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"Protection without Discrimination"

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Abstract

This paper shows that domestic regulations may fully respect the non-discrimination principle of the WTO and still act as a protectionist device. The core mechanism is a profit shifting effect between firms within sectors. By increasing production costs of all operating firms in a market, domestic regulations force the least efficient firms to exit, increasing market shares of surviving firms. This generates protectionism in the aggregate if it forces relatively more foreign firms to exit, or if domestic firms are relatively more efficient. Introducing political economy motives in the model, this paper shows that trade liberalization increases the use of domestic regulations in the non-cooperative equilibrium, because it improves their protectionist effect. Moreover, a trade agreement may be welfare reducing if governments only care about the most efficient firms. If the firm productivity distribution differs across countries, the low productivity country cannot retaliate to a non-discriminatory protectionist policy from the high productivity country. In this context, a Pareto improving trade agreement requires an international income redistribution between countries, which is at odds with the principle of reciprocity in trade negotiations. These results may help explaining why recent trade negotiations are proven difficult and face increasing opposition.

Keywords: Trade protection, Non-discrimination, WTO, domestic regulations

J.E.L: F02, F12, F13

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1 Introduction

The last decades have been marked by important progress in liberalizing international trade. Through the succession of multilateral negotiation rounds at the GATT/WTO, tariffs, the most explicit protectionist policy tool, have been reduced to historically low levels. These negotiations have been based on two key principles: non-discrimination and reciprocity.[1] Despite this clear success, suspicion remains that protectionist policies may be carried out through the use of other, less explicit policy instruments. This possibility led to important concerns in trade negotiations about the increasing prevalence of Non-Tariff Measures (NTMs) and particularly those regarding domestic regulations and standards.[2]

These domestic regulations may be justified for many reasons such as the need of protecting public health, the environment, respecting social objectives, ensuring a relevant product information to consumers or fitting local tastes. However, they also raise new questions. Their implementation may be justified because of their welfare improving effects, but the extra adaptation costs they generate may have a trade restrictive effect. There is thus a fear that, while officially set up for legitimate objectives, they may in fact be implemented, at least partly, to harm foreign producers. Domestic regulations may be designed to be easier to deal with for domestic producers, being *de facto* discriminatory and thus used as hidden protectionist policies.[3] To find a balance between these fair goals but preventing the use of domestic regulations as a protectionist tool, WTO redactors explicitly introduced a Technical Barrier to Trade (TBT) agreement and a Sanitary and Phyto-Sanitary (SPS) agreement. These agreements allow countries to set their own domestic regulations and standards. But they stipulate that any domestic regulation or technical standard should fully respect the non-discrimination principle. They also promote the use of international standards.

The main objective of this paper is to show that the key principles of the WTO do not ensure efficient outcomes when domestic regulations are considered. Trade protection is usually broadly defined as "government action or inaction that discriminates in favor of home producers against foreign producers" (e.g. Anderson (2013)). This paper challenges this definition by showing that, with domestic regulations, there is no need to discriminate between domestic and foreign producers (at the micro level) to favor the domestic industry at the expense of the foreign

[1] The non-discrimination principle requires countries to apply the same trade policies to foreign firms, no matter their country of origin (most favored nation) and to apply the same domestic policies to domestic and foreign firms (national treatment). The principle of reciprocity is a principle that should govern trade negotiations and requires that countries exchange "equivalent concessions" in trade barriers reductions/access to foreign markets.

[2] According to the 2012 World Trade report, the number of new Sanitary and Phyto-Sanitary (SPS) notifications per year was around 200 in 1995 to go up to around 1100 in 2010. The number of Technical Barrier to Trade (TBT) notifications per year was less than 200 in 1995 to go up to around 1500 in 2010. In both cases, the number of specific trade concerns (STC) raised at the WTO increased over the years.

[3] see for example Grundke and Moser (2019).

industry (at the macro level).[4] Therefore, domestic regulations may be turned away from their official welfare enhancing objectives and used as protectionist devices, while *fully* respecting the principle of non-discrimination. Moreover, in this context, the principle of reciprocity may not ensure a Pareto improving trade agreement.

The core mechanism is a profit shifting effect between firms within sectors. Suppose a domestic regulation raises production costs of *all* firms operating in the local market. The first, direct effect is to force the least efficient firms to leave the market. This exit induces a second, indirect effect: it increases market shares of surviving firms. This indirect effect may dominate for the most efficient firms. The introduction of any costly regulation or standard thus reallocates market shares and profits from the least efficient domestic and foreign firms towards the most efficient domestic and foreign firms. Crucially, this mechanism is at work even if the cost increase is strictly the same for all firms, i.e. without discriminating between firms.

This mechanism can generate protectionism for two reasons. The first is based on the direct effect. While foreign and domestic firms pay in absolute terms the same additional costs to access the domestic market, the cost increase may be larger in relative terms for foreign firms (i.e. the exporters). In other words, a non-discriminatory NTM may distort their relative cost structure. When properly designed, such an NTM will force relatively more foreign producers to exit and therefore generates an aggregate profit shifting effect in the local market from the foreign to the domestic industry. The second reason is based on the indirect effect and is straightforward: even if the NTM does not distort the relative cost structure, it has an aggregate protectionist effect if domestic firms are relatively more productive, and therefore over-represented among the group of the most efficient firms. This profit shifting effect between firms within sectors has been studied in the literature, addressing other issues.[5] Nonetheless, and to the best of my knowledge, this paper is the first to consider it as a protectionist mechanism and addresses how it challenges the key principles of the WTO.

This paper develops a simple model to illustrate the two effects of the mechanism described above. We consider a "new trade" model of monopolistic competition with heterogeneous firms in the line of Chaney (2008), where we assume away free entry to get profits in equilibrium and where a non-manufacturing sector absorbs all trade imbalances, shutting down (standard) terms of trade effects. We start from a situation where governments are assumed to have reached a trade agreement in the spirit of the WTO, where they thus do not have discriminatory policy

[4]Note that this protectionist effect induced by domestic regulations is distinct from another important concern, namely that domestic regulations may generate global inefficiencies when governments do not internalize the effect of these measures on foreign countries (see Grossman *et al.* (2020)).

[5]Most notably, it is at the roots of "raising rival costs" strategies (Salop and Scheffman (1983), Rogerson (1984)).

instruments at their disposal, such as tariffs. Governments can only, but freely, choose local regulations and standards (i.e. NTMs) provided that they are non-discriminatory.[6]

To isolate the protectionist motive behind these NTMs, we consider them as having no welfare improving effect. This also allows to keep the argument general, as it holds no matter the type of regulations and standards considered and the type of externalities they are (officially) supposed to fix. NTMs in the model only increase operation costs for firms in the local market.[7] The unique reason behind their implementation is therefore a beggar-thy-neighbor motive: to shift profits in the local market from foreign to domestic firms in the aggregate. The alternative would be to introduce positive welfare effects to these NTMs, but this would make the protectionist motive more difficult to distinguish from a global inefficiency induced by governments not internalizing the impact of their decisions on other countries. Moreover, it is not clear how this positive effect should enter the utility function, which would depend on the inefficiency/externality NTMs are supposed to solve, e.g. do they address pollution concerns or tastes divergence between countries? Ruling out any positive effect on welfare implies that a benevolent government would not implement them, as they only consist in a cost burden for firms. Yet, our mechanism emphasizes a major role for producers' interests. We therefore introduce political economy motives in the objective function of the government.

To illustrate the two mechanisms underlined above in a tractable way, we present two versions of the model. We first consider a fully symmetric two country version of the model. Here, an NTM distorts the cost structure between domestic firms and (foreign) exporters, as long as the export fixed cost is not equal to the domestic fixed cost. Governments balance the welfare loss due to less varieties available with the income gains by the domestic industry in the local market. Hence, in the non-cooperative equilibrium, each country may implement some NTMs for protectionist purposes. But this unilateral policy is clearly inefficient, as the mirror country chooses the exact same policy, withdrawing the gains in the domestic market by losses in the foreign market. Countries are therefore trapped in a prisoner's dilemma and the non-discrimination principle cannot preclude this situation. Moreover, we show that a decrease in trade costs increases the equilibrium level of NTMs, as its protectionist effect becomes more effective when the economy is more open, i.e. the profit shifting is larger. This means that, somewhat counterintuitively, a local industry facing more competition from abroad may ask to be taxed *more*, not *less*. This result may explain the rise in NTMs observed over the last decades and support the view that this rise is, at least partly, driven by protectionist motives.

[6] We thus also abstract from the use of labor taxes/subsidies, as they would only apply to domestic producers.

[7] We assume the government can choose NTMs to increase either the fixed or the variable cost of firms, or both. As we will show, in this setup with constant markups, the fixed cost is the only one that can generate an exit differential between domestic and foreign firms and will thus be the only one used in equilibrium.

