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 governments to consumer welfare when making their policy decision, but also on the degree of market power of firms and on the terms of trade variations due to the incomplete pass-through. Overall, our results highlight the importance of demand characteristics in shaping the structure of protection, possibly accommodating some of the empirical puzzles of the "protection for sale" literature.

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

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

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1 Introduction

Free trade is often the welfare maximizing choice in many theoretical models and frequently advocated in international policy frameworks. However, when trade policy comes into play, free trade is rarely chosen by individual countries and not easily chosen by groups of countries. There are a number of explanations for this discrepancy between theory and practice. One is that real markets are not perfectly competitive and there are market imperfections. Another reason is that politics matters and there are many sources of strategic interactions to be taken into account. There is a vast literature on this topic, however, one of the most influential papers is the one by Grossman and Helpman (1994) (henceforth GH), which develop a formal micro-founded model with clear-cut testable predictions about the cross-sectional 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 optimum, the structure of protection that emerges in the political equilibrium entails an import tariff (export tax) 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 seem to have surprising little power over the government, which is not in line with the GH model. As a matter of fact, the unexpectedly benevolent government is the very puzzle of empirical studies on the "protection for sale" type of models. In addition, the GH model predicts that unorganized industries should receive negative protection (e.g. an import subsidy), while according to the empirical evidence, industries classified as unorganized receive positive levels of trade protection.[1]

In a subsequent paper Grossman and Helpman (see Grossman and Helpman, 1995) 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 of the GH model have been proposed. For instance, Mitra (1999) endogenizes lobbies formation; heterogeneous firms are considered in Bombardini (2005); Matschk 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). Despite these models demonstrate that additional factors can enrich the original framework, yet the core of the GH model and its basic predictions remain unchanged.

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 entails protection in all sectors, whether organized or not; second, the imperfectly competitive structure of the economy implies that free-trade is no more 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). These results are mainly driven by the degree of market power of firms, which introduces linkages between sectors (cross-price effects) and rivalry between lobbies. As a consequence, individual lobbies have

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

a smaller incentive to ask for protection. Furthermore, although the model takes lobbies as exogenous, the scope for lobby formation seems reduced with respect to the GH model: since unorganized sectors will be protected anyway, they have an incentive to act as free riders.

A specific feature of the Chang (2005) paper is given by the Dixit-Stiglitz market structure, which implies that markups are constant, so ruling out, by construction, any possible terms of trade effects from the analysis. In this paper we relax this assumption by introducing a general model of monopolistic competition with variable markups into a model with special interest groups, where trade policy is the result of a political calculus as in GH. One immediate implication is that domestic and foreign producer prices reflect the government interventions in trade, so that equilibrium trade policies now depend on the rich interplay of different mechanisms, namely: (i) the political support motive for trade interventions, due to the campaign contributions of organized sectors able to influence government decisions; (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 trade protection related to the existence of a certain degree of strategic interactions among firms in a monopolistic competition framework allowing for variable markups and incomplete 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 interactions between the first and the second forces. Finally, in Grossman and Helpman (1995), where the small-country assumption is removed and border prices depend on purchases and sales, trade protection is the result of the first and of the third motives.

Our results can be summarized as follows. For sectors organized into interest groups 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 size of the pass-through, and is inversely related to the level of import penetration, provided that the relative weight the government attaches to aggregate welfare and the gross markup on domestic sales are relatively high; under general conditions, namely a sufficient high degree of product differentiation, the endogenous export policy consists in an export subsidy for organized sectors and in an export tax for unorganized sectors.

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 continuum 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. 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. 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:

$$X_i = \int_0^{K_i} u(x_{i,h})dh, \tag{2}$$

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 $(0, \infty)$. 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

$$E_i = \int_0^{K_i} p_{i,h} x_{i,h} dh, \tag{4}$$

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 $v(\cdot) = (u')^{-1}(\cdot)$, 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 P_i solves the equation:

$$P_i = U'\left(\int_0^{K_i} u\left(v\left(p_{i,h}/P_i\right)\right) dk_i\right). \tag{7}$$

The consumer surplus from differentiated goods is defined as $\mathcal{S} \equiv \sum_{i=1}^{n}\left(U(X_i) - \sum_{i=1}^{n} E_i\right)$ and, by Roy's identity, $\partial\mathcal{S}/\partial p_{i,h} = -x_{i,h}$.

