



Endogenous Protection within a framework of monopolistic competition à la Dixit –Stiglitz

Protección Endógena en una estructura de mercado de competencia monopolística à la Dixit-Stiglitz

MARÍA CECILIA GÁNAME

Facultad de Ciencias Económicas,
Universidad Nacional de Córdoba
mganame@eco.unc.edu.ar

ABSTRACT

This paper studies the determination of trade policy by considering an imperfect competitive market. The model adopts the political process developed by Grossman and Helpman (1994), but it also takes into account a different economic structure, which is based on the Footloose Capital model. Two new appealing insights come from the consideration of monopolistic competition. Firstly, in this setting the interest group seems to be more worried to persuade the government to set a high tariff when it can charge a low mark-up. Secondly, the initial distribution of industry might also influence the structure of protection in one economy.

Keywords: Endogenous trade policy; Monopolistic competition; Trade; Economic geography.

JEL classification: F12, F13, R30.

RESUMEN

La autora estudia la determinación de la política comercial en un marco de competencia imperfecta. El modelo incorpora el proceso político desarrollado por Grossman and Helpman (1994), teniendo en cuenta una estructura económica diferente, basada en el modelo Footloose Capital. Dos nuevas predicciones surgen al considerar competencia imperfecta. En primer lugar, en este marco, un lobby parece estar más preocupado en persuadir al gobierno de aplicar un arancel elevado cuando puede cargar al precio un bajo mark-up. En segundo lugar, la distribución inicial de la firma puede influir en la estructura de protección en una economía.



Palabras claves: Política comercial endógena; Competencia monopolística; Comercio; Geografía económica.

Clasificación JEL: F12, F13, R30.

I. INTRODUCTION

Quite often incumbent governments design economic policies considering not only the general well-being of societies but also their own political interests. Trade policies are one of the various sets of tools that policy makers have at hand to pursue their political objectives. This set comprises instruments of ad-valorem nature, quantity restrictions and a complex and diversified range of non-tariff barriers. Trade policies affect individuals' wealth, serving as frequent instruments to redistribute incomes among different groups in the society. Governments favor some interest groups by protecting them from foreign competition; while, at the same time, negatively affect others agents of a community.

During the three last decades, theoretical and empirical research has focused in analyzing the political process from which the structure of trade protection is determined. The Grossman and Helpman (1994) model is the prominent framework that explains the formation of trade policy in a representative democracy. This political-support approach has the interesting characteristic of providing micro-foundations to the player's actions, which are less formally specified in previous political economy models. The political process is developed by considering perfect competition. During the last decades, this core background has been extended in several ways.¹

Chang (2005) is one of the first attempts to analyze the determination of trade policy in an alternative market structure. This model adopts the political process developed by Grossman and Helpman (1994), but it takes into account the Krugman-Dixit-Stiglitz monopolistic competitive model. Two new insights, which are somewhat different from predictions of the core model under perfect competition, arise from this extension. Interestingly, an organized export sector may be affected by either an export subsidy or an

1. Bombardini (2008), Facchini et al. (2006), Gawande and Bandyopadhyay (2000), Gawande, et al. (2006) and Mitra (1999) present interesting theoretical extensions of the core model.

export tax. Moreover, the inverse of import penetration positively affects the level of endogenous tariff, regardless the political status of the productive sector. The author concludes that these differences in predictions suggest that endogenous levels of protection vary with the characteristics of the industrial sector, i.e. the market structures.

Facchini *et al.* (2010) have extended the Grossman and Helpman (1994) model by allowing different degrees of substitutability between domestically produced and imported goods in an *ad hoc* manner. The model relies on the Dixit-Stiglitz monopolistic model but introduces different degree of substitutability between differentiated goods *vis á vis* different source countries. The main prediction is that higher levels of protection in small economies are explained by a higher degree of substitutability between domestic and imported varieties.

Alternatively, Ossa (2013) has developed a general equilibrium framework of trade, which is based on the traditional model of Ricardo (1817), the monopolistic competition setting of Krugman (1980) and the core model of political economy.² The model serves to introduce a novel quantitative analysis of non-cooperative and cooperative trade policy; the quantitative application is a multi-regional and multi-industrial study for a big country; it hands estimations of the United States tariffs.³ One of the main results is that estimates of optimal tariffs, which are computed by taking as given all other countries' factual tariffs, are decreasing in the elasticity of substitution due to the profit shifting effect.⁴ The intuitive explanation posed by the author is that lower elasticities give the United States more monopoly power in world markets, which it optimally exploits by setting higher tariffs. The negative relationship between tariffs and the elasticity of substitution is also present when Nash tariffs are computed.⁵ When cooperative tariff are estimated, the relationship reverses; world cooperative tariffs are negative for those industries that evidence the lowest elasticities and increases strongly for industries with high elasticity of substitution.

2. The author introduces government's preferences as a reduced form of the incumbent's objective function specified in Grossman and Helpman (1994). The numerical exercise computes the political economy weights using estimates of Goldberg and Maggi (1999).

3. The author considers 7 regions, which are Brazil, China, the European Union, India, Japan, the United States and the Rest of the World, and 26 manufacturing industries.

4. As industries' mark ups are constants, the profit shifting effect captures changes in country i 's welfare due to changes in country i 's aggregate profits originated in changes of industry output.

5. In this case, countries optimally retaliate.

The present paper contributes the study of determination of trade policy within a monopolistic competitive framework. It presents a background introduced in Gáname (2005) and based on the political-support model of Grossman and Helpman (1994) that, though similar in nature to those models presented in Chang (2005), Facchini et al. (2010) and Ossa (2013), considers another economic structure based on the Footloose Capital model (Martin and Rogers, 1995). The Footloose Capital model (henceforth, FC) belongs to the New Economic Geography branch; it is the most tractable model among the economic geography settings. Hence, this paper aims to explore whether the fashion of the market structure may provide some new predictions.

In fact, the setting developed hands two new appealing insights that come from the consideration of monopolistic competition. Firstly, the interest group seems to be more worried to persuade the government to set a high tariff when it can charge a low mark-up. This insight is in line with the argument presented in Baldwin and Robert-Nicoud (2007). The authors show that asymmetric appropriability of rents is the reason why interest groups fight harder to avoid losses. Secondly, the initial distribution of industry might also influence the structure of protection in one economy. On the one hand, the presence of a high number of firms in the economy involves a tough level of competition among them, which tends to erode the potential gains that capital owners would derive from the protectionist policy. In this situation, lobbying activity might become less fruitful. On the other hand, if the number of firms might reflect a measure of lobby's political power, a higher number of firms will magnify the potential gains of protection. Hence, the lobby would be more willing to bid for protection.

