# Entry Barriers, Rent-Shifting, And The Home Market Effect

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**Abstract**

I introduce entry barriers into an otherwise standard model of the home market effect. Entry barriers cause market sizes to become endogenous by creating rents. I prove that the endogeneity of market size has four implications. First, endogenous market size magnifies the standard home market effect. Second, it is no longer true that both countries benefit unambiguously from mutual trade liberalization. In particular, if rents are sufficiently large and country sizes are sufficiently unequal, a trade agreement will reduce welfare in the smaller country. Third, an increase in entry barriers increases the market size of the larger country. Despite the reduction in product variety, welfare in the larger country may actually increase. Fourth, governments can use trade policy to shift foreign rents to their countries and enlarge their home markets, generating a greater incentive for "beggar-thy-neighbor" trade policies than in the standard model.

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# 1 Introduction

Profits or rents have traditionally been absent from general equilibrium models of international trade. Recently Neary [20] has introduced profits into a general equilibrium trade model by fixing the number of firms and assuming oligopolistic competition. However, he does not study the rent-shifting that was the highlight of the partial equilibrium literature initiated by Brander and Spencer [2][3]. In this paper we study the impact of rents and rent-shifting in a standard home market effect model modified to include barriers to entry.

Brander and Spencer (1984) (BS henceforth) showed that an increase in a domestic tariffs created rents for the home country at the expense of foreign countries. The literature triggered by BS illustrated the rent-shifting motivation for different trade instruments building upon traditional industrial organization models of oligopolistic competition.[1]In these setups the reason for profits were entry barriers, which prevented the number of firms from reaching its free-entry level. Given the existence of profits, trade policy allowed strategic governments to improve the competitivity of domestic firms and to worsen the relative position of foreign firms. An increase in domestic tariff was isomorphic to an increase in the production costs of foreign firms, which shifted the reaction functions of these firms so that they sold lower quantities in the domestic markets. Trade policy then favored domestic firms regarding their strategic interaction with foreign companies. Therefore, rent-shifting ocurred as a fixed number of domestic firms obtained higher profits.

The rent-shifting motivation was the source of prolific research in the 1980s; however, it was not until Neary's model that international trade theory considered profits in general equilibrium. General equilibrium models of international trade had avoided the question of rents for different reasons. The two main streams of the comparative advantage theory, the Ricardian and Heckscher–Ohlin models, work in perfect competition scenarios in which there is no room for profits.Although it allows for monopolistic competition, the home market effect models fail to consider rents because they assume free entry, under which entrants erode profits. Finally, in the heterogeneous firm models introduced in Melitz[18], aggregate rents are zero; unsuccessful entrants fully erase the profits generated by successful firms.

Neary (2009) introduced rents into a mainstream model of trade, a general equilibrium setup with Ricardian characteristics. He considered a continuum of goods and let the trading partners in his model have technological advantages in different sectors. Trade of goods took place in oligopolistic markets, in which the number of firms was lower than its free-entry level. Neary conceptualized entry barriers by fixing the number of firms like the rent-shifting literature. However, Neary did not study the rent-shifting motivation and did not relate rents to standard trade theory results.

This paper studies the impact of rents and rent-shifting in a modified home market effect model.

[1]See and Dixit (1984)[5] and Eaton and Grossman (1986)[7] for some examples of this literature.

Rents arise in my model because governments' regulation creates entry barriers, which generate a fixed value of rents per firm. Although these rents are associated with individual firms, they could accrue to governments, companies or any resident from the origin-country of the firms. For example, if the source of entry barriers is an abuse of patent protection, the rents accrue to firms and are called profits; however, if the source of entry barriers is an excess of red-tape regulation, Djankov et *al.*[6] show that the rents accrue to bureaucrats and administrative employees. Any entry barrier that relates to regulation and generates local rents is consistent with the main mechanism of the model. This paper then differs from Neary's setup because I fix individual rents instead of fixing the number of firms to conceptualize entry barriers. I follow international trade theory's tradition and let the number of firms be endogenous in my model.

This paper also differs from Neary because it builds upon Helpman and Krugman's setup[15], a trade model of the home market effect initiated by Krugman's seminal paper in 1980. In this regard, this relates closely to Ossa's [21], which has studied motivations for raising tariffs taking the Helpman and Krugman model as his benchmark. He showed that an increase in domestic tariffs increased the number of firms in the home country and reduced this number in the other country. Therefore, a tariff rise increased effective importing prices but decreased the set of imported products. Ossa showed that the latter effect was stronger than the former so that a tariff rise reduced the price index of the home country. However, Ossa made the free-entry assumption, standard in the home market effect literature. Consequently, Ossa's model did not consider rents and therefore it could not capture the rent-shifitng motivation.

By causing market sizes to become endogenous, entry barriers generate a rent-shifitng motivation in this paper.[2]Entry barriers generate a fixed value of rents per firm and therefore make a country's income dependent on an endogenous variable, the country's number of domestic firms (i.e the higher the number of domestic firms, the higher the country's income). The rent-shifting motivation then emerges because an increase in domestic tariffs increases the number of firms in the home country and reduces this number in the other country. Therefore, a tariff rise increases the home country's income at the expense of the foreign country. Contrary to the standard rent-shifting literature, rent-shifting then occurs because the number of firms increases and not because a fixed number of firms make higher profits. Furthermore, I show that a tariff rise reduces the price index of the home country and therefore that Ossa's results are robust to the introduction of rents. Hence, I add the rent-shifting motivation to Ossa's model so that the incentives for setting high tariffs in my model are greater than in the standard model.

The endogeneity of market sizes caused by entry barriers has three important implications besides the appearance of the rent-shifting motivation. First, entry barriers and rents exacerbate the standard home market effect. An increase in a country's world labor share makes the home market more attractive

[2]I refer to domestic income in terms of the homogenous good, as explained in Section 4. Other papers have shown that trade policy can generate a decrease in price indices and an increase in real income. This paper is unique because it presents an additional motivation for raising tariffs that is related to income in terms of the homogenous good.

and therefore increases the country's number of firms. The increase in the number of firms increases the country's income and thereby induces endogenously more entry to the domestic market. This endogenous force is then the reason for the magnification of the standard home market effect. Second, the endogeneity of market size makes it is no longer true that both countries benefit unambiguously from mutual trade liberalization. The reason is that mutual trade liberalization reduces the market size and the number of firms in the small country. The reduction in the number of firms reduces the small country's income and tends to increase its price index. If rents are sufficiently large and the country is sufficiently small, the income decrease and the price index increase will reduce the welfare of the small country. Third, the endogeneity of market sizes guarantees that an increase in entry barriers will increase the large country's market size. The paper shows that for some parameter values, this effect is sufficiently strong that the large country benefits from the increase in entry barriers. This result obtains despite the reduction in the number of product varieties available to consumers..

Because this paper describes a motivation to set excessively high tariffs, it also relates to a set of models aiming to justify the existence of the W.T.O. Among these papers, Bagwell and Staiger [1] used a terms-of-trade externality motivation to provide a rationale for trade agreements ans Mrazovak [19] builds a $n$-good set-up with the goal of better understanding W.T.O. negotiations. My paper differs from Bagwell and Staiger (1998) because it does not consider terms-of-trade externalities, and from Mrazovak's because it builds upon a standard general equilibrium model of trade. Finally, my paper connects to Haufler and Wooton's [14], which described a rent-shifting mechanism similar to mine. In their model governments used policy to attract foreign firms and persuade them to achieve foreign direct investment. Rent-shifting then occurred as governments extracted the profits of foreign firms via lump sum taxes. Although similar, this rent-shifting mechanism is different from mine and not set in a standard model of trade.

The relationship between entry barriers and rents has been an old concern in the industrial organization literature. Many studies have analyzed differences in entry barriers across sectors and over time, but only a few have provided generic evidence. In this regard, Geroski (1995)[11] performed the most comprehensive survey. Geroski (1995) considered estimations of an entry equation, in which entry was a function of the difference between expected post-entry profits and entry costs. He showed that most estimates of "limit profits", i.e., the profit level at which entry becomes zero in the entry equation, were greater than zero. [3] [4] Therefore, Geroski concluded that entry barriers were high.

The link between entry barriers and rents has become a concern in recent studies in the field of development economics. In particular, there is a large body of literature on red-tape regulation that was triggered by the seminal paper of Djankov et *al.*'s (2002). Djankov et *al.* (2002) retrieved data on

[3] See Geroski (1991)[12]. Many of these studies include capital raising requirements, which is a measure of entry barriers when access to credit is constrained.

[4] Geroski (1991)[10]gives many examples of the interaction.

the number of procedures, official time, and official costs required for firms to start operating legally. The authors found high official costs in most countries and showed that the rents created by excessive regulation accrued to bureaucrats and administrative employees. Ciccone et *al.* [4] examined the sectors considered in the article of Djankov et *al.* but enlarged their sample with additional requirements for firm operation.[5]The authors found that entry was slower in industries in which it was necessary to register land, build facilities, purchase equipment and procure specific licenses. They also showed that the speed of entry decreased with the strength of these requirements.

In summary, evidence from the fields of industrial organization and development economics suggests that entry barriers exist and create rents. Despite this evidence, only Neary (2009) introduced rents into a general equilibrium model of international trade. I develop my home market effect model modified to account for entry barriers and rents in the remainder of this paper. In the next section, I present the model setup and solve for the autarky equilibrium. I next show that my method for conceptualizing entry barriers is consistent with Neary's model and the industrial organization models employed by the rent-shifting literature. In section 3 I solve for the trade equilibrium and show that entry barriers exacerbate the standard home market effect and make it no longer true that mutual trade liberalization is unambigously beneficial. In Section 3, I also study the welfare implications of an increase in entry barriers. Section 4 studies the emotivation for rent-shifting policies and section 5 concludes.

