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Protection for Sale with Price Interactions and Incomplete Pass-Through

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Abstract

We extend the protection for sale model of Grossman and Helpman (1994) by introducing a general model of monopolistic competition with variable markups and incomplete pass-through. We show that the structure of protection emerging in the political equilibrium not only depends on the weight attached by the government to consumer welfare when making its policy decision, but also on the degree of market power of firms and on the terms-of-trade variations due to the degree of pass-through. Our results highlight the importance of preferences in shaping the structure of protection and are consistent with the occurring of protectionism also in unorganized industries.

Keywords: Protection for Sale; Monopolistic Competition; Incomplete Pass-Through; Endogenous Markups.

J.E.L. Classification Codes: F12; F13.

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1 Introduction

Over the last decades, as recently documented by Caliendo et al. (2015) and Bown and Crowley (2016), significant progress has been made in the liberalization of international trade regimes worldwide. Yet there are huge variations in the levels of trade protection across countries, (with high income countries having more liberal regimes), and within countries across different sectors, with agriculture, textiles, apparel and footwear facing greater import barriers. Moreover, the recent great recession has led to the emergence of protectionist forces. In the aftermath of the crisis, especially in countries strongly hurt by the economic downturn and struggling with a slow recovery, governments have been facing growing political pressure to undertake protectionist measures.[1] Notably, the risk of trade wars is at the center of the current policy debate.[2]

It is necessary for governments to strike a balance between the interests of politically organized groups - e.g. shareholders of large firms as well as their workers, or even voters and consumers with special interests - and those of the society as a whole. Industries and individual firms may demand protection, and a small tariff may yield positive terms-of-trade effects on top of fiscal revenue, but this also implies higher prices for consumers. Exporters may push for an export subsidy, but this is costly for taxpayers and can erode the terms of trade. Which policy is then socially preferable? And which trade policy will emerge in the political equilibrium? What are the economic forces and the mechanisms that lead to one outcome or the other?

Several scholars have tackled these questions and the literature on the topic is vast. Theoretical models have considered different mechanisms and shed light on many aspects, but some key issues remain open. The empirical literature has tried to verify the main predictions of the models with some success, but a few puzzles remain to be solved.

We contribute to the literature on protection for sale by developing a general model of monopolistic competition that simultaneously encompasses several motives for trade protection that have so far been treated separately. With this tool in hand, we seek to understand how the underlying structure of preferences affects trade policy decisions in an environment in which the government must find a compromise between the interests of lobbies and the costs of trade protection for consumers. We highlight the importance of the interplay between demand characteristics and the behavior of firms, showing how several factors can explain why we observe one outcome in one context and a different outcome in another. In particular, what may appear as an empirical puzzle may actually be the expected result of market characteristics that were not properly taken into account. We show that the trade policy emerging in the political equilibrium may either be strongly protectionist or more liberal depending on the degree of market competition, on the import penetration, on the power of lobbies, on the price interactions between firms, on the degree of pass-through and on the terms-of-trade effects.

The literature related to our work dates back to the earlier contributions of Findlay and Wellisz (1982) and Hillman (1982). One of the most influential papers is the one by Grossman and Helpman (1994) (henceforth GH) who develop a formal micro-founded model with clear-cut testable predictions about the cross-sector structure of protection. In their model, trade policy endogenously emerges from the interaction between government and organized sectoral lobbies. GH show that, within a perfectly competitive framework where free trade is the social

[1] So far the recent resurgence of protectionism has not been 1930s-style, rather it has entailed several abuses of legitimate discretion. On the economic risks of this "murky protectionism", see Baldwin and Evenett (2009).

[2] In this respect, the European Union's long-planned trade deal with the US has been halted indefinitely and negotiations have shown no sign of progress since the 2016 United States presidential election.

optimum, the structure of protection that emerges in the political equilibrium entails an import tariff (export subsidy) in organized sectors and an import subsidy (export tax) in unorganized sectors. Moreover, the level of protection is positively related to the import penetration ratio for unorganized sectors and negatively for organized sectors, while the opposite holds for import elasticity. These predictions are confirmed by many empirical studies, such as Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000). However, the same studies often find that lobbies have an unexpected small weight in the government objective function and, given this result, they seem to get a surprisingly large amount of protection.[3] As a matter of fact, the unexpectedly benevolent government is one of the puzzles of empirical studies on the "protection for sale" type of models. In addition, the GH model predicts that unorganized industries should receive negative protection, while according to the empirical evidence, industries classified as unorganized receive positive levels of trade protection.[4]

In a subsequent paper, Grossman and Helpman (see Grossman and Helpman 1995b) study endogenous protection in a two-country setting, where terms of trade are operative. In this context, the optimum tariff (or export tax) argument for protection delivers a motive for taxing international trade also in unorganized sectors. A number of further extensions to the GH model have been proposed. For instance, Mitra (1999) endogenizes lobby formation; heterogeneous firms are considered in Bombardini (2008); Matschke and Sherlund (2006) incorporate labor unions and labor mobility into the model; Facchini et al. (2006) develop a quota version of the GH model; trade in intermediate inputs is introduced in Gawande et al. (2012); Paltseva (2014) explores the implications of the existence of demand linkages and inter-industry rivalry among lobbies, showing how in these circumstances the lobbying strategy of organized sectors tends to be less aggressive; Ludema (2001) presents a model with oligopolistic firms that engage in collusion in the domestic market and in political lobbying for import protection; Stoyanov and Yildiz (2015) develop a model in which countries choose whether to participate in preferential or multilateral free trade negotiations under the pressure of lobbies; lobbying activities of multinational firms are investigated by Hillman and Ursprung (1993), Grossman and Helpman (1995a) and Polk et al. (2014) among others.

Overall these models demonstrate that additional factors can enrich the original framework and provide some theoretical explanations for the empirical findings that, as discussed, are not always fully consistent with the predictions of GH's protection for sale model.

An interesting extension of the baseline model, relevant for this paper, is found in Chang (2005), who considers the case of monopolistic competition *à la* Dixit and Stiglitz (1977). The predictions of this model depart from the original ones in three fundamental ways: first, the equilibrium outcome for imports entails protection in all sectors, whether organized or not, while for exports also sectors represented by lobbies may bear a tax on their sales; second, the imperfectly competitive structure of the economy implies that free trade is no longer the welfare-maximizing choice; third, the level of protection always varies inversely with the import penetration ratio (in GH this happens in organized sectors only). However, the constant elasticity of substitution (CES) model of monopolistic competition used in Chang (2005) lacks flexibility and any possible price interactions and terms-of-trade effects are ruled out from the

[3] The weight on social welfare in the government objective function is found to be several times (hundreds to thousands) higher than that on political contributions or, equivalently, the government seems to weight almost equally campaign contributions and aggregate welfare net of campaign contributions. For an interpretation of this puzzle, see Imai et al. (2009).

[4] On this matter, see Ederington and Minier (2008).

analysis by construction.[5]

Our model, instead, considers a general framework of monopolistic competition that generates price interactions among firms and is flexible enough to encompass several distinct types of utility functions, while preserving tractability. Specifically, we employ generalized additively separable preferences.[6] As a consequence, demand is characterized by variable elasticity. This is taken into account by producers, whose pricing displays variable markups, meaning that firms adjust their price to sales, thus reacting to market conditions, even within a monopolistically competitive framework. One immediate implication is that domestic and foreign producer prices reflect government interventions in trade, so that equilibrium trade policies now depend on the rich interplay between different mechanisms, namely: (i) the political motive for trade protection, due to the campaign contributions of special interest groups organized into lobbies; (ii) the imperfect competition motive for trade protection reflecting the non-optimality of free trade in a non-competitive setting; (iii) the terms-of-trade motive for protection related to the existence of a certain degree of tariff (and subsidy) absorption or pass-through. It should be noted that the first force drives the main results in the GH seminal paper, while in Chang (2005) results stem from the second force only. The terms-of-trade motive generated by variable markups and imperfect pass-through is, instead, a specific mechanism of the framework we propose.

Our results can be summarized as follows. For sectors organized into lobbies, the endogenous import tariff is always positive and inversely related to the degree of import penetration. For unorganized sectors the endogenous import policy can be a tariff or a subsidy, depending on the interactions of the underlying mechanisms, with the profit motives and the terms-of-trade gains working towards the introduction of an import tariff, and the relative strength of the lobbying forces pushing towards an import subsidy. For exports, the trade-offs faced by the government are more challenging. On the one hand, the profit motive requires an export subsidy, on the other hand the terms-of-trade effects call for an export tax. Aggressive lobbies and lower degree of pass-through may move the equilibrium towards an export subsidy for the organized sectors and towards an export tax for the unorganized sectors; however, an equilibrium in which also the latter may benefit from protection, when serving the foreign market, may still emerge.

Overall, we show that by making use of a more flexible model of monopolistic competition, which allows us to nest different mechanisms in a unified framework, it is possible to obtain various trade policy outcomes consistently with the strong variation of trade policy observed across sectors and the occurring of protectionism also in unorganized industries.

The remainder of the paper is organized as follows. Section 2 describes our assumptions about the economic environment. Section 3 characterizes the open economy version of the model. Section 4 presents the interactions between the various lobbies and the government in the light of the GH protection for sale framework. Section shows the structure of protection emerging in the political equilibrium. Section 6 summarizes the main results of the paper and concludes.

[5]A model with monopolistically competitive markets and CES preferences is also used by Stoyanov (2009) to study the effects of foreign lobbies on trade policy of a country belonging to a Free Trade Agreement and to distinguish the effects of partner country lobbying from rest-of-the-world lobbying.

[6]Generalized additively separable preferences are fully characterized in Pollak (1972) .

2 Closed Economy

Consider an economy with n monopolistically competitive sectors and a perfectly competitive sector producing an homogeneous good used as numéraire. The typical monopolistically competitive sector i is characterized by the presence of a number K_i of horizontally differentiated varieties indexed by h whose production requires labor and a fixed amount of a sector-specific input, which is inelastically supplied by households. Horizontally differentiated varieties are considered as imperfect substitutes by consumers. Each firm produces only one variety and each variety is produced by a single firm. The homogenous good is produced using only labor by means of a one-to-one technology. Aggregate labor supply is assumed to be sufficiently large for a positive supply of the numéraire. In the competitive equilibrium the wage rate is thus equal to one.