The 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 P. However, 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. Firms have a partial perception of the demand elasticity since they neglect the impact of their pricing decisions on the market equilibrium. In other words firms only consider the partial equilibrium (i.e. direct) effects of their pricing decisions on demand and treat X_i and P_i parametrically. This way of expressing the direct and indirect

demand functions points towards taking a "firm's eye view of demand", as meant by Mrázová and Neary (2017), and allows us to distinguish between direct and indirect price effects.[2]

Given this negligibility assumption the elasticity of the indirect demand function $\varepsilon_{x_{i,h}}$ as perceived by the producer is

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

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 accounts also for the indirect effects of a price change.[3] 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, lobbies ideal trade policy will be based on both direct and indirect effects.

Following Mrázová and Neary (2017), we will make use of the following measure of curvature of the demand function, which will come in hand 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, whose behaviour needs to be characterized. In what follows we will work under the assumption that demand becomes less elastic when the quantity consumed increases, or equivalently more elastic when the price increases. This assumption is not new to the trade literature and it is sometimes referred to as 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.[4] As a consequence of this assumption, openness to trade, by reducing incumbent firms sales in the domestic market, will give rise to an increase in the price elasticity. Thus, following Krugman (1979), "[we] make the assumption without apology" (p. 476).

2.2 Pricing and Closed-Economy Equilibrium

On the production side, differentiated goods require labor, with a marginal cost c_i defined at the sectoral 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 mass 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 $\pi_{i,h} = (p_{i,h} - c_i) N x_{i,h}$, then the first-order condition for profit maximization requires that the marginal revenue is equal to the marginal cost:

$$D_{x_{i,h}}(x_{i,h}, X_i) x_{i,h} + D(x_{i,h}, X_i) = c_i, \tag{10}$$

[2] In what follows we will switch from direct to indirect demand functions as long as we keep on taking a "firm's eye view of demand".

[3] Notice 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 $\epsilon_{x_{i,h}} = -\frac{dx_{i,h}}{dp_{i,h}} \frac{p_{i,h}}{x_{i,h}}$ the effective elasticity of the direct demand function, then it must be $\epsilon_{x_{i,h}} = \varepsilon_{x_{i,h}} - \kappa_{x_{i,h}}$, where $\kappa_{x_{i,h}} = \left(\frac{\partial x_{i,h}(p_{i,h}, P_i)}{\partial P_i} \frac{\partial P_i}{\partial p_{i,h}} \right) \frac{p_{i,h}}{x_{i,h}} > 0$.

[4] Empirical results from Mrázová and Neary (2017) and De Loecker at al. (2016) strongly support this assumption. For a review of the empirical evidence see, among others, Zhelobodko, Kokovin, Parenti, and Thisse (2012).

where we have made use of the indirect demand function $p_{i,h} = D(x_{i,h}, X_i)$. Given the negligibility assumption, X_i is treated parametrically. 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 say that the elasticity of the (perceived) demand function must be larger than 1, i.e. $\varepsilon_{x_{i,h}} > 1$.

Equation (10) yields the usual markup over marginal cost pricing condition which can be expressed in terms of the direct demand perceived elasticity. Let $\mu_{i,k} = p_{i,h}/c_i$ denote the (gross) markup, then

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

The above equation then implies that, under the assumption that the elasticity is decreasing in $x_{i,h}$, a higher consumption of the differentiated product brings about an increase in the markup.

The quantity $x_{i,h}$ which solves (10) is the unique maximizer of the profit function provided that the second-order condition holds:

$$D_{x_{i,h},x_{i,h}}(X_i, x_{i,h})x_{i,h} + 2D_{x_{i,h}}(X_i, x_{i,h}) < 0, \tag{12}$$

which can be re-formulated more compactly by using the measure of the curvature of the demand function introduced in the previous section, that is $\rho_{x_{i,h}} < 2$. This restricts the analysis to preferences such that $\varepsilon_{x_{i,h}} > 1$ and $\rho_{x_{i,h}} < 2$.