Nevertheless, in this symmetric two country world, the principle of reciprocity allows trade negotiations on a deep agreement (i.e. covering domestic policies) to reach an efficient outcome: the two countries can exchange equivalent reductions in the cost of NTMs, which would result in equal exchanges in market access, more varieties available to consumers, and equal welfare gains in both countries. This result however only holds if governments care about their entire industry. If they care about the most efficient firms only, a trade agreement may be welfare reducing, because those firms benefit from NTMs in the other country.

This result also does not hold when comparing asymmetric countries. To highlight this point, we next introduce an asymmetry in the firm productivity distribution, thus allowing to focus on the second indirect effect described above. In this case, one country may be interested in running a non-discriminatory protectionist policy because it hosts relatively more of the most efficient firms. But, this cannot be the case for the other country, as implementing such non-discriminatory measures would shift profits away from its industry. It follows that in the non-cooperative equilibrium, only one country may put NTMs in place for a protectionist purpose.

In this situation, a cooperative equilibrium reached by a new trade agreement can still be Pareto improving. However, for this to be the case, countries should not exchange "equivalent concessions". To be Pareto improving, a trade agreement necessitates an uneven exchange of market access and profits and thus an international income redistribution from the high to the low productivity country. This is at odds with the reciprocity principle. This result also casts doubt on the desirability of implementing international standards and rather call for harmonization only among similar countries.[8] More generally, this result may illustrate why recent trade negotiations at the WTO have proven difficult, with complaints from developing countries about stringent regulations that restrict access to developed countries markets.

Related literature and paper contribution

The mechanism put forward in this paper has empirical support, in two separate ways. First, there is empirical evidence for "raising rivals' costs" strategies; increased costs for all benefit the best firms at the expense of less efficient competitors.[9] This provides evidence for the core

[8] A similar result appears in the study of optimal trade policy in the presence of preference heterogeneity (Grossman *et al.* (2020), Parenti and Vannoorenberghe (2019)). Both papers find that differences in preferences between countries implies that a pure harmonization of standards may not be optimal. While our conclusion is the same, it complements theirs as based on supply-side reasons (differences in the productivity distribution) and not demand-side reasons.

[9] For example, Bartel and Thomas (1987) have assessed the impact of the implementation of a new regulation in the late 70s in the US, OSHA, that aimed at increasing the safety on workplaces. They estimate the direct negative effect and the indirect positive effect of this regulation and find evidence for both. Another example is Suzuki (2013) who shows that an increase of one standard deviation in land use regulation in Texas increases the

mechanism, but typically does not assess its protectionist impact. Second, the empirical trade literature has explored the potential protectionist impact of NTMs, in particular TBTs and SPS measures. Interestingly, several studies at the firm level have documented a heterogeneous protectionist impact across firms (exporters). For instance, Fontagné *et al.* (2015) test the impact of the SPS measures that raised concerns at the WTO and find that large exporters suffer less than small ones. Fugazza *et al.* (2018) find that large Peruvian exporters benefit rather than lose from the introduction of NTMs in their destination markets. The reverse is true for small exporters, which are hurt by more stringent market-access barriers. These papers cannot really assess whether the measures are discriminatory (or not) as they do not observe the impact on domestic firms, but their results support our mechanism.[10]

On the theoretical side, this paper first relates to the role of non-discrimination and reciprocity in trade negotiations. Bagwell and Staiger (1999) have shown under perfect competition that these two key principles of the GATT/WTO allow to neutralize the terms of trade effect and thus allow to reach efficient outcomes in trade negotiations, even when governments are politically motivated. With imperfect competition, trade agreements may have to solve for externalities other than terms of trade, such as production delocation or profit shifting. Several papers have shown that these principles still allow trade agreements to reach efficient outcomes.[11] In particular, Ossa (2011) has reinterpreted these two principles in a "new trade" model *à la* Krugman where countries have an incentive to raise import tariffs in order to attract a larger share of the world manufacturing production. This delocation effect may be alternatively understood as a profit shifting effect if we assume away free entry. Protected domestic firms then capture profits of foreign firms (Ossa (2012, 2014)).[12] It is important to note that the profit shifting we put forward in this paper is different and new because, by considering another instrument than tariffs, profits shift from inefficient towards efficient firms and not from foreign to domestic firms. It is only indirectly, in the aggregate, that it can generate protection.

When tariff manipulations are restricted, countries may implement some regulatory protectionism, i.e. use domestic regulations and standards that favor domestic firms over foreign

entry cost in the lodging industry by 10%, decreases the number of operating firms (hotels) by 15% and increases the revenue per room by 6%. Again, surviving firms benefit from the regulation because of the less competitive environment induced by the regulation.

[10] More evidence in line with our mechanism includes Asprilla *et al.* (2019) on the impact of NTMs on market power, Fontagne *et al.* (2020) on trade facilitations measures, or Fernandes *et al.* (2019) on pesticides regulations.

[11] These new motives for a trade agreement appear because governments do not have all policy instruments at their disposal, which is also the case in this paper. See Bagwell and Staiger (2012, 2015), Campolmi *et al.* (2014) and Grossman (2016) for a discussion.

[12] Mrazova (2011) makes a similar argument in an oligopolistic framework, showing that import tariffs may be motivated by both a terms of trade effect and a profit shifting effect. As Ossa (2011), she gives a new interpretation to the principles of non-discrimination and reciprocity, which still ensures an efficient outcome.

ones.[13] This discrimination may be clear or hidden: NTMs may be *de jure* non-discriminatory, but *de facto* easier to deal with for domestic firms (see Sykes (1999)). This paper highlights that NTMs do not need to put any extra burden on foreign firms to be used as protectionist instruments. Building on Bagwell and Staiger (2001), Staiger and Sykes (2011) have shown that large countries may still use *de facto* non-discriminatory product standards to manipulate their terms of trade. Mei (2019) extends Ossa (2011) to domestic regulations and makes a similar argument. When there is a negative consumption externality, large countries may pass part of the cost of the regulation on foreign firms inducing a global inefficiency, even under national treatment. The mechanism in this paper is different as it relies on a pure local externality only, based on rent capturing by the domestic industry.

The literature has explored the incentives of heterogeneous firms to lobby for trade policy outcomes. One empirical regularity is that only the most efficient firms do lobbying (Bombardini (2008), Blanga-Gubbay *et al.* (2020)). This generates an interesting insight. This paper focuses on the interest of the whole domestic industry, but the mechanism first favors the most efficient firms. In a situation where only the best firms are organized in each market, their interests will be aligned internationally, which is not the case if the interest of whole industry is considered. In this situation, a deep trade agreement may be welfare reducing because governments decisions are shaped by the interests of the best firms that also benefit from NTMs in their export markets. This echoes Rodrik (2018), who suggests that recent trade agreements over regulatory rules may actually be shaped by the rent-seeking behavior of large exporters. It also shows that it is important to know which firms are politically organized in each country to understand if their interests are aligned or opposed internationally, thus resulting, in the words of Maggi and Ossa (2019), in "co-lobbying" or "counter lobbying" in international negotiations.

2 Model - symmetric countries

2.1 Economic environment

We consider a simple heterogeneous firm trade model in the line of Chaney (2008), with two symmetric countries, Home (H) and Foreign (F). Without loss of generality, we focus on the Home perspective. Each economy is composed of two sectors: M and A. Labor (L) is the only factor of production. Sector M is characterized by increasing returns to scale in the production of a continuum of varieties and is subject to monopolistic competition *à la* Dixit-Stiglitz. Sector

[13] See for example Fischer and Serra (2000), Baldwin (2000), Suwa Eisenmann and Verdier (2002). Note that regulatory protectionism may also occur without discriminating foreign firms if preferences differ among countries, see Grossman *et al.* (2020) for a comprehensive analysis.

A produces a homogeneous good under perfect competition and constant returns to scale, and serves as a numeraire. Firms are owned by domestic agents.

Consumers.

The preferences of the representative consumer in both countries are depicted by a quasi-linear utility function U, with a CES sub-utility function over the continuum of manufacturing varieties:[14]

$$U = A + \mu \ln C_M \qquad C_M = \left(\int c_i^{1-\frac{1}{\sigma}} \right)^{\frac{1}{1-\frac{1}{\sigma}}} \text{, with } \sigma > 1 \tag{1}$$

C_M and A denote consumption for the M composite good and the numeraire good, respectively. σ is the constant elasticity of substitution between any two varieties and μ the preference parameter over manufactured goods. Utility maximization yields the following domestic demand for variety i:

$$c_i = \frac{\mu L}{\int_{h \in \Theta} p_h^{1-\sigma} d_h} p_i^{-\sigma} \tag{2}$$

where p_i is the price of variety i, and Θ is the set of all available varieties h in this economy. From now on, we normalize the mass of consumers/workers to $L = 1$.

Firms.

The numeraire good (A) is produced with one unit of labor per unit of output and the wage rate is normalized to 1. We assume that μ is sufficiently small such that both countries produce good A. This good is freely traded between countries, ensuring factor price equalization.