# 2 The Autarkic Economy

## 2.1 Model Setup

I consider a country called Home and study its autarky equilibrium. The utility of the representative consumer depends on a single homogeneous "outside good" and a composite of differentiated manufacturing products. Preferences are represented by a Cobb-Douglas-C.E.S. function written as follows:

$$(1)\, U(x,y) = \left[\sum_{i=0}^{N} z_i^{\frac{\theta-1}{\theta}}\right]^{\frac{\alpha\theta}{\theta-1}} y^{1-\alpha}$$

where $z_i$ is the consumption of a differentiated manufacturing product, $y$ denotes the consumption of the homogeneous good, $\alpha$ is the expenditure share associated with the manufacturing products, $\theta > 1$ denotes the elasticity of substitution among the product varieties, and $N$ refers to the total amount of varieties. Under an autarky regime all of these varieties are produced at Home. Technologies are represented by the following (inverse) production functions:

[5]Ciccone et al. (2007) used a New Trade Theory framework to model delayed entry. However, their dynamic environment was built to explain labor reallocation across sectors, whereas my paper emphasizes the role of rents.

$$(2)\, L_y = y \qquad (3)\, L_i = f + bz_i^s$$

where $L_y$ denotes the labor required to produce $y$ units of the outside good, and $L_i$ denotes the total labor required to produce $z_i^s$ units of a manufacturing product. The technology in the manufactuting sector is given by the increasing returns to scale function displayed in Equation (3), which is based on two components: $b$, the marginal labor requirement, and $f$, the fixed labor requirement. The manufacturing goods market is monopolistically competitive and the outside good market is perfectly competitive.

The regulatory environment is summarized by an exogenous parameter $E \epsilon (0, \infty)$; a higher parameter value indicates a higher degree of entry barriers. The degree of entry barriers fully determines the value of rents per firm, which I call $c \epsilon (0, \infty)$. The relationship is given by an increasing function $\pi : E \rightarrow c$ so that the higher is the entry barriers degree, the higher the value of rents per firm.[6]Let me call $\bar{E}$ the specific value of the parameter $E$ that describes the entry barriers degree of this economy; for now, $\bar{E}$ might take any value in the interval $(0, \infty)$. The following equation must then hold in equilibrium:

$$(4)\, \bar{c} = \pi(\bar{E})$$

where $\bar{c}$ denotes the value of rents per firms associated with the specific value $\bar{E}$ that describes this economy. The form of the rents displayed in (4) depend on the nature of the entry barriers considered. Because any entry barrier that relates to regulation and generates local rents is consistent with the main mechanism of the model, the rents displayed in (4) may take different forms. The entry barriers may relate to environmental regulation and, for instance, refer to requirements for environmental impact statements. The entry barriers may also refer to a lack of financial regulation so that credit constraints are excessively large. When credit constraints are excessively large, the rents displayed in (4) accrue to firms and are called profits.

## 2.2 Autarky Equilibrium

An equilibrium is defined as a vector of prices and total number of firms for which the maximizing agents clear the labor, homogeneous and manufacturing goods markets. In equilibrium the value of rents per firm must be given by (4). I set the equilibrium conditions and find the values for the endogenous variables.

Under perfect competition in the homogeneous good market, the price of this good must equal its unit production cost. This equality determines the wage rate in equilibrium, as shown in the following equation:

[6]I do not put any upper bound in the set of possible values because that is not required under an autarky regime.

$$(5)\, W = p_h = 1$$

where $W$ is the wage rate, $p_h$ is the price of the outside good and the number 1 indicates that this price has been set as the numeraire ($p_h = 1$). Utility maximization with the above preferences then yields the following demands:

$$(6)\, y^d = (1-\alpha)I \qquad (7)\, z_i^d = \frac{p_i^{-\theta}}{P^{1-\theta}}\alpha I \;\; \forall \; i$$

where $y^d$ denotes the demand for the outside good , $I$ denotes income, $P$ is Home's price index, $z_i^d$ is the demand for variety $i$ and $p_i$ is the price of that variety. The price index is determined via utility maximization and written as follows:

$$(8)\, P = [\sum_{i=0}^{N} p_i^{1-\theta}]^{\frac{1}{1-\theta}}$$

I obtain the indirect utility function by inputting the demand functions displayed in Equations (6) and (7) into Equation (1). The indirect utility function is then given by the following expression:

$$(9)\, V = \frac{P^{-\alpha} I}{\alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}}$$

Home's income is given by the household labor earnings and the aggregate value of the rents, which may accrue to the government, to the household or to the bureaucrats and administrative employees. The household labor earnings equal the labor supply (because the wage rate is 1) and the aggregate value of the rents equals the number of firms multiplied by the value of rents per firm. The income of the representative consumer is then summarized as follows:

$$(10)\, I = L + N\bar{c}$$

where $L$ denotes Home's labor supply and $N$ is the total number of firms. Manufacturers set profit-maximizing prices using the demands displayed in (7). Because these demands have a constant price elasticity equal to $\theta$, firms charge a constant mark-up over the marginal cost:

$$(11)\, \frac{\theta b}{\theta - 1} = p = p_i = 1 \;\; \forall \; i$$

As Helpman and Krugman, I have choosen units chosen such that $\frac{\theta-1}{\theta} = b$. This choice of units yields an equilibrium price for manufacturing products equal to 1; $p = 1$. Given this profit maximization price, Equation (4) is written as follows:

$$(4')\, \pi = \frac{z_i^s}{\theta} - f = \bar{c} \ \veebar \ i$$

Equation (4') determines the quantity of each manufacturing product in equilibrium. This quantity is written as follows:

$$(12)\, z_i^s = z_i^d = z = \theta(f + \bar{c}) \ \veebar \ i$$

where $z_i^s$ denotes the supply of variety $i$ and $z_i^s = z_i^d$ denotes that the market is in equilibrium. Equation (12) reflects the intuitive idea that markets with higher entry barriers relate to larger firm size. The total number of varieties is given by the outside good market equilibrium, which is determined by the demand displayed in Equation (4) and the supply of the good. The total number of varieties is then written as follows:[7]

$$(13)\, N = \frac{\alpha L}{\theta(f + \bar{c}) - \bar{c}\alpha} < \frac{\alpha L}{\theta f} = \bar{N}$$

[8]where $\bar{N}$ denotes the total number of firms (or varieties) under the free-entry assumption. Note that the total number of firms depends on firm size, represented by the term $\theta(f + \bar{c})$ in Equation (13), and the total expenditure in the manufacturing products, represented by $\bar{c}\alpha$ and by $\alpha L$. On the one hand, an increase in entry barriers augments the expenditure in manufacturing products and thereby increases the total number of firms. On the other hand, an increase in entry barriers augments the size per firm and thereby reduces the total number of firms. It is important to note the latter effect of an entry barriers increase is stronger than the former effect: an increase in entry barriers reduces the total number of firms. Analogously, the total number of firms is lower in this model than under the free-entry assumption.

## 2.3 Consistency Of The Entry Barrier Measure

I investigate the welfare effects of an entry barriers increase for the autarkic economy. This analysis will create a benchmark for use in Section 3, in which I will analyze the effects of an entry barriers increase under a trade regime. I also employ the analysis to show that my measure of entry barriers is consistent

[7]See Appendix 2 for the full derivation.

[8]In a one-period setup, savings are zero so that agents spend all the rents in consumption goods. The rents may accrue to the government, to the firms or to the household. Therefore, zero-savings means that the government's budget is balanced and that household's dividends equal the value of the rents that accrue to the firms.

with the rent-shifting literature's modeling of entry barriers (and therefore with Neary's model as well). Finally, I demonstrate that my entry barriers measure is consistent with other standards employed by industrial organization economists.

Let me first begin with the comparison between my model and the industrial organization models employed in the rent-shifting literature. In these models an increase in entry barriers increases both individual and industry profits but augments prices and thus reduces consumer surplus. Because the effect on consumer surplus more than offset the profits increase, the industrial organization models associate entry barriers with a lower social welfare. I next show that an increase in my entry barriers measure yields the same predictions in my model. To this end, I employ Equation (13) and present the aggregate value of total rents, which I thwn write in the following way:

$$(14)\, N\bar{c} = \frac{\alpha L}{\frac{\theta f}{\bar{c}} + (\theta - \alpha)}$$

An increase in the entry barriers measure reduces the total number of firms but increases the value of rents per firms. Because the latter effect is stronger than the former, the total rents displayed in Equation (14) are decreasing in entry barriers. Therefore, rents and income (as well as welfare up to this point) increase with entry barriers. However, an increase in entry barriers has an additional effect on welfare through the price index. In particular, the decrease in the total number of firms increases this index. Hence, an increase in entry barriers has two opposing effects on welfare. For the purpose of comparing these effects, I write Home's indirect utility function in terms of the entry barriers measure:

$$(15)\, V = \frac{P^{-\alpha} I}{\alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}} = \frac{\left[\frac{\theta L(\bar{c}+f)}{\theta f + \bar{c}(\theta-\alpha)}\right]\left[\frac{1}{\frac{\alpha L}{\theta f + \bar{c}(\theta-\alpha)}}\right]^{\frac{\alpha}{1-\theta}}}{\alpha^{\alpha}(1-\alpha)^{1-\alpha}}$$

Equation (15) makes it possible to disentangle the two effects of an entry barrier increase. The income increase is represented by an increase in the value of the former term in square brackets. The price index increase is represented by a decrease in the latter term. Appendix 1 proves that the price index effect is stronger than the income effect: an increase in entry barriers reduces welfare under an autarky regime. Therefore, an increase in my entry barriers measure reduces total firms, and increases the price index and total rents while reducing welfare. Hence, the choice of introducing entry barriers as a fixed value of rents per firm rents in my model is consistent with both Neary's and the rent-shifting literature.

Moreover, if we measure market concentration using the Herfindahl index, my modeling of entry barriers is consistent with the intutitive idea that an increase in the entry barriers increases the concentration.

I construct the Herfindahl index for this economy from Equations (12) and (13), which I display in the following:

$$(16)\, HH = \sum_{i=1}^{N} S_i^2 = \frac{\theta^2[\theta f + \bar{c}(\theta - \alpha)](f + \bar{c})^2}{\alpha L} \qquad S_i = \frac{z_i}{\sum_{j=1}^{N} z_j}$$

Equation (16) shows that a higher value for the entry barrier measure increases the HH indicating a higher market concentration. Hence, my entry barrier measure is consistent with other industrial organization standards.