2.1 Preferences and Demand

The economy is populated by N households having identical preferences, but different factor endowments. Preferences are modelled as in Thisse and Ushchev (2016). The utility function of the representative individual is quasi-linear in the homogeneous good and additive across sectors:

$$\mathcal{U} = x_0 + \sum_{i=1}^{n} U(X_i), \tag{1}$$

where x_0 is the homogenous good (numéraire), $U(\cdot)$ is a monotonic increasing transformation function, twice differentiable, and X_i is a sub-utility function such that preferences are additively separable:

$$X_i = \sum_{h=1}^{K_i} u(x_{i,h}), \tag{2}$$

where $x_{i,h}$ denotes consumption of variety h of the generic sector i, $u(\cdot)$ is thrice differentiable, strictly increasing and strictly concave on $(0, \infty)$ and $u(0) = 0$. According to (2) preferences over the differentiated goods are symmetric and consumers love variety.

Let Y be the income of the representative consumer, then the budget constraint can be compactly written as

$$x_0 + \sum_{i=1}^{n} E_i = Y, \tag{3}$$

where E_i is total expenditure for varieties produced in sector i, that is

$$E_i = \sum_{h=1}^{K_i} p_{i,h} x_{i,h}, \tag{4}$$

with $p_{i,h}$ denoting the price of variety h.

For each variety h, standard utility maximization yields the indirect demand function $D(\cdot)$:

$$p_{i,h} = D(x_{i,h}, X_i) = U'(X_i) u'(x_{i,h}), \tag{5}$$

while for the numéraire we have $x_0 = Y - \sum_{i=1}^{n} E_i$.

Let $v(\cdot) = (u')^{-1}(\cdot)$, then the Marshallian demand for variety h immediately follows:

$$x_{i,h} = v\left(p_{i,h}/P_i\right) = x_{i,h}(p_{i,h}, P_i), \tag{6}$$

where the price index P_i solves the equation:

$$P_i = U'\left(\sum_{h=1}^{K_i} u\left(v\left(p_{i,h}/P_i\right)\right)\right). \tag{7}$$

From the direct demand function (6) Marshall's first law of demand ensures that $\frac{dx_{i,h}}{dp_{i,h}} = \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial p_{i,h}} + \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i}\frac{\partial P_i}{\partial p_{i,h}} < 0$, where the first term (negative) captures the direct effect on demand of variety h of an increase in its own price, while the second term (positive) measures the effect that an increase in its own price has on the price index P_i. However, echoing Chamberlin, monopolistically competitive firms take the aggregate market conditions as given and in making their pricing decisions they will only be concerned about the demand function they perceive. To put it differently, firms only consider the partial equilibrium (i.e. direct) effects of their pricing decisions on demand and treat market-specific aggregate variables, X_i and P_i, parametrically, thus neglecting strategic interaction effects of oligopolistic types. This way of expressing the direct and indirect demand functions points towards taking a "firm's eye view of demand", as suggested by Mrázová and Neary (2017), and allows us to distinguish between direct and indirect price effects. It should be noted that this negligibility assumption holds at firm level, but not at sector level. We will see, in fact, that given the pricing decisions made by single producers in isolation, the ideal trade policy of lobbies will be based on both direct and indirect effects, and price interactions will come into play. In what follows, we will switch from direct to indirect demand functions as long as we continue taking a "firm's eye view of demand".

The utility function (1) has some very convenient properties. First, the consumer surplus from differentiated goods is defined as $\mathcal{S} \equiv \sum_{i=1}^{n}(U(X_i) - E_i)$ and, by Roy's identity, $\partial\mathcal{S}/\partial p_{i,h} = -x_{i,h}$. Second, the elasticity of demand for a good, as perceived by the producer, depends only on the quantity of that good. Indeed, by using (5), the elasticity of the indirect demand function, $\varepsilon_{x_{i,h}}$, as perceived by the producer, immediately follows

$$\varepsilon_{x_{i,h}} \equiv -\frac{D(x_{i,h}, X_i)}{x_{i,h}D_{x_{i,h}}(x_{i,h}, X_i)} = -\frac{u'(x_{i,h})}{x_{i,h}u''(x_{i,h})} > 0, \tag{8}$$

where $D_{x_{i,h}}(x_{i,h}, X_i)$ is the partial derivative of the indirect demand function with respect to $x_{i,h}$. Clearly, the elasticity so defined is different from the effective price elasticity which also accounts for the market equilibrium effects.[7]

Following Mrázová and Neary (2017), we will make use of the following measure of curvature of the demand function, which will come in handy later:

$$\rho_{x_{i,h}} \equiv -\frac{D_{x_{i,h},x_{i,h}}(x_{i,h}, X_i)x_{i,h}}{D_{x_{i,h}}(x_{i,h}, X_i)} = -\frac{u'''(x_{i,h})x_{i,h}}{u''(x_{i,h})}. \tag{9}$$

Our framework clearly allows for variable elasticity of demand, the behaviour of which needs to be characterized. In what follows we will work under the following assumption.

[7] Note that the elasticity so defined is exactly equal to the elasticity of the direct demand function as perceived by producers, that is $\frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial p_{i,h}}\frac{p_{i,h}}{x_{i,h}}$. Denote by $\epsilon_{x_{i,h}} \equiv -\frac{dx_{i,h}}{dp_{i,h}}\frac{p_{i,h}}{x_{i,h}}$ the effective elasticity of the direct demand function, and by $\kappa_{x_{i,h}} \equiv \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i}\frac{\partial P_i}{\partial p_{i,h}}\frac{p_{i,h}}{x_{i,h}}$, then it must be that $\epsilon_{x_{i,h}} = \varepsilon_{x_{i,h}} - \kappa_{x_{i,h}}$.

Assumption 1 - Subconvexity

The elasticity of demand as perceived by the producer, $\varepsilon_{x_{i,h}}$, is decreasing in the quantity consumed $x_{i,h}$.

According to Assumption 1 demand becomes less elastic when the quantity consumed increases, or equivalently more elastic when the price increases. This assumption is not new to trade literature and is sometimes referred to as the law of elasticity or Marshall's second law of demand, and corresponds to what Mrázová and Neary (2017) call "subconvexity", that is demand being less convex at a given point than a CES demand with the same price elasticity.[8] In Appendix A we show that Marshall's second law of demand holds if

$$\rho_{x_{i,h}} < \frac{\varepsilon_{x_{i,h}} + 1}{\varepsilon_{x_{i,h}}}. \tag{10}$$

As a consequence of this assumption, openness to trade, by reducing the sales of incumbent firms in the domestic market, will give rise to an increase in price elasticity and yield pro-competitive effects. Thus, following Krugman (1979), "[we] make the assumption without apology".[9]

2.2 Pricing and Closed-Economy Equilibrium

On the production side, differentiated goods require labor, with a marginal cost c_i defined at the sector level, and a sector-specific input which is inelastically supplied. The supply of the sector-specific input pins down the number of firms in each sector to a constant number K_i. Each firm produces a single horizontally differentiated variety and sets the quantity (or the price), taking as given all the other market variables. Let the profit function be $\pi_{i,h} = (p_{i,h} - c_i)\, N x_{i,h}$. The first-order condition for profit maximization requires that the marginal revenue be equal to the marginal cost. For any positive marginal cost, this implies that the elasticity of the (perceived) demand function must be larger than 1, i.e. $\varepsilon_{x_{i,h}} > 1$. The second-order condition for a maximum requires the profit function to be concave, using the measure of the curvature of the demand function (9), this corresponds to $\rho_{x_{i,h}} < 2$. See Appendix A for details.

The first-order condition yields the usual markup over marginal cost pricing condition, which can be expressed as follows. Let $\mu_{i,k} = p_{i,h}/c_i$ denote the (gross) price markup, then

$$p_{i,h} = \mu_{i,h} c_i \text{ with } \mu_{i,h} = \frac{\varepsilon_{x_{i,h}}}{\varepsilon_{x_{i,h}} - 1}. \tag{11}$$

Under Assumption 1 a higher consumption of the differentiated product brings about an increase in the markup.

Note that a different interpretation of (11) is that of a best reaction function of the generic producer to the prices set by competitors operating in the same sector. In Appendix A, we

[8] Under CES preferences, in fact, $\rho_{x_{i,h}} = (\varepsilon_{x_{i,h}} + 1)/\varepsilon_{x_{i,h}}$, where $\varepsilon_{x_{i,h}}$ also equals the constant elasticity of substitution. For an in-depth discussion on this subconvexity assumption, see Mrázová and Neary (2017) and Zhelobodko et al. (2012). Notably, Dixit and Stiglitz (1977) and Krugman (1979) argue that this assumption is intuitively plausible.

[9] If we remove Assumption 1 and allow for an elasticity of demand increasing in the quantity consumed, a trade-induced expansion in market size will bring about an increase in the markup. In these circumstances the pro-competitive effects of trade liberalization would vanish, and, on the contrary, we would observe anti-competitive effects. For an interesting analysis in this direction and the related discussion, see Bertoletti and Epifani (2014).

show that, given ASSUMPTION 1, the price elasticity to the price index is below one, that is $0 < (dp_{i,h}/dP_i)(P_i/p_{i,h}) < 1$. The reaction function thus implies a positive, but less than proportional, price adjustment in response to a change in P_i.[10] This guarantees the existence of a symmetric Nash equilibrium in which each firm is optimally pricing given the prices of all varieties.

Before turning to the open economy case, it is instructive to understand what happens to quantities and prices if the marginal cost increases. Obviously, following an increase in the marginal cost, the price will always increase as well, meaning that there is positive pass-through. See Appendix A for a proof. However, what is relevant for the analysis which follows is whether the price increases more or less than proportionally relative to the increase in the marginal cost. In other words, we are interested in clarifying the conditions under which we have partial, complete or super absolute pass-through. In what follows we will work under the following assumption.

ASSUMPTION 2 - INCOMPLETE PASS-THROUGH

Preferences are such that the demand functions are sufficiently subconvex to give rise to incomplete pass-through in equilibrium.

