due to a decrease in complying firms and its consequence on the probability of losing market access. An increase in enforceability or in the lobby power of agents interested in having preferences revoked in the importing country also reduces entry. However, given that less productive firms exit, the total effect is ameliorated.

I applied this setting to a change in the enforceability and scope of labor provisions included in the labor chapter of PTAs that the US signs with developing countries. The model yields an augmented gravity equation that includes a term that captures uncertainty. Using this equation, I tested whether a country that received the updated labor provisions eliminated the uncertainty after the PTA is in

force. I find that in this case the uncertainty is still present. On the contrary, I cannot reject the lack of uncertainty in the case of the country with old provisions. Finally, I cannot reject invariant uncertainty in any case. It suggests that the levels of uncertainty may be similar before and after for the country with the new provisions but too noisy for the country with the old provisions, possibly indicating the lack of an effect.

The paper can be extended in multiple ways. A potential way is to use a setting with firms that do not have measure zero. In that case, the action of individual firms may be explicitly taken into account and also their individual contribution to the overall uncertainty. This feature may be important to study the conditions under which the firms tend to internalize. Another potential extension is allowing for an explicit modeling of the relationship between firms and the government in the developing country. In the current model there is no role for the domestic government. However, a government may be a way the industry have to get insurance against non-complying firms through the local enforceability of the required provisions.

The setting presented in this paper only considers a PTA signed by two countries in which one of them has all the power of setting the provisions. This is restrictive mostly to PTAs signed by developed and developing countries. The interrelation between bargaining over enforceable provisions and how firms may respond to that is another potential extension for settings where countries have similar bargaining power.

Finally, the increasing depth of PTAs and the current intention of some developed countries of effectively applying their legal clauses may provide more sharp empirical applications in the future.

References

[1] Alessandria, George, Joseph P. Kaboski, and Virgiliu A. Midrigan. "Us trade and inventory dynamics." The American Economic Review 101.3 (2011): 303-307.

[2] Baier, Scott L., Jeffrey H. Bergstrand, and Michael Feng. "Economic integration agreements and the margins of international trade." Journal of International Economics 93.2 (2014): 339-350.

[3] Bems, Rudolfs, Robert C. Johnson, and Kei-Mu Yi. "Vertical linkages and the collapse of global trade." The American Economic Review 101.3 (2011): 308-317.

[4] Bloom, N., Eifert, B., Mahajan, A., McKenzie, D., & Roberts, J. (2013). "Does management matter? Evidence from India." The Quarterly Journal of Economics, 128(1), 1-51.

[5] Bolle, Mary Jane. "Overview of labor enforcement issues in free trade agreements." Federal Publications (2016).

[6] Bonnal, Michaël. "Export performance, labor standards and institutions: Evidence from a dynamic panel data model." Journal of Labor Research 31.1 (2010): 53-66.

[7] Brown, D. K., Deardorff, A. V., & Stern, R. M. (1993). "International labor standards and trade: a theoretical analysis (No. 333)." Institute of Public Policy Studies, University of Michigan.

[8] Carballo, J., Handley, K., & Limão, N. (2017). "Trade Collapse and Policy Uncertainty in the Great Recession." Mimeo, University of Maryland.

[9] Dehejia, Vivek H., and Yiagadeesen Samy. "Labor Standards and Economic Integration in the European Union: an Empirical Analysis." Journal of economic integration (2008): 817-847.

[10] Dixit, Avinash. "Entry and exit decisions under uncertainty." Journal of political Economy (1989): 620-638.

[11] Eaton, Jonathan, Samuel Kortum, Brent Neiman, and John Romalis. "Trade and the global recession." The American Economic Review 106, no. 11 (2016): 3401-3438.

[12] Hakobyan, Shushanik. "GSP expiration and declining exports from developing countries." mimeo (2014).

[13] Handley, Kyle. "Exporting under trade policy uncertainty: Theory and evidence." Journal of international Economics 94.1 (2014): 50-66.

[14] Handley, Kyle, and Nuno Limão. "Policy uncertainty, trade and welfare: Theory and evidence for China and the US." No. w19376. National Bureau of Economic Research, 2016.

[15] Handley, Kyle, and Nuno Limão. "Trade and investment under policy uncertainty: theory and firm evidence." American Economic Journal: Economic Policy 7.4 (2015): 189-222.

[16] Hirsch, Barry T., and David A. Macpherson. "Union membership and coverage database from the current population survey: Note." Industrial & labor relations review 56.2 (2003): 349-354.

[17] Horn, Henrik, Petros C. Mavroidis, and André Sapir. "Beyond the WTO? An Anatomy of EU and US Preferential Trade Agreements." The World Economy: Global Trade Policy 2010: 223-246

[18] Kamata, Isao. "Regional Trade Agreements with Labor Clauses: Effects on labor standards and trade." La Follette School of Public Affairs Working Paper Series 2014-002 (2014).