In order to operate in the manufacturing sector, firms have to pay two types of fixed overhead production costs. First, firms have to pay F_P, the cost of setting up the production facility. On top of it, firms also have to bear a fixed cost F_d, capturing the cost of distribution in the domestic market and the cost of adapting the product to the standards and regulations in place. To alleviate notations, we label $F = F_P + F_d$, the total amount of fixed costs any firm has to pay to operate in its domestic market.

A firm i produces with a constant marginal production cost a_i. The cost of producing q units of good i with marginal cost a_i is thus: $C_i(q) = a_i q + F$. Given the demand function (2), the optimal price charged by a firm i is a constant mark-up over its marginal cost: $p_i = \frac{\sigma}{\sigma - 1} a_i$. We refer to the profits of a Home firm i in its domestic (Home) market as π_{HH}; we use the first subscript for the firm location and the second for the destination market. Profits are given by:

$$\pi_{HH}(a_i) = \frac{\mu}{\sigma} P_H^{\sigma-1} \left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma} a_i^{1-\sigma} - F \tag{3}$$

[14] The use of a quasi-linear utility function is motivated by the introduction of political economy motives for protection within this single manufacturing sector economy. The market outcome would not be qualitatively be different with homothetic preferences. This extension is available upon request.

where $P_H = \left(\int_{i\in\Theta} p_i^{1-\sigma} di\right)^{\frac{1}{1-\sigma}}$ is the perfect price index at Home.

Accessing the foreign market is also costly and entails two types of trade costs. In order to serve the foreign market, firms first have to pay an additional fixed cost F_x. This reflects the costs implied by the regulations and standards in the foreign country, as well as the costs associated with managing remotely the distribution of the firm's product; it is the counterpart of F_d in the foreign market. Second, shipping goods to the foreign country is subject to an iceberg variable trade cost τ.[15] Finally, we also make the standard assumption that $\tau^{1-\sigma}F < F_x$, ensuring that only a fraction of operating firms chooses to export. It follows that profits of firm i in the foreign market are:

$$\pi_{FH}(a_i) = \frac{\mu}{\sigma} P_H^{\sigma-1} \tau^{1-\sigma} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} a_i^{1-\sigma} - F_x \tag{4}$$

Firm heterogeneity.

We assume that firms' marginal costs are drawn from a Pareto distribution. This assumption is made because, beyond tractability, it ensures that aggregate profits in each market are independent of the number of operating firms. It thus allows us to focus on a specific case where the motive for implementing an NTM exclusively comes from a profit shifting effect between firms. Specifically, we assume that marginal costs a are comprised between 0 and 1, and are drawn from a Pareto distribution $G(a)$ with a shape parameter $\rho > 1$: $G(a) = a^{\rho}$.[16] Finally, as we assume away free entry, we simply consider as in Chaney (2008) that there is a group of entrepreneurs proportional to country size.

Policy instrument: Non-discriminatory NTMs.

As explained in the introduction, we consider a situation where governments have to fully comply with non-discriminatory obligations. The only policy instruments available are those that affect domestic and foreign firms in the exact same way. NTMs and in particular TBTs and SPSs measures are allowed by the WTO, as long as they are implemented for social, health or sanitary purposes and under the condition that they are non-discriminatory. Arguably, these measures may raise the cost of production for firms. We thus assume that the implementation of non-discriminatory NTMs in country j implies some extra costs that *all* firms have to bear in order to operate in this market.[17] NTMs in country j may affect both the fixed and variable costs of all operating firms. They may increase fixed costs (F_d or F_x) by an amount T_j, and

[15] Note that we focus on the case where these trade costs are exogenous, the policymaker cannot manipulate them.

[16] We assume that the standard regularity condition is satisfied: $\rho - (\sigma - 1) > 0$.

[17] These costs are however only local: paying them allows to respect the local regulation and standards but does not help meeting regulations and standards in the other country.

the variable cost of a firm i by an amount $t_j \equiv \kappa_j a_i$. However, in this setup of monopolistic competition with CES preferences and no income effect, a change in the variable cost is fully neutral for firms. It increases all prices proportionally. Relative prices, market shares and thus profits stay constant, i.e. $\frac{\partial \pi_{ij}}{\partial \kappa_j} = 0$, leaving the equilibrium mass of operating firms unaffected. It only harms consumers and, in the absence of any positive effect on welfare, should not be used by a policy maker. In contrast, an increase in the fixed costs has two opposite effects on firms profits. First, it reduces profits of all operating firms, forcing the least efficient firms to exit the market. In turn, it redistributes market shares of exiters towards the firms that survive. For some of those firms, this last effect will dominate and they will thus benefit from this measure. Introducing the additional fixed cost T_j into (3) and (4) for a firm i and taking the derivative, we get:

$$\frac{\partial \pi_{ij}}{\partial T_j} = \underbrace{\frac{\mu}{\sigma} \frac{\partial P_j^{\sigma-1}}{\partial T_j}}_{\text{positive effect}} p_{ij}^{1-\sigma} - \underbrace{1}_{\text{negative effect}} \tag{5}$$

This highlights what we mean by non-discriminatory at the micro level: all operating firms pay the additional cost T_j, and two firms with the same local price experience the same profit variation, no matter their country of origin. We show in the next section how this basic mechanism may generate protectionism in the aggregate. In the following it will be useful to measure everything relative to the fixed costs F domestic firms have to pay. Hence, we rewrite the policy instrument in country j as $T_j = \beta_j F$. Similarly, we rewrite the fixed costs foreign firms have to pay as $F_x = \gamma F$, where γ measures the relative fixed costs to access market j for domestic and foreign producers. In the following, we thus focus on the role of β_j, the policy intrument governments choose. We interpret a larger β_j as a more stringent standard or regulation (NTM) in country j.[18]

2.2 Market equilibrium

We first describe the equilibrium given the policy choices β_H and β_F. In the next section, we will analyze the government choice.

Given the symmetry of the model, we focus on the Home market. Firms first draw their marginal costs from $G(a)$. Given their draw, they decide to produce or not and whether to serve the foreign market as well. Firms decide to produce and serve the domestic market if their draw is such that $a_i \leq a_{HH}$, where a_{HH} is defined by $\pi_{HH}(a_{HH}) = 0$. Foreign firms decide to serve the Home market if their draw is such that $a_i \leq a_{FH}$, where a_{FH} is defined by $\pi_{FH}(a_{FH}) = 0$. Note that, due to the imposed symmetry between countries, these two cutoffs are the same in

[18] In the following, we may also refer to a larger β_j as a higher level of NTMs, or to an increase in NTMs.

the two countries and exporters are the mirror image of importers. The two zero-cutoff-profit (ZCP) conditions to serve market H are given by:

$$\pi_{HH}(a_{HH}) = 0 \Leftrightarrow \frac{\mu}{\sigma} P_H^{\sigma-1} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} a_{HH}^{1-\sigma} = (1+\beta_H) F \tag{6}$$

$$\pi_{FH}(a_{FH}) = 0 \Leftrightarrow \frac{\mu}{\sigma} P_H^{\sigma-1} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \tau^{1-\sigma} a_{FH}^{1-\sigma} = (\gamma+\beta_H) F \tag{7}$$

with $P_H^{1-\sigma} = \lambda \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \left(a_{HH}^{1-\sigma+\rho} + \tau^{1-\sigma} a_{FH}^{1-\sigma+\rho}\right)$ and $\lambda = \frac{\rho}{1-\sigma+\rho}$.

Using these two conditions, it is straightforward to solve for the two endogenous variables a_{HH} and a_{FH}. Given $G(a)$, the mass of Home and Foreign firms serving the Home market are:[19]

$$a_{HH}^{\rho} = \frac{\mu}{\sigma\lambda F} \frac{1}{(1+\beta_H)} \frac{1}{\left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma}\right)^{\frac{1-\sigma+\rho}{\sigma-1}}\right)} \tag{8}$$

$$a_{FH}^{\rho} = \frac{\mu}{\sigma\lambda F} \frac{1}{(1+\beta_H)} \frac{\left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma}\right)^{\frac{\rho}{\sigma-1}}}{\left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma}\right)^{\frac{1-\sigma+\rho}{\sigma-1}}\right)} \tag{9}$$

We can now assess the impact of an NTM on the sharing of pure profits between domestic and foreign competitors. To do so, we compute the aggregate pure profits made by Home firms in market H: $\Pi_{HH} = \int_0^{a_{HH}} \pi_{HH}(a) dG(a)$ and the aggregate pure profits made by Foreign firms in market H: $\Pi_{FH} = \int_0^{a_{FH}} \pi_{FH}(a) dG(a)$. We get:

$$\Pi_{HH}(\beta_H) = \frac{\mu}{\rho} \left(\frac{\sigma-1}{\sigma}\right) \frac{1}{\left(1 + \tau^{1-\sigma} \left(\frac{(1+\beta_H)}{(\gamma+\beta_H)} \tau^{1-\sigma}\right)^{\frac{1-\sigma+\rho}{\sigma-1}}\right)} \tag{10}$$

$$\Pi_{FH}(\beta_H) = \frac{\mu}{\rho} \left(\frac{\sigma-1}{\sigma}\right) \frac{\frac{\gamma+\beta_H}{1+\beta_H} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma}\right)^{\frac{\rho}{\sigma-1}}}{\left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma}\right)^{\frac{1-\sigma+\rho}{\sigma-1}}\right)} \tag{11}$$

Here appears a nice property of the Pareto distribution: the aggregate pure profits made by operating firms is independent of the stringency of the NTM β_H:

$$\Pi_{HH} + \Pi_{FH} = \frac{\mu}{\rho} \left(\frac{\sigma-1}{\sigma}\right) \tag{12}$$

It follows:

[19] We assume that $\frac{\mu}{\sigma\lambda F} < 1$, to ensure there is always selection.