From (11) it can be shown that to have incomplete pass-through, the demand function must be such that $\rho_{x_{i,h}} < 1$ as long as we disregard the general equilibrium effects and treat P_i parametrically (see Mrázová and Neary 2017). However, when we account for general equilibrium effects, the condition is more stringent, and to have incomplete pass-through it must be that

$$\rho_{x_{i,h}} < 1 - \frac{1}{\varepsilon_{x_{i,h}}} \frac{\kappa_{x_{i,h}}}{\varepsilon_{x_{i,h}} - \kappa_{x_{i,h}}}, \tag{12}$$

where $\kappa_{x_{i,h}} \equiv \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i} \frac{\partial P_i}{\partial p_{i,h}} \frac{p_{i,h}}{x_{i,h}} > 0$. See Appendix A for a proof. When preferences are purely additive or the external function $U(\cdot)$ is linear, then (12) boils down in the condition $\rho_{x_{i,h}} < 1$, which ensures incomplete pass-through in partial equilibrium. In what follows we assume Marshall's first and second laws always hold and that preferences are not too convex, so that in the general equilibrium condition (12) is always satisfied.[11]

ASSUMPTION 2 is supported by the available empirical evidence suggesting that prices respond sluggishly and incompletely to cost shocks. See e.g. Gopinath and Itskhoki (2010) and De Loecker et al. (2016).

3 Open Economy and Equilibrium

Consider two countries, each characterized by the above market structure. The homogeneous good is freely traded, while tariffs and subsidies may be imposed by each country on the differentiated sectors. To simplify notation, it is convenient to assume that the closed economy model corresponds to an integrated economy that is then split into two countries. In the generic sector i, the number of firms located in the home country H is $\lambda_i K_i$, while $(1 - \lambda_i)K_i$ firms

[10] In the CES case, constant markups imply that the reaction functions are flat. Hence, there is no price interplay between firms.

[11] Incomplete pass-through requires that the marginal revenue curve be steeper than the demand curve, which is the case when the demand curve is not too convex, i.e. condition (12) must always hold. Note that this is a stronger assumption than just subconvexity. The CES demand is in fact too convex as it generates super pass-through (i.e. the CES marginal revenue curve is flatter than the demand curve).

are located in the foreign country F (with $0 < \lambda_i < 1$). The number of firms located in each country is given, therefore we exclude the possibility of location choices.

Firms maximize profits in each market separately (i.e. markets are segmented), therefore price markups may differ in the two markets and depend on the convexity of demand. The pricing conditions derived in the previous Section, thus, hold with respect to the demand conditions prevailing in each market. In open economy, trade policy interventions imply that consumer prices incorporate the effect of tariffs and subsidies. In the H market, for the generic sector i, consumer prices for the generic domestically produced variety h and for the generic imported foreign variety f satisfy the following pricing conditions:

$$p_{i,h} = \mu_{i,h} c_i, \tag{13}$$

$$p_{i,f} = \mu_{i,f} \left(c_i + t_i - s_i^* \right), \tag{14}$$

where t_i is the (specific) import tariff applied by the H country and s_i^* is the (specific) export subsidy applied by the F country.

Given the structure of preferences, the marginal costs and the trade policy, and by using the conditions describing the behaviour of consumers and producers, it is possible to express prices and quantities of the varieties sold in the H market as a function of t_i and s_i^*. The equilibrium for the H economy is characterized by the sequences $\{p_{i,h},\, p_{i,f},\, x_{i,h},\, x_{i,f}\}_{i=1}^{n}$ contingent on the trade policy rates $\{t_i, s_i^*\}_{i=1}^{n}$. Starting from free trade, the assumptions made in the previous Section are sufficient to ensure that the following inequalities must hold in equilibrium:[12]

$$0 < \partial p_{i,h}/\partial t_i < \partial p_{i,f}/\partial t_i < 1, \tag{15}$$

therefore $\partial x_{i,h}/\partial t_i > 0$, $\partial x_{i,f}/\partial t_i < 0$. See Appendix B. The economic interpretation of the effects of a tariff is straightforward: (i) the import tariff is partially absorbed by foreign producers, and the higher prices of imported varieties lead to a lower demand; (ii) home firms adjust their prices in reaction to the new demand conditions resulting from the pricing decision made by foreign competitors. The demand for the home produced varieties increases, because of the substitution effect. As a consequence of Assumption 1 the elasticity of demand for domestic varieties will decrease, leading home producers to set a higher markup. On the other hand, in the import market the elasticity of demand for foreign varieties will rise, thus the markup will be lower. Intuitively, the first effect can be regarded as a standard pricing effect of the trade policy, while the second effect is a complementarity effect arising from the price interactions among firms due to the existence of variable markups.

Symmetric pricing equations hold for the foreign market. By denoting the foreign variables counterpart with a star superscript, given the policy rates $\{t_i^*, s_i\}_{i=1}^{n}$, the model generates the sequences $\{p_{i,h}^*,\, p_{i,f}^*,\, x_{i,h}^*,\, x_{i,f}^*\}_{i=1}^{n}$ which describe the equilibrium of the F economy. Given the assumptions made in the previous Section and starting from free trade, the following inequalities must hold in equilibrium:

$$-1 < \partial p_{i,h}^*/\partial s_i < \partial p_{i,f}^*/\partial s_i < 0, \tag{16}$$

[12] Note that a change in marginal cost is equivalent to a change in a specific tariff, hence, Assumption 2 also ensures incomplete pass-through of the specific tariff. Under ad valorem tariff, instead, subconvexity of demand alone is sufficient to guarantee incomplete pass-through. The CES case is again a useful benchmark: CES demand yields complete pass-through of ad valorem tariff and super pass-through of specific tariff or marginal cost. See Feenstra (2015) for details.

where $p^*_{i,h}$ is the price of the generic home variety h in the foreign market, while $p^*_{i,f}$ is the price of the generic foreign variety in the foreign market. From (16) the introduction of an export subsidy determines a decrease of the price of the home variety sold abroad, but the decline of prices is less than proportional because of the incomplete pass-through. The prices of the varieties produced in the foreign market will also decline but less, so that the substitution effect ensures that $\partial x^*_{i,h}/\partial s_i > 0$, $\partial x^*_{i,f}/\partial s_i < 0$. See Appendix B.

4 Lobbies, Government, and Welfare Measures

The typical individual derives income from wages, public transfers and from the ownership of the sector-specific input, which is assumed to be indivisible and nontradable. Public transfers are given by the net revenues from the trade policy, that are completely redistributed to each individual by the government. Additionally, owners of the specific factor earn firms' profits. Transfers and firm profits depend on the number of firms K_i operating in each sector of the economy, which in turn is exogenously determined by the specific factor endowments. We further assume that the size of the population in the two countries is N in country H and N^* in country F.

The constant λ_i, used above to indicate the fraction of the total number of firms that are based in country H, also represents the share of the world endowment of the specific factor used in sector i that is owned by the individuals in the domestic country.

In country H the owners of the specific factor used in sector i obtain a gross aggregate welfare equal to

$$W_i(\mathbf{t},\mathbf{s}) = l_i + \Pi_i(t_i, s_i) + \alpha_i N\left[R(\mathbf{t},\mathbf{s}) + \mathcal{S}(\mathbf{t},\mathbf{s})\right], \tag{17}$$

where $\mathbf{t}$, $\mathbf{s}$ denote the import tariff and the export subsidy vectors for domestic and foreign varieties produced in all n sectors, l_i is total labor income, $\Pi_i(t_i, s_i) = \lambda_i K_i \pi_{i,h}$ represents the aggregate reward to the specific factor used for the production of goods in sector i, with $\pi_{i,h} = (p_{i,h} - c_i)x_{i,h}N + (p^*_{i,h} + s_i - t^*_i - c_i)x^*_{i,h}N^*$ denoting overall profits of the generic domestic firm h stemming from the trade policy, α_i is the fraction of the population owning the i-specific factor, $R(\mathbf{t},\mathbf{s}) = \sum_{i=1}^{n}(1-\lambda_i)K_i t_i x_{i,f} - \frac{N^*}{N}\sum_{i=1}^{n}\lambda_i K_i s_i x^*_{i,h}$ indicates the net per-capita revenue generated by the trade policy and $\mathcal{S}(\mathbf{t},\mathbf{s})$ is the consumer surplus.

Let L be the subset of sectors in which owners of the specific factors have been able to organize themselves and form a lobby. In each sector $i \in L$, lobbies aim at influencing the trade policy by offering the government some campaign contribution schedule $C_i(\mathbf{t},\mathbf{s})$ contingent on the trade policy. Thus, owners of the specific factor used in the organized sector $i \in L$ obtain a net welfare equal to $V_i = W_i - C_i$. Each lobby will set its contribution schedule so as to maximize its net welfare, taking into account the government's objective function, which is given by

$$G(\mathbf{t},\mathbf{s}) = \sum_{i\in L} C_i(\mathbf{t},\mathbf{s}) + aW(\mathbf{t},\mathbf{s}), \tag{18}$$

where the parameter $a > 0$ measures the relative weight the government attaches to aggregate welfare $W(\mathbf{t},\mathbf{s})$ (i.e. the lower a, the higher the degree of corruption) which, in turn, is found to be

$$W(\mathbf{t},\mathbf{s}) = l + \sum_{i=1}^{n}\Pi_i(t_i, s_i) + N\left[R(\mathbf{t},\mathbf{s}) + \mathcal{S}(\mathbf{t},\mathbf{s})\right], \tag{19}$$

with l being the aggregate labor income (and also labor supply).