This note is structured as follows. Section II presents the formal background, in which economic and political behaviors are specified. Section III introduces interesting insights that emerge from the political game when the spatial distribution of firms is taken as given, i.e. a short run analysis. Section IV gives the concluding remarks. Annex A presents the equilibrium of the spatial distribution of firms when trade costs (included trade policy) are considered exogenous. Finally, Annex B shows the comparative static analysis.

II. THE THEORETICAL FRAMEWORK

This section presents the main features of the model as well as a description of agents' preferences over trade policy, the specification of how

these preferences are aggregated into political demands and the government's objective function.

II.1 The economic structure

As it was mentioned above, the economic structure takes the form of the FC model which takes into account two economies, two sectors and two productive factors. One of the assumptions introduced is that one economy is small and represents the home country while the other is a large region and can be viewed as the rest of the world. They have similar tastes and technologies. The production structure is characterized by two different sectors, the industrial sector, which is considered as the *modern* one and the agricultural *traditional* sector. On the one hand, the industrial sector produces a number of varieties under increasing returns to scale and firms compete monopolistically. On the other hand, the agricultural sector produces a homogeneous good under constant return to scale and perfect competition. This good is traded without frictions; while differentiated goods are traded between countries with frictions and trade costs are modeled *à la* iceberg. The two economies are endowed with two factors, physical capital and labor. While the manufacture activity uses both factors, the agriculture sector only employs labor. In the short-run capital factor cannot migrate from one economy to the other. Labor is the inter-sectoral mobile factor and is also considered as immobile between regions.

The two economies are populated by individuals with identical preferences though different endowments. The typical consumer of the small economy maximizes the following quasi-linear Dixit-Stiglitz utility function:⁶

$$U = c_A + \mu \ln \left(\sum_{i=1}^n c_i^{\frac{\sigma-1}{\sigma}} + \sum_{i=1}^{n^*} \bar{c}_i^* \frac{\sigma-1}{\sigma} \right)^{\frac{\sigma}{\sigma-1}} \quad (1)$$

where c_A denotes the consumption of the agricultural good, which is chosen to be the numeraire good. c_i and \bar{c}_i^* are, respectively, the domestic and foreign differentiated industrial good i consumed by a representative resident of the small economy, and n and n^* are the numbers of varieties produced domestically and abroad, respectively.⁷ Thus, the total number of varieties

6. The rest of the world has an identical economic structure. All variables of the large economy are denoted by an asterisk.

7. One of the results in the Dixit-Stiglitz monopolistic competition model is that there is one firm per variety and one variety per firm.

available in both regions equals $N = n + n^*$. μ represents the expenditure on all varieties and $\sigma > 1$ is a parameter that stands for both the own price and substitution constant elasticities.⁸

The total expenditure that a typical individual devotes to all sorts of goods is given by the amount E . With quasi-linear preferences, the demand functions of local and foreign goods, c_i and \bar{c}_i^* , are given by the following expressions:

$$c_i = \frac{p_i^{-\sigma} \mu}{\sum_{i=1}^n p_i^{1-\sigma} + \sum_{i=1}^{n^*} \bar{p}_i^{*1-\sigma}} \quad \text{and} \quad \bar{c}_i^* = \frac{\bar{p}_i^{*- \sigma} \mu}{\sum_{i=1}^n p_i^{1-\sigma} + \sum_{i=1}^{n^*} \bar{p}_i^{*1-\sigma}} \quad (2)$$

where p_i denotes the price of the local differentiated good i , \bar{p}_i^* stands for the price of the foreign differentiated good i and $P = \left(\sum_{i=1}^n p_i^{1-\sigma} + \sum_{i=1}^{n^*} \bar{p}_i^{*1-\sigma} \right)^{\frac{1}{1-\sigma}}$ is the average price that prevails in the home economy.

Hence, demands depend on the level of its own prices as well as on the level of the average price; the smaller the average price, the lower the demand of a particular variety. Equations (2) also show that when the intensity of preferences for differentiated goods strengthens, i.e. μ increases, demands of varieties augment. The demand function of the numeraire good is equal to:

$$c_A = E - \mu \quad (3)$$

Equations (2) and (3) represent the optimal choices of an individual in terms of consumption. The corresponding indirect utility function takes the form:

$$V(P, E) = E + \mu \left[\ln(P^{-1} \mu) \right] - \mu \quad (4)$$

where $s(P) = [\ln(P^{-1} \mu)] - \mu$ accounts for the consumer surplus that each individual derives from the consumption of goods.

The two productive sectors use different technologies. The technology in the agricultural sector is modeled as simple as possible. This sector uses

8. Preferences are modeled by taking into account a sub-utility function that imposes diminishing marginal utility of expenditure on differentiated good; the advantage of this modelling strategy is that one avoids the problem of indeterminacy of expenditure allocation. For more details, see Baldwin et al. (2003).

only labor to produce the traditional good under constant returns to scale. It requires one unit of labor to produce one unit of the numeraire good, $a_A=1$. The aggregate supply of labor is sufficient to ensure a positive supply of this good. As a result of these assumptions, the wage rate of labor, w , equals 1. Labor factor is considered to be immobile across regions but mobile across sectors.

The industrial sector exhibits increasing return to scale. A typical firm faces a cost function which is not homothetic.⁹ The fixed cost includes the reward of capital while the variable cost involves the retribution of labor:

$$TC = \pi K + a_{mc} Xw \tag{5}$$

where π is the reward of capital, a_{mc} is the input-output requirement of labor and $X = x + \bar{x}$ is the total supply of a typical firm, x is supplied at home, while \bar{x} is offered abroad. To keep the cost structure in a simple fashion, it is assumed that each firm requires only one unit of physical capital, that is $K=1$.¹⁰

Each firm can sell its production in the local market or abroad. When domestic varieties are sold in the large region, local firms face an iceberg trade cost, τ^* . For simplicity, in this paper, the iceberg trade cost only comprises an ad-valorem tariff, t^* , which is set by the foreign government; hence, $\tau^*=(1+t^*)$. Similarly, when a foreign firm wants to sell its production in the small economy, it faces a trade cost $\tau=(1+t)$ that consists of an ad-valorem tariff, t , which is introduced by the domestic government; in this setting $\tau=(1+t)$ arises endogenously. The maximization problem of a local firm gives the following pair of prices:

$$p_i = \frac{\sigma}{\sigma-1} a_{mc} \quad \text{and} \quad \bar{p}_i = \tau^* \frac{\sigma}{\sigma-1} a_{mc} \tag{6}$$

where p_i is the price of the domestic variety i that prevails in the small economy and \bar{p}_i is the price of the domestic variety i that prevails in

9. The factor intensity of the fixed cost differs from the factor intensity of the variable cost (Baldwin et al., 2003: p. 71).