# 3 Trade Regime With Equal Trade Costs

## 3.1 Model Setup

I consider the case of two countries referred to as Home and Foreign and indicates the variables concerning the latter with a superscript asterisk (*). Preferences are identical across countries so that the foreign consumers' utility is summarized by a function analogous to (1). Technologies are also identical across countries, then foreign production is given by functions analogous to (2) and (3). The manufacturing goods market is monopolistically competitive, and the homogeneous good market is perfectly competitive.

Trade costs apply only to manufacturing goods and are of the Samuelson iceberg type: for a unit of manufacturing product to arrive in another country, $\tau$ units ($\tau > 1$) must be shipped. These iceberg costs are decomposed into transport costs and trade barriers. I keep the former identical across countries and let the latter differ across nations in Section 4. Similar to Ossa, I refer to trade barriers as tariffs for the sake of concreteness; however, these trade barriers reflect any policy impediments to trade.[9]

In a trade regime each country's welfare depends on its own and on its trading partner's measure of entry barriers. Therefore, setting a trade regime requires a prejudgment regarding differences in entry barriers across countries. In Appendix 1 I employ the Doing Business (DB) indicators from the World Bank and data from the IMF to study differences across from an empirical perspective. As I show in the Appendix, the empirical study justifies the following assumption:

$$(4'')\, E = E^* = \bar{E} \quad \textit{and therefore} \quad c = c^* = \bar{c}$$

where $E^*$ measures the degree of entry barriers in Foreign and $c^*$ is the value of rents per firm associated with that degree. Equation (4') states that the value of the entry barriers measure is the same across countries.

[9] As Ossa, I abstract from tariff revenue to make the model tractable.

Finally, I make a set of assumptions to rule out the uninteresting case of complete specialization. To ensure that both countries produce at least one unit of a manufacturing product, I assume that the countries are sufficiently equal in size. I refer to Home's world labor share as $S_l$ and the vector of exogenous parameters as $\Gamma$ so that we can write the assumptions as follows:

$$(17)\ \overrightarrow{S_l} = \frac{\rho}{1+\rho}[1+\frac{N(\Gamma)\bar{c}}{L^w}] < S_l < [1-\frac{N(\Gamma)\bar{c}\rho}{L^w}]\frac{1}{1+\rho} = \overleftarrow{S_l}$$

where $\rho = \tau^{1-\theta} < 1$ denotes the measure of iceberg costs, $L^w$ denotes the world labor supply and $N(\Gamma)\bar{c}$ denotes the aggregate value of world rents. Note that Equation (17) makes explicit the dependence of the total number of firms on the vector of exogenous parameters.[10]In Appendix 3 I replace the equilibrium total number of firms in Equation (17) and display the assumptions in terms of these parameters. The assumptions displayed in Equation (17) are standard restrictions in the home market effect literature. In particular, as we impose $\bar{c} = 0$ in Equation (17), this equation converges to the restrictions imposed by Helpman and Krugman. Note that for these restrictions to be fulfilled, it is necessary to place an upper bound on the value of rents per worker. This bound is written as follows:

$$(18)\ \frac{N(\Gamma)\bar{c}}{L^w} < \frac{1}{2\rho} - \frac{1}{2}$$

The upper bound on the value of rents per worker becomes more restrictive as the economy approaches free trade (i.e $\rho$ goes up). The logic governing this result is as follows: as trade costs decrease, the number of entrants in each country becomes more sensitive to relative country size. Therefore, the bounds displayed in Equation (17) become more restrictive, and the minimum value of rents per worker must decrease. Appendix 3 displays Equation (18) in terms of the exogenous parameters.

Finally, I assume that both countries produce the outside good so that there is not complete specialization. Given the set of assumptions displayed in Equations (17)-(18), a sufficient condition for incomplete specialization is that both countries have a sufficiently large labor supply to produce all manufacturing products and still have some labor remaining. Instead of imposing bounds on the countries' labor supply, I follow Ossa and place an upper bound on the income share spent on manufacturing goods. The labor required to produce all manufacturing products then decreases so that the requirements on countries' labor supply are implied by Equation (17). The upper bound on the share of income spent on manufacturing goods is as follows:

$$(19)\ \alpha < \frac{[\bar{c}+f]\theta\rho}{[(\bar{c}+f)\theta-\bar{c}][1+\rho]}$$

[10]I follow Helpman et al. in [8]and treat $N$ as a continuous variable.

In the following, I make the set of assumptions composed by Equations (17)-(19). As noted above, these assumptions guarantee that the countries produce at least one unit of both the outside good and a manufacturing product.

### 3.2 Trade Equilibrium

The equilibrium is characterized by a vector of prices, total and domestic number of firms, under which the maximizing agents clear the markets. In equilibrium the value of rents per firm is given by Equation (4"). In a trade regime, there is an extra market clearing condition and an extra unknown compared to the equilibrium from section 2. The extra condition is market clearing for foreign manufacturing products, and the extra unknown is the number of foreign firms. I proceed by setting the equilibrium conditions and finding the values for the endogenous variables.

Because every nation produces the outside good, perfect competition equalizes wages and the good price across countries. Let me set this price as the numeraire and write the following:

$$(20)\, p_h = 1 = W = W^*$$

Utility maximization with the above preferences yields the demands for the outside goods, which are written as follows:

$$(21)\, y^d = (1-\alpha)I \qquad (22)\, y^{*d} = (1-\alpha)I^*$$

where (21) is Home's demand for the outside good. Utility maximization also yields the demand for Home and Foreign-produced manufacturing products, which are written as follows:

$$(23)\, z_i^d = \frac{p_i^{-\theta}}{P^{1-\theta}}\alpha I + \frac{\rho^{\frac{\theta}{\theta-1}} p_i^{-\theta}}{P^{*\,1-\theta}}\alpha I^*$$

$$(24)\, z_i^{*d} = \frac{\rho^{\frac{\theta}{\theta-1}} p_i^{*-\theta}}{P^{1-\theta}}\alpha I + \frac{p_i^{*-\theta}}{P^{*\,1-\theta}}\alpha I^*$$

where Equation (23) shows the demand for Home-produced manufacturing products. Let me use these demands to obtain countries' indirect utility functions, which are summarized by the following equations:

$$(25)\, V = \frac{P^{-\alpha} I}{\alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}} \qquad (26)\, V^* = \frac{P^{*-\alpha} I^*}{\alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}}$$

A country's welfare increases with its income and decreases with its price index. I display the price indices in the following equations:

$$(27)\, P = [\sum_{i=0}^{n} p_i^{1-\theta} + \sum_{i=0}^{n^*} \rho p_i^{*\,1-\theta}]^{\frac{1}{1-\theta}} \qquad (28)\, P^* = [\sum_{i=0}^{n} \rho p_i^{1-\theta} + \sum_{i=0}^{n^*} p_i^{*\,1-\theta}]^{\frac{1}{1-\theta}}$$

where $n$ denotes Home's number of domestic firms. Countries' incomes are a product of labor earnings and of the rents generated by entry barriers. Income levels are then sumarized as follows:

$$(29)\, I = L + n\bar{c} \qquad (30)\, I^* = L^* + n^*\bar{c}$$

As shown in Equations (29) and (30), a country's income level in terms of the homogeneous good increases with its number of domestic firms. Because this number is endogenous, income levels and market sizes become endogenous variables. This article is unique in suggesting the endogeneity of market size and assessing the implications of this endogeneity.

Notice in Equations (29) and (30) that all rents associated with domestic firms accrue to domestic income. Thus, only residents benefit from rents associated with domestic firms. By definition, all entry barriers that create rents accruing to "the government" or to bureaucrats satisfy the income definitions displayed in Equations (29) and (30).[11]Profits, on the other hand, may accrue to investors whose portfolios contain shares of foreign assets. However, the latter case is empirically irrelevant given the strong evidence of home equity bias. Several recent studies have argued that investor portfolios are disproportionately composed of domestic assets and therefore that most profits accrue to residents.[12]This evidence and information about other sorts of rents that undoubtedly accrue to residents suggest the use of the income definitions displayed in (29) and (30). Hence, I make the non-strong assumption that all rents associated with domestic firms accrue to home income and employ these definitions througout the paper.[13]

I now establish the pricing rules for firms. As in the autarky equilibrium, the demand for manufacturing products has a constant price elasticity equal to $\theta$. Therefore, firms charge a constant mark-up

[11]I placed quotation marks here because the government's budget must be balanced. Then, "the government" should be interpreted as residents, who benefit from a lump sum payment that redistributes the government's surplus.

[12]The seminal paper in this literature is French and Poterba (1991)[9]. For recent evidence, see Lane and Molesi-Ferretti (2003)[16], Lutje and Menkhoff (2007)[17] and Strong and Xu (2003)[23], among other articles in this literature.