How do lobbies determine their campaign contributions? In this policy game, as in GH, we focus on contributions schedules that are truthful, in which case a group's contribution reflects exactly its own willingness to pay for a change in trade policy (see Bernheim and Whinston 1986). In the Nash equilibrium, each lobby optimally chooses its campaign contribution C_i, taking as given the decisions made by the other lobbies and knowing that the trade policy will be set by the government to maximize its objective function (18). Formally, the political donation is non-negative and cannot exceed the group's welfare:

$$C_i(\mathbf{t}, \mathbf{s}) = \max\left[0, W_i(\mathbf{t}, \mathbf{s}) - B_i\right], \tag{20}$$

where B_i is a constant. The contribution schedule (20) is truthful since it reflects the true preferences of the lobby. In these circumstances, as shown by Bernheim and Whinston (1986), the government objective function is, then, equivalent to

$$\widetilde{G}(\mathbf{t}, \mathbf{s}) = \sum_{i \in L} W_i(\mathbf{t}, \mathbf{s}) + aW(\mathbf{t}, \mathbf{s}). \tag{21}$$

5 The Equilibrium Level of Protection

We are now ready to study the non-cooperative equilibrium structure of protection emerging in the domestic economy, taking the foreign trade policy as given. Before doing so, we first analyze how changes in the trade policy affect the aggregate welfare and the welfare of individual lobbies. For the sake of exposition, we first discuss the equilibrium import policy and then the equilibrium export policy. We will also assume that the foreign trade policy is taken as given by the home government and lobbies, and that both import tariff and export subsidy are set to zero, that is $t_i^* = s_i^* = 0$. Therefore in what follows we will derive the politically optimal policy from a unilateral perspective.

5.1 Import Trade Policy

We start by examining the impact of import trade policy on the aggregate welfare. From equation (19) the marginal effect of an import tariff on the aggregate welfare is given by:

$$\begin{aligned} \frac{\partial W}{\partial t_j} &= \frac{\partial \Pi_j}{\partial t_j} + N\left(\frac{\partial R}{\partial t_j} + \frac{\partial \mathcal{S}}{\partial t_j}\right) \\ &= NK_j\lambda_j(p_{j,h} - c_j)\frac{\partial x_{j,h}}{\partial t_j} + \\ &+ NK_j(1-\lambda_j)\left[\frac{\partial x_{j,f}}{\partial t_j}t_j + \left(1 - \frac{\partial p_{j,f}}{\partial t_j}\right)x_{j,f}\right], \end{aligned} \tag{22}$$

where the first term represents the positive effects on profits due to higher domestic sales and the second term measures the positive change in the net aggregate tariff revenue. The variation in the price of the domestic goods does not enter the equation since the effects on the producers and those on the consumers counterbalance each other. Similarly, the change in the tariff revenue is partly compensated by the change in the consumer surplus due to higher import prices, thus the net aggregate revenue depends on the degree of tariff absorption, that is the source of a positive terms-of-trade effect. Starting from free trade, the effect of an import tariff on the aggregate welfare is positive and the welfare-maximizing import tariff (i.e. the socially optimal import policy) can be characterized as follows.[13]

LEMMA 1
The welfare-maximizing import tariff, t_j^W, is positive for any sector of the economy and satisfies the following condition:

$$\frac{t_j^W}{p_{j,f}} = \frac{\theta_{j,f}}{\epsilon_{x_{j,f}}} + z_j \frac{\mu_{j,h} - 1}{\mu_{j,h}} \frac{\sigma_{x_{j,h}}}{\epsilon_{x_{j,f}}}, \tag{23}$$

where $\theta_{j,f} = \left(1 - \frac{\partial p_{j,f}}{\partial t_j}\right) / \frac{\partial p_{j,f}}{\partial t_j} > 0$ *measures the inverse of the pass-through,* $\epsilon_{x_{j,f}} = -\left(\frac{\partial x_{j,f}}{\partial t_j} / \frac{\partial p_{j,f}}{\partial t_j}\right) \frac{p_{j,f}}{x_{j,f}} > 0$ *is the elasticity of import demand,* $z_j = \frac{\lambda_j x_{j,h} p_{j,h}}{(1-\lambda_j) x_{j,f} p_{j,f}}$ *is the inverse of import penetration*[14] *and* $\sigma_{x_{j,h}} = \left(\frac{\partial x_{j,h}}{\partial t_j} / \frac{\partial p_{j,f}}{\partial t_j}\right) \frac{p_{j,f}}{x_{j,h}} > 0$ *is the cross elasticity measuring the reactivity of demand for home varieties to changes in the price of foreign varieties.*
PROOF: *See Appendix C.*

LEMMA 1 is the result of two beneficial effects of a tariff: (i) a positive effect on the net aggregate revenue, thank to the lower producer price on foreign varieties (i.e. terms-of-trade gains); (ii) a positive effect on the profits of the domestic producers (due to imperfect competition). The first effect is larger the lower the elasticity of import demand and is related to the degree of pass-through.[15] In the case of complete pass-through it will be equal to zero, while under super pass-through it will be negative. The second effect is stronger the larger the size of the H country in the world economy (i.e. high z_j), the higher the markup,[16] and the higher the reallocation of demand towards home produced goods. Note that only one of the above effects would suffice for the social optimum to entail a positive tariff.[17] Our result is then in contrast with GH, where the benchmark welfare-maximizing policy is free trade for all sectors, since their setup features perfect competition for a small open economy (i.e. none of the two beneficial effects is present).[18] When markets are monopolistically competitive, instead, firms are never price takers, since each is specialized in the production of a product that nobody else produces. The implications of this market structure are then twofold. On the one hand, with sufficiently subconvex preferences, foreign producers would find it optimal to absorb a fraction of the specific tariff leading to a terms-of-trade gain for the H country. On the other hand, the import tariff renders domestic products relatively cheaper compared with

[13] From (22) it can be easily verified that, starting from free trade (i.e. $t_j = 0$), the marginal effect on welfare of the introduction of a tariff is unambiguously positive as long as there is incomplete or complete pass-through.

[14] More precisely, z_j denotes the market share of home varieties relative to the market share of foreign varieties.

[15] This motive for protection has the same nature of the standard terms-of-trade effect for a large country under perfect competition, as shown in Grossman and Helpman (1995b).

[16] Note that the markup term corresponds to the price-cost margin, which also equals the inverse of the perceived elasticity of demand, namely $\frac{\mu_{j,h}-1}{\mu_{j,h}} = \frac{p_{j,h}-c_i}{p_{j,h}} = \frac{1}{\varepsilon_{x_{j,h}}}$.

[17] See also Venables (1982), Gros (1987) and Flam and Helpman (1987) who show that in a small country the optimal tariff is strictly positive for a monopolistically competitive sector. By engineering an increase in the price of imported goods the tariff shifts home demand from foreign to domestic goods. Domestic producers can then sell larger quantities at the initial price and find it profitable to increase prices and expand production.

[18] Of course our result is consistent with that of Chang (2005) who conducts her analysis under a Dixit-Stiglitz monopolistic competition and ad valorem tariff. In that case the positive effect on profits makes a tariff always desirable, even in the absence of any terms-of-trade effect, since with CES preferences an ad valorem tariff implies a one-to-one pass-through.

imports, redirecting the demand towards home goods and extracting monopolistic rents from foreign markets.

Consider now the effects of a change in the import tariff of a generic sector j on the welfare of the lobby in sector $i \in L$, denoted as W_i From equation (17), it follows that the welfare effect due to a marginal increase in t_j is

$$\begin{aligned}
\frac{\partial W_i}{\partial t_j} &= \frac{\partial \Pi_i}{\partial t_j} + \alpha_i N \left(\frac{\partial R}{\partial t_j} + \frac{\partial \mathcal{S}}{\partial t_j} \right) \\
&= \delta_{ij} \lambda_j K_j N \left[\frac{\partial p_{j,h}}{\partial t_j} x_{j,h} + (p_{j,h} - c_j) \frac{\partial x_{j,h}}{\partial t_j} \right] + \\
&- \alpha_i N K_j \left[(1 - \lambda_j) \frac{\partial p_{j,f}}{\partial t_j} x_{j,f} + \lambda_j \frac{\partial p_{j,h}}{\partial t_j} x_{j,h} \right] + \\
&+ \alpha_i N K_j (1 - \lambda_j) \left(t_j \frac{\partial x_{j,f}}{\partial t_j} + x_{j,f} \right),
\end{aligned} \tag{24}$$

where δ_{ij} is an indicator variable equal to 1 if $j = i$ and to zero otherwise, that is to say that the import policy implemented in sectors other than $i \in L$ affects the aggregate welfare of the lobby only through the redistributed revenues and the consumer surplus. The first term refers to the welfare gains deriving from the ownership of the specific factor, consisting in the increased revenues stemming from higher sales and higher prices. The second term refers to the losses suffered by the consumers, deriving from higher prices on foreign and domestic varieties. The last term represents the net effect of a tariff on trade policy revenues.

Given the above expression and starting from free trade, we have the following result.

Lemma 2

A lobby of a sector i will prefer:

(i) *an import tariff for its own sector, t_i^L, such that the following condition is satisfied:*

$$\frac{t_i^L}{p_{i,f}} = \frac{\theta_{i,f}}{\epsilon_{x_{i,f}}} + \frac{z_i}{\alpha_i} \left(\frac{1 - \alpha_i}{\epsilon_{x_{i,f}}} \sigma_{p_{i,h}} + \frac{\mu_{i,h} - 1}{\mu_{i,h}} \frac{\sigma_{x_{i,h}}}{\epsilon_{x_{i,f}}} \right), \tag{25}$$

where $\sigma_{p_{i,h}} = \left(\frac{\partial p_{i,h}}{\partial t_i} / \frac{\partial p_{i,f}}{\partial t_i} \right) \frac{p_{i,f}}{p_{i,h}} > 0$ measures the price interaction as the home price reactivity to the foreign price;

(ii) *an import tariff (or an import subsidy), t_j^L,* for any other sector $j \neq i$ *such that the following condition is satisfied:*

$$\frac{t_j^L}{p_{j,f}} = \frac{\theta_{j,f} - z_j \sigma_{p_{j,h}}}{\epsilon_{x_{j,f}}}. \tag{26}$$

Proof: *See Appendix C.*

According to Lemma 2 a lobby will always prefer a positive import tariff for its own sector, while for the other sectors the result would depend on the degree of tariff absorption of the foreign competitors, measured by the term $\theta_{j,f}$, and on import penetration. In particular, a positive tariff will be preferred by a lobby also for other sectors if the degree of tariff absorption is sufficiently high, so that the positive terms-of-trade effect dominates the negative effect on welfare due to higher prices of domestic varieties captured by the term $z_j \sigma_{p_{j,h}}$. On the contrary, in the case of higher pass-through of a tariff into import prices (i.e. low $\theta_{j,f}$), the lobby will prefer an import subsidy (negative import tariff) for all the other sectors.[19] Lobby i, in fact, having no claims on the profits of other sectors, would benefit from a decline in the price of goods in the other sectors. Note that in GH a lobby will always prefer an import subsidy for other sectors, since this would reduce the price of imports as well as the price on domestically produced varieties.