10. As in Grossman and Helpman (1994), the production structure consists of two productive sectors; one sector produces the homogeneous good under constant returns to scale using only the mobile factor. Due to assumptions related to this sector, the wage rate is fixed at one; hence, the rewards to capital factor adjust to absorb the operating surplus of a firm that produces a variety under increasing returns to scale.

the large economy. $\frac{\sigma}{\sigma-1} > 1$ denotes the mark-up that a local firm charges above the marginal cost, given by a_{mc} . Firms have the same marginal cost and the elasticity of substitution, σ , is the same for every pair of varieties. Hence, domestic varieties that are sold at the local market are equally priced (i.e. $p_i = p$). Also one can see that $\bar{p}_i = \tau^* p_i$ and $\bar{p}_i = \bar{p} = \tau^* p$. Similarly, foreign firms maximize benefits; the maximization problem gives the prices for each foreign variety i in each market:

$$p_i^* = \frac{\sigma}{\sigma-1} a_{mc}^* \quad \text{and} \quad \bar{p}_i^* = \tau \frac{\sigma}{\sigma-1} a_{mc}^* \quad (7)$$

where p_i^* is the price of the foreign variety that prevails in the foreign economy and \bar{p}_i^* accounts for the price of the foreign variety that prevails domestically. In this case, $p_i^* = p^*$, $\bar{p}_i^* = \bar{p}^*$ and $\bar{p}^* = \tau p^*$. Moreover, since the economies are assumed to have the same technology in every sector, $a_{mc} = a_{mc}^*$, domestic and foreign varieties have the same price in domestic and foreign markets respectively, that is $p = p^*$. However, an asymmetry in prices between both regions arises since trade policy applied by governments is generally different, $\bar{p} \neq \bar{p}^*$.

As it was remarked previously, this paper assumes only one sort of trade policy instrument. Hence, in the small economy, the policy-maker only may influence internal prices of varieties by introducing an ad-valorem import tariff, t .¹¹ The government introduces a wedge between the internal and foreign prices if it decides to set a tariff. The tax revenue that the incumbent derives from this policy, in per capita terms, is given by:

$$r = \sum_{i=1}^{n^*} (\tau - 1) p_i \bar{c}_i^* \quad (8)$$

The government redistributes the tax income equally among individuals. Individuals also derive income from alternative sources. Each resident derives income as owner of *one unit* of labor and also, possibly, as owner of capital factor. It is assumed that individuals may have at most one unit of capital. Those individuals that own physical capital will perceive that their incomes are influenced by the external competition of foreign varieties. For this

11. The model features a shortcoming in this respect, since does not formally consider a wider range of trade policy instruments and the proper selection mechanism that government may apply. Though Grossman and Helpman (1994) and Chang (2005) take into account a wider set of instruments, authors circumscribe them to a sub-set of trade policy such as ad-valorem taxes and subsidies applied on exports as well as on imports.

reason, they will be interested to prevent such competition via a tariff applied to them. A higher tariff increases the average price of the small economy since

$$P = \left(\sum_{i=1}^n p_i^{1-\sigma} + \sum_{i=1}^{n^*} \bar{p}_i^{*1-\sigma} \right)^{\frac{1}{1-\sigma}} = \left(np^{1-\sigma} + n^* \bar{p}^{*1-\sigma} \right)^{\frac{1}{1-\sigma}} \text{ and } \bar{p}^* = \tau p^* .$$

As it can be seen from equation (2), a higher average price tends to increase the demand of each local differentiated good, which of course favors local firms.

II.2 The political game

The study focuses on the short-run period; hence, capital cannot flow from one region to the other in order to look for higher rewards. In the short run, other strategies can be taken in order to increase benefits; capital owners may have an economic incentive that drives them to influence the government in its trade policy choice. By avoiding the external competition, local firms capture a higher share of domestic market, which increases total profits. Owners of capital have a common interest in doing that, so they may choose to join forces for political activity. As in Grossman and Helpman (1994) setting, it is assumed that capital owners can overcome the free-rider problem that arises in collective actions and organize themselves into an interest group.

The lobby that represents the interest of capital owners makes political contributions contingent on the tariff imposed by the government. $C_{IG}(\tau)$ denotes the contribution schedule offered by the interest group. The lobby chooses the optimal level of the contribution maximizing its total net welfare $V_{IG} = W_{IG} - C_{IG}$. The gross welfare is given by:

$$W_{IG} = I_{IG} + \sum_{i=1}^n \pi_i [p_i, P(\tau)] + \alpha_{IG} [R(\tau) + S(P(\tau))] \quad (9)$$

where I_{IG} is total labor supply of capital owners, π_i is the profit of a firm that produces a particular variety i , α_{IG} is the fraction of the voting population that owns capital and belongs to the lobby, $R(\tau) = Ir(\tau)$ is the total tax revenue, $S(P(\tau)) = Is(P)$ stands for the aggregate consumer surplus, and I represents total population in the small economy.

As in Grossman and Helpman (1994), the government is interested in both the level of contributions and in the well-being of individuals. The incumbent cares about the total amount of contributions because they are a potential source of economic funds to finance campaign spending; contribu-

tions may also provide other direct benefits to politicians.¹² The well-being of the society is of concern to the government because individuals, as voters, are more likely to re-elect a government that has taken actions to improve their standard of living. Hence, the linear objective function that reveals the government's preferences just equals to:

$$G = C_{IG} + \theta W(p, P(\tau)) \quad (10)$$

where θ is the weight that government attaches to the society's welfare relative to the amount of campaign contributions and W is the aggregate welfare given by:

$$W = I + \sum_{i=1}^n \pi_i [p, P(\tau)] + [R(\tau) + S(P(\tau))] \quad (11)$$

I is the total income of labor factor since $w=1$. Aggregate welfare also comprises the total income of capital owners, the total tax revenue, because the incumbent government redistributes tariff revenue in the form of poll subsidies, and the aggregate consumer surplus.

Political activity governs the scene of the short run. The model has the structure of the principal-agent problem. This situation arises when a *principal* attempts to persuade an agent to take an action that may be costly for the agent to perform. The political ingredient considers two kinds of actors. First, a single interests group, the principal, serves to coordinate campaign contributions and to communicate the political offers to the incumbent. The lobby chooses its contributions maximizing the net welfare of its members; and contributions are linked to the trade policy implemented by the incumbent. Second, an incumbent government, the *agent*, maximizes its own objective function given by equation (10).¹³

The sequence of the model is as follows. The short-run setting is characterized by a two-stage non-cooperative game in which the lobby chooses its political contribution in the first stage and the government sets the trade policy in the second. The short-run equilibrium gives the optimal

12. Mitra, Thomakos and Ulubaşoğlu (2002) emphasize that in dictatorships the “other sort of benefits” are the main reason why dictators are interested in contribution funds.