[13]The full home bias is a simplifying but not basic assumption. As long as domestic markets increases with the number of domestic firms, the channels described in this paper still exist.

over marginal cost. Making the same unit choice as in the autarky equilibrium, we can write:

$$(31)\ \frac{\theta b}{\theta - 1} = 1 = p_i = p_i^* \ \veebar\ i$$

Notice in Equation (31) that I am not imposing price equalization across products or countries. Instead, price equalization results from equal labor productivity levels and incomplete specialization. The pricing rule displayed in Equation (31), along with Equation (4'), determines the equilibrium quantity of each manufacturing product. This quantity is written as follows:

$$(32)\ z_i^s = z_i^d = z = \theta(f + \bar{c})\ \veebar\ i \qquad (33)\ z_i^{*s} = z_i^{*d} = z = \theta(f + \bar{c})\ \veebar\ i$$

Equations (32) and (33) state that firm size is the same across the two countries, which is an implication of the countries' having the same entry barriers measure. These equations and market clearing determine Home's number of domestic firms in equilibrium.[14] I next follow Helpman and Krugman closely and present Home's share of firms in terms of Home's labor share. I call Home's share of firms $S_n$ and write:

$$(34)\ S_n = \frac{n}{N(\Gamma)} = \frac{S_l[1+\rho] - \rho[1 + \frac{N(\Gamma)\bar{c}}{L^w}]}{[1+\rho] - 2\rho[1 + \frac{N(\Gamma)\bar{c}}{L^w}]}$$

From Equation (34), we obtain two standard results in the home market effect literature. First, Home's share of firms increases with its labor share: larger markets are more conducive to the creation of new businesses because they allow to serve a larger number of consumers freely (without making consumers pay the iceberg costs). This standard result has given place to the home market effect, which refers to the more than proportional increase in a country's share of firms due to an increase in its labor share. According to the home market effect, firms should concentrate in countries with large domestic markets. Second, Home's share of firms becomes more sensitive to its labor share as the economy approaches free trade.[15]

Finally, market clearing in the outside good market determines the total number of firms. This number is written as follows:

$$(35)\ N(\Gamma) = \frac{\alpha L^w}{\theta(f + \bar{c}) - \bar{c}\alpha}$$

Notice in Equation (35) that the total number of firms is independent of the trade cost parameter. This number depends on consumers' expenditure on manufacturing products and on the firm size like in

[14] I refer to manufacturing goods markets equilibrium.
[15] Appendix 4 shows Home's share of firms in terms of the exogenous parameters.

the autarky equilibrium. Equation (35), along with Equation (34), describes the equilibrium of the model and Appendix 4 shows that this equilibrium is stable. Next, I use these equations to run comparative statics exercises.

### 3.3 Comparative Statics

I study how the introduction of rents alters the standard home market effect described in Helpman and Krugman's seminal model. The following proposition characterizes the home market effect in my model:

**Proposition 1.** *If $c > 0$ and Condition (17) hold, then $\frac{\partial S_n}{\partial S_l} > \frac{1+\rho}{1-\rho} = \frac{\partial S_n}{\partial S_l}^{HK}$, which is the home market effect in the Helpman-Krugman model. Thus, the existence of rents magnifies the home market effect under incomplete specialization.*

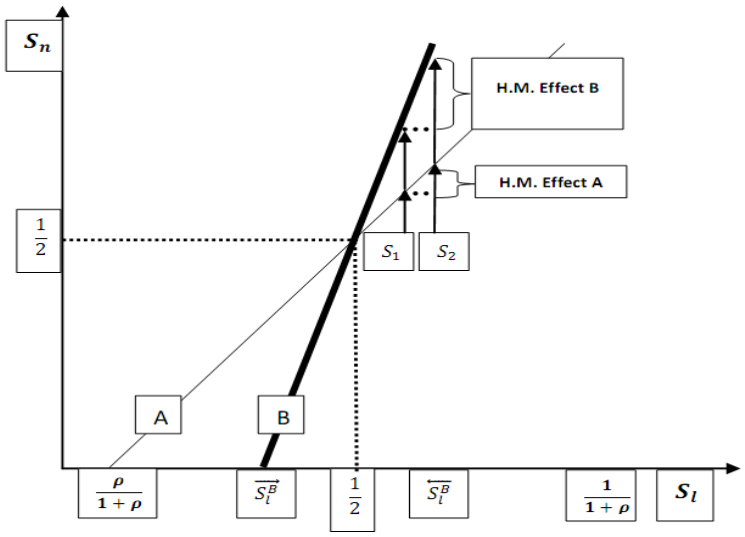
**Proof. See Appendix 4**

Figure 1 illustrates the magnification of the home market effect stated in Proposition 1. The $x$-axis displays Home's labor share, and the $y$-axis shows Home's share of firms. The segment labeled A depicts the relationship between the two shares when rents are zero, as in the Helpman-Krugman model. As rents become positive (and we move from the Helpman-Krugman model to my setup), the A segment rotates counterclockwise over $(\frac{1}{2}, \frac{1}{2})$ so that the new relationship is represented by the segment labeled B. Because the relative steepness of the lines fully conveys the the difference in the home market effects, the existence of rents magnifies this effect.

In the Helpman-Krugman model an increase in Home's labor share from $S_1$to $S_2$ makes the home market more attractive and thereby attracts more firms; this is the standard home market effect. If rents are positive, the attraction of more firms increases Home's income and thus its market size. This market size increase makes Home an even more attractive market, increasing by more its number of firms. Hence, rents exacerbate the standard home market effect. Appendix 3 shows that the magnification of the home market is increasing in the entry barriers measure.

**Figure 1.**

**Home Market Effect.**




I now run a comparative statics experiment on the income share spent on manufacturing goods. This experiment illustrates another contribution of this article with respect to the Helpman-Krugman model. Using Equations (34) and (35), I state the following proposition:

**Proposition 2.** *A large country's share of firms increases with the share of income spent on manufacturing goods. More formally,* $\frac{\partial S_n}{\partial \alpha} > 0$ *if and only if* $S_l > \frac{1}{2}$.

**Proof. See Appendix 4**

To develop the logic behind Proposition 2, I will employ Equation (35) to show that an increase in the income share increases world rents. Then I wil employ Equation (34) to show that an increase in world rents raises a large country's share of firms.

An increase in the income share of manufacturing products makes entry into the market for these products more attractive, increasing the total number of firms. Given a fixed level of rents per firm, the increase in the total number of firms increases the aggregate value of world rents. Furthermore, the increase in world rents raises the large country's share of firms and the intutuition is as follows: most firms are located in the large country so that this country captures the greatest portion of world rents. Therefore, an increase in world rents increases the large country's relative market size, increasing its share of firms.

The introduction of rents magnifies the home market effects and makes countries' shares of firms dependent on industry characteristics through the dependence of these characteristics on world rents. Any change in expenditure shares, the elasticity of substitution or fixed production costs alters world

rents and therefore countries' shares of firms. These results make this model different from the existing models of the home market effect.

### 3.4 Welfare Implications Of Mutual Trade Liberalization

I employ Equations (34) and (35) and the indirect utility functions displayed in (25) and (26) to investigate the welfare implications of a trade agreement. I show that mutual trade liberalization will benefit a large country but harm a small country under some circumstances. This result distinguishes this setup from the Helpman and Krugman model (and the existing home market effect models), in which trade agreements are unambigously Pareto improving. Let me take the Helpman and Krugman model as my benchmark.

In Helpman and Krugman's model, a small country's welfare depends on the only endogenous argument, its price index. Because a trade agreement triggers opposing effects on this index, it creates opposing forces on welfare. On the one hand, such an agreement reduces tariffs and thus effective prices for a given set of importing products. This effect tends to reduce the price index and thereby to increase welfare. On the other hand, such an agreement reduces (increases) the number of firms in the small country (the large country). As a result, the set of importing products increases (decreases), which tends to increase the price index and thus to reduce welfare. Although the agreement has opposing effects, it unambiguously improves the small country's welfare, as stated in the following remark:

**Remark.** *In the Helpman-Krugman model, a trade agreement has two opposing effects on a small country's price index and welfare. However, the reduction in effective import prices more than offsets the increase in the imported products set. Hence, the net welfare effect is unambiguous: a trade agreement benefits the small country and is unambiguously Pareto improving.*

In the remainder of this subsection I show that when rents are postive, a trade agreement might harm a small country. Specifically, I show that rents reinforce the adverse effects on such a country's price index and generate adverse effects on its income. For illustrative purposes, I assume that Home's labor share is $S_l < \frac{1}{2}$, which makes this nation a small country, and compare its situation in this model to its situation in the Helpman and Krugman setup.

In this model, the adverse effects on the price index are magnified because a trade agreement causes a greater reduction in Home's number of firms. Note first that Home's rents are lower than Foreign's rents (Home is the small country) and therefore Home's relative market size is smaller in this model than in Helpman and Krugman. Therefore, a trade agreement, which makes firm shares more sensitive to market size, causes a greater reduction in the Home's number of firms. Because the reduction in the number is greater, the expansion of the imported product set and thus the price index's tendency to rise are stronger in this model. Hence, the introduction of rents reinforces the adverse effects on a small

country's price index with respect to the Helpman and Krugman' setup.

In addition, a trade agreement reduces a small country's income. In my setup a country's income level depends on its number of firms, so income levels are affected by a trade agreement. An agreement reduces a small country's number of firms and thus its domestic rents and income level. Hence, rents create additional negative welfare effects for a small country with respect to Helpman and Krugman, in which income is exogenous and therefore a trade agreement only affects its price index.

Because rents reinforce and create additional channels through which an agreement reduces a small country's welfare, the agreement might harm this country. It can be proved that a trade agreement harms a small country for a reasonably large set of parameters. Proposition 3 describes a particular subset and therefore provides a sufficient condition under which a trade agreement reduces a small country's welfare. Proposition 3 is written as follows:

**Trade Agreement. Proposition 3.** *A trade agreement benefits a large country. Furthermore, if the entry barriers and $\theta$ are sufficiently large, the agreement will harm a sufficiently small country and create a conflict of interest. Formally, if $\theta$ is greater then a threshold $\theta^{TA} < 2$ and $c$ is greater than a threshold $c^{TA}$, there is a $S_l^\rho$ such that $\overrightarrow{S_l} < S_l^\rho < \frac{1}{2}$ and $\frac{\partial V(S_l^\rho)}{\partial \rho} < 0$.*

**Proof. See Appendix 5.**

Proposition 3 states that the income loss generated by the agreement more than offsets any price index reduction under some conditions. I now comment on the three conditions. First, the lower bound of the elasticity of substitution ensures that any price index reduction is sufficiently small. This bound is a considerably mild restriction, as this parameter only takes values greater than 1. Second, Proposition 3 requires that the small country be sufficiently small. A sufficiently small size guarantees that the reduction in the small countries' number of firms is sufficiently large (and thus its price index tendency to increase and its income fall are sufficiently strong). Finally, Proposition 3 requires sufficiently large entry barriers and rents, which guarantees that this model is sufficiently different from the Helpman and Krugman model.

Appendix 4 proves that if countries are sufficiently unequal in size, a trade agreement may not be Pareto improving. In particular, the agreement may create a conflict of interest between large countries, which will benefit from the agreement, and small countries, which may suffer from a decrease in trade costs. On other hand, the welfare gains for large countries are greater in this model than in Helpman and Krugman's model. Therefore, the Pareto efficiency of a trade agreement might be restored using a compensation system, which would make it possible for large countries to persuade small countries to agree on mutual trade liberalization.