Before turning to the open economy case, it is instructive to understand what happens to quantities and prices if the marginal cost increases. In the Appendix, we show that condition (12) implies that, following an increase in the marginal cost, the price will increase as well, therefore $dp_{i,h}/dc_i > 0$ and $dx_{i,h}/dc_i < 0$. 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 (or euro-per-euro pass-through). From (11) it can be shown that for having incomplete pass-through in equilibrium, $0 < dp_{i,h}/dc_i < 1$, the demand function must be such that $\rho_{x_{i,h}} < 1$ as long as the we neglect the general equilibrium effects and treat P_i parametrically. However, when we account for general equilibrium effects the condition is more stringent, and to have incomplete pass-through it must be that

$$\rho_{x_{i,h}} < 1 - \frac{\kappa_{x_{i,h}}}{1 - \kappa_{x_{i,h}}}, \tag{13}$$

where $\kappa_{x_{i,h}} \equiv \frac{\partial x_{i,h}(p_{i,h}, P_i)}{\partial P_i} \frac{\partial P_i}{\partial p_{i,h}} \frac{p_{i,h}}{x_{i,h}}$. See the Appendix for a proof. When preferences are purely additive or the external function $U(\cdot)$ is linear, then (13) boils down into the condition $\rho_{x_{i,h}} < 1$, which ensures incomplete pass-through in partial equilibrium. As shown by Mrázová and Neary (2017) these conditions characterize subconvex demand functions, that is to say less convex than a CES demand function having the same demand elasticity $\varepsilon_{x_{i,h}}$. In what follows we assume that first and the second Marshall's laws always hold and that preferences are not too convex, so that in the general equilibrium condition (13) is always satisfied.

Before concluding this section, notice that a different interpretation of (11) is that of best reaction function of the generic producer to the prices set by competitors operating in the same sector. In the Appendix, we show that, given the assumptions made, it must be $0 < dp_{i,h}/dP_i < 1$. The reaction function thus implies a positive, but less than proportional, price

adjustment in response to a change in P_i.[5] This guarantees the existence of a symmetric Nash equilibrium in which each firm is optimally pricing given the prices of all varieties.

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 are located in the foreign country F (with $0 < \lambda_i < 1$).

Firms maximize profits in each market separately (i.e. markets are segmented). The pricing conditions defined above, thus, hold with respect to the demand conditions prevailing in each market. In the 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:

$$p_{i,h} = \mu_{i,h} c_i, \tag{14}$$

$$p_{i,f} = \mu_{i,f} \left(c_i + t_i - s_i^* \right), \tag{15}$$

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

Given the structure of preferences, the marginal costs and the trade policy, from 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^* provided that an equilibrium exists and is unique. Henceforth, we assume that this is the case, so that, 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 for the H economy. Starting from free-trade, the assumptions made in the previous Section are sufficient to ensure that the following inequalities must hold in equilibrium:

$$0 < \partial p_{i,h}/\partial t_i < \partial p_{i,f}/\partial t_i < 1, \tag{16}$$

therefore $\partial x_{i,h}/\partial t_i > 0$, $\partial x_{i,f}/\partial t_i < 0$. See the Appendix. 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) second, firms adjust their prices in reaction to the new demand conditions resulting from the pricing decision of the competitors. The demand for the home produced varieties increase, because of the substitution effect. As a consequence the elasticity of demand for domestic varieties will decrease, leading home producers to set a higher markup.[6]

Intuitively, the first effect can be regarded as a standard pricing effect of the trade policies, while the second effect is a complementarity effect arising from the strategic interactions among

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

[6] Incomplete pass-through and strategic price interactions ensure that starting from free trade a marginal increase in the export subsidy on foreign varieties would have the following effects on prices $-1 < \partial p_{i,f}/\partial s_i^* < \partial p_{i,h}/\partial s_i^* < 0$ and on quantities $\partial x_{i,f}/\partial s_i^* > 0$, $\partial x_{i,h}/\partial s_i^* < 0$.

firms due to the existence of variable markups. Clearly, the magnitude of the reaction of home prices to a tariff crucially depends on import penetration. It should be noted that subconvexity of the demand function would have been sufficient to guarantee incomplete tariff pass-through under ad-valorem tariffs; however, with specific tariffs, as in this paper, a stronger assumption is needed, namely that the demand curve is not too convex, (i.e. condition 13 must always hold).[7]

Symmetric pricing equations hold for the foreign market. By denoting with a star superscript the foreign variables counterpart, 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:

$$-1 < \partial p_{i,h}^*/\partial s_i < \partial p_{i,f}^*/\partial s_i < 0, \tag{17}$$

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 (17) 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 the Appendix.