13. Grossman and Helpman (1994) and Chang (2005) allow for competition among many lobbies that represent interests of specific factor owners. As it will be noted in sub-section III.1, a single organized interest group is a special case, with similar predictions about the structure of protection that emerges in case where there is rivalry among interest groups.

levels of contributions and trade policy, which is reflected by a parameter that measures the level of freeness.

III. THE SHORT-RUN EQUILIBRIUM

III.1 The endogenous protection

Grossman and Helpman (1994) assume that the interaction between lobbies and the government takes the form of a menu auction in the sense of Bernheim and Whinston (1986). Bernheim and Whinston (1986) develop a model that is adaptable to many cases in which a single individual is endowed with the power to make a relevant decision and differently affected agents offer rewards in an attempt to obtain their most preferred outcome. In lemma 2, authors characterize the set of Nash Equilibria for first-price menu auctions; proposition 1 of *protection for sale* is a characterization of the equilibrium to the particular case of a trade policy game in which the economic structure features perfect competition within sectors and technology is governed by constant returns to scale.

This paper follows the Grossman and Helpman (1994) approach assuming the same kind of interaction between the government and a single lobby. In this background, if the contribution function is differentiable and the equilibrium price maximizes both the welfare of the particular lobby and the government's objective function, the lobby may choose a contribution that is *locally truthful*. Such a contribution schedule has the interesting property of indicating identical marginal changes in the contribution and in the lobby's welfare when both changes are caused by a marginal change in the tariff, that is:

$$\frac{\partial C_{IG}^{\circ}(\tau^{\circ})}{\partial \tau} = \frac{\partial W_{IG}(p^{\circ}, P^{\circ}(\tau^{\circ}))}{\partial \tau} \tag{12}$$

In equilibrium, truthful contributions induce the government to behave as if it were maximizing $\theta W + W_{IG}$.¹⁴ In this case, the objective function of the government is characterized by a social welfare function that weights differently the members of society. Lobby's members receive a weight of $(1+\theta)$ and individuals who are not organized receive a smaller weight, θ . The first order condition of this problem is:¹⁵

14. One can decompose total welfare by distinguishing welfare of not organized individuals from well-being of those who belong to the interest group.

15. Goldberg and Maggi (1999) have pointed out that the same trade policy outcome may arise when, instead of assuming a menu-auction problem, it is assumed a Nash bargaining game.

$$\frac{\partial W_{IG}(p^\circ, P^\circ(\tau^\circ))}{\partial \tau} + \theta \frac{\partial W(p^\circ, P^\circ(\tau^\circ))}{\partial \tau} = 0 \quad (13)$$

Equation (13) characterizes the equilibrium domestic tariff, and consequently the equilibrium of domestic prices, of all varieties supported by the differentiable contribution function.

To look for the derivatives of the lobby's welfare and the aggregate welfare with respect to the tariff, first a final expression for profits of a typical firm has to be calculated:

$$\Pi = (pc + \overline{pc})I - [\pi + a_{mc}(x + \bar{x})] \quad (14)$$

Equation (14) depends on optimal demands (equations 2) and the marginal cost, i.e. $a_{mc} = p \frac{\sigma-1}{\sigma}$.

Hence, after replacing in equation (14) all expressions, and considering the fact that the market clears when $(c + \tau^* \bar{c})I = x + \bar{x}$, firm's profits are equal to:

$$\Pi = \frac{1}{\sigma} \left[\frac{\mu I}{n + n^* \tau^{1-\sigma}} + \frac{\tau^{*1-\sigma} \mu^* I^*}{n^* + n \tau^{*1-\sigma}} \right] - \pi \quad (15)$$

where μ^* represents the expenditure on all differentiated goods in the large economy. Equation (15) can be expressed in terms of the spatial

distribution of expenditure, $s_\mu = \frac{\mu I}{\Xi^w}$ and $1 - s_\mu = \frac{\mu^* I^*}{\Xi^w}$ where

$\Xi^w = \mu I + \mu^* I^*$ is the total world expenditure in varieties, and in terms

of the given spatial distribution of industry, $s_n = \frac{n}{N}$.¹⁶

$$\Pi = \frac{1}{\sigma} \left[\frac{s_\mu}{s_n + (1-s_n) \tau^{1-\sigma}} + \frac{\tau^{*1-\sigma} (1-s_\mu)}{(1-s_n) + s_n \tau^{*1-\sigma}} \right] \frac{\Xi^w}{K^w} - \pi \quad (16)$$

16. The assumption of 1 unit of capital per firm implies that the total number of firms equals the total the total stock of physical capital in the world.

The marginal changes in aggregate welfare and in lobby's welfare due to a marginal change in the tariff are given by the sum of the marginal changes in profits, total tax revenue and aggregate consumer surplus. As it is expected, the marginal policy change positively affects profits. Such change has two different impacts in tax revenue. On the one hand, a positive direct effect which reflects the fact that when the tariff changes, the income revenue changes in the same direction for a given level of imports. On the other hand, an indirect negative effect, which shows the change in import quantities as the tariff is modified. Finally, the effect of the marginal tariff change on the aggregate consumer surplus is, of course, negative.

Replacing the impacts of the tariff change on profits, on the total tax income and on the aggregate consumer surplus into equation (13), the following expression arises in the short run:

$$\left[-(1-s_n)\tau^{1-\sigma} + \tau^{-\sigma}(1-s_n) + \tau^{-1}\sigma s_n \right] = -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} \frac{(\sigma-1)}{\sigma} s_n + \sigma s_n \quad (17)$$

Equation 17 can be written in terms of a freeness parameter as:

$$\left[-\phi + \phi^{\frac{\sigma}{\sigma-1}} + s_n \left(\phi - \phi^{\frac{\sigma}{\sigma-1}} + \phi^{\frac{1}{\sigma-1}} \sigma \right) \right] = -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} \frac{(\sigma-1)}{\sigma} s_n + \sigma s_n \quad (18)$$

where $\phi = \tau^{1-\sigma}$ represents a measure of freeness that takes values between zero and one. As τ increases, ϕ tends to zero. By contrary, when differentiated goods are almost traded freely, ϕ is near to one. If trade were completely free, $t = 0$; however, in this setting with monopolistic competition, when the incumbent maximizes the general welfare, the outcome is a second best optimal tariff. Therefore, the level of freeness would tend to be less than one.