We are now ready to study the equilibrium structure of protection. First, consider the marginal effect of a tariff on the government objective function:

$$\begin{aligned} \frac{\partial \widetilde{G}}{\partial t_j} &= \sum_{i \in L} \frac{\partial W_i}{\partial t_j} + a \frac{\partial W}{\partial t_j} \\ &= (I_j + a) N K_j \lambda_j \left[\frac{\partial p_{j,h}}{\partial t_j} x_{j,h} + (p_{j,h} - c_j) \frac{\partial x_{j,h}}{\partial t_j} \right] + \\ &+ (\alpha_L + a) N K_j \left\{ (1 - \lambda_j) \left[\frac{\partial x_{j,f}}{\partial t_j} t_j + \left(1 - \frac{\partial p_{j,f}}{\partial t_j} \right) x_{j,f} \right] - \lambda_j \frac{\partial p_{j,h}}{\partial t_j} x_{j,h} \right\}, \end{aligned} \tag{27}$$

where $I_j = \sum_{i \in L} \delta_{ij}$ is an indicator variable such that $I_j = 1$ if $j \in L$ and $I_j = 0$ if $j \notin L$, while $\alpha_L = \sum_{i \in L} \alpha_i$ is the fraction of the population represented by lobbies.

The government is clearly subject to the same market forces already discussed above, however, it must also evaluate the political incentives for protection, namely the interests of the lobbies, as expressed through the campaign contribution, and social welfare. In the government objective function, such political incentives are accounted for by the terms I_j, α_L and a, representing organized or unorganized sectors, the share of the population represented by lobbies and the relative weight of social welfare, respectively. The combination of such elements allows for the possibility of different outcomes to emerge in the political equilibrium, given the structure of the economy.

The solution to the government maximization problem, yielding the equilibrium structure of protection (i.e. the politically optimal import policy), can be summarized as follows.

Proposition 1

For the organized sector i the political equilibrium import tariff, t_i^G, must satisfy the following condition:

$$\frac{t_i^G}{p_{i,f}} = \frac{\theta_{i,f}}{\epsilon_{x_{i,f}}} + z_i \left(\frac{1 - \alpha_L}{a + \alpha_L} \frac{\sigma_{p_{i,h}}}{\epsilon_{x_{i,f}}} + \frac{1 + a}{a + \alpha_L} \frac{\mu_{i,h} - 1}{\mu_{i,h}} \frac{\sigma_{x_{i,h}}}{\epsilon_{x_{i,f}}} \right), \tag{28}$$

so that $t_i^W < t_i^G < t_i^L$.

For the unorganized sector $j \neq i$ the political equilibrium import tariff (or subsidy), t_j^G, must satisfy the following condition:

$$\frac{t_j^G}{p_{j,f}} = \frac{\theta_{j,f}}{\epsilon_{x_{j,f}}} + z_j \left(- \frac{\alpha_L}{a + \alpha_L} \frac{\sigma_{p_{j,h}}}{\epsilon_{x_{j,f}}} + \frac{a}{a + \alpha_L} \frac{\mu_{j,h} - 1}{\mu_{j,h}} \frac{\sigma_{x_{j,h}}}{\epsilon_{x_{j,f}}} \right), \tag{29}$$

so that $t_j^L < t_j^G < t_j^W$.

[19] Clearly, this is always the case in the knife-edge case of complete pass-through (i.e. $\theta_{j,f} = 0$) and in the case of super pass-through (i.e. $\theta_{j,f} < 0$).

Proof: *See Appendix C.*

Proposition 1 states that the lobby's campaign contributions are indeed effective in pushing the government decision towards a higher level of protection in organized sectors and towards a lower level of protection in unorganized sectors with respect to the social optimum. This feature is common to the original GH framework and to all subsequent works. The general framework of our analysis, however, adds some new insights on the importance of the market structure for the equilibrium outcome. In particular, the equilibrium tariff can be represented as the sum of three conceptually different components: first, the terms-of-trade motive for protection related to the degree of pass-through of tariff into import prices, measured by the term $\frac{\theta_{i,f}}{\epsilon_{x_{i,f}}}$; second, the original GH political motive for protection, captured by the term $z_i \frac{1-\alpha_L}{a+\alpha_L} \frac{\sigma_{p_{i,h}}}{\epsilon_{x_{i,f}}}$, measuring the increase in domestic producer prices due to the increase in import prices;[20] third, the imperfect competition motive for protection represented by the term $z_i \frac{a+1}{a+\alpha_L} \frac{\mu_{i,h}-1}{\mu_{i,h}} \frac{\sigma_{x_{i,h}}}{\epsilon_{x_{i,f}}}$. These three components have been treated separately in the literature and, in particular, the relationship between market structure and the relative importance of each component was not made explicit. In our framework, instead, the price interaction among producers may generate different outcomes, mainly depending on the structure of preferences.

According to Proposition 1, the tariff levied on unorganized sectors may be either positive or negative (import subsidy). The outcome for unorganized sectors crucially depends on the degree of tariff absorption, on the degree of product substitutability, as implied by the structure of consumer preferences, and by the combination of the size of the lobby representation (pushing towards a subsidy) and government preferences. In particular, the government will opt for a positive import tariff also for unorganized sectors, if the degree of tariff absorption is sufficiently large or if only a small fraction of the population is represented by lobbies and the government is strongly interested in social welfare.

We conclude this Section by discussing the role of import penetration in determining the equilibrium tariff. From Proposition 1 we notice that the tariff is negatively correlated with the import penetration for organized sectors, which is the typical result of all "protection for sale" models even in the absence of imperfectly competitive markets.[21] Intuitively, the larger the fraction of the domestic market served by the organized home producers, the larger the amount of contributions received by the government. On the other hand, the tariff may be positively or negatively correlated with the import penetration for unorganized sectors. In particular, we have a positive relationship if the term in parentheses of (29) is negative, that is when the lobbies' interest as consumers prevails on the imperfect competition motive for trade protection embodied in social welfare (i.e. $\alpha_L \sigma_{p_{j,h}} > a \frac{\mu_{j,h}-1}{\mu_{j,h}} \sigma_{x_{j,h}}$). This makes explicit the interplay between the political framework and the market structure. It should be noted that under perfect competition $\mu_{j,h} = 1$ (i.e. marginal cost pricing), the relationship will always be positive, as in GH.

[20] It should be noted that under perfect competition, as in GH, $\theta_{i,f} = 0$ and $\mu_{i,h} = 1$, therefore condition (28) boils down in $\frac{t_i^G}{p_{i,f}} = \frac{1-\alpha_L}{a+\alpha_L} \frac{z_i}{\epsilon_{x_{i,f}}}$, since the price interaction is perfect, i.e. $\sigma_{p_{i,h}} = 1$. For a derivation of the GH result under a specific tariff, see Feenstra (2015).

[21] From Lemma 1 and consistently with the theoretical literature on optimal trade policy under imperfectly competitive markets, we observe that the optimal tariff is an increasing function of the size of the economy.

5.2 Export Trade Policy

We now characterize the export trade policy. In the current framework, an export subsidy crucially differs from an import tariff mainly because it does not affect the domestic consumer surplus. The absence of a consumer surplus effect in H greatly simplifies the analysis. In fact, the only effect that an export subsidy has on the domestic economy is that of changing the pricing decision of exporters and their sales abroad, and to increase taxes.[22] An export subsidy bears no benefit to consumers, while imposing on them the cost of the subsidy itself. Only the owners of some sector-specific inputs are able to benefit from a positive subsidy, since they may increase their reward.

In the case of an import tariff, positive terms-of-trade effects and imperfect competition imply that a positive import tariff may be socially optimal, so that both consumers and firms can gain from protection. On the contrary, in the case of an export subsidy the contrast between owners of the specific factor (i.e. firms) and consumers is apparent: an export subsidy may allow a few firms to increase their profits abroad, while spreading the cost among all the consumers.

Another difference between the export subsidy and the import tariff regards the impact that the price and quantity interactions among firms have on the economy. A change in the import tariff introduces an interplay between local and foreign producers, with both producing goods that are consumed domestically. A change in the export subsidy, while introducing a similar interplay between exporters and foreign producers, only affects goods that are consumed abroad. In other words the quantity and price interactions that crucially determine the equilibrium tariff are irrelevant for the export policy.

Consider now the implications on social welfare. Using the same notation adopted in the previous section, from equation (19) the marginal effect of an export subsidy s_j on the aggregate welfare is given by:

$$\begin{aligned}\frac{\partial W}{\partial s_j} &= \frac{\partial \Pi_j}{\partial s_j} + N^* \frac{\partial R}{\partial s_j} \\ &= \lambda_j K_j N^* \left[\frac{\partial p^*_{j,h}}{\partial s_j} x^*_{j,h} + \left(p^*_{j,h} - c_j\right) \frac{\partial x^*_{j,h}}{\partial s_j} \right].\end{aligned} \tag{30}$$

where the first term represents the negative terms-of-trade effect due to a lower export price (since $\frac{\partial p^*_{j,h}}{\partial s_j} < 0$), while the second term reflects the positive effects on profits due to higher foreign sales. The welfare-maximizing export subsidy (i.e. the socially optimal export policy) can be characterized as follows.

Lemma 3
The welfare-maximizing export subsidy (or tax), s_j^W, satisfies the following condition:

$$\frac{s_j^W}{p^*_{j,h}} = -\frac{1}{\epsilon^*_{x_{j,h}}} + \frac{\mu^*_{j,h} - 1}{\mu^*_{j,h}}, \tag{31}$$

where $\epsilon^*_{x_{j,h}} = -\left(\frac{\partial x^*_{j,h}}{\partial s_j} / \frac{\partial p^*_{j,h}}{\partial s_j} \right) \frac{p^*_{j,h}}{x^*_{j,h}} > 0$ *is the export demand elasticity and* $\mu^*_{j,h}$ *is the gross markup of home producers in the foreign market.*

Proof: *See Appendix C.*

[22] This is clearly the result of having assumed that markets are segmented.