### 3.5 Welfare Implications Of A Change In The Extent Of Entry Barriers

I study the welfare implications of an increase in entry barriers, for which I employ my analysis from section 2 as my benchmark. One example of an entry barriers increase that affected trading partners is the signature of the TRIP agreement. The agreement established international standards for intellectual property protection causing the low- and middle-income countries to strengthen their patent and IPR systems. When interpreted as the TRIP agreement then, the entry barriers increase that I model should be thought of affecting low- and middle-income trading partners.

For illustrative purposes, I have divided my analysis into two steps. First, I link the changes in aggregate variables caused by the entry barriers increase to welfare implications affecting both countries. Second, I investigate idiosyncratic welfare effects, studying how the increase in entry barriers affects each country based on its market size.

In a trade equilibrium the increase in entry barriers has welfare implications through its impact on aggregate variables. These implications are isomorphic to the welfare implications for a country in autarky, which I discussed in Section 2. Specifically, an increase in the entry barriers reduces the total number of firms and thus the increases price indices and the world income. The increase of the price indices more than offsets the increase of the world income; therefore, an entry barrier increase tends to reduce countries' welfare like in the autarky equilibrium. I call this negative effect on countries' welfare the "autarky effect" throughout this section. If the "autarky effects" were the only welfare implications of the entry barriers increase, the two countries would be harmed as a result of the change in regulations. Furthermore, the "autarky effects" increase market concentration, rents and price indices while reducing welfare. These are the effects of an entry barriers increase illustrated in the 1980s industrial organization literature and associated with strengthened intellectual property protection in several articles. Then my "autarky effects" are consistent with this literature.[16]

I now address the concept of idiosyncratic welfare effects. The increase in entry barriers has idiosyncratic welfare effects because it affects each country's number of firms in a different amount. To the purpose of investigating how the entry barriers increase alters countries' number of firms, I use Equations (34) and (35) and assert the following:

**Remark** *An increase in entry barriers raises (lowers) the large (small) country share of firms. More formally,* $\frac{\partial S_n}{\partial c}_{c=\bar{c}} > 0$ *if and only if* $S_l > \frac{1}{2}$.

The large country's share of firms increases with world rents (recall our discussion of Proposition 2). Furthermore, if this share increase is sufficiently large, an increase in entry barriers increases not just the

[16] For example, although through channels different from mine, Grossman and Lai (2004)[13] show that an increase in the protection of intellectual property raises profits, but increases market concentration.

share but also the large country's number of firms.[17] Furthermore, the increase in the karge country's number of firms tends to raise its income and to reduce its price index. In other words, an increase in entry barriers might increase a large country's welfare despite the "autarky effects." I call the welfare effects caused by the change in a country's number of firms "size-dependent effects."

In summary, the net welfare effect of a measure increase results from the balance between the "size-dependent effects" and "autarky effects." The following proposition shows that the former are stronger than the latter for a set of parameters. The proposition is written as follows:

**Entry Barriers Change. Proposition 4** *An increase in entry barriers harms a small country and benefits a sufficiently large country under some conditions. Formally, there is a* $S_l^c(\Gamma_{EB})$ *such that* $\frac{1}{2} < S_l^c(\Gamma_{EB}) < \overleftarrow{S_l}$ *and* $\frac{\partial V(S_l^c(\Gamma_{EB}))}{\partial c}_{c=\bar{c}} > 0$ *for a set of parameters* $\Gamma_{EB}$ .

**Proof. See Appendix 6.**

Proposition 4 disentangles the welfare effects of an entry barriers increase for a large country and provides a set of parameters under which this country benefits. Note that Proposition 4 partially characterizes this set. The large country must be sufficiently large that the "size-dependent effects" are sufficiently large and compensate for the "autarky effect." Appendix 5 proves this result for a sufficiently open to trade economy, which tends to magnify the "size-dependent effects."[18]

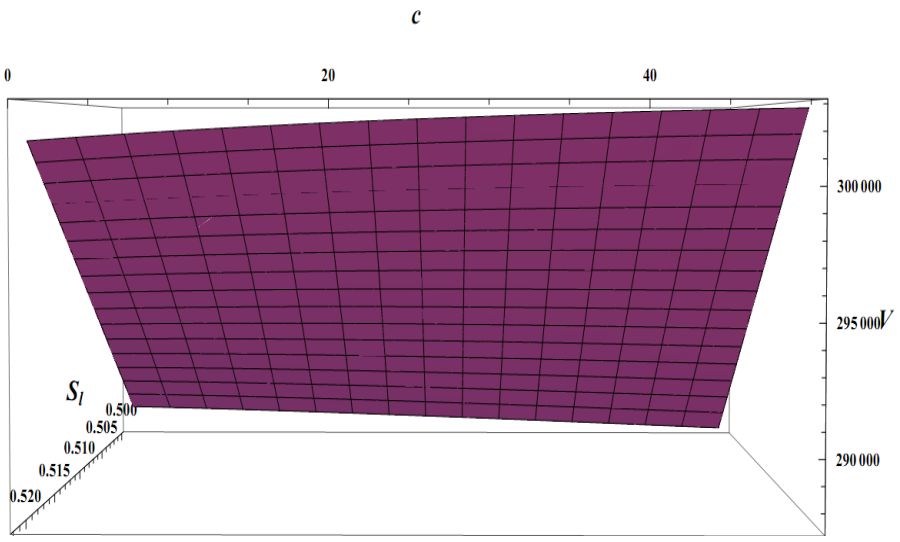
Figure 2 illustrates that a large country must be sufficiently large that it benefits from the increase in entry barriers, as stated in Proposition 4. The horizontal axis measures the entry barriers, which range from c=0 to c=50, the vertical axis displays the indirect utility, and the remaining axis displays a large country's labor share. Home's labor share ranges from 0.5 to 0.522, allowing the country to be large and to be "sufficiently large." If Home's labor share is in the neighborhood of +0.5, its utlity is greater if c=0 than if c=50, as depicted in Figure 2. However, the opposite is true if Home is a sufficiently large country whose labor share is in the neighborhood of -0.522.

[17] Firms exits in the small country could be thought of as firm infringement on the patents and IPR systems imposed by the TRIP agreement.

[18] The relationship between the size-dependent effects and the trade cost parameter are not monotonic but the former increase with tariffs fall for a wide range of parameters.

**Figure 2.**

**Welfare Effects For A Large Size-Country.**




# 4 Trade Regime With Different Trade Costs

I let trade costs vary across countries and study these countries' incentives to raise tariffs unilaterally. I show that a rise in domestic tariffs increases a country's number of firms and thus shrinks its set of imported products. Because the shrinkage of this set more than offsets the increase in effective importing prices, a domestic tariffs increase reduces a country's price index. In other words, I show that Ossa's model results remain valid when entry barriers and rents are considered. Furthermore, I show that a tariffs rise increases the home country's income and therefore that the rent-shifting motivation emerges in the standard model when rents are considered.[19]

## 4.1 Model Setup

As in the previous section, utility functions are identical across countries and are represented by a function analogous to (1). Furthermore, technologies are also identical and given by functions the analogous to (2) and (3). The manufacturing goods market remains monopolistically competitive, and the homogeneous good market remains perfectly competitive.

Trade costs still apply only to manufacturing goods and represent tariffs or any impediment to trade. In particular, $\rho_H = \tau_H^{1-\theta} < 1$ denotes the tariffs measure on domestic products, and $\rho_F = \tau_F^{1-\theta} < 1$ denotes the same measure for foreign products. I call Home's labor share $S_l$ and the vector of exogenous

[19] I refer to income in terms of the homogeneous good.

parameters $\Gamma$ so that the following assumption guarantees that both countries produce at least one unit of a manufacturing good:

$$(36)\ \overrightarrow{S_l} = \frac{\rho_H[1-\rho_F][1+\frac{N(\Gamma)\bar{c}}{L^W}]}{1-\rho_H\rho_F} < S_l < \frac{1-\rho_F[1-\rho_H][1+\frac{N(\Gamma)\bar{c}}{L^W}]-\rho_H\rho_F}{1-\rho_H\rho_F} = \overleftarrow{S_l}$$

The upper bound in equation (36) ensures that there is at least one manufacturing producer in Foreign; the lower bound does the same for Home. Note that a decrease in Home's tariffs -an increase in $\rho_H$- increases the lower bound, turning this bound more restrictive. As a result of the increase in Home's tariffs, the minimum level of its labor share at which Equation (36) is satisfied increases. The intuition for this result goes as follows: a decrease in Home's tariffs makes entry to its merket less profitable and therefore Home's market size must enlarge so that at least one producer enters the market. Furthermore, it is required an upper bound on rents per worker for Equation (36) to hold. This bound is written as follows:[20]

$$(37)\ \frac{N(\Gamma)\bar{c}}{L^w} < \frac{[1-\rho_H][1-\rho_F]}{\rho_H+\rho_F-2\rho_H\rho_F}$$

Let me now establish a set of sufficient conditions under which both countries produce the outside good. This set is written as follows:

$$(38)\ \alpha < \frac{[\bar{c}+f]\theta[1-\rho_H]\rho_F}{[\bar{c}(\theta-1)+f\theta][1-\rho_H\rho_F]} \quad IF \quad \rho_H < \rho_F$$

$$\alpha < \frac{[\bar{c}+f]\theta[1-\rho_F]\rho_H}{[\bar{c}(\theta-1)+f\theta][1-\rho_H\rho_F]} \quad IF \quad \rho_H > \rho_F$$

Given Assumption (36), the set of assumptions displayed in (38) guarantees that complete specialization does not take place in equilibrium.

## 4.2 Trade Equilibrium

An equilibrium is characterized by a vector of prices, total and domestic numbers of firms, under which the maximizing agents clear the markets. In equilibrium the value of rents per firm is given (4"). These equilibrium conditions are the same as in the previous section with the exception of the market clearing condition for manufacturing products. I will now derive the equilibrium conditions and find the values for the endogenous variables.