Equation (18) cannot be solved in general for the degree of freeness, ϕ , since such level in the left hand side has different powers in each term. The left hand side (henceforth LHS) of equation (18) can take positive, null or negative values. It takes positive values for admissible values of $\sigma > 1$ and $0 < s_n < 1$. The higher the value of σ , the higher the probability that the LHS expression is positive for a particular s_n . For small values of s_n , the LHS expression can still be positive; however, as s_n tend to zero, it tends to be negative. A necessary condition for the LHS of equation (18) to be positive

is that $s_n \sigma \phi^{\frac{1}{\sigma-1}} > (1-s_n) \left(\phi - \phi^{\frac{\sigma}{\sigma-1}} \right)$ (C1). If the left hand side (LHS) is positive, as ϕ increases, the LHS increases. A sufficient condition for this positive relation is that $\phi^{\frac{1}{\sigma-1}} > \frac{\sigma-1}{\sigma}$ (C2).¹⁷ Though one cannot obtain from (18)

a final expression to measure the level of protection, it might be interesting to consider the LHS as a proxy of the inverse of such measure and analyze how it is influenced by political and economic variables. Some constructive predictions arise from this approximation.¹⁸

Like one of the relevant outcomes of the Grossman-Helpman approach, equation (18) confirms that when the incumbent has a remarkable concern for the well-being of the society, it will avoid creating an important excess burden via the introduction of a high tariff. Hence, for a high value of θ , the LHS of equation (18) will also be high.

As the share of voters who are members of the interest group increases, the level of trade freeness also increases. Though this prediction is also present in Grossman and Helpman (1994), its explanation here is somewhat different. In a setting in which many lobbies interact, the fact that lobbies want to increase the domestic price of their goods but to lower the prices of the other goods in order to avoid the excess burden as consumers generates a competitive mechanism that makes lobbies' actions to neutralize each other. Here, with only one interest group as *principal*, the competition effect is absent. However, the members of the lobby, as consumers, also want to avoid the high social cost of a protective tariff. The deadweight loss that the lobby faces increases as the share of population who belongs to the lobby increases.¹⁹ However, the extra profits that the group as a whole obtains with the tariff implementation do not change with changes in α_{IG} . The negative effect of the tariff on the lobby's welfare could be relatively more important than the positive effect of the extra benefit for high values of α_{IG} . The incentive to lobby for a tariff diminishes as the share of individuals that belongs to the interest group increases. Hence, the optimal trade policy for the government might be one which is near to the second best optimal tariff that such government would choose when maximizes general welfare.

17. This condition does not hold for values of θ near to zero and values of θ near to one.

18. Annex B presents the derivations of comparative statics.

19. The negative impact that the tariff has in consumer surplus is multiplied by the total number of people that belongs to the lobby.

When $\alpha_{IG} = 1$, the LHS equals to $\frac{s_n + s_n \sigma (\sigma - 1)}{\sigma}$, which is positive since by assumption $\sigma > 1$. If $\alpha_{IG} \cong 0$, the fraction of population that owns capital is very low. The LHS is positive when $\theta > \frac{1}{\sigma - 1}$ (C3) holds. In this case, a high level of free trade is the probable outcome when the demand elasticity is relatively high and the government is well concerned about general welfare.²⁰

Though lobbies would persuade the government to introduce a tariff when demand elasticity is high, the incumbent will follow the Ramsey rule when $1 > \frac{(1 + \theta)}{(\alpha_{IG} + \theta)} \frac{1}{\sigma^2}$ (C4) holds. The political cost that government may

bear increases with the excess burden that individuals have to face when the incumbent set a tariff and this burden is higher at higher demand elasticity. When $\theta > 0$ and θ and σ are high, condition (C4) holds. Moreover, though $\theta = 0$, the government would follow the Ramsey rule. A similar reasoning as the one explained in the previous paragraph applies. If the proportion of the society that belongs to the lobby is high, α_{IG} , the lobby's welfare will be more affected by the negative effect that the tariff imposes to its members as consumers than by the positive effect that members can derive as capital owners. Therefore, it is more likely that the government sets a wedge between the domestic and foreign prices when the demand elasticity is low, since the deadweight that the incumbent introduces in this case is lower.²¹

The spatial distribution of firms also seems to influence the structure of protection in an economy.²² The relationship between the industry share and the inverse of the level of protection is a priori ambiguous. On the one hand, one might expect that concentration of firms in one region would

20. When the elasticity of demand is high, the deadweight loss is important.

21. The effect of the elasticity of substitution is not easy to visualize since such variable is also present in the LHS of equation (18). Chang (2005) does not present a definite relationship between trade policy and the elasticity of substitution, as well as does not hand an insight on the effect of mark up on the level of protection. Nonetheless, from equation (22) of Chang (2005), one would infer a positive relationship between the inverse of mark up and the level of protection obtained with an ad-valorem import tax.

22. Some caution have to be taken when one analyses the impact of s_n on the level of freeness due to the fact that this variable is also present in the LHS of equation (18). However, interesting plausible insights rises from the following analysis presented in the text.

reflect the political power of the industrial sector since the gains that producers would obtain from an increase in protection would be magnified by the number of firms. In this case, the lobby would have much to lose from free trade; hence, it would bid more actively for protection. On the other hand, the presence of a high number of firms in such economy involves a tough level of competition among firms that tends to lower the potential gains that capital owners would derive from the protectionist policy. In fact, when local competition is important, foreign competition and the lobbying activity to avoid it become irrelevant. The relationship between a given industrial share and the level of freeness will be positive if the following inequality holds:

$$1 > \frac{(1+\theta)}{(\alpha_{IG} + \theta)} \frac{\sigma - 1}{\sigma} \frac{1}{\sigma} \quad (C5)$$

If the sign of condition (5) is inverted, the relationship is negative. Finally, a particular distribution of industry might not influence the level of freeness when this level is too small, that is when the economy is almost closed. For levels of freeness near to zero, expression (18) approximates to:

$$\phi^{\frac{1}{\sigma-1}} = -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} \frac{(\sigma-1)}{\sigma^2} + 1 \quad (19)$$

where $\phi^{\frac{1}{\sigma-1}} = \tau^{-1}$ also measures the degree of trade freeness. In this case, the economic variables that affect the level of protection are the demand elasticity and the level of mark-up, which depends on demand elasticity. The protectionist government follows the Ramsey rule as long as $\sigma > 2$. Political variables impact in the level of protection in a similar manner as they do in the general case.

III.2 Political Contributions

The characterization of the equilibrium (equation 13) involves the fact that the interest group may offer contributions that are locally truthful.²³

23. The consideration of truthful contributions restricts the set of Nash equilibria that emerge when contributions are assumed to be differentiable to the set of truthful Nash equilibria supported by truthful bids functions. Bernheim and Whinston (1986) have shown that a player can substitute a truthful strategy for a non-truthful one without facing any additional cost. Since these strategies are also coalition proof, the authors have argued that truthful Nash equilibria may be focal among the set of Nash equilibria.