From the above lemma it clearly emerges that if the terms-of-trade loss is small, then the optimal policy will consist in an export subsidy. An export subsidy is able to increase profits of domestic firms in the foreign market, while raising the tax burden levied on domestic consumers. However, a small subsidy will increase profits by more than the value of the subsidy itself and the overall welfare effect will be positive. Conversely, if the negative terms-of-trade effect of an export subsidy prevails over the positive effect induced by the additional profits on newly exported units of home production, the welfare maximizing export policy will consist in an export tax. Intuitively, in this case an export tax can be socially desirable, as it generates fiscal revenues and terms-of-trade gains able to outweigh the profit loss in the foreign market. This result is in contrast with GH, where a perfectly competitive market implies that the optimal policy is free trade, but is, as expected, consistent with the findings of the literature on optimal trade policy under imperfectly competitive markets.[23]

We now turn to the effects of a change in the export subsidy of a generic sector j on the welfare of the lobby in sector $i \in L$. From equation (17), it follows that the welfare effect due to a marginal increase in s_j is

$$
\begin{aligned}
\frac{\partial W_i}{\partial s_j} &= \frac{\partial \Pi_i}{\partial s_j} + \alpha_i N^* \frac{\partial R}{\partial s_j} \qquad (32)\\
&= \delta_{ij}\lambda_j K_j N^* \left[\left(\frac{\partial p^*_{j,h}}{\partial s_j} + 1 \right) x^*_{j,h} + \left(p^*_{j,h} + s_j - c_j \right) \frac{\partial x^*_{j,h}}{\partial s_j} \right] + \\
&\quad - \alpha_i \lambda_j K_j N^* \left(x^*_{i,h} + s_j \frac{\partial x^*_{j,h}}{\partial s_j} \right).
\end{aligned}
$$

Export trade policy in their own sectors affects the welfare of lobbies in two ways: (i) the reward for the owners of the sector-specific input, and (ii) the cost of the trade policy itself. It can be shown that the resulting preferred trade policy will tend to be an export subsidy if the fall in prices on the foreign market is not too great. On the other hand, for sectors others than its own, the lobby will always prefer an export tax (negative subsidy), since a positive subsidy would represent a cost for taxpayers and would worsen the terms of trade. The following result holds.

Lemma 4
A lobby of a sector i will prefer:

(i) *an export policy for its own sector, s_i^L, such that the following condition is satisfied:*

$$\frac{s_i^L}{p^*_{i,h}} = \frac{1}{\alpha_i} \left(\frac{\theta^*_{i,h}}{\epsilon^*_{x_{i,h}}} + \frac{\mu^*_{i,h} - 1}{\mu^*_{i,h}} \right) - \frac{\theta^*_{i,h} + 1}{\epsilon^*_{x_{i,h}}}, \qquad (33)$$

where $\theta^*_{i,h} = -\left(\frac{\partial p^*_{i,h}}{\partial s_i} + 1 \right) / \left(\frac{\partial p^*_{i,h}}{\partial s_i} \right) > 0$ measures the inverse of the pass-through of home exporters;

(ii) *an export tax , s_j^L,* for any other sector *$j \neq i$ such that the following condition is satisfied:*

$$\frac{s_j^L}{p^*_{j,h}} = -\frac{\theta^*_{j,h} + 1}{\epsilon^*_{x_{j,h}}}. \qquad (34)$$

[23]See, e.g. Flam and Helpman (1987), who clearly show that the net outcome of an export subsidy can be either positive or negative, depending on the trade-off between the change in the terms of trade and the effects on profits.

PROOF: *See Appendix C.*

From LEMMA 4 we notice that an export policy influences the welfare of individual lobbies along three main dimensions. First, there is the positive effect $\frac{1}{\alpha_i}\frac{\mu^*_{i,h}-1}{\mu^*_{i,h}}$ ascribed to the higher demand for home varieties and entailing major profits for domestic producers. In this sense an export subsidy affects the resource allocation in the same way as a tariff. Second, the positive term $\frac{1}{\alpha_i}\frac{\theta^*_{i,h}}{\epsilon^*_{x_{i,h}}}$ is due to the incomplete pass-through, implying that the subsidy is partially absorbed by exporters thus increasing their reward.[24] In the case of complete pass-through this term vanishes, while in the case of super pass-through it becomes negative. Third, there is a negative effect captured by $-\frac{\theta^*_{i,h}+1}{\epsilon^*_{x_{i,h}}}$ which stems from the terms-of-trade loss and the cost of the policy for taxpayers, which, however, individuals belonging to the lobby will share with the rest of the population. This last effect is magnified when the pass-through is incomplete.

For the lobby, the cost of the subsidy is represented by the increase in the tax rate for its members. In practice, lobbies may easily represent only a small fraction of the population and the effect on prices is probably minor. In this case, our model would imply that the lobby contributes to an export subsidy for its own sector and to an export tax in other sectors. In that case our result will be in line with the findings of GH and Chang (2005).

We are now ready to study the equilibrium structure of protection for exports. Consider the marginal effect of a subsidy on the government objective function:

$$\begin{aligned}\frac{\partial \widetilde{G}}{\partial s_j} &= \sum_{i\in L}\frac{\partial W_i}{\partial s_j} + a\frac{\partial W}{\partial s_j} \\ &= (I_j{+}a)\,\lambda_j K_j N^* \frac{\partial p^*_{j,h}}{\partial s_j}x^*_{j,h} + (I_j-\alpha_L)\,\lambda_j K_j N^* x^*_{j,h} + \\ &+ (I_j{+}a)\,\lambda_j K_j N^* \left(p^*_{j,h}+s_j-c_j\right)\frac{\partial x^*_{j,h}}{\partial s_j} + \\ &- (a{+}\alpha_L)\,\lambda_j K_j N^* s_j \frac{\partial x^*_{j,h}}{\partial s_j}.\end{aligned} \tag{35}$$

Starting from free trade, the effects of a marginal increase in an export subsidy on the welfare of a corrupt government depend on the positive effects on profits in favour of domestic producers and on the negative effects due to the terms-of-trade loss as well as on the cost of this policy. When deciding the export policy for an organized sector, the government will attach a higher weight to the first positive effect, so that in equilibrium it is more likely that sectors represented by lobbies will benefit from an export subsidy, while the result for the unorganized sectors will crucially depend on the size of the relative weight, a, attached to social welfare. The solution to the government maximization problem, yielding the equilibrium structure of protection (i.e. the politically optimal export policy), can be summarized as follows.

PROPOSITION 2

For the organized sector i the political equilibrium export policy, s_i^G, must satisfy the following condition:

$$\frac{s_i^G}{p^*_{i,h}} = \frac{a+1}{a{+}\alpha_L}\left(\frac{\theta^*_{i,h}}{\epsilon^*_{x_{i,h}}} + \frac{\mu^*_{i,h}-1}{\mu^*_{i,h}}\right) - \frac{\theta^*_{i,h}+1}{\epsilon^*_{x_{i,h}}}, \tag{36}$$

[24]For $\alpha_i \to 1$, the two terms cancel out $\frac{1}{\alpha_i}\frac{\theta^*_{i,h}}{\epsilon^*_{x_{i,h}}}$ and $-\frac{\theta^*_{i,h}}{\epsilon^*_{x_{i,h}}}$, and (33) boils down in (31).

so that $s_i^W < s_i^G < s_i^L$.

For the unorganized sector $j \neq i$ *the political equilibrium export policy,* s_j^G, *must satisfy the following condition:*

$$\frac{s_j^G}{p_{j,h}^*} = \frac{a}{a+\alpha_L}\left(\frac{\theta_{j,h}^*}{\epsilon_{x_{j,h}}^*} + \frac{\mu_{j,h}^* - 1}{\mu_{j,h}^*}\right) - \frac{\theta_{j,h}^* + 1}{\epsilon_{x_{j,h}}^*}, \tag{37}$$

so that $s_j^L < s_j^G < s_j^W$.

PROOF: *See Appendix C.*

According to the above proposition the political equilibrium subsidy for the organized sector lies above the socially optimal subsidy and below the one preferred by the lobby itself; for the unorganized sectors $j \neq i$ the political equilibrium export subsidy lies below the socially optimal subsidy and above the export tax preferred by the lobby. Clearly, a positive export subsidy is likely to be chosen for the organized sectors, given the government interest in campaign contributions, provided that the last term in (36) is fully offset by the positive effects on profits of domestic producers. Unorganized sectors may, instead, receive a subsidy or bear a tax, depending on whether the relative weight the government assigns to social welfare is high or low, and on the magnitude of the incomplete pass-through. Contrary to GH, where the equilibrium export policy for the unorganized sectors is represented by an export tax, in this framework the final outcome is not clear-cut. Finally, an important remark is in order. From PROPOSITION 2 we observe how a lower pass-through (i.e. a higher $\theta_{i,h}^*$) tends to push the equilibrium towards a higher export subsidy for the organized sectors and towards an export tax for the unorganized sectors.

6 Conclusions

In this paper we consider the way in which the conclusions reached in the literature on protection for sale must be modified if one takes simultaneous account of price interactions and incomplete pass-through. To this end we make use of a general model of monopolistic competition with a structure of preferences allowing for price markups to vary in response to trade policy shifts and to affect the equilibrium tariff and subsidy set by a government influenced by the political contributions of lobbies. The resulting setup accommodates three incentives of trade protection in a unified framework: terms of trade effects due to incomplete pass-through, political motive due to the action of special interest groups, and direct profit effect due to imperfect competition. We show that in each sector trade policy is the result of the non-trivial interplay of these different incentives.

We find that for sectors organized into interest groups the endogenous import tariff is always positive and inversely related to the degree of import penetration, consistently with previous theoretical findings. On the other hand, for sectors which are not represented by a lobby the endogenous import policy can be a tariff or a subsidy, and is found to be inversely related to the level of import penetration, provided that the importance that the government attaches to aggregate welfare and/or the gross markup on domestic sales are relatively high. Clearly, this last finding may in part explain why industries classified as unorganized also receive positive levels of trade protection. Finally, turning to exportations, we find that a positive export subsidy is chosen for the organized sectors, provided that the terms-of-trade loss is fully offset by the major profits for domestic producers stemming from this trade policy. Unorganized sectors may, instead, benefit from a subsidy or bear a tax, depending on how much the government values political contributions against the welfare of individuals. The final outcome depends, also for unorganized sectors, on the degree of pass-through.