[20] Appendix 6 displays equation (37) in terms of the exogenous parameters.

Note that neither the world supply nor the world demand for the outside good is altered by differences in trade costs across countries. Market clearing in the market of the outside good is then given by the price and the total number of firms displayed in the previous section. In particular, the equilibrium price is given by Equation (20), and wage rates equalize across countries $p_h = 1 = W = W^*$. Furthermore, the total number of firms is written as follows:

$$(35)\, N(\Gamma) = \frac{\alpha L^w}{\theta(f + \bar{c}) - \bar{c}\alpha}$$

I consider now equilibrium in the markets for manufacturing products. Because the elasticity of substitution is constant and wage equalize, prices equal 1 in equilibrium and the supply of manufactuting products remains unchaged. However, differences in trade costs across countries modify the demand for varieties, which are now written as follows:

$$(39)\, z_i^d = \frac{1}{g}\alpha I + \frac{\rho_F^{\frac{\theta}{\theta-1}}}{g^*}\alpha I^*$$

$$(40)\, z_i^{*d} = \frac{\rho_H^{\frac{\theta}{\theta-1}}}{g}\alpha I + \frac{1}{g^*}\alpha I^*$$

where $g$ and $g^*$ are decreasing monotonic transformations of the price indices, in which terms I present the results in this section. The price index transformations are given by the following expressions:

$$(41)\, g = P^{1-\theta} = n + n^*\rho_H \qquad (42)\, g^* = P^{*\,1-\theta} = n^* + n\rho_F$$

Furthermore, countries' indirect utility functions can be written in terms of the transformations in the following way:

$$(43)\, V = \frac{g^{\frac{\alpha}{\theta-1}} I}{\alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}} \qquad (44)\, V^* = \frac{g^{*\,\frac{\alpha}{\theta-1}} I^*}{\alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}}$$

Notice in Equations (43) and (44) that Home's welfare increases with the $g$ transformations and its income level. We are now ready to derive Home's share of firms that clears the markets of manufacturing products. This share is written as follows:

$$(45)\, S_n = \frac{S_l[1 - \rho_H\rho_F] - \rho_H[1 - \rho_F][1 + \frac{N(\Gamma)\bar{c}}{L^w}]}{1 - \rho_H\rho_F - [\rho_H + \rho_F - 2\rho_H\rho_F][1 + \frac{N(\Gamma)\bar{c}}{L^w}]}$$

Note in Equation (45) that larger domestic markets are still more conducive to starting new businesses: Home's share of firms increases with its labor share. Furthermore, Home's share of firms increases with Home's tariffs and decreases with Foreign's tariffs, as shown in Appendix 8. Equation (45), along with Equation (35), defines the equilibrium of the model. I next use these equations to perform comparative statics exercises and investigate countries' incentives to raise tariffs.

### 4.3 Comparative Statics: A Large Country Definition And Rent-Shifting

I study how rents, the distinctive characteristic of this model, affect Home's share of firms. This study provides a large country definition that differs from the definition provided in section 2. Then, I show that a domestic tariffs increase allows governments to shift foreign rents to their home countries and reduce their price indices. The following proposition summarizes my study of rents and firm share:

**Proposition 5.** *If $\bar{c} > 0$ and Conditions (36),(37) and (38) hold, then $\frac{\partial S_n}{\partial c}_{c=\bar{c}} > 0$ if and only if $S_l > \frac{\rho_H[1-\rho_F]}{\rho_H+\rho_F-2\rho_H\rho_F} = \bar{S}_n$. Therefore, in an incomplete specialization equilibrium, Home is a large country if and only if $S_l > \bar{S}_n$.*

**Proof. See Appendix 6.**

Proposition 5 argues that a world rents increase augments the firm share of the country in which more than half of the firms are located, the large country. However, Proposition 5 defines a large country differently from Proposition 1. In particular, if Home's tariffs were larger than Foreign's tariffs$-\rho_f > \rho_c-$, Home could be a large country with a labor share lower than one half $-\bar{S}_n < \frac{1}{2}-$. The intuition for this result goes as follows: the increase in tariffs increases the importing prices for domestic consumers, who then substitute Home for foreign-produced varieties. The substitution increases the expenditure on domestic products and thereby enlarges Home's market size. Home's market then becomes more attractive so that the tariffs rise increases both Home's firm share and its number of firms. Hence, market size is not fully determined by labor shares but also by tariffs levels.

Because a tariffs rise makes the home country more attractive and increases its number of firms, a tariffs rise shrinks the set of imported products in this country. The effect of the shrinkage in this set more than offsets the increase in the effective importing prices so that a tariffs rise reduces the home country's price index. Therefore, my model produces the same qualitative results as Ossa's model. The following Proposition summarizes the results on the price index:

**Proposition 6.** *Under conditions (36),(37) and (38), a country's price index decreases (increases) with domestic (foreign) tariffs. Therefore, the decrease in the imported product set has a stronger effect than the increase in the effective price of these products. Formally,* $\frac{\partial g}{\partial \rho_H} < 0$ *and* $\frac{\partial g}{\partial \rho_F} > 0$*, or equivalently,* $\frac{\partial P}{\partial \rho_H} > 0$ *and* $\frac{\partial P}{\partial \rho_F} < 0$.

**Proof. See Appendix 8.**

Proposition 6 states that a country's price index decreases with domestic tariffs and increases with the tariffs of its commercial partner. An increase in Foreign's tariffs increases the market size of the foreign country and this country's number of firms. The increase in the number of foreign firms increases the intensity of competition in the world market and makes entry to Home's market less profitable. Hence, an increase in foreign tariffs reduces Home's number of domestic firms and thereby increases this country's price index. Proposition 6 confirms that my paper yields the same qualitative results as Ossa's model and shows that his results are robust to the introduction of rents. I now more thoroughly compare the motivations for raising tariffs described in Ossa to the motivations described in this paper. My model reconciles Ossa's framework with the 1980s rent-shifting literature because it shows that a tariffs rise creates both a price index reduction and a rent-shifting motivation. An interesting question then is how the incentives associated with the two models differ quantitatively. The following proposition compares the incentives from the two models in terms of rates of change:[21]

**Proposition 7.** *The rate of utility change resulting from a change in tariffs is greater in this model than in Ossa's setup. Formally, an increase in tariffs triggers the following changes:* $\ddot{V}^{ossa} = [\frac{\alpha}{\theta-1}]\ddot{g}^{ossa}$ *,* $\ddot{V}^{EB} = [\frac{\alpha}{\theta-1}][\ddot{g}^{ossa} + A] + \ddot{I}^{EB}$ *and* $\ddot{I}^{EB} > 0$ *and* $A > 0$*, where* $\ddot{V}^{ossa}$ *and* $\ddot{g}^{ossa}$ *ddenote the rate of utility increase arising from an increase in tariffs in Ossa's setup,* $\ddot{V}^{EB}$ *is the utility increase in this model and* $[\frac{\alpha}{\theta-1}]$ *represents the relative weight of the price index in the indirect utility function.*

**Proof. See Appendix 8.**

Proposition 7 states that the incentives for raising tariffs, when expressed in change rates, are greater in this model than in Ossa's setup for two reasons. First, an increase in domestic tariffs causes a larger rate of increase in the g function, which can be expressed as the sum of Ossa's rate plus a positive term. This result lies in the existence of rents: when rents are considered, an increase in the number of domestic firms increases the domestic income and home-market size by more so that the home country attracts more firms than in Ossa's model. Hence, the increase in the number of domestic firms and the decrease in the imported product set are greater in this model. Second, an increase in domestic tariffs causes an

[21] Because of the multiplicative form of the indirect utility function, the comparison between the two model in absolute terms is complicated. In particular, the introduction of entry barriers creates a distortion, which might reduce countries' utility levels, as shown in the previous section. Because of the multiplicative form, the distortion in the utility levels affects the absolute utility changes; therefore, these changes might be stronger in either model.

income increase in terms of the homogeneous good which does not occur in Ossa's model. Hence, the motivation for increase tariffs is stronger in this model.

# 5 Conclusion and Further Research

This paper adds entry barriers to a general equilibrium model of international trade and investigates its implications for trade patterns and welfare. The paper shows that rents generated by entry barriers modify standard international trade theory results. In particular, I build upon a standard home market effect model, in which relative market sizes are particularly relevant in the determination of each country's number of firms, trade patterns, and welfare. The paper shows that entry barriers exacerbate the relevance of market size that was the highlight of the home market effect literature initiated by Krugman. When entry barriers are considered, market size becomes more relevant because larger markets profit not only from higher labor earnings but also from higher rents. Along these lines, the paper shows that the rents generated by entry barriers exacerbate the standard home market effect.

Furthermore, the article emphasizes the importance of market size by showing that market sizes might distinguish winners from losers in the context of a trade agreement. In particular, this paper shows that if entry barriers are sufficiently and the trading partners sufficiently unequal in size, a trade agreement harms small countries. This result is an innovation in the home market effect literature and challenges the Pareto optimality of trade agreements in other main streams models of international trade, opening an avenue for further research. It would be particularly interesting to determine whether Pareto optimality is robust to the introduction of rents in a factor proportion model. In these models small countries benefit from trade agreements because a decrease in domestic tariffs eliminates price distortions for both consumers and producers. I do not consider these positive effects of trade agreements in this paper. An augmented version of the model I have presented could address this research question. In this regard, Romalis's model (2004)[22], which combines characteristics of the home market effect and factor proportion models, could be of a great help.

In addition, the paper shows that market size is determined not only by labor forces but also by domestic and foreign tariffs. An increase in domestic tariffs increases the demand for a country's products and thus raises its market size. The market size increase attracts more firms and therefore increases the country's income and reduces its price index. hence, this paper reconciles the rent-shifting theory from the 1980s with Ossa's model.

This paper investigates the implications of a change in the degree of entry barriers. The article proves that an increase in entry barriers may create welfare redistribution effects. In this respect, this paper connects to an emergent line of research investigating the consequences of market failure and credit constraints. Rather than pursing this line of research, I chose a more general approach to addressing entry barriers. I chose to take the existence of entry barriers as a given following the empirical evidence provided in other fields of economics. This choice allowed me to highlight the implications of regulatory entry barriers and their relevance for further research. However, I did not model entry barriers, as such

an effort would call for an integrated framework investigating their causes and consequences. This type of integrated framework would make it possible to further investigate the bidirectional causal relationship between trade and entry barriers.