When the lobby plays truthful contributions, it will choose the maximum level of its net welfare in such a way that will induce the government to select the lobby's most preferred trade policy. Since the lobby aims to increase its net welfare (B_{IG}), it will do it by diminishing the level of contribution until making the government be *indifferent* between the trade policies that it can choose. In this case, the incumbent has two alternative possibilities; it can select the lobby's most preferred policy, τ° , or the one that maximizes general welfare. As it was mentioned above, when the government maximizes general welfare, as there is a distortion in the economy due to the monopolistic pricing rule, it will choose a second best small tariff. This tariff, τ^W , will be lower than that the lobby prefer the most. The equilibrium campaign contribution that satisfies the incumbent's indifferent situation is equal to $C_{IG}(p^\circ(\tau^\circ), B_{IG}) = \theta W(p(\tau^W)) - \theta W(p^\circ(\tau^\circ))$.

As Grossman and Helpman (1994) have pointed out, when there is only a single organized interest group, it contributes to the government an amount that is proportional to the excess burden that the equilibrium trade policy imposes on the society. The proportionality component is given by the relative weight that the incumbent set on general welfare. The excess burden is given by the sum of the gain in producer surplus when government chooses the lobby's most preferred equilibrium tariff, the tax revenue that the government derives from such policy and the loss of consumer surplus as a result of the protectionist policy. In this case, the government payoff is equal to $G = \theta W(p(\tau^W))$, just the same to what the incumbent would derived if it were implemented a second best trade policy.

VI. CONCLUDING REMARKS

This paper has aimed to explain how tariffs are endogenously determined within a background of imperfect competition. The model incorporates in an economic geography setting, the political standpoint of why governments may select trade policies that are far from those that maximize the general well-being. Particularly, two different backgrounds are combined in order to characterize the political game and the economic structure. The Grossman and Helpman (1994) model has usefully served to characterize the political game due to the fact that, as it well known, it provides micro-foundations for each payer's behavior. The FC model has provided an economic structure in which one of the two sectors competes monopolistically. Both models share the nicely feature of being relatively tractable; therefore,

these frameworks were selected as pillars to build a first simple background that helps to understand how economic variables, that are relevant in a monopolistic competition structure, may determine the endogenous tariff.

As it can be expected, predictions derived from the influence of political variables are the same than those of derived in the Grossman and Helpman (1994) setting. All else given, a relevant government's concern about the welfare of the general electorate will predict a high level of freeness. Though competition among lobbies is not present in this setting, as the share of voters who are members of the interest group increases, the level of trade freeness also increases. The deadweight loss that the lobby faces when a high tariff is implemented increases with α_{IG} , but the extra profits that the group as a whole can derive do not change. When the negative impact in the welfare's lobby becomes relatively more important than the positive effect of the extra benefit due to the tariff change, the lobby does not contribute. In fact, as truthful contributions reflect the marginal change in lobby's welfare, a negative impact prevents the lobby to bid for protection.

Two new appealing insights come from the consideration of a monopolistic competition structure. Firstly, in this setting the interest group seems to be more worried to persuade the government to implement a high level of protectionism when it can charge a low mark-up. This insight is in line with the argument presented in Baldwin and Robert-Nicoud (2007); the authors explain the asymmetric incentive that makes interest groups to fight harder in order to avoid losses; the asymmetric appropriability of rent is the reason for that.²⁴ Secondly, the initial distribution of industry might also influence the structure of protection in an economy. On the one hand, the presence of a high number of firms in such economy involves a tough level of competition among firms that tends to erode the potential gains that capital owners would derive from the protectionist policy. In this situation, lobbying activity might become less fruitful. On the other hand, if the number of firms might reflect a measure of lobby's political power, a higher number of firms will magnify the potential gains from protection. Hence, the lobby would be more willing to bid for protection. When an economy is almost closed, the industry share is not a relevant variable in the determination of the trade policy.

24. As authors explain, in an expanding industry, entry tends to erode those rents that may arise from persuading the government to set the lobby's most preferred policy. Differently, in declining industries, sunk costs rule out entry as long as the rents are not too high. In other words, there is an asymmetric appropriability of rents.

V. REFERENCES

- Baldwin, R., Forslid R., Martin P., Ottaviano G. and Robert-Nicoud F. (2003). *Economic geography and public policy*. PUP Princeton.
- Baldwin, R. and Robert-Nicoud F. (2007). "Entry and asymmetric lobbying: why governments pick losers". *Journal of the European Economic Association*, 5 (5), 1064-1093.
- Bernheim, B. Douglas and Michael, Whinston (1986): "Menu auctions, resources allocation and economic influence". *Quarterly Journal of Economics*, 101,1-31.
- Bombardini, M. (2008). "Firm heterogeneity and lobby participation". *Journal of International Economics*, 75 (2), 329-348.
- Chang, PL. (2005). "Protection for sale under monopolistic competition". *Journal of International Economics*, 66, 509-526.
- Facchini, G., Olarreaga M., Silva P. and Willmann G. (2010). "Substitutability and Protectionism: Latin America's Trade Policy and Imports from China and India". *World Bank Economic Review*, 24(3), 446-473.
- Facchini, G., Van Biesebroeck J. and Willmann G. (2006). "Protection for Sale with Imperfect Rent Capturing". *Canadian Journal of Economics* 39 (3), 845-873.
- Gáname, M. (2005). "The effect of endogenous protection on the economic landscape". Instituut voor Ontwikkelingsbeleid en -beheer (IOB-UA), Working Paper #01. Retrieved from : http://www.ua.ac.be/main.asp?c=*IOBE&n=4267&ct=001595&e=o74944.
- Gawande, K. and Bandyopadhyay U. (2000). "Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection". *The Review of Economics and Statistics*, 82 (1),139-152.
- Gawande, K., Krishna P. and Robbins M. (2006). "Foreign Lobbies and U.S. Trade Policy". *The Review of Economics and Statistics*, 88 (3), 563-571.
- Goldberg P. and Maggi G. (1999). "Protection for sale: an empirical investigation". *American Economic Review*, 85(5), 1135-1155.
- Grossman, G. and Helpman E. (1994). "Protection for sale". *American Economic Review*, 84(4), 833-850.
- Martin, P. and Rogers C. (1995). "Industrial location in public infrastructure". *Journal of International Economics*, 39, 335-351.
- Mitra, D.(1999). "Endogenous Lobby formation and endogenous protection: a long run model of trade policy determination". *American Economic Review*; 89 (5),1116-1134.