Lemma 1. *The pure profit variation of any set of firms due to any NTM is equal to the opposite of pure profit variation of all other firms.*

A change in the stringency of the NTM thus only affects the sharing of the total profits in a market. We get:

$$\frac{\partial \Pi_{HH}}{\partial \beta_H} = (1-\gamma)\,\frac{\mu}{\sigma\lambda}\frac{\left(\frac{1+\beta_H}{\gamma+\beta_H}\tau^{1-\sigma}\right)^{\frac{\rho}{\sigma-1}}}{(1+\beta_H)^2\left(1+\tau^{1-\sigma}\left(\frac{1+\beta_H}{\gamma+\beta_H}\tau^{1-\sigma}\right)^{\frac{1-\sigma+\rho}{\sigma-1}}\right)^2} \tag{13}$$

While non-discriminatory, the NTM produces an aggregate profit shifting between domestic and foreign firms, as long as $\gamma \neq 1$: there is not only a profit shifting from less to more efficient firms, the sharing of the aggregate profits between Home and Foreign firms is also affected. What is driving this result? The NTM cost that firms have to pay to serve the domestic market is the same for domestic and foreign firms. However, the NTM distorts the relative fixed cost that domestic and foreign firms have to pay in order to operate in the domestic market, as long as $\gamma \neq 1$. The percentage increase in the total fixed cost paid to operate is indeed not the same. It is equal to β_H for domestic firms and to $\frac{\beta_H}{\gamma}$ for foreign firms. Therefore, as the change in demand ($\mu P^{\sigma-1}$) is the same for all firms, the group that faces a larger percentage fixed cost will experience a fiercer selection due to the NTM. It follows that, if $\gamma < 1$, an NTM implementation is tougher for foreign firms than for domestic firms (a_{FH} decreases relatively more than a_{HH}) and generates an aggregate profit shifting from foreign to domestic firms. It follows:

Lemma 2. *If $\gamma < 1$, the pure profit variation of all domestic firms on the domestic market due to any NTM is positive: a non-discriminatory NTM has an aggregate protectionist effect.*

In the following, we will restrict our analysis to the case where $\gamma < 1$. We have some reasons to focus on this situation. First, this seems more natural when considering our framework. Indeed, if $\gamma > 1$, foreign firms would have to pay more fixed costs to access the domestic market than domestic firms, although those costs do not cover the costs associated with setting up the production facility that domestic firms have to pay. Moreover, $\gamma < 1$ is in line with recent calibrations of trade models with heterogeneous firms. For example, di Giovanni and Levchenko (2012) have calibrated a model in line with our framework and find that, over a sample of 50 countries, fixed costs associated with entry in a foreign market are on average about 40% of the fixed costs associated with domestic production, i.e. $\gamma = 0.4$. Melitz and

Redding (2015) also calibrate a heterogeneous firm trade model and pick $\gamma = 0.545$ in order to match the average fraction of U.S. manufacturing firms that export. Finally, note that if $\gamma > 1$, a non-discriminatory protectionist policy is still possible; governments should then implement an entry subsidy for all firms rather than costly regulations and standards.

3 Equilibrium policy choice

We now turn to the objective function of the government and its choice in the non-cooperative and cooperative equilibrium.

3.1 Government objective function

We assume that the objective function of the government is a weighted average between social welfare and profits of domestic firms. The political economy motives behind this objective function may be easily micro-funded via the Protection for Sale framework of Grossman and Helpman (1994), assuming that the entire domestic industry is politically organized.[20] We may alternatively assume that the government only cares about the profits of a subset of firms only (those that would be organized). We assume that the government objective function takes the following form:

$$G_H(\beta_H, \beta_F) = \alpha W_H(\beta_H, \beta_F) + (1-\alpha)\,\Pi_H\left(\beta_H, \beta_F\right) \tag{14}$$

with $\alpha \in (0,1)$ and where $W_H(\beta_H, \beta_F)$ represents social welfare, which is defined as:

$$W_H(\beta_H, \beta_F) = \Pi_H\left(\beta_H, \beta_F\right) + 1 + S_H(\beta_H) \tag{15}$$

Indirect utility is measured by the sum of total income, i.e. firms' profits in both markets: $\Pi_H\left(\beta_H, \beta_F\right) = \Pi_{HH}\left(\beta_H\right) + \Pi_{HF}\left(\beta_F\right)$ and labor earnings (normalized to 1), plus the consumer surplus $S_H(\beta_H) = \mu \ln \frac{\mu}{P_H} - \mu$. In this setup without income effects, NTMs have only local effects. Given the form of preferences, variations in total income only translate into variations in the consumption of the numeraire good. Thus, NTMs at Home do not affect spending and thus profits in the Foreign market. Similarly, consumer surplus only depends on the decision made by the domestic government and is not affected by the foreign government's decision.[21]

[20] Note that this formulation may also capture other political economy motives for protection since in this setup firm profits are proportional to firm sales and to employment in the manufacturing sector.

[21] Without income effects, the effect that is absent is the negative impact of β_H on foreign income, that in turn would reduce foreign consumption of manufactured goods and export profits made by domestic firms there. Introducing income effects does not qualitatively change the effect of NTMs. An example with Cobb Douglas preferences is available upon request.

The optimal choice for the government is given by:

$$\alpha \frac{\partial W_H(\beta_H, \beta_F)}{\partial \beta_H} + (1-\alpha) \frac{\partial \Pi_H(\beta_H, \beta_F)}{\partial \beta_H} = 0 \tag{16}$$

Given that profits are separable and immune from the policy choice in the other market, the decision of the two governments are independent: no matter the decision of the Foreign government, the decision of the Home government only affects the sharing of aggregate profits in the Home market, which does not depend on the Foreign decision. The optimal choice of the government is equivalent to:

$$\alpha \frac{\partial S_H(\beta_H)}{\partial \beta_H} + \frac{\partial \Pi_{HH}(\beta_H)}{\partial \beta_H} = 0 \tag{17}$$

The implementation of NTMs has two effects. First, it reduces consumer surplus, by forcing some firms to exit the market: $\frac{\partial S_H(\beta_H)}{\partial \beta_H} < 0$. Second, as shown above, it increases the aggregate market share of Home firms in their domestic market, thus increasing their profits: $\frac{\partial \Pi_{HH}}{\partial \beta_H} > 0$. As NTMs only generate a local externality, the government decision boils down to a tradeoff between the (weighted) loss of consumer surplus and the income gain coming from the profit shifting.

3.2 Non-cooperative equilibrium policy choice

Replacing into (17) and rearranging, we obtain an implicit solution for β_H^*:

$$\frac{\sigma-1}{\sigma} = \alpha \frac{1+\beta_H^*}{1-\gamma} \left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H^*}{\gamma+\beta_H^*} \tau^{1-\sigma}\right)^{\frac{1-\sigma+\rho}{\sigma-1}}\right) \left(1 + \left(\frac{\gamma+\beta_H^*}{1+\beta_H^*} \tau^{\sigma-1}\right)^{\frac{\rho}{\sigma-1}}\right) \tag{18}$$

The right-hand side of this expression is monotonically increasing in β_H, ensuring a unique solution β_H^*.[22] The more the government puts weight on domestic profits and income (lower α), the larger β_H^* is. Note that this profit shifting effect is not driven by a terms of trade externality. Standard terms of trade are fixed in this setup with an outside good. With a utility based measure, they would go in the opposite direction as the NTM decreases imports while export do not change. By introducing an NTM, the government pushes the economy to produce and consume a smaller mass of varieties. Even if this effect is opposite to closing the gap with the social planner solution, it allows the domestic industry to capture more of the rents in the monopolistic sector. If those are valued enough by the government (low enough α), it leads to a protectionist NTM. Without political economy motives however ($\alpha = 1$), the optimal decision

[22] See appendix A for a proof.

is to not implement any NTM, as the effect on consumer surplus always dominates the one on income. Note that we have assumed here that the government cares about the entire domestic industry. From a lobbying perspective however, if only the most efficient firms are organized as suggested in the literature (e.g. Bombardini (2008), Blanga-Gubbay *et al.* (2020)), the outcome may be a more stringent NTM, because the most efficient firms are those that gain from the profit shifting. This will be crucial when looking at the outcome of the cooperative equilibrium.