4 Lobbies, Government, and Welfare Measures

The typical individual derives income from wages, public transfers and possibly from the ownership of the sector-specific input, which is assumed to be indivisible and nontradable. Public transfers are constituted by the net revenue from the trade policy, which is completely redistributed to each individual by the government. Additionally, owners of the specific factor earn firms' profits. Transfers and firms' 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. The constant λ_i used above to indicate the fraction of the total number of firms that are based in country H, thus 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.

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

$$W_i(\mathbf{t}, \mathbf{s}) = l_i + \Pi_i(t_i, s_i) + \alpha_i N \left[R(\mathbf{t}, \mathbf{s}) + S(\mathbf{t})\right], \tag{18}$$

where $\mathbf{t}$, $\mathbf{s}$ denote the import tariff and the export subsidy vectors, l_i is labor income (and also labor supply), $\Pi_i(t_i, s_i) = \lambda_i K_i \pi_{i,h}$ represents the aggregate reward to the specific factor, $\pi_{i,h} = (p_{i,h} - c_i)x_{i,h}N + (p_{i,h}^* + s_i - c_i)x_{i,h}^* N^*$ are overall profits of the generic domestic firm 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, the population in the two countries is N and N^*, and $S(\mathbf{t})$ is the consumer surplus expressed as a function of the tariffs.

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

[7] The CES case is a useful benchmark. The CES demand is in fact too convex as it generates complete pass-through under ad-valorem tariffs and super pass-through under specific-tariffs (i.e. marginal revenues are flatter than demand). See Feenstra (2015) for details.

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

$$G(\mathbf{t}, \mathbf{s}) = \sum_{i \in L} C_i(\mathbf{t}, \mathbf{s}) + aW(\mathbf{t}, \mathbf{s}), \tag{19}$$

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

$$W(\mathbf{t}, \mathbf{s}) = l + \sum_{i=1}^{n} \Pi_i(t_i, s_i) + N[R(\mathbf{t}, \mathbf{s}) + S(\mathbf{t})], \tag{20}$$

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

In this policy game, the contributions schedules are truthful, that is, a group's contribution reflects exactly the group's willingness to pay for a change in trade policy (see Bernheim and Whinston, 1986). The government objective function is, thus, 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 as given the foreign trade policy. 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.

5.1 Import Trade Policy

We start by examining the impact of import trade policy on aggregate welfare. From equation (20) the marginal effect of an import tariff on the aggregate welfare is given by:

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

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, so that the net aggregate revenue depends on the degree of tariff absorption, which is the source of a positive terms of trade effect.

The effect of an import tariff on the aggregate welfare can be summarized as follows.

LEMMA 1

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

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

where $\theta_{j,f} = \left(1 - \frac{\partial p_{j,f}}{\partial t_j}\right) / \left(\frac{\partial p_{j,f}}{\partial t_j}\right) > 0$ *measures the pass-through,* $\epsilon_{j,f} = -\left(\frac{\partial x_{j,f}}{\partial t_j} / \frac{\partial p_{j,f}}{\partial t_j}\right)(p_{j,f}/x_{j,f}) > 0$ *is the elasticity of import demand,* $z_j = \lambda_j x_{j,h} p_{j,h} \left[(1-\lambda_j) x_{j,f} p_{j,f}\right]^{-1}$ is the inverse import penetration *and* $\sigma_{j,hf} = -\left(\frac{\partial x_{j,h}}{\partial t_j} / \frac{\partial x_{j,f}}{\partial t_j}\right)(x_{j,f}/x_{j,h}) > 0$ *measures the reallocation of demand from foreign to home variaties.*

PROOF: See the Appendix.