We argue that future research should address the empirical relevance of the protection-for-sale class of models taking into account the role played by preferences and market structure in shaping the equilibrium trade policy.

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Declarations of Interest

None.

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Appendix A

Marshall's Second Law and Convexity of the Demand Function

In this Appendix we first derive the condition which ensures that Marshall's second law holds (i.e. elasticity $\varepsilon_{x_{i,h}}$ is declines in the quantity sold $x_{i,h}$) so that ASSUMPTION 1 holds. From the definition of elasticity and the indirect demand function we have:

$$\varepsilon_{x_{i,h}} = -\frac{D(x_{i,h}, X_i)}{x_{i,h} D_{x_{i,h}}(x_{i,h}, X_i)} = -\frac{u'(x_{i,h})}{x_{i,h} u''(x_{i,h})}. \tag{A.1}$$

The derivative of $\varepsilon_{x_{i,h}}$ with respect to the quantity consumed $x_{i,h}$ is simply:

$$\frac{d\varepsilon_{x_{i,h}}}{dx_{i,h}} = -\frac{u''(x_{i,h}) x_{i,h} u''(x_{i,h}) - u'(x_{i,h}) u''(x_{i,h}) - u'(x_{i,h}) x_{i,h} u'''(x_{i,h})}{\left[x_{i,h} u''(x_{i,h})\right]^2}, \tag{A.2}$$

which can be written as

$$\frac{d\varepsilon_{x_{i,h}}}{dx_{i,h}} = -\frac{u'(x_{i,h}) u''(x_{i,h})}{\left[x_{i,h} u''(x_{i,h})\right]^2} \left(\frac{u''(x_{i,h}) x_{i,h}}{u'(x_{i,h})} - 1 - \frac{x_{i,h} u'''(x_{i,h})}{u''(x_{i,h})} \right), \tag{A.3}$$

or equivalently

$$\frac{d\varepsilon_{x_{i,h}}}{dx_{i,h}} = -\frac{u'(x_{i,h}) u''(x_{i,h})}{\left[x_{i,h} u''(x_{i,h})\right]^2} \left(-\frac{1}{\varepsilon_{x_{i,h}}} - 1 + \rho_{x_{i,h}} \right). \tag{A.4}$$

In order to have $\frac{d\varepsilon_{x_{i,h}}}{dx_{i,h}} < 0$, the following condition must hold:

$$\rho_{x_{i,h}} < \frac{\varepsilon_{x_{i,h}} + 1}{\varepsilon_{x_{i,h}}} \tag{A.5}$$

This shows the derivation of condition (10).

Profit Maximization

Given the profit function $\pi_{i,h} = (p_{i,h} - c_i) N x_{i,h}$, the first-order condition for profit maximization is:

$$D_{x_{i,h}}(x_{i,h}, X_i) x_{i,h} + D(x_{i,h}, X_i) = c_i, \tag{A.6}$$

where we have made use of the indirect demand function $p_{i,h} = D(x_{i,h}, X_i)$, taking X_i as given. Clearly, the above condition implies that for any positive marginal cost it must be $D_{x_{i,h}}(X_i, x_{i,h}) x_{i,h} + D(X_i, x_{i,h}) > 0$, which is equivalent to saying that the elasticity of the (perceived) demand function must be larger than 1, i.e. $\varepsilon_{x_{i,h}} > 1$. Rearranging, it can be shown that the pricing condition (11) must hold.

The quantity $x_{i,h}$ which solves (A.6) is the unique maximizer of the profit function provided that the second-order condition holds:

$$D_{x_{i,h}, x_{i,h}}(X_i, x_{i,h}) x_{i,h} + 2 D_{x_{i,h}}(X_i, x_{i,h}) < 0, \tag{A.7}$$

which can be re-formulated more compactly by using the measure of the curvature of the demand function (9), that is $\rho_{x_{i,h}} < 2$.

Price Elasticity to the Price Index

We now show that Assumption 1 ensures that $0 < (dp_{i,h}/dP_i)(P_i/p_{i,h}) < 1$. Totally differentiate (11) taking as given the marginal cost c_i:

$$dp_{i,h} = \frac{\partial \mu_{i,h}}{\partial x_{i,h}} \frac{\partial x_{i,h}}{\partial p_{i,h}} dp_{i,h} + \frac{\partial \mu_{i,h}}{\partial x_{i,h}} \frac{\partial x_{i,h}}{\partial P_i} dP_i. \tag{A.8}$$

Note that Assumption 1 implies $\frac{\partial \mu_{i,h}}{\partial x_{i,h}} > 0$. Re-arranging:

$$\frac{dp_{i,h}}{dP_i} = \frac{\frac{\partial \mu_{i,h}}{\partial x_{i,h}} \frac{\partial x_{i,h}}{\partial P_i}}{1 - \frac{\partial \mu_{i,h}}{\partial x_{i,h}} \frac{\partial x_{i,h}}{\partial p_{i,h}}}. \tag{A.9}$$

Recalling (6), we have $\frac{\partial x_{i,h}}{\partial P_i} = -v' \frac{p_{i,h}}{P_i^2} > 0$ and $\frac{\partial x_{i,h}}{\partial p_{i,h}} = v' \frac{1}{P_i} < 0$, thus the above equation can be manipulated to yield:

$$\frac{dp_{i,h}}{dP_i} \frac{P_i}{p_{i,h}} = \frac{-\frac{\partial \mu_{i,h}}{\partial x_{i,h}} v' \frac{1}{P_i}}{1 - \frac{\partial \mu_{i,h}}{\partial x_{i,h}} v' \frac{1}{P_i}}, \tag{A.10}$$

from which is clear that $0 < \frac{dp_{i,h}}{dP_i} \frac{P_i}{p_{i,h}} < 1$.

Positive Pass-Through

We now demonstrate that (A.7) implies that, following an increase in the marginal cost, the price set by the firm will increase as well, therefore $dp_{i,h}/dc_i > 0$. Totally differentiating condition (A.6), taking P_i as given, yields:

$$\left[D_{x_{i,h},x_{i,h}}(X_i, x_{i,h}) x_{i,h} + 2D_{x_{i,h}}(X_i, x_{i,h})\right] \frac{\partial x_{i,h}(p_{i,h}, P_i)}{\partial p_{i,h}} dp_{i,h} = dc_i. \tag{A.11}$$

Since $\frac{\partial x_{i,h}(p_{i,h}, P_i)}{\partial p_{i,h}} < 0$, to have a positive relationship between the marginal cost and the price level, then (A.7) must hold.

It should be noted that the above condition is sufficient to yield a positive relationship between $p_{i,h}$ and c_i also in equilibrium, provided that Marshall's first law is satisfied, that is under the assumption that $\frac{\partial x_{i,h}(p_{i,h}, P_i)}{\partial p_{i,h}} + \frac{\partial x_{i,h}(p_{i,h}, P_i)}{\partial P_i} \frac{\partial P_i}{\partial p_{i,h}} < 0$.

Incomplete Pass-Through

We now derive the condition which ensures incomplete pass-through, so that Assumption 2 holds. We start by re-writing (11)

$$p_{i,h}\left(1 + \eta_{x_{i,h}}\right) = c_i, \tag{A.12}$$

where $\eta_{x_{i,h}} \equiv -\frac{1}{\varepsilon_{x_{i,h}}}$. By making use of (8) we have

$$\frac{d\eta_{x_{i,h}}}{dx_{i,h}} = \frac{u''(x_{i,h})}{u'(x_{i,h})} \left(1 - \rho_{x_{i,h}} + \frac{1}{\varepsilon_{x_{i,h}}}\right), \tag{A.13}$$

To simplify notation let $\gamma_{x_{i,h}} \equiv -\frac{u''(x_{i,h})}{u'(x_{i,h})}\left(1-\rho_{x_{i,h}}+\frac{1}{\varepsilon_{x_{i,h}}}\right)$, thus $\frac{d\eta_{x_{i,h}}}{dx_{i,h}} = -\gamma_{x_{i,h}}$. Totally differentiating (A.12) and using the above result gives:

$$dp_{i,h}\left(1+\eta_{x_{i,h}}\right) - p_{i,h}\gamma_{x_{i,h}}dx_{i,h} = dc_i, \tag{A.14}$$

where from the direct demand function we have that $dx_{i,h} = \left(\frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial p_{i,h}} + \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i}\frac{\partial P_i}{\partial p_{i,h}}\right)dp_{i,h}$. Therefore to have incomplete pass-through it must be that

$$\left(1+\eta_{x_{i,h}}\right) - p_{i,h}\gamma_{x_{i,h}}\left(\frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial p_{i,h}} + \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i}\frac{\partial P_i}{\partial p_{i,h}}\right) > 1, \tag{A.15}$$

which given (A.13) can be written as

$$-\frac{1}{\varepsilon_{x_{i,h}}} + x_{i,h}\frac{u''(x_{i,h})}{u'(x_{i,h})}\left(1-\rho_{x_{i,h}}+\frac{1}{\varepsilon_{x_{i,h}}}\right)\left(\frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial p_{i,h}}\frac{p_{i,h}}{x_{i,h}} + \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i}\frac{\partial P_i}{\partial p_{i,h}}\frac{p_{i,h}}{x_{i,h}}\right) > 0, \tag{A.16}$$

or equivalently as

$$-\frac{1}{\varepsilon_{x_{i,h}}} - \frac{1}{\varepsilon_{x_{i,h}}}\left(1-\rho_{x_{i,h}}+\frac{1}{\varepsilon_{x_{i,h}}}\right)\left(-\varepsilon_{x_{i,h}}+\kappa_{x_{i,h}}\right) > 0. \tag{A.17}$$

Taking P_i as given (i.e. $\kappa_{x_{i,h}} \equiv \frac{\partial x_{i,h}(p_{i,h},P_i)}{\partial P_i}\frac{\partial P_i}{\partial p_{i,h}}\frac{p_{i,h}}{x_{i,h}} = 0$) the above condition boils down to:

$$-\frac{1}{\varepsilon_{x_{i,h}}} + \frac{1}{\varepsilon_{x_{i,h}}}\left(1-\rho_{x_{i,h}}+\frac{1}{\varepsilon_{x_{i,h}}}\right)\varepsilon_{x_{i,h}} > 0, \tag{A.18}$$

that can be simplified to

$$\rho_{x_{i,h}} < 1. \tag{A.19}$$

If we account for the market equilibrium effects, however, the above condition will not be sufficient to have incomplete pass-through. For $\kappa_{x_{i,h}} > 0$, (A.17) can be re-written as

$$1-\rho_{x_{i,h}} - \frac{1}{\varepsilon_{x_{i,h}}}\left(1-\rho_{x_{i,h}}+\frac{1}{\varepsilon_{x_{i,h}}}\right)\kappa_{x_{i,h}} > 0, \tag{A.20}$$

or equivalently

$$\rho_{x_{i,h}} < 1 - \frac{1}{\varepsilon_{x_{i,h}}}\frac{\kappa_{x_{i,h}}}{\varepsilon_{x_{i,h}}-\kappa_{x_{i,h}}}. \tag{A.21}$$

This shows the derivation of condition (12).