Trade liberalization.

One important question is the impact of trade openness on the equilibrium level of NTMs. Two possibilities have been put forward. During the multilateral negotiations leading to the creation of the WTO, a serious concern in the public debate was the possibility of a race to the bottom with respect to domestic regulations due to the fiercer market competition induced by lower tariffs (see Bagwell and Staiger (2001) for a discussion). The literature has alternatively suggested that there could be some trade policy substitution. As countries commit to reduce tariffs, they may be tempted to use other policy instruments, like some discriminatory NTMs, to restore previous levels of trade protection (see Kee *et al.* (2009), Limao and Tovar (2011), Beverelli *et al.* (2019)). The empirical evidence points to an increase in NTMs over time (e.g. Ederington and Ruta (2016)). This paper proposes another reason for this trend. Trade liberalization may increase the equilibirum level of NTMs because it affects the relative exit rate of Home and Foreign firms inplied by an NTM. We get:

Proposition 1. *The lower the variable trade costs, the larger the equilibrium NTM.*

Proof. see appendix A.

This result may sound like a trade policy substitution. It is however different. Trade liberalization leads Foreign firms to benefit from a better access to the Home market and thus a larger local market share, both because CIF prices of exporters are lower and because new (less efficient) foreign firms enter the Home market. A given NTM still forces the least efficient firms to exit, but the exit diffferential between Home and Foreign firms is magnified with lower trade costs, as can be easily checked taking the ratio of (8) and (9). In turn, the same NTM leads to a larger aggregate profit shifting with lower trade costs, i.e. $\frac{\partial^2 \Pi_{HH}(\beta_H)}{\partial \beta \partial \tau} < 0$. The efficiency of NTMs to protect the domestic industry is thus increased by lower trade costs. From the perspective of a lobbying model where the domestic industry is organized, this result is also interesting. A decrease in trade costs increases market competition which in turn decreases market shares of all domestic firms. In contrast to the race to the bottom hypothesis, the

optimal response of an organized sector in that case is not to ask for *less* taxation, but for *more*. This result may be a reason why trade liberalization seems to have increased incentives to implement these NTMs. At least part of this increase may be due to the improved protectionist effect of these measures, even if they are *de facto* fully non-discriminatory.

3.3 Cooperative equilibrium

Cooperative equilibrium policy choice and reciprocity.

Under cooperation, governments decide on β_H and β_F to maximize their joint objective function $G^W(\beta_H, \beta_F)$. We have:

$$\begin{aligned} G_H(\beta_H, \beta_F) &= \alpha + \alpha S_H(\beta_H) + \Pi_H(\beta_H, \beta_F) \\ G_F(\beta_F, \beta_H) &= \alpha + \alpha S_F(\beta_F) + \Pi_F(\beta_F, \beta_H) \end{aligned}$$

Recall that $\Pi_H(\beta_H, \beta_F) + \Pi_F(\beta_F, \beta_H) = 2\frac{\mu}{\rho}\left(\frac{\sigma-1}{\sigma}\right)$. It follows:

$$G^W(\beta_H, \beta_F) \equiv G^H(\beta_H, \beta_F) + G^F(\beta_F, \beta_H) = 2\frac{\mu}{\rho}\left(\frac{\sigma-1}{\sigma}\right) + \alpha\left(2 + S_H(\beta_H) + S_F(\beta_F)\right) \quad (19)$$

The objective under cooperation is thus the first best, defined by $\beta_H = \beta_F = 0$. Indeed, NTMs shift profits between countries but income is constant at the world level, no matter the level of NTMs (see (12)). Besides, they only generate additional costs without any positive welfare effect. In this fully symmetric setup, a trade agreement based on reciprocity can thus restore efficiency; the two countries can make "equivalent concessions" by each withdrawing their NTMs. This would induce equivalent exchanges of market access and profits while increasing consumer surplus in both countries.

Cooperative equilibrium and set of organized firms.

This result however depends critically on the set of firms included in the objective function of governments. Suppose now that in each country, only the most efficient exporters are organized and influence the government decision. Therefore the Home government, instead of taking into account the profits of the entire domestic industry $\Pi_H(\beta_H, \beta_F)$, only cares about the profits of these firms: $\widetilde{\Pi_H}(\beta_H, \beta_F) = \widetilde{\Pi_{HH}}(\beta_H) + \widetilde{\Pi_{HF}}(\beta_F)$. The aggregate protectionist effect derived before implied $\frac{\partial \Pi_{HF}(\beta_F)}{\partial \beta_F} < 0$ (see (13)). However, if only the most efficient exporters are considered, we now have $\frac{\partial \widetilde{\Pi_{HF}}(\beta_F)}{\partial \beta_F} > 0$; the most efficient Home exporters gain from an NTM implementation in the Foreign country. Put differently, their interest with respect to β_F is opposite to the one of the Home industry as a whole and is now aligned with organized firms

in the Foreign country: lobbies have now aligned interests internationally. The joint objective function of governments can then be written as:

$$G^W(\beta_H, \beta_F) = \widetilde{\Pi_H}(\beta_H, \beta_F) + \widetilde{\Pi_F}(\beta_F, \beta_H) + \alpha\left(2 + S_H(\beta_H) + S_F(\beta_F)\right) \tag{20}$$

The joint objective of governments under cooperation does not coincide with the first best anymore as aggregate profits of organized firms worldwide increase with positive NTMs. This has an important implication for the outcome of the cooperative equilibrium. To make this point clear, suppose that in the non-cooperative equilibrium, some NTMs $\beta_H^* > 0$ and $\beta_F^* > 0$ are implemented. Governments then jointly negotiate β_H and β_F. In this case, the level of NTMs increases in both countries, because each government now internalizes that its NTMs also generate a positive externality for the best exporters (the organized firms) of the other country. We get:

$$\left.\frac{\partial G^W(\beta_H, \beta_F)}{\partial \beta_H}\right|_{\beta_H=\beta_H^*} = \underbrace{\left.\frac{\partial \widetilde{\Pi_{HH}}(\beta_H)}{\partial \beta_H}\right|_{\beta_H=\beta_H^*} + \alpha \left.\frac{\partial S_H(\beta_H)}{\partial \beta_H}\right|_{\beta_H=\beta_H^*}}_{=0} + \left.\frac{\partial \widetilde{\Pi_{FH}}(\beta_H)}{\partial \beta_H}\right|_{\beta_H=\beta_H^*} > 0$$

$$\left.\frac{\partial G^W(\beta_H, \beta_F)}{\partial \beta_F}\right|_{\beta_F=\beta_F^*} = \underbrace{\left.\frac{\partial \widetilde{\Pi_{FF}}(\beta_F)}{\partial \beta_F}\right|_{\beta_F=\beta_F^*} + \alpha \left.\frac{\partial S_F(\beta_F)}{\partial \beta_F}\right|_{\beta_F=\beta_F^*}}_{=0} + \left.\frac{\partial \widetilde{\Pi_{HF}}(\beta_F)}{\partial \beta_F}\right|_{\beta_F=\beta_F^*} > 0$$

It follows:

Proposition 2. *If only the most efficient firms are organized, a trade agreement makes both countries worse off (from a pure welfare perspective) compared to the non-cooperative equilibrium.*

This result directly relates to Rodrik (2018) and Maggi and Ossa (2019). Rodrik (2018) raises concerns about trade agreements on regulatory rules, as governments may be influenced by large exporters to shape trade agreements to capture rents in their export markets. Such agreements could be detrimental to welfare. This is precisely what is happening here. Both governments jointly agree to make NTMs more stringent to raise profits of their best exporters, at the expense of social welfare. Maggi and Ossa (2019) explore how trade agreements on domestic regulations affect welfare when governments are influenced by producer lobbies. They show that trade agreements are welfare improving if they imply internationally opposite interests among lobbies, but they can be welfare decreasing when lobbies have aligned interests internationally. In their perfectly competititve setting, they show that producer lobbies have opposite interests

internationally over process standards, but aligned interests over product standards. Here, what determines whether lobbies' interests are aligned or not internationally is not the policy in question, but the identity of the firms that are organized. The profit shifting we put forward in this paper implies that the most efficient firms have aligned interests worldwide. If they are the only ones organized, trade agreements may bring the economy further away from the first best.

4 Model - Asymmetric countries

We now turn to the asymmetric case of our model, which provides new insights about the conditions for a trade agreement to be Pareto improving.