LEMMA 1 is the result of two beneficial effects of a tariff: (i) a positive effect on the profits of the domestic producers (due to imperfect competition); (ii) a positive effect on the net aggregate revenue, thank to the lower producer price on foreign varieties (i.e. terms of trade gains). Note that only one of the above effects would suffice in order for the social optimum to entail a positive tariff.[8] Our result is 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).[9]

Consider now the effects of a change in the import tariff of a generic sector j on the welfare of the lobby in sector $i \in L$. From equation (18), it follows that the welfare effect due to a marginal increase in t_j is

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

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 consumers' surplus.

The first term refers to the welfare gains deriving from the ownership of the specific factor, consisting in increased revenues stemming from higher sales and higher prices. The second term

[8] See also 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.

[9] This result is consistent with Chang (2005), where the positive effect on profits makes a tariff always desirable, even in the absence of any terms of trade effect.

refers to the losses suffered as 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 we have the following result.

LEMMA 2
A lobby of a sector i would prefer:

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

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

where $\epsilon_{i,hf} = -\left(\frac{\partial x_{i,f}}{\partial t_i}/\frac{\partial p_{i,h}}{\partial t_i}\right)(p_{i,h}/x_{i,f}) > 0$ denotes the cross price elasticity of imports;

(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:*

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

PROOF: See the Appendix.

According to LEMMA 2 a lobby would 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 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 effects on welfare due to higher domestic prices. On the contrary, in the case of higher pass-through of a tariff into import prices (i.e. low $\theta_{j,f}$), the lobby would prefer an import subsidy (negative import tariff) for all 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:

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

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 the 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, 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:

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

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:

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

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

PROOF: *See the Appendix.*

PROPOSITION 1 states that the campaign contributions by the lobby 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, brings about 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, $\frac{\theta_{j,f}}{\epsilon_{j,ff}}$; second, the original GH political motive for protection, captured by the term $z_i \frac{1-\alpha_L}{a+\alpha_L} \frac{1}{\epsilon_{i,hf}}$ measuring the increase in domestic producer prices following the increase in import prices;[10] third, the imperfect competition motive for protection represented by the term $z_i \frac{\mu_{i,h}-1}{\mu_{i,h}} \sigma_{i,hf}$. These three components have been treated separately in the literature and, in particular, the relationship between the market structure and the relative importance of each component was not made explicit. In our framework, instead, the strategic interaction among producers may generate different outcomes, mainly depending on the degree of product substitutability.

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 consumer preferences, and by the combination of the size of the lobby representation (pushing

[10] It should be noted that under perfect competition condition as in GH $\theta_{i,f} = 0$ and $\mu_{i,h} = 1$, therefore condition (28) boils down into $\frac{t_i^G}{p_{i,f}} = z_i \frac{1-\alpha_L}{a+\alpha_L} \frac{1}{\epsilon_{i,hf}}$, where the cross price elasticity of imports $\epsilon_{i,hf}$ coincides with the price elasticity of imports when we have only one good.

towards a subsidy) and government preferences. In particular, the government would opt for a positive import tariff also for the unorganized sectors when the degree of tariff absorption is sufficiently large or when 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 and, even though apparently counterintuitive, it is consistent with a vast empirical literature on the topic. 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 $\frac{\alpha_L}{a} > \frac{\mu_{j,h}-1}{\mu_{j,h}} \frac{\sigma_{j,hf}}{\epsilon_{j,hf}}$, which makes explicit the interplay between the import penetration, the political framework and the market structure. It should be noted that under perfect competition (i.e marginal cost pricing, $\mu_{j,h} = 1$), we find a positive relationship, as in GH.

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.

In particular, the difference between the export subsidy and the import tariff regards the impact of the strategic behavior between firms over the economy. A change in the import tariff introduces an interplay between local and foreign producers, with both of them producing goods that are consumed domestically. On the contrary, a change in the export subsidy, while introducing a similar interaction between local and foreign producers, only affects goods that are consumed abroad. The absence of a consumer surplus effect greatly simplifies the analysis. In fact, the only effect that an export subsidy has on the domestic economy is to change the pricing decision of exporters and to increase taxes.

An export subsidy bears no benefit to the consumers, while imposing on them the cost of the subsidy itself. Only owners of some sector-specific input are able to benefit from a positive subsidy, since they may increase their reward. This situation resembles that of a free-riding problem much more closely than in the case of an import tariff (where positive terms of trade effects are operative). Indeed, now the contrast between owners of the specific factor (i.e. firms) and consumers is apparent: an export subsidy may allow few firms to increase their profits abroad, while spreading the cost among all the consumers. As a consequence, the higher the concentration of the specific factor, the stronger the free-riding incentives of the lobby.