[19] Limão, Nuno. "Preferential trade agreements." No. w22138. National Bureau of Economic Research, 2016.

[20] Novy, Dennis, and Alan M. Taylor. "Trade and uncertainty." No. w19941. National Bureau of Economic Research, 2014.

[21] Orefice, Gianluca, and Nadia Rocha. "Deep integration and production networks: an empirical analysis." The World Economy 37.1 (2014): 106-136.

[22] Ornelas, Emanuel. "Special and differential treatment for developing countries." No. 66432. London School of Economics and Political Science, LSE Library, 2016.

[23] Osnago, Alberto, Nadia Rocha, and Michele Ruta. "Deep trade agreements and vertical FDI: the devil is in the details." World Bank Policy Research Working Paper 7464 (2015).

[24] Sala, Davide, Philipp JH Schröder, and Erdal Yalcin. "Market access through bound tariffs." Scottish Journal of Political Economy 57.3 (2010): 272-289.

[25] Samy, Yiagadeesen, and Vivek H. Dehejia. "Trade and labor standards ind the European Union: A gravity model approach." The International Trade Journal 25.5 (2011): 581-618.

[26] Schott, Peter K. "The relative sophistication of Chinese exports." Economic policy 23.53 (2008): 6-49.

[27] Weil, D. (1992). "Building safety: The role of construction unions in the enforcement of OSHA." Journal of Labor Research, 13(1), 121-132.

A The Domestic Government

In the model, the government of the exporting country does not play a role. However, the cost of losing preferential access may be high enough to induce it to employ resources to force firms to comply. In this appendix I present an extension of the model to show that the externality may not be eliminated if verifying violations is costly.

I assume that the government chooses how much of the cost support it will verify starting from the most productive firm. The rationale behind this is that it may be easier to verify large firms first than small and relatively less productive firms.[48] The total cost of verification is assumed to be increasing in the number of firms the government decides to analyze. I define $c_v = c_v(c^U; \phi, V, \Phi)$ to be the optimal choice of the government which depends on the endogenous number of exporting firms c^U, the upgrading technology ϕ, factors determining verification costs V, and other factors determining the preferences of the government Φ. The reason of why both c^U and ϕ affect c_v is that I assume that the government has also the national income in its objective function. Otherwise, it may not choose to control standards related to an importing country.

Firms that are found violating standards can choose between paying a large fine that will make them exit and upgrading the next period.[49] Hence, for $c < c_v$, firms' value function is:

$$\Pi_v(\tau_s, c) = \max\{\Pi_{es}(\tau_s, c) - K_s, \Pi_{ew}(\tau_s, c)\} \tag{18}$$

where the first argument is the value of upgrading and the second argument is the value of waiting but knowing that it will be optimal to upgrade in the following period given that the government will find it. Specifically, $\Pi_{es}(\tau_s, c) = \pi(\tau_s, zc) + \beta E\Pi_{es}(\tau', zc)$ and $\Pi_{ew}(\tau_s, c) = \pi(\tau_s, c) + \beta[E\Pi_{es}(\tau', zc) - K_s]$. The marginal firm below c_v is indifferent between the two and determines the cutoff c^W, which can be shown to have the following expression:

$$c^W = c^D \phi \tag{19}$$

This result has the following implications. First, it implies that under uncertainty the number of firms that upgrades knowing that the government will be enforcing standards is larger than in the baseline case ($c^W > c^U\phi$). Second, it also implies that only for firms above c^W the government will be effectively enforcing standards. This means that verifying up to c^W works as a fixed cost for the government since only above that threshold an increase in the number of firms covered will actually reduce the probability of losing preferences for the industry. In fact, it is only the credible threat of domestically enforcing standards what works for firms in the interval $[c^U\phi, c^W]$. Third, firms in the interval $[c^W, c_v]$ will wait to be caught and upgrade the following period. This captures firms that

[48] A similar conclusion can be achieved if the government starts from low productivity firms.

[49] The fine is chosen to be large to show that even under an extreme case where all firms always prefer upgrading rather than exiting, the externality can persist.

improve standards only after an inspection. Finally, all firms above c_v will not comply with standards as long as $c_v > c^U \phi$.[50]

The optimal choice of c_v will depend on the marginal gain of having more firms committing to standards. Therefore, this extension illustrates that even under a domestic government willing to enforce standards, the probability of losing preferences may still be greater than zero and the externality present through c_v.

[50] The analysis is valid as long as $U(\omega, \gamma, \lambda) > \phi$, otherwise all firms will comply when the threat is credible.