As shown above, a deep trade agreement between two symmetric countries, based on reciprocity, could restore efficiency under the condition that governments do care about their entire domestic industry (something we assume again from now on). This result does not hold anymore when the firm distribution is asymmetric between countries. Suppose that one country hosts relatively more of the most efficient firms in the world. It will benefit from the profit shifting, even without the effect on the relative cost structure studied above in the symmetric case. This country may thus have an incentive to implement an NTM. Moreover, this country may benefit from the profit shifting effect in *both* markets. Therefore, there is no way to retaliate with another non-discriminatory NTM for the low productivity country, as this would unambiguously worsen its situation.[23]

What could a trade agreement do in this situation? We show in this section that a Pareto improving trade agreement is possible but would require an international profit shifting and thus an international income redistribution, from the high to the low productivity country. This contradicts the principle of reciprocity in trade negotiations, at least the way it is usually understood.

4.1 Assumptions

We develop here a specific case of the open economy described above, in order to assess the role of an asymmetry in the marginal cost distribution. We make here two additional assumptions to do so in the easiest way. First, we restrict our analysis to the knife-edge case where $\gamma = 1$.

[23]The protectionist effect of non-discriminatory NTMs in this paper is based on the reallocation of market shares of exiters towards the most efficient firms. Note that in the case of an asymmetry in the firm efficiency distribution as here, an additional mechanism exists, away from the CES case. With variable markups, changes in variable costs for all firms also reallocate market shares among incumbents, in turn generating another possible source of protection in the aggregate.

We therefore abstract from the possibility that the NTM generates an aggregate profit shifting by altering the relative cost between domestic firms and foreign exporters. Second, we assume zero variable trade costs, i.e. $\tau = 1$. It follows that i) two firms with the same marginal cost will serve the same market(s), irrespective of their country of origin, and ii) their prices will be the same in each market. These two additional assumptions are useful to study the role of an asymmetric distribution because the market equilibrium does not depend anymore on firms' country of origin. The model is otherwise as before.

The role of these two assumptions appears clearly when looking at the definition of the two cutoffs. From (8) and (9) we get $a_{HH} = a_{FH}$ (and symmetrically $a_{FF} = a_{HF}$). There is thus one cutoff in the Home and one in the Foreign market. In the following, we thus refer to the cutoff in market j as a_j, with $a_j^\rho = \frac{\mu}{2\sigma\lambda F}\frac{1}{(1+\beta_j)}$, while price indices are now given by $P_j = \left(2\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\lambda a_j^{1-\sigma+\rho}\right)^{\frac{1}{1-\sigma}}$ with $j = H, F$. The aggregate profits are as before: $\Pi_j = \int \pi_H(a)dG(a) + \int \pi_F(a)dG(a) = \frac{\mu}{\rho}\left(\frac{\sigma-1}{\sigma}\right)$, $j = H, F$. In the absence of any asymmetry, the aggregate profits are independent of β_H and β_F because there is, in each market, no aggregate profit shifting between the two groups (because $\gamma = 1$). In this case, governments have thus no incentive to introduce an NTM, as it would only reduce consumer surplus without generating any additional income. However, at the firm level, an NTM still generates winners and losers that are sorted according to their productivity. We get:

$$\frac{\partial \pi_j(a_i)}{\partial \beta_j} = \frac{F}{\lambda\left(\frac{\mu}{2\sigma\lambda F}\right)^{\frac{1-\sigma}{\rho}}} a_i^{1-\sigma}(1+\beta_j)^{\frac{1-\sigma}{\rho}} - F \quad \text{for } j = H, F \tag{21}$$

It follows:

Lemma 3. *The variation of firm i's profits in market j depends only on the stringency of the NTM implemented there (β_j), and not on firm location.*

This result holds because $\gamma = 1$ (i.e. cost variation is the same for domestic and foreign firms), implying that winners and losers from a given NTM are the same in both markets.

4.2 Asymmetry

Suppose now that we break the symmetry by introducing a disruption in the relative firm marginal cost distribution. We assume that a set S of firms in Foreign "become" Home firms. Note that this has no impact on the market equilibrium. The introduction of this disruption only alters the aggregate profits of H and F firms.[24] They are now given by: $\Pi_H = \frac{\mu}{\rho}\left(\frac{\sigma-1}{\sigma}\right) + \Pi_S$

[24]We could assume additionally that some H firms "become" F firms, in order to keep national incomes constant. This has no importance in this setup with quasi-linear preferences.

and $\Pi_F = \frac{\mu}{\rho}\left(\frac{\sigma-1}{\sigma}\right) - \Pi_S$, where Π_S is the aggregate profit of firms in S that "switch" from F to H. As long as the marginal costs distribution of "switchers" does not replicate the original distribution (and thus generates an asymmetry), their aggregate profits will depend on the NTMs implemented in Home and Foreign: $\Pi_S(\beta_H, \beta_F) = \int_{k\in S} \pi_H^k(a, \beta_H)dG(a) + \int_{k\in S} \pi_F^k(a, \beta_F)dG(a)$. Lemma 3 implies that the set of switchers will benefit or lose from a given NTM implementation in H *and* in F: $\frac{\partial \Pi_S(\beta_H,\beta_F)}{\partial \beta_H} = \frac{\partial \Pi_S(\beta_H,\beta_F)}{\partial \beta_F}$ for $\beta_H = \beta_F$. It follows:

Proposition 3. *If* $\frac{\partial \Pi_S}{\partial \beta_j} \neq 0$ *for some* β_j*, the implementation of the same non-discriminatory NTM shifts profits in both countries towards the same firms: it has an aggregate protectionist effect in one country and an "anti-protectionist" in the other.*

Corollary. *The two countries will not implement the same level of NTMs.*

When there is a productivity distribution asymmetry, countries will not choose the same level of NTMs (except the case with no NTMs in both countries). This directly raises the question of the benefits of implementing international standards, as promoted by the TBT and SPS agreements. Suppose that NTMs have a positive effect on welfare (not modelled here), but at the same time increase production costs as suggested in the literature. The implementation of a positive international standard will have, on top of its positive welfare effect, a redistributive effect between countries as it will induce a profit shifting effect towards firms of the same origin in the aggregate everywhere it is put in place. This may be one explanation for the complaints of developing countries about recent trade negotiations over norms and standards in the Doha round. This result also echoes the one in Grossman *et al.* (2020) and Parenti and Vannoorenberghe (2019), showing that international standards may be desirable only among similar countries. In these papers, similarity is with respect to the demand side, while we focus here on the supply side.

4.3 Non-cooperative equilibrium

The outcome of the non-cooperative equilibrium depends on the shape of $\frac{\partial \Pi_S}{\partial \beta_j}$ and thus on the productivity of switchers. For example, if switchers were among the most *and* the least productive, the sign of $\frac{\partial \Pi_S}{\partial \beta_j}$ may well not be constant. To foster intuition, we focus on a simple case, where one country (Home by assumption) is made unambiguously more productive. Formally, we assume that a share η of firms having a marginal cost $a \in [0, \overline{a}]$ in the foreign country "switch" their country of origin, from F to H. Therefore, the most efficient firms are

overrepresented in H. In that case, $\Pi_S(\beta_H, \beta_F)$ is given by:

$$\Pi_S(\beta_H, \beta_F) = \underbrace{\eta \int_0^{\overline{a}} \pi_H(a) dG(a)}_{\Pi_S^H(\beta_H)} + \underbrace{\eta \int_0^{\overline{a}} \pi_F(a) dG(a)}_{\Pi_S^F(\beta_F)} \tag{22}$$

We have:

$$\frac{\partial \Pi_S^j(\beta_j)}{\partial \beta_j} = \begin{cases} \eta F \overline{a}^{\rho} \left(\left(\frac{a_j(\beta_j)}{\overline{a}} \right)^{\sigma-1} - 1 \right) & \text{if } \overline{a} < a_j(\beta_j) \\ 0 & \text{if } \overline{a} \geq a_j(\beta_j) \end{cases} \tag{23}$$

Therefore, an NTM unambiguously shifts profits towards H firms in the aggregate, as $\frac{\partial \Pi_S^j(\beta_j)}{\partial \beta_j} \geq 0$, $\forall \beta_j$. The decision of the two governments is taken as before: $\frac{\partial \Pi_{jj}(\beta_j)}{\partial \beta_j} + \alpha \frac{\partial S_j(\beta_j)}{\partial \beta_j} = 0$, for $j = H, F$. Note that $\frac{\partial \Pi_S(\beta_H, \beta_F)}{\partial \beta_H} = \frac{\partial \Pi_S^H(\beta_H)}{\partial \beta_H} = \frac{\partial \Pi_{HH}(\beta_j)}{\partial \beta_H} \geq 0$, while $\frac{\partial \Pi_S(\beta_H, \beta_F)}{\partial \beta_F} = \frac{\partial \Pi_S^F(\beta_F)}{\partial \beta_F} = -\frac{\partial \Pi_{FF}(\beta_F)}{\partial \beta_F} \leq 0$. It is straightforward that the foreign government will not introduce an NTM, as it would shift profits towards Home firms, reducing consumer surplus. The Home government will introduce an NTM if the profit shifting is large enough to more than compensate for the consumer surplus loss. Labeling $\widetilde{a} = \left(\frac{\mu}{2\sigma\lambda F} \right)^{\frac{1}{\rho}}$, the marginal cost of the least efficient firm if no NTM is implemented, the Home government implements an NTM if and only if:

$$\left(\frac{\overline{a}}{\widetilde{a}} \right)^{\rho} \left(\left(\frac{\widetilde{a}}{\overline{a}} \right)^{\sigma-1} - 1 \right) > \frac{2\alpha}{\eta} \frac{\sigma}{\sigma - 1} \tag{24}$$

See appendix B for a proof.[25]

The left-hand side of (24) is necessarily positive as $\frac{\widetilde{a}}{\overline{a}} \geq 1$. It follows that if the Home government is politically motivated enough, i.e. if α is small enough, it will introduce an NTM. Only the high productivity country may have a unilateral incentive to implement an NTM. In this situation the low productivity country will never implement any NTM because it would shift local rents towards foreign firms. In other words, the low productivity country is harmed by the beggar-thy-neighbor policy of the high productivity country and cannot retaliate. Can a deep trade agreement make everyone better off? This is the focus of the next section.

