

UC San Diego

Recent Work

Title

Regulatory Entry Barriers and Trade

Permalink

<https://escholarship.org/uc/item/6k8954nn>

Author

Tobal, Martin

Publication Date

2011-10-01

Regulatory Entry Barriers and Trade

Martin Tobal

UCSD

Abstract

This paper develops a New Trade Theory model modified with entry barriers, thereby creating a link between the traditional interests of development and industrial organization economists and research on international trade. I show that entry barriers cause the market size to become endogenous by creating rents. Furthermore, I prove that the endogeneity of market size has four implications. First, governments can use trade policy to shift foreign rents to their countries and enlarge their home markets. Second, endogenous market size magnifies the standard home-market effect. Third, the endogeneity of market size interferes with the unambiguous Pareto optimality of trade agreements. In particular, if rents are sufficiently large and the country size is sufficiently small, a trade agreement will negatively affect the country in question. Therefore, I consider a new research question: what are consequences of trade agreements in terms of welfare redistribution? Finally, I show that an increase in entry barriers increases the market size of large countries. If the market size increase is sufficiently large, the country benefits. These results challenge the idea that higher entry barriers decrease welfare.

1 Introduction

Economists have traditionally been concerned about entry barriers. In the fields of development economics and industrial organization, empiricists have provided evidence for barriers that generate rents. Furthermore, theorists have associated profits with different obstacles to market entry. This paper proposes a New Trade Theory model that includes entry barriers and thereby creates a link between the issues that interest traditional economists and research on international trade.

General equilibrium models of international trade have avoided the question of rents for different reasons.¹ The two 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.² Although it allows for monopolistic competition, the New Trade Theory fails to consider rents because it assumes free entry, under which entrants erode profits. Finally, in the heterogeneous firm models introduced in Melitz (2003)[19], aggregate rents are zero; unsuccessful entrants fully erase the profits generated by successful firms. This paper introduces entry barriers and studies the role of rents.

The paper focuses on a specific set of entry barriers: those related to the regulation of the economy. These barriers include credit constraints; incomplete investor protection; patents; health, safety and environmental laws; and red-tape regulation. The paper assumes that these barriers exist and thus that individual firms generate rents. Thus, credit constraints reduce