Consider now the implications on social welfare. Using the same notation adopted in the previous section, from equation (20) the marginal effect of an export subsidy s_j on the aggregate welfare is given by:

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

where the first term represents the negative terms of trade effect due to a lower export price, while the second term reflects the positive effects on profits due to higher foreign sales.

The resulting final effect of an export subsidy on the aggregate welfare can be summarized as follows:

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

$$\frac{s_j}{p_{j,h}^*} = -\frac{1}{\epsilon_{j,h}^*} + \frac{\mu_{j,h}^* - 1}{\mu_{j,h}^*}, \tag{31}$$

where $\epsilon_{j,h}^* = -\left(\frac{\partial x_{j,h}^*}{\partial s_j} / \frac{\partial p_{j,h}^*}{\partial s_j}\right)\left(p_{j,h}^*/x_{j,h}^*\right) > 0$ is the export demand elasticity and $\mu_{j,h}^*$ is the gross markup of home producers in the foreign market.
PROOF: See the Appendix.

Clearly, 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.

Consider now the effects of a change in the export subsidy of a generic sector j on the welfare of the lobby in sector in sector $i \in L$. From equation (18), it follows that the welfare effect due to a marginal increase in s_j is

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

Export trade policy in their own sectors affects lobbies' welfare through two channels: (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 of prices in the foreign market is not too high. On the other hand, for sectors others than its own, the lobby would prefer an export tax (negative subsidy), since a positive subsidy would represent a cost for the taxpayer and would worsen the terms of trade. The following result holds:

LEMMA 4
A lobby of a sector i would prefer:

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

$$\frac{s_i^L}{p_{i,h}^*} = \frac{1}{\alpha_i}\left(\frac{\theta_{i,h}}{\epsilon_{i,h}^*} + \frac{\mu_{i,h}^* - 1}{\mu_{i,h}^*}\right) - \frac{x_{i,h}^*}{p_{i,h}^*} / \left(\frac{\partial x_{i,h}^*}{\partial s_i}\right), \tag{33}$$

where $\theta_{i,h} = -\left(\frac{\partial p_{i,h}^*}{\partial s_i} + 1\right) / \left(\frac{\partial p_{i,h}^*}{\partial s_i}\right) > 0$

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

$$\frac{s_j^L}{p_{j,h}^*} = -\frac{x_{i,h}^*}{p_{i,h}^*} / \left(\frac{\partial x_{i,h}^*}{\partial s_i} \right). \tag{34}$$

PROOF: See the Appendix.

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 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 for an export subsidy for its own sector and for an export tax in other sectors. This result is in line with the findings in GH and Chang (2005).

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

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

For the organized sector the political equilibrium subsidy lies above the socially optimal subsidy and below the 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.

PROPOSITION 2

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

$$\frac{s_i^G}{p_{i,h}^*} = \frac{1+a}{a+\alpha_L} \left(\frac{\theta_{i,h}}{\epsilon_{i,h}^*} + \frac{\mu_{i,h}^* - 1}{\mu_{i,h}^*} \right) - \frac{x_{i,h}^*}{p_{i,h}^*} / \left(\frac{\partial x_{i,h}^*}{\partial s_i} \right), \tag{36}$$

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:*

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

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

[to be completed]

5.3 Discussion

[to be written]

6 Conclusions

[to be completed]

In this paper we investigate how a monopolistic competition market structure, which allows for markups to vary in response to trade policy shifts, is able to affect the equilibrium tariff and subsidy set by a government influenced by political contributions of lobbies. We show that in each sector trade policy is the result of a non-trivial interplay of different mechanisms each of which pushing the economy away from free trade. 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, depending on the trade policy exerted by the foreign country, 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 also industries classified as unorganized receive positive levels of trade protection. Finally, turning to exportations, we find that the endogenous export policy turns out to be an export subsidy for organized sectors and an export tax for unorganized sectors. We argue that future research should address the empirical relevance of the protection-for-sales class of models taking into account the role played by the market structure in shaping the equilibrium trade policy.

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Appendix

[to be written]