4.4 Cooperative equilibrium and reciprocity

The principle of reciprocity is defined in a broad and relatively vague way in the WTO texts, simply stating that countries should exchange "equivalent concessions". It has been formalized by Bagwell and Staiger (1999) as an equivalent exchange of market access between countries,

[25] This equation is non linear in $\overline{a}$. This because a small $\overline{a}$ means that only few firms switch, thus the profit shifting cannot be large. Increasing $\overline{a}$ implies more profit shifting, but also more less efficient switchers that after some point will be hurt by the NTM.

which thus ensures no terms of trade manipulation (see Bagwell and Staiger (2001) about domestic policies). In a model featuring a delocation motive for trade policy, Ossa (2011) formalizes the principle of reciprocity as an increase in imports, keeping the trade balance unchanged. As such, it also eliminates the possibility of delocation in his setup. Mrazova (2011) shows that in an oligopolistic setup, reciprocity should be defined as keeping the profit balance constant. However, none of these definitions allow to reach an agreement that would be Pareto improving in our analysis. Below, we provide the conditions that an agreement should respect in our setup to ensure a Pareto improvement. It requires "non equivalent concessions", i.e. non equivalent exchanges in market access and profits.

Cooperative solution: Pareto improvement.

The first best is characterized by the maximization of the joint welfare of governments, as defined in (19). The condition for a cooperative equilibrium to emerge is to be Pareto improving. We define as β_H^{CE} and β_F^{CE} the NTMs that would be chosen in the cooperative equilibrium, while β_H^* and β_F^* are those chosen under the non-cooperative equilibrium. We consider the situation where there is an inefficiency to solve, namely that the high productivity country has chosen to implement unilaterally some NTMs as in the example just above: $\beta_H^* > 0$ and $\beta_F^* = 0$. We define variation between the cooperative equilibrium situation and the non-cooperative one with Δ. A cooperative agreement thus requires to respect the following:

$$\Delta G_H(\beta_H, \beta_F) \equiv G^H(\beta_H^{CE}, \beta_F^{CE}) - G^H(\beta_H^*, \beta_F^*) \geq 0 \tag{25}$$

$$\Delta G_F(\beta_F, \beta_H) \equiv G^F(\beta_F^{CE}, \beta_H^{CE}) - G^F(\beta_F^*, \beta_H^*) \geq 0 \tag{26}$$

The variation in the objective functions of the two governments is the (weighted) sum of the variation of consumer surplus and the variation in aggregate profits (and thus income). We may rewrite these conditions as:

$$\Delta G_H(\beta_H, \beta_F) \geq 0 \Leftrightarrow \Delta \Pi_S(\beta_H, \beta_F) + \alpha \Delta S_H(\beta_H) \geq 0$$

$$\Delta G_F(\beta_F, \beta_H) \geq 0 \Leftrightarrow \alpha \Delta S_F(\beta_F) - \Delta \Pi_S(\beta_H, \beta_F) \geq 0$$

To be Pareto improving, a deep trade agreement has to respect the following necessary

conditions:

$$\begin{aligned}\Delta S_F(\beta_F) + \Delta S_H(\beta_H) &\geq 0\\ \Delta S_H(\beta_H) &\geq 0\\ \Delta S_F(\beta_F) &\leq 0\\ \Delta \Pi_S(\beta_H, \beta_F) &\leq 0\end{aligned}$$

Proposition 4. *When protectionist NTMs are implemented due to an asymmetry in the productivity distribution, a Pareto improving agreement requires an international income redistribution.*

Proof. see appendix C.

A Pareto improvement implies an aggregate profit shifting from country H to country F ($\Delta \Pi_S(\beta_H, \beta_F) \leq 0$) and thus an international income redistribution. This is intuitive: to improve world welfare, the Home government should decrease its NTMs (which is the only inefficiency), leading to more market access and more profits for Foreign firms. This implies a cost for Home that therefore needs to be compensated by an increase in the NTMs in the Foreign country, in turn implying more market access and more profits for Home firms there. As a result, both countries increase their imports. However, this increase in NTMs reduces social welfare in the Foreign country, while the reduction of the NTMs improves social welfare at Home. Put differently, equivalent exchange of market access and profits have asymmetric welfare effects. Therefore, to get a Pareto improving agreement, countries should make a non equivalent exchange in market access, leading to an international profit shifting and thus an international income redistribution from Home to Foreign. This is not compatible with any standard definition of reciprocity.

5 Conclusion

This paper has shown that non-discriminatory NTMs can be used as protectionist tools, by shifting profits towards domestic firms in the local market. This means that non-discriminatory requirements do not avoid the possibility of beggar-thy-neighbor policies. Moreover, this type of policy becomes more efficient as the economy becomes more open to international trade, providing a possible reason for the rise in NTMs observed over the years after the creation of the WTO. It also shows trade agreements may be welfare detrimental if governments are only influenced by the most efficient firms, as informally argued by Rodrik (2018). When countries

differ in their firm productivity distribution, the implementation of international standards induces some international income distribution. In this context, a deep trade agreement (on domestic regulation) should not be based on reciprocity to ensure a Pareto improvement. These results may explain why recent negotiations have proven difficult.

This paper suggests that beyond non-discrimination obligations with respect to firms' origin, NTMs may need to be discriminatory with respect to firms size/efficiency. NTMs that would be proportionally more costly for more efficient firms (for instance through a cross-subsidization policy) would not reallocate market shares and profits, avoiding the possibility of protectionist policies.

Overall, our results question the efficiency of the two key principles of the WTO when negotiations deal with domestic policies. WTO redactors were aware of these possible problems. The answer has been the inclusion of the non-violation clause, allowing complaints even if no agreement has been violated. However, analyzing various non-violation claims, Staiger and Sykes (2011) conclude that "the pertinent non-violation decisions to date all seem to suggest that the measure in question must somehow favor domestic over imported goods. A regulatory measure that disadvantages them equally (in non-discriminatory fashion) seems outside the scope of the doctrine". This paper thus suggests that a new doctrine is needed for international trade rules over domestic policies.

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A Non-cooperative equilibrium - symmetric countries

Decision of the Home government is given by:

$$\frac{\partial \Pi_{HH}(\beta_H)}{\partial \beta_H} + \alpha \frac{\partial S_H(\beta_H)}{\partial \beta_H} = 0$$

Consumer surplus may be written as $S_H(\beta_H) = \mu \ln \mu - \mu + \frac{\mu}{\sigma - 1} \ln P_H^{1-\sigma}$. We obtain:

$$\begin{aligned}
\frac{\partial S_H}{\partial \beta_H} &= -\frac{\mu}{\sigma \lambda} \frac{\sigma}{\sigma - 1} \frac{1 + \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma} \right)^{\frac{\rho}{\sigma-1}}}{(1+\beta_H) \left(1 + \tau^{-\rho} \left(\frac{1+\beta_H}{\gamma+\beta_H} \right)^{\frac{\rho}{\sigma-1}-1} \right)} \\
\frac{\partial \Pi_{HH}}{\partial \beta_H} &= (1-\gamma) \frac{\mu}{\sigma \lambda} \frac{\left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma} \right)^{\frac{\rho}{\sigma-1}}}{(1+\beta_H)^2 \left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma} \right)^{\frac{1-\sigma+\rho}{\sigma-1}} \right)^2}
\end{aligned}$$

It follows directly that β_H is given by:

$$\frac{\sigma - 1}{\alpha \sigma} = \frac{1 + \beta_H}{1 - \gamma} \left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma} \right)^{\frac{1-\sigma+\rho}{\sigma-1}} \right) \left(1 + \left(\frac{\gamma+\beta_H}{1+\beta_H} \tau^{\sigma-1} \right)^{\frac{\rho}{\sigma-1}} \right)$$

This defines a unique equilibrium as the RHS is monotonically increasing in β_H (see below).

Trade liberalization.