Appendix B

Inequalities (15)-(16)

In this Appendix we first show that given the assumptions of Section 2 in equilibrium, we have (15). From (14) the marginal effect of an increase in the import specific tariff is analogous to that produced by an increase in the marginal cost. ASSUMPTION 2 then implies incomplete pass-through, that is $0 < \partial p_{i,f}/\partial t_i < 1$, in fact following the introduction of an import tariff, foreign producers will charge a lower markup in the domestic market. On the other hand, domestic producers will face a higher demand for their varieties and will be induced to charge a higher a markup, that is why $\partial p_{i,h}/\partial t_i > 0$. However, imperfect substitutability among varieties ensures that the reaction of home producers to foreign prices is less than proportional, so that $\partial p_{i,h}/\partial t_i < \partial p_{i,f}/\partial t_i$.

Consider now inequalities (16). The introduction of an export tariff is isomorphic to a decrease of the marginal cost. ASSUMPTION 2 ensures incomplete pass-through, therefore $-1 < \partial p^*_{i,h}/\partial s_i < 0$. Following the introduction of an export subsidy home producers will then charge a higher markup in the foreign market. Conversely, foreign producers will face a lower demand for their varieties and will then charge lower markups, $\partial p^*_{i,f}/\partial s_i < 0$. As in the previous case, since the price change represents the best response of foreign producers to a decrease in the price by home producers, imperfect substitutability among varieties ensures that $\partial p^*_{i,h}/\partial s_i < \partial p^*_{i,f}/\partial s_i$.

Appendix C[25]

Proof of Lemma 1

From (22) the welfare-maximizing tariff must satisfy the following condition:

$$\lambda_j (p_{j,h} - c_j) \frac{\partial x_{j,h}}{\partial t_j} + (1 - \lambda_j) \left[\frac{\partial x_{j,f}}{\partial t_j} t_j + \left(1 - \frac{\partial p_{j,f}}{\partial t_j} \right) x_{j,f} \right] = 0, \tag{C.1}$$

which can be easily manipulated as follows by introducing the definitions $\theta_{j,f} = \left(1 - \frac{\partial p_{j,f}}{\partial t_j}\right) / \left(\frac{\partial p_{j,f}}{\partial t_j}\right)$, $\epsilon_{x_{j,f}} = -\left(\frac{\partial x_{j,f}}{\partial t_j} / \frac{\partial p_{j,f}}{\partial t_j}\right) (p_{j,f}/x_{j,f})$, and $\sigma_{x_{j,h}} = \left(\frac{\partial x_{j,h}}{\partial t_j} / \frac{\partial p_{j,f}}{\partial t_j}\right) \frac{p_{j,f}}{x_{j,h}}$:

$$\frac{t_j^W}{p_{j,f}} = \frac{\theta_{j,f}}{\epsilon_{x_{j,f}}} + \frac{\lambda_j}{1 - \lambda_j} (p_{j,h} - c_j) \frac{x_{j,h}}{x_{j,f} p_{j,f}} \frac{\sigma_{x_{j,h}}}{\epsilon_{x_{j,f}}}. \tag{C.2}$$

By recalling the pricing condition (13) and $z_j = \lambda_j x_{j,h} p_{j,h} \left[(1 - \lambda_j) x_{j,f} p_{j,f} \right]^{-1}$, the result of LEMMA 1 immediately follows.

Proof of Lemma 2

From (24), after some straightforward manipulations, introducing the definitions of $\theta_{j,f}$, $\epsilon_{x_{j,f}}$, $\sigma_{x_{j,h}}$, z_j used for LEMMA 1 and a measure of the reactivity home prices to foreign prices, $\sigma_{p_{j,h}} = \left(\frac{\partial p_{j,h}}{\partial t_j} / \frac{\partial p_{j,f}}{\partial t_j}\right) \frac{p_{j,f}}{p_{j,h}}$, and using the pricing condition (13), the preferred tariff, t_j^L, for a lobby must satisfy the following condition:

$$\frac{t_j^L}{p_{j,f}} = \frac{\theta_{j,f}}{\epsilon_{x_{i,f}}} + \frac{z_j}{\alpha_i} \left(\frac{\delta_{ij} - \alpha_i}{\epsilon_{x_{j,f}}} \sigma_{p_{j,h}} + \delta_{ij} \frac{\mu_{j,h} - 1}{\mu_{j,h}} \frac{\sigma_{x_{j,h}}}{\epsilon_{x_{j,f}}} \right). \tag{C.3}$$

which collapses into (25) for $j = i$ and $\delta_{ij} = 1$, and into (26) for $j \neq i$ and $\delta_{ij} = 0$.

[25] For further details, see the Technical Appendix available on the authors' homepages.

Proof of Proposition 1

From (27), after some manipulations, introducing the definitions of $\theta_{j,f}$, $\epsilon_{x_{j,f}}$, $\sigma_{x_{j,h}}$, z_j and $\sigma_{p_{j,h}}$, and using the pricing condition (13), the import policy emerging in the political equilibrium must satisfy the following condition:

$$\frac{t_j^G}{p_{j,f}} = \frac{\theta_{j,f}}{\epsilon_{x_{i,f}}} + z_j \left(\frac{I_j - \alpha_L}{a + \alpha_L} \frac{\sigma_{p_{j,h}}}{\epsilon_{x_{j,f}}} + \frac{I_j + a}{a + \alpha_L} \frac{\mu_{j,h} - 1}{\mu_{j,h}} \frac{\sigma_{x_{j,h}}}{\epsilon_{x_{j,f}}} \right), \tag{C.4}$$

Since $I_j = 1$ if $j \in L$ and $I_j = 0$ if $j \notin L$ the results of equations (28) and (29) immediately follow. Inequalities $t_i^W < t_i^G < t_i^L$ and $t_j^L < t_j^G < t_j^W$ follow from close inspections of (23), (25), (28) and of (23), (26), (29).

Proof of Lemma 3

The marginal effect of an export subsidy on welfare can be written as

$$\begin{aligned} \frac{\partial W}{\partial s_j} &= \frac{\partial \Pi_j}{\partial s_j} + N^* \frac{\partial R}{\partial s_j}, \\ &= \lambda_j K_j N^* \left[\left(\frac{\partial p_{j,h}^*}{\partial s_j} + 1 \right) x_{j,h}^* + \left(p_{j,h}^* + s_j - c_j \right) \frac{\partial x_{j,h}^*}{\partial s_j} \right] + \\ &- \lambda_j K_j N^* \left(x_{j,h}^* + s_j \frac{\partial x_{j,h}^*}{\partial s_j} \right), \end{aligned} \tag{C.5}$$

that can be simplified to deliver (30). Since we are interested in characterizing the welfare maximizing export policy, we write the first order condition as follows

$$\left(\frac{\partial p_{j,h}^*}{\partial s_j} / \frac{\partial x_{j,h}^*}{\partial s_j} \right) \frac{x_{j,h}^*}{p_{j,h}^*} + \frac{p_{j,h}^* + s_j - c_j}{p_{j,h}^*} = \frac{s_j}{p_{j,h}^*}. \tag{C.6}$$

By introducing the definition of $\epsilon_{x_{j,h}}^*$ and using the fact that the optimal pricing equation of home producers in the foreign market is analogous to (14), that is $p_{j,h}^* = \mu_{i,h}^* (c_j - s_j)$, (C.6) can be expressed as in (31).

Proof of Lemma 4

From (32), after some manipulations, introducing $\theta_{j,h}^*$ and $\epsilon_{x_{j,h}}^*$, and using the pricing condition $p_{j,h}^* = \mu_{i,h}^* (c_j - s_j)$, the preferred export policy, s_j^L, for a lobby must satisfy the following condition:

$$\frac{s_j^L}{p_{j,h}^*} = \frac{\delta_{ij}}{\alpha_j} \left(\frac{\theta_{j,h}^*}{\epsilon_{x_{j,h}}^*} + \frac{\mu_{j,h}^* - 1}{\mu_{j,h}^*} \right) - \frac{\theta_{j,h}^* + 1}{\epsilon_{j,h}^*}, \tag{C.7}$$

which collapses into (33) for $j = i$ and $\delta_{ij} = 1$, and into (34) for $j \neq i$ and $\delta_{ij} = 0$.

Proof of Proposition 2

From (27), recalling the definitions of $\theta_{j,h}^*$ and $\epsilon_{x_{j,h}}^*$, and using the pricing condition $p_{j,h}^* = \mu_{i,h}^* (c_j - s_j)$, the export policy emerging in the political equilibrium must satisfy the following condition:

$$\frac{s_j^G}{p_{j,h}^*} = \frac{I_j + a}{a+\alpha_L}\left(\frac{\theta_{j,h}^*}{\epsilon_{j,h}^*} + \frac{\mu_{j,h}^* - 1}{\mu_{j,h}^*}\right) - \frac{\theta_{j,h}^* + 1}{\epsilon_{x_{j,h}}^*}. \tag{C.8}$$

Since $I_j = 1$ if $j \in L$ and $I_j = 0$ if $j \notin L$ the results of equations (36) and (37) immediately follow. Inequalities $s_i^W < s_i^G < s_i^L$ and $s_j^L < s_j^G < s_j^W$ follow from close inspection of (31), (33), (36) and of (31), (34), (37).