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# 6 Appendices

- APPENDIX 1.

In this Appendix I justify Assumption (4') by studying differences in the degree of entry barriers from an empirical perspective. In particular, I compare degrees of entry barriers across the trading partners considered in my model: countries with similar labor productivities levels but different market sizes.A preliminary, intuitive interpretation suggests that countries with similar productivity levels will have similar degrees of regulation. I test this intuitive idea employing the Doing Business (DB) indicators from the World Bank and data from the IMF.[22]

The DB ranks economies based on indicators that measure the regulations affecting the life cycles of domestically owned firms. Many indicators assume that firms do not engage in foreign trade; however, the ranking remains a useful proxy for regulatory environments.[23] My sample includes the 173 countries that appear in the IMF estimates for GDP, which proxies for market sizes, and income per capita, which proxies for labor productivity. These income measures are expressed in P.P.P. terms. In all regressions, the dependent variable is the 2010 DB ranking, and the independent variables are the proxies for labor productivity and market size.

Table 1 displays the results. In Column (1), the independent variable is G.D.P., and in Column (2), the independent variable is income per capita. Column (3) includes the two regresses. The results displayed in the first two columns of Table 1 suggest that the variation in the countries' regulatory environments is better explained by labor productivity than by market size. Whereas only 4.6 % of the index variability is accounted for by the GDP, 41.6% of the same variability is accounted for by the income per capita. Furthermore, G.D.P. loses its significance but income per capita remains significant in Column (3), in which the two variables are included in the same regression. These results suggest that countries with similar labor productivity levels but different market sizes have similar regulatory environments.

[22] From the IMF Outlook Set.
[23] The indices are built from case studies.

**Table 1.**

| Dependant Variable | D.B. Ranking | | |
|---|---|---|---|
| Independant Variables | I | II | III |
| gdp (P.P.P.) | -0.007*** | | -0.003 |
| | (0.003) | | (0.002) |
| gdp per capita (P.P.P.) | | -0.002*** | -0.002*** |
| | | (0.000) | (0.000) |
| Constant | 89.931*** | 115.692*** | 116.053*** |
| | (3.881) | (3.916) | (3.920) |
| Observations | 173 | 173 | 173 |
| R-squared | 0.046 | 0.416 | 0.422 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

- APPENDIX 2.

This Appendix shows that the total number of firms displayed in Equation (14) and clear the outside good market. The Appendix also shows that utility decreases with the entry barriers measure in an autarky regime. To set equilibrium in the homogeneous good market, let me first state the labor usage per firm under the equilibrium quantity displayed in Equation (12). This labor usage per firm is the following:

$$l_i = (\theta - 1)\bar{c} + \theta f$$

Since, the marginal labor requirement for the homogeneous good equals 1, the supply of this good is the written as follows:

$$H^s = L - N[(\theta - 1)\bar{c} + \theta f]$$

Finally, under the income definition displayed in (10), the demand for the homogeneous good in (6) is written as follows:

$$H^d = (1 - \alpha)(L + N\bar{c})$$

Equilibrium in the homogeneous good market is then given by the following:

$$H^s = H^d \Longleftrightarrow N = \frac{\alpha L}{\theta f + \bar{c}[\theta - \alpha]}$$

this total number of firms is the same as that displayed in equation (14). Let me now take equation (15) and show that utility decreases with the entry barriers measure. Taking the derivative, I obtain the following:

$$\frac{\partial V}{\partial c}_{c=\bar{c}} = \frac{L\alpha[-f(1-\alpha) - \bar{c}(\theta - \alpha)]\theta[\frac{L\alpha}{-\bar{c}\alpha + (\bar{c}+f)\theta}]^{\frac{\alpha}{-1+\theta}}}{[\theta - 1][\bar{c}\alpha - (\bar{c} + f)\theta]^2} < 0$$

This proves that indirect utility falls with the entry barriers measure.

- APPENDIX 3.

This Appendix displays the set of conditions in equations (17) and (18) in terms of the exogenous parameters. As for equation (17), let me plug (35) into this equation and obtain:

$$\frac{[\bar{c}+f]\theta\rho}{[(\bar{c}+f)\theta-\bar{c}\alpha][1+\rho]} > S_l > \frac{\bar{c}[\theta-\alpha(1+\rho)]+f\theta}{[(\bar{c}+f)\theta-\bar{c}\alpha][1+\rho]}$$

As for (18), let me plug (35) into this equation. The inequality is then fulfilled *if and only if*:

$$f\theta(1-\rho)+\bar{c}[\theta(1-\rho)-\alpha(1+\rho)]>0$$

which requires the following condition to hold:

$$\text{IF } \alpha < \tfrac{\theta(1-\rho)}{1+\rho}\text{, then Nothing.}$$

$$\text{IF } \alpha > \tfrac{\theta(1-\rho)}{1+\rho}\text{, then } \bar{c} < \grave{c} = \tfrac{f\theta(1-\rho)}{\alpha(1+\rho)-\theta(1-\rho)}$$

- APPENDIX 4.

This Appendix displays Home's firms share in terms of the exogenous parameters, shows the stability of the equilibrium, and proves the comparative statics results from Section 3. Plugging equation (35) into (34) yields the following:

$$S_n = \frac{S_l[f\theta+\bar{c}(\theta-\alpha)][1+\rho]-[\bar{c}+f]\theta\rho}{f\theta[1-\rho]-\bar{c}[\alpha(1+\rho)-\theta(1-\rho)]}$$

Let me now prove the stability of this equilibrium. To this end, I remind the reader that equilibrium in the markets of manufacturing products requires:

$$\frac{I}{g}=\frac{I^*}{g^*}$$

The equilibrium is then stable if $\frac{I}{g} > \frac{I^*}{g^*}$ for any $S_n < S_n^*$, and $\frac{I}{g} < \frac{I^*}{g^*}$ for any $S_n > S_n^*$ where $S_n^*$is the share of firms displayed in Equation (34). Subtracting the terms, I obtain the following:

$$\frac{I}{g}-\frac{I^*}{g^*}=\frac{[L+\bar{c}N]\rho-LS_l[1+\rho]+S_n[L(1-\rho)-2\bar{c}N\rho]}{N[1-S(1-\rho)][-S_n(1-\rho)-\rho]}$$

This expression then proves the stability of the model.

Let me now go over the comparative statics results. Taking the expression for Home's share of firms given in this Appendix, I prove the Home-Market magnification:

$$\frac{\partial S_n}{\partial S_l} - \frac{1+\rho}{1-\rho} = \frac{2\bar{c}\alpha\rho[1+\rho]}{f\theta[1-\rho] - \bar{c}[\alpha(1+\rho) - \theta(1-\rho)]} > 0$$

where the last inequality results from assumption (18). Taking the derivative of the above expression with respect to the entry entry barriers measure, I obtain:

$$\frac{\partial S_n}{\partial S_l \partial c} = \frac{2f\alpha\theta\rho(1+\rho)}{(f\theta[1-\rho] - \bar{c}[\alpha(1+\rho) - \theta(1-\rho)])^2} > 0$$

This shows that the home market effect increases with the entry barriers measure. Furthermore, taking the expression for Home's share of firms displayed in this Appendix, we obtain the following result:

$$\frac{\partial S_n}{\partial \alpha} = \frac{\bar{c}(\bar{c}+f)(2S_l\text{-}1)\theta\rho(1+\rho)}{(f\theta[1-\rho] - \bar{c}[\alpha(1+\rho) - \theta(1-\rho)])^2}$$

; therefore:

$\frac{\partial S_n}{\partial \alpha} > 0$ *if and only if* $S_l < \frac{1}{2}$, Home is large size-country.

- APPENDIX 5.

This Appendix proves Proposition 3. Let me plug the equilibrium values in equation (25) and obtain the following expression for Home's indirect utility function:

$$V = [\alpha(1+\rho)]^{\frac{\alpha}{\theta-1}}[\bar{c}+f]\theta[\frac{L\ (S_l[(\bar{c}+f)\theta - \bar{c}\alpha][1-\rho] - \bar{c}\alpha\rho)}{([\bar{c}+f]\theta - \bar{c}\alpha)(f\theta(1-\rho) + \bar{c}[\theta(1-\rho) - \alpha(1+\rho)])}]^{\frac{\alpha}{\theta-1}+1}$$

Let me take the derivative of the expression displayed above with respect to the trade cost parameter:

$$\frac{\partial V}{\partial \rho} = \frac{V}{[\theta-1]}[\frac{\alpha}{1+\rho} + \frac{\alpha\bar{c}(2S_l-1)(\alpha+\theta-1)([\bar{c}+f]\theta - \bar{c}\alpha)}{(S_l[(\bar{c}+f)\theta - \bar{c}\alpha][1-\rho] - \bar{c}\alpha\rho)(f\theta(1-\rho) + \bar{c}[\theta(1-\rho) - \alpha(1+\rho)])}]$$

The former term inside the square bracket is positive. The latter term is positive *if and only if* $S_l > \frac{1}{2}$. Therefore, the trade agreement makes the large size-country better off. As for the small size-country, the latter term is negative, so this country is worse off *if and only if* the latter is greater than the former term in absolute value. This happens when Home's labor share is lower than an upper bound because the latter term increases with Home's labor share, as shown in the following.

$$\frac{\partial[\frac{\alpha c(2S_l-1)(\alpha+\theta-1)([\bar{c}+f]\theta-\bar{c}\alpha)}{(S_l[(\bar{c}+f)\theta-\bar{c}\alpha][1-\rho]-\bar{c}\alpha\rho)(f\theta(1-\rho)+\bar{c}[\theta(1-\rho)-\alpha(1+\rho)])}]}{\partial S_l} > 0$$

; therefore, we can state the upper bound the following way. IF

$$S_l < \tilde{S}_l = \frac{\bar{c}\left(\alpha[(c+f)\theta+c\alpha]\rho^2+[(\bar{c}+f)\theta-c\alpha][\alpha+(\theta-1)(1+\rho)]\right)}{\left([(\bar{c}+f)\theta-c\alpha]\left(-f\theta(1-\rho)^2+\bar{c}(\theta-\theta(\rho-4)\rho-[2+\alpha(\rho-3)][1+\rho]\right)\right)}$$

$$\text{, then } \frac{\partial V}{\partial \rho} < 0$$

It now suffices to prove that the upper bound is greater than the lower bound derived from equation (17). This happens *if and only if*:

$$\tilde{S}_l - \overrightarrow{S_l} = \frac{(f\theta(1-\rho)+\bar{c}[\theta(1-\rho)-\alpha(1+\rho)])\left(-f\theta(1-\rho)\rho+\bar{c}\left(1+\rho+\theta(-1+(-2+\rho)\rho)+\alpha\left(-1+\rho^2\right)\right)\right)}{(1+\rho)\left(-f\theta(1-\rho)^2-\bar{c}(\theta(\rho-4)\rho-\theta+[2+\alpha(\rho-3)][1+\rho])\right)} > 0$$

Note that IF $\alpha > -\frac{\theta\rho}{1+\rho}-\frac{\theta-2}{3-\rho}$ and $c > c^{TA} = \frac{f\theta(1-\rho)^2}{\theta-\theta(\rho-4)\rho-[2+\alpha(\rho-3)][1+\rho]}$ then $\tilde{S}_l - \overrightarrow{S_l} > 0$.