Call $F(\beta_H)$ the RHS of the above expression:

$$\begin{aligned}
F(\beta_H) &= \frac{1 + \beta_H}{1 - \gamma} \left(1 + \tau^{1-\sigma} \left(\frac{1+\beta_H}{\gamma+\beta_H} \tau^{1-\sigma} \right)^{\frac{1-\sigma+\rho}{\sigma-1}} \right) \left(1 + \left(\frac{\gamma+\beta_H}{1+\beta_H} \tau^{\sigma-1} \right)^{\frac{\rho}{\sigma-1}} \right) \\
&= \frac{1 + \beta_H}{1 - \gamma} \left(1 + \tau^{-\rho} \left(\frac{1+\beta_H}{\gamma+\beta_H} \right)^{\frac{\rho}{\sigma-1}-1} + \tau^{\rho} \left(\frac{\gamma+\beta_H}{1+\beta_H} \right)^{\frac{\rho}{\sigma-1}} + \frac{\gamma+\beta_H}{1+\beta_H} \right)
\end{aligned}$$

We get:

$$\frac{\partial F(\beta_H)}{\partial \beta_H} = \frac{1}{1 - \gamma} \left(\begin{array}{l} 2 + \frac{\rho}{\sigma-1} \left(\tau^{-\rho} \left(\frac{1+\beta_H}{\gamma+\beta_H} \right)^{\frac{\rho}{\sigma-1}-1} + \tau^{\rho} \left(\frac{\gamma+\beta_H}{1+\beta_H} \right)^{\frac{\rho}{\sigma-1}-1} \right) \\ - \left(\frac{\rho}{\sigma-1} - 1 \right) \left(\tau^{-\rho} \left(\frac{1+\beta_H}{\gamma+\beta_H} \right)^{\frac{\rho}{\sigma-1}} + \tau^{\rho} \left(\frac{\gamma+\beta_H}{1+\beta_H} \right)^{\frac{\rho}{\sigma-1}} \right) \end{array} \right) > 0$$

$$\frac{\partial F(\beta_H)}{\partial \tau} = \frac{1 + \beta_H}{1 - \gamma} \rho \left(\tau^{\rho-1} \left(\frac{\gamma+\beta_H}{1+\beta_H} \right)^{\frac{\rho}{\sigma-1}} - \tau^{-\rho-1} \left(\frac{1+\beta_H}{\gamma+\beta_H} \right)^{\frac{\rho}{\sigma-1}-1} \right) > 0$$

$\frac{\partial F(\beta_H)}{\partial \beta_H} > 0$ implies that (18) defines a unique equilibrium. Moreover, as $\frac{\partial F(\beta_H)}{\partial \tau} > 0$, trade liberalization (a decrease in τ) increases the equilibrium NTM β_H^*.

Proof:

$$\begin{aligned}\frac{\partial F(\beta_H)}{\partial \tau} &> 0 \Leftrightarrow \tau^{\rho-1}\left(\frac{\gamma+\beta_H}{1+\beta_H}\right)^{\frac{\rho}{\sigma-1}} - \tau^{-\rho-1}\left(\frac{1+\beta_H}{\gamma+\beta_H}\right)^{\frac{\rho}{\sigma-1}-1} > 0 \\ &\Leftrightarrow 1 > \tau^{1-\sigma}\left(\frac{1+\beta_H}{\gamma+\beta_H}\tau^{1-\sigma}\right)^{\frac{2\rho+1-\sigma}{\sigma-1}}\end{aligned}$$

A sufficient condition for $\frac{\partial F}{\partial \beta} > 0$ is:

$$\begin{aligned}\tau^{-\rho}\left(\frac{1+\beta_H}{\gamma+\beta_H}\right)^{\frac{\rho}{\sigma-1}-1} + \tau^{\rho}\left(\frac{\gamma+\beta_H}{1+\beta_H}\right)^{\frac{\rho}{\sigma-1}-1} &> \tau^{-\rho}\left(\frac{1+\beta_H}{\gamma+\beta_H}\right)^{\frac{\rho}{\sigma-1}} + \tau^{\rho}\left(\frac{\gamma+\beta_H}{1+\beta_H}\right)^{\frac{\rho}{\sigma-1}} \\ \Leftrightarrow 1 > \tau^{1-\sigma}\left(\frac{1+\beta_H}{\gamma+\beta_H}\tau^{1-\sigma}\right)^{\frac{2\rho}{\sigma-1}-1}&\end{aligned}$$

B Non-cooperative equilibrium - asymmetric countries

Recall that Π_S is given by:

$$\Pi_S(\beta_H, \beta_F) = \underbrace{\eta \int_0^{\overline{a}} \pi_H(a) dG(a) da}_{\Pi_S^H(\beta_H)} + \underbrace{\eta \int_0^{\overline{a}} \pi_F(a) dG(a) dx}_{\Pi_S^F(\beta_F)}$$

This implies that aggregate profits at the country level are no more constant with respect to a possible NTM implemented in each country, because aggregate profits of "switchers" depend on β_H and β_F. We obtain:

$$\Pi_S^H(\beta_H) = \eta F(1+\beta_H)\overline{a}^{\rho}\left(\lambda\left(\frac{a_H(\beta_H)}{\overline{a}}\right)^{\sigma-1} - 1\right)$$

It follows:

$$\begin{aligned}\frac{\partial \Pi_S^H(\beta_H)}{\partial \beta_H} &= \eta F\lambda\left(\frac{\mu}{2\sigma\lambda F}\right)^{\frac{\sigma-1}{\rho}}\overline{a}^{1-\sigma+\rho}\frac{1}{\lambda}(1+\beta_H)^{\frac{1-\sigma}{\rho}} - F\overline{a}^{\rho} \\ &= \eta F\overline{a}^{\rho}\left(\left(\frac{a_H(\beta_H)}{\overline{a}}\right)^{\sigma-1} - 1\right)\end{aligned}$$

Condition for a positive NTM.

An NTM is introduced by the Home government if, around $\beta_H = 0$, the income gain more than compensates the consumer surplus loss. Labeling $\widetilde{a} = \left(\frac{\mu}{2\sigma\lambda F}\right)^{\frac{1}{\rho}}$, we get:

$$\left.\frac{\partial \Pi_S^H(\beta_H)}{\partial \beta_H}\right|_{\beta_H=0} = \eta F\overline{a}^{\rho}\left(\left(\frac{\widetilde{a}}{\overline{a}}\right)^{\sigma-1} - 1\right)$$

Moreover,

$$\left.\frac{\partial S(\beta)}{\partial \beta_H}\right|_{\beta_H=0} = -\frac{\mu}{\sigma\lambda}\frac{\sigma}{(\sigma-1)} < 0$$

It follows:

$$\left.\frac{\partial \Pi_S^H(\beta_H)}{\partial \beta_H}\right|_{\beta_H=0} + \alpha \left.\frac{\partial S(\beta)}{\partial \beta_H}\right|_{\beta_H=0} > 0$$
$$\Leftrightarrow \left(\frac{\overline{a}}{\widetilde{a}}\right)^{\rho}\left(\left(\frac{\widetilde{a}}{\overline{a}}\right)^{\sigma-1} - 1\right) > \frac{2\alpha}{\eta}\frac{\sigma}{(\sigma-1)}$$

C Cooperative equilibrium - asymmetric countries

To get a Pareto improvement, we need the following two conditions to be fulfilled:

$$(1)\ \Delta G_H(\beta_H, \beta_F) \geq 0 \Leftrightarrow \Delta \Pi_S(\beta_H, \beta_F) + \alpha \Delta S_H(\beta_H) \geq 0$$
$$(2)\ \Delta G_F(\beta_F, \beta_H) \geq 0 \Leftrightarrow \alpha \Delta S_F(\beta_F) - \Delta \Pi_S(\beta_H, \beta_F) \geq 0$$

We show here the necessary conditions for these conditions to be respected. First, note that conditions (1) and (2) imply $\Delta G_H(\beta_H, \beta_F) + \Delta G_F(\beta_F, \beta_H) \geq 0$. As the profit shifting is a zero sum game, we thus need $\Delta S_F(\beta_F) + \Delta S_H(\beta_H) \geq 0$. Second, remind that $\Delta S_F(\beta_F) = S_F\left(\beta_F^{CE}\right) - S_F(\beta_F^*)$. For condition (2) to be respected, we need:

$$\alpha \Delta S_F(\beta_F) > \Delta \Pi_S(\beta_H, \beta_F)$$

As $\frac{\partial S_F(\beta_F)}{\partial \beta_F} < 0$ and $\beta_F^* = 0$, we necessarily have $\Delta S_F(\beta_F) \leq 0$, it follows that:

$$\Delta \Pi_S(\beta_H, \beta_F) < 0$$

For condition (1) to be respected, we need:

$$\alpha \Delta S_H(\beta_H) > -\Delta \Pi_S(\beta_H, \beta_F)$$

As $\Delta \Pi_S(\beta_H, \beta_F) < 0$, it follows:

$$\Delta S_H(\beta_H) > 0$$