- Mitra, D., Thomakos D. and Ulubaşođlu M. (2002). "Protection for sale in a developing country: democracy versus dictatorship". *Review of Economics and Statistics*, 84(3), 497-508.
- Ossa, R. (2013). "Trade Wars and Trade Talks with Data". Mimeo, University of Chicago Booth School of Business. Retrieved from: <http://faculty.chicagobooth.edu/ralph.ossa/research/trade%20wars.pdf>.

ANNEX A

The Footloose Capital Model: The spatial distribution of firms

As it was mentioned above, the endogenous level of protection is derived by considering the spatial distribution of firms as given; hence, the background allows for a short-run analysis. NEG models take into account the possibility of factor mobility; this consideration is crucial in defining the spatial distribution of economic activity in the long run.

The FC model assumes capital services move from one region to another in the long run. Unlike in the short run, capital owners can offer their capital services in every region, looking for the highest nominal reward.²⁵ In this context, the long run equilibrium is only achieved when capital owners have not incentive to continue offering capital services in the other region. This situation happens either when capital earns the same retribution in both regions or when such factor is agglomerated in one of the two regions and this region pays the highest (and only) reward. In other words, one can visualize two types of long run equilibria; the interior ones which equalize profits between regions, $\pi = \pi^*$, or the core-periphery outcomes in which $s_n = 0$ and $\pi < \pi^*$ or $s_n = 1$ and $\pi > \pi^*$. Focusing in interior outcomes, the equilibrium division of industry equals to:

$$s_n = -\frac{\phi}{(1-\phi)} + \frac{(1-\phi\phi^*)s_\mu}{(1-\phi)(1-\phi^*)} \quad (A1)$$

25. Although capital services are perfectly mobile in the long run, the FC model assumes capital owners are completely immobile across regions. Thus, owners spend their incomes in the region where they live. This assumption prevents the model from displaying circular causality, an important characteristic of most NEG models. Though this absence makes the FC model totally tractable, it brings the disadvantage of losing the self-reinforcing mechanism that is present in other economic geography models.

where $\phi^* = \tau^{*1-\sigma}$ characterizes the foreign level of freeness, which is considered as an exogenous variable. Equation (A1) shows the positive relationship between the share of industries located in the small economy and the spatial distribution of expenditure in differentiated goods. Such relation reflects the fact that a high market size in one region tends to encourage concentration of firms in that economy. The process involves the interaction of two opposite forces. On the one hand, monopolistic firms desire to locate their production in the largest market in order to increase their sales and profits and to export to small ones, when trade barriers are present. Such behavior is a distinctive characteristic of the monopolistic industry and defines the so-called *market access effect*, which is an agglomeration force. On the other hand, firms want to avoid competition locating their production in regions in which there are fewer competitors. This effect is called the *market crowding effect* and represents a dispersion force. Both forces make up the *home market effect* which highlights the outcome that for an exogenous change in the share of market size, the relocation of firms is more than proportional to that exogenous change, that is

$$\frac{\partial s_n}{\partial s_\mu} = \frac{(1-\phi\phi^*)}{(1-\phi)(1-\phi^*)} > 1$$

The *home market effect* depends crucially on the levels of freeness of the home economy and the rest of the world. When protection diminishes and both economies become freer in terms of trade, the home market effect becomes more powerful. The reduction in protection weakens the two forces, the *market access* advantage and the *market crowding* disadvantage. However, the fall in the tariff weakens the dispersion force at a higher speed than it weakens the agglomeration force. Hence, freer trade magnifies the degree of relocation of firms; capital becomes more footloose as the level of trade freeness increases. Algebraically, these effects can be shown by the following partial derivatives:

$$\frac{\partial HME}{\partial \phi} = \frac{1}{(1-\phi)^2} > 0 \quad \text{and} \quad \frac{\partial HME}{\partial \phi^*} = \frac{1}{(1-\phi^*)^2} > 0 \quad (A2)$$

The reasoning behind this argument is that as trade gets freer, competition from firms that are located in the other economy becomes as important as domestic competition. The *market crowding* disadvantage of being in the larger market turns into an irrelevant problem. Hence, the incentive to

relocate capital factor from one region to the other in order to avoid competition vanishes; competition is not very much localized for low tariff barriers. The advantage of producing in the larger market, the *market access effect*, also erodes as the level of freeness increases since firms can have access to all markets when barriers are dismantled.

This paper has endogenously determined the level of protection in the small economy. Though an extended formal background should be considered to explore how political variables would impact on the spatial distribution of firms, one can intuitively follow a path of reasoning to have a roughly first notion. Since the level of freeness depends on political and economic variables and the *home market effect* depends on this level, one can deduce implicitly that impact in terms of such variables:

$$HME = f\left(\phi(\theta, \alpha_{IG}, \sigma, \bar{s}_n)\right) \quad (A3)$$

Hence, intuitively, when the government has a valuable concern on the well-being of individuals, the share of voters who are members of the interest group, the mark-up and the constant elasticity are high, the home market effect would become powerful since the level of freeness tends to be relatively high. An exogenous positive change in the market size would trigger a more than proportional change in the location of industry.

An interesting issue arises when one considers the initial spatial distribution of industry. The home market effect may be affected by the *initial* share of firms, i.e. \bar{s}_n since, as it was mentioned above, it affects the level of freeness. However, the direction of such impact is a priori not determined. If condition (C5) holds, a high initial share will reinforce the home market effect. When the economy is almost closed, the initial distribution of industry does not impact on the home market effect.

Equation (A1) shows that the location of industry depends not only on the market size but also on other variables. The first expression in the RHS of equation (A1) is indeed related with the level of freeness. Hence, the total impact of the level of freeness on spatial location is given by the following expression:

$$\frac{\partial s_n}{\partial \phi} = -\frac{1}{(1-\phi)^2} + \frac{1}{(1-\phi)^2} s_\mu \quad (A4)$$

When trade costs are asymmetric, they affect differently the location of industry. In fact, a high level of protection in one economy creates a positive profit gap that favors such economy. The difference in profits stimulates capital to flow from the region with high level of freeness to the other, with high level of protection. While the level of freeness in the home economy negatively affects the share of local industries, the level of freeness in the foreign economy affects positively the industry share of the local region:

$$\frac{\partial s_n}{\partial \phi^*} = \frac{1}{(1 - \phi^*)^2} s_\mu > 0 \tag{A5}$$

A government that scarcely weights the welfare of individuals in the short run and set a high tariff will induce a relocation of firms to its economy in the long run. Such relocation in favor of the relatively closed country is also probable when capital owners who are part of the lobby are few, the mark-up that firms can charge is low and the demand of varieties is relatively inelastic. Moreover, the likelihood of such relocation increases when the foreign country is a freer trader.