Furthermore, if $\theta > 2$ , the condition on alpha is trivial.

Moreover if $\alpha > \frac{\theta(1-\rho)}{1+\rho}$, assumption (18) and requires $\bar{c} < \grave{c} = \frac{f\theta(1-\rho)}{\alpha(1+\rho)-\theta(1-\rho)}$ . However, we have: $\grave{c} > c^{TA}$. This proves Proposition 3.

Q.E.D.

- APPENDIX 6.

This Appendix proves Proposition 4. Let me take the expression for Home's indirect utility displayed in the previous Appendix. Taking derivative of this expression with respect to $c$ yields the following:

$$\frac{\partial V}{\partial c}_{c=\bar{c}} = \frac{\alpha V}{[\theta-1]}[-\frac{f(1-\alpha)+\bar{c}(\theta-\alpha)}{(\bar{c}+f)([\bar{c}+f]\theta-c\alpha)}+\frac{f(2S_l-1)\theta(\alpha+\theta-1)(1-\rho)\rho}{(S_l[(\bar{c}+f)\theta-\bar{c}\alpha][1-\rho]-\bar{c}\alpha\rho)(f\theta(1-\rho)+\bar{c}[\theta(1-\rho)-\alpha(1+\rho)])}]$$

This proves that a small size-country is always worse off. As for the large size-country, the latter term in the square bracket is positive. Therefore, if it offsets the negative former term, the large-size country is better off.

I next use Home's indirect utility function and the parameter values for the simulation depicted in Figure 2. In particular, let me use: $\rho = 0.9\,; f = 100;\ \theta = 6;\ L^W = 500000$ and $\alpha = 0.15$. This choice guarantees that the economy is sufficiently open to trade. Next, I choose a labor share and $c$ values in the intervals $c\,\epsilon[0, 50]$ and $S_l\,\epsilon[0.5, 0.522]$, so Home is a large size-country. In particular, I choose the middle point of the $c-$interval and set $\bar{c} = 25$ . Let me distinguish two cases for these parameter values.

$$\text{When } S_l = 0.511, \text{ I obtain } \frac{\partial V}{\partial c}_{c=\bar{c}} = \frac{\alpha V}{[\theta-1]}[0.000114248] > 0.$$

$$\text{When } S_l = 0.505, \text{ I obtain } \frac{\partial V}{\partial c}_{c=\bar{c}} = \frac{\alpha V}{[\theta-1]}[-0.00281317] < 0.$$

This proves Proposition 4.

- APPENDIX 7.

This Appendix displays the set of conditions in equations (36) and (37) in terms of the exogenous parameters and shows Proposition 5 As for equation (36), let me plug (35) into this equation and obtain:

$$\overrightarrow{S_l} = \frac{\theta[f+\bar{c}]\rho_H[1-\rho_F]}{[(\bar{c}+f)\theta - c\alpha][1-\rho_H\rho_F]} < S_l < \frac{\theta f[1-\rho_H][1-\rho_F] + \bar{c}[\theta(1-\rho_H)(1-\rho_F) - \alpha(1-\rho_H\rho_F)]}{[(\bar{c}+f)\theta - \bar{c}\alpha][1-\rho_H\rho_F]} = \overleftarrow{S_l}$$

As for (37), let me plug (35) into this equation. The inequality is then fulfilled *if and only*:

$$\theta f[1-\rho_H][1-\rho_F] + \bar{c}[\theta(1-\rho_H)(1-\rho_F) - \alpha(1-\rho_H\rho_F)] > 0$$

which requires the following condition to hold:

$$\text{IF } \alpha < \frac{\theta[1-\rho_H][1-\rho_F]}{[1-\rho_H\rho_F]}, \text{ then Nothing.}$$

$$\text{IF } \alpha < \frac{\theta[1-\rho_H][1-\rho_F]}{[1-\rho_H\rho_F]}, \text{ then } \bar{c} < \check{c} = \frac{\theta f[1-\rho_H][1-\rho_F]}{\alpha[1-\rho_H\rho_F] - \theta[1-\rho_H][1-\rho_F]}$$

To the purpose of proving Proposition 5. let me first write Home's share of firms in terms of the exogenous parameters. Plugging equation (35) into (45) yields the following:

$$S_n = \frac{S_l[1-\rho_H\rho_F][(\bar{c}+f)\theta - \bar{c}\alpha] - [\bar{c}+f]\theta\rho_H[1-\rho_F]}{\theta f[1-\rho_H][1-\rho_F] + \bar{c}[\theta(1-\rho_H)(1-\rho_F) - \alpha(1-\rho_H\rho_F)]}$$

Taking derivative of this expression with respect to the entry barriers measure yields the following:

$$\frac{\partial S_n}{\partial c} = \frac{f\alpha\theta[1-\rho_H\rho_F][S_l(\rho_H+\rho_F-2\rho_H\rho_F) - \rho_H(1-\rho_F)]}{(\theta f[1-\rho_H][1-\rho_F] + \bar{c}[\theta(1-\rho_H)(1-\rho_F) - \alpha(1-\rho_H\rho_F)])^2}$$

which is positive *if and only if*:

$$S_l > \frac{\rho_H[1-\rho_F]}{\rho_H+\rho_F-2\rho_H\rho_F} = \bar{S}_n$$

This proves Proposition 4.

- APPENDIX 8.

This Appendix proves Proposition 6. It also proves that Home's share of firms increases with its own tariffs and decreases with foreign trade costs. Let me first prove the latter. Since world rents are independent of tariffs, I can work with the definition of Home's share displayed in equation (45), which I next do for the sake of simplicity. Taking the derivative of equation (45) with respect to the tariffs measures, I obtain the following:

$$\frac{\partial S_n}{\partial \rho_H} = \frac{[1+\frac{\bar{c}N}{L^W}][1-\rho_F][-(1-S_l)(1-\rho_F)+\frac{\bar{c}N}{L^W}\rho_F]}{[1-\rho_H\rho_F-(\rho_H+\rho_F-2\rho_H\rho_F)(1+\frac{\bar{c}N}{L^W})]^2} < 0$$

where the last inequality results from conditions in section 4. Consider now a change in tariffs, we have the following:

$$\frac{\partial S_n}{\partial \rho_F} = \frac{[1+\frac{\bar{c}N}{L^W}][1-\rho_H][S_l(1-\rho_H)-\frac{\bar{c}N}{L^W}\rho_H)}{[1-\rho_H\rho_F-(\rho_H+\rho_F-2\rho_H\rho_F)(1+\frac{\bar{c}N}{L^W})]^2} > 0$$

where the last inequality results from the sets of conditions made in section 4. As for Home's price index, I next show that its $g$ function is increasing in domestic tariffs, which prove that its price index decreases with Home's trade costs. Taking the derivative of the g function with respect to Home's tariffs, I obtain the following:

$$\frac{\partial g}{\partial \rho_H} = \frac{-[S_l(1-\rho_H)-\frac{\bar{c}N}{L^W}\rho_H]\rho_F}{[1-\rho_H\rho_F-(\rho_H+\rho_F-2\rho_H\rho_F)(1+\frac{\bar{c}N}{L^W})]} + \frac{[-(1-S_l)(1-\rho_F)-\frac{CN}{L^W}\rho_F][1-\rho_H\rho_F]}{[1-\rho_H\rho_F-(\rho_H+\rho_F-2\rho_H\rho_F)(1+\frac{\bar{c}N}{L^W})]^2} < 0$$

where the last inequality results from the fact that the two terms are negative under the sets of conditions made in section 4.

This proves Proposition 6.

- APPENDIX 9.

This Appendix shows Proposition 7. To this purpose, I keep working with Home's labor share in terms of the total number of firms. In Ossa's model, the rate of change due to a rise in domestic tariffs is written as follows:

$$\ddot{g}^{ossa} = -\frac{\left(\frac{\partial g}{\partial \rho_H}\right)^{OSSA}}{g^{OSSA}} = \frac{\rho_F}{1-\rho_H\rho_F}$$

In this model, the same rate is written as follows:

$$\ddot{g}^{EB} = -\frac{\left(\frac{\partial g}{\partial \rho_H}\right)^{EB}}{g^{EB}} = \frac{\rho_F}{1-\rho_H\rho_F} + \frac{\frac{\bar{c}N}{L^W}[(1-S_l)(1-\rho_F) - \frac{CN}{L^W}\rho_F]}{[S_l(1-\rho_H) - \frac{\bar{c}N}{L^W}\rho_H[1-\rho_H\rho_F - (\rho_H+\rho_F-2\rho_H\rho_F)(1+\frac{\bar{c}N}{L^W})]}$$

This proves Proposition 7.