The market size

Since market sizes are also relevant variables that define the economic landscape between different countries, it is a useful task to fully characterize them. Market shares are defined by the total income that local individuals spend on differentiated goods in each market in terms of total world spending on such goods. In the quasi-linear utility function (equation 1) the intensity parameter, μ , which reveals the preferences for varieties, is assumed to be common to all individuals in each region. However, though identical inside each country, it may differ across them; $\mu \neq \mu^*$. Hence, the total spending on differentiated goods is simply $\Xi = I\mu$ in the home region and $\Xi^* = I^*\mu^*$ in the foreign country, and the sum of both represents total world spending on differentiated goods, Ξ^w . The local market size is therefore

$$s_\mu = \frac{I\mu}{\Xi^w} \text{ and the foreign market size is equal to } 1 - s_\mu = \frac{I^*\mu^*}{\Xi^w} .^{26}$$

As it was mentioned in section II, in every region each individual is endowed with one unit of labor and possible one unit of capital; accordingly,

26. The quasi-linear structure of preferences implies that income effects are absent; hence consumer spending on differentiated goods is independent of income.

the home population equals the number of labor, $I = L$. Labor force in the home economy can be expressed in terms of world labor endowment, $L = s_L L^W$, where $L^W = L + L^*$ and $s_L = L / L^W$. Relative home market size is therefore:

$$s_\mu = \frac{s_L}{s_L + (1 - s_L) \frac{\mu^*}{\mu}} \quad (\text{A6})$$

Equation (A6) expresses the relative market size of the home economy in terms of its share of world labor and the ratio of the intensity parameters. The more skewed local individuals' preferences on differentiated goods relatively with those of the foreign economy, $\frac{\mu^*}{\mu} < 1$, the bigger relative home market size. Also, a higher share of labor factor involves a higher market size.

What means “small economy”?

It has been used the term “*small economy*” without precisely defining in terms of what parameters the economy might be considered *small*. The *small economy* term was used to highlight the existence of some kinds of asymmetries in the model, beyond the one that exists in trade costs, without explicitly specifying which asymmetries were taken place.

As in other NEG models, in the FC setting uneven economies may arise because of differences in market size and factors endowments. The domestic economy can be small due to the fact that its relative market size is low, $s_\mu < 1/2$. Equation (A6) defines the market share in terms of the intensity ratio of preferences and the labor share of world labor endowment. Therefore, a low relative market size can be the result of a relative lower expenditure on differentiated goods by local individuals, a small population in the home country, or both. The economy also might be small in terms of the capital endowment, i.e. $s_k < 1/2$.

When differences between regions are the outcome of differences in market share, a small size spurs firms to locate in the larger region; the market access advantage operates in favor of the rest of the world. However, the small economy has the advantage of being the region in which firms face less competition. A dispersed equilibrium is the likely result when trade costs are high since the small region protects pretty well its industry from competition coming from the large region. As equation (A4) shows, though

a lower trade cost boosts the impact of s_μ on s_n , since $s_\mu < 1/2$; such impact does not predominate in the determination of the geographical distribution of firms. There is a process of delocation of firms from the small region to the large one as the tariff falls. The political game can prevent such a delocation when the local lobby has the incentive and succeeds in the short run to persuade the government to set a high tariff, or when the incumbent scarcely cares about the general welfare, or both.

If the economy is small in terms of capital endowment, an interesting issue to analyze is whether the region is an importer or exporter of such factor. The difference between the share of employed capital, s_n , and the spatial distribution of capital owners, s_k , gives the direction of capital flows. The small economy hosts foreign capital when the following inequality holds:

$$\frac{s_\mu - \phi + \phi\phi^*(1 - s_\mu)}{(1 - \phi)(1 - \phi^*)} \geq 1/2 \tag{A7}$$

Because of similar arguments as those expressed above, this situation is likely to occur when the local government implements a high tariff, when the foreign government follows a free trade policy and when the small economy is not too small in terms of the market size.

ANNEX B

The Comparative Statics Analysis

The effect of the weight government attaches to the well-being, θ , on the proxy of the level of freeness (LHS of equation 18) is:

$$\begin{aligned} \frac{\partial LHS}{\partial \theta} &= - \left[\frac{(\alpha_{IG} + \theta) - (1 + \theta)}{(\alpha_{IG} + \theta)^2} \right] \left(\frac{\sigma - 1}{\sigma} s_n \right) \\ &= \frac{(1 - \alpha_{IG})}{(\alpha_{IG} + \theta)^2} \left(\frac{\sigma - 1}{\sigma} s_n \right) \geq 0 \quad \text{since } \alpha_{IG} \leq 1 \quad \text{and } \sigma > 1 \end{aligned} \tag{B1}$$

Similarly, total differentiation of equation (18) with respect to the share of voters who belong to the interest group, α_{IG} , is positive:

$$\frac{\partial LHS}{\partial \alpha_{IG}} = \frac{1}{(\alpha_{IG} + \theta)^2} \frac{\sigma - 1}{\sigma} s_n > 0 \tag{B2}$$

The inverse of mark up (IMU) also impacts on the proxy of the level of freeness; as $IMU = (\sigma - 1)/\sigma$ increases, the proxy expression diminishes since:

$$\frac{\partial LHS}{\partial IMU} = -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} s_n < 0 \quad (B3)$$

The own price and substitution elasticities are represented by only one parameter, σ :

$$\begin{aligned} \frac{\partial LHS}{\partial \sigma} &= -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} s_n \left[\frac{\sigma - (\sigma - 1)}{\sigma^2} \right] + s_n \\ &= -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} s_n \left[\frac{1}{\sigma^2} \right] + s_n \end{aligned} \quad (B4)$$

Government will follow a modified Ramsey rule if expression (B4) is positive; hence condition (C4) is derived by taken into account that $\partial LHS/\partial \sigma > 0$, which implies:

$$1 > \frac{(1+\theta)}{(\alpha_{IG} + \theta)} \left[\frac{1}{\sigma^2} \right] \quad (\text{Condition (C4)})$$

Finally, the impact of the share of firms on the proxy level of freeness equals:

$$\frac{\partial LHS}{\partial s_n} = -\frac{(1+\theta)}{(\alpha_{IG} + \theta)} \frac{(\sigma - 1)}{\sigma} + \sigma \quad (B5)$$

When $\partial LHS/\partial s_n > 0$, the following inequality holds:

$$1 > \frac{(1+\theta)}{(\alpha_{IG} + \theta)} \frac{\sigma - 1}{\sigma} \left[\frac{1}{\sigma} \right] \quad (\text{Condition (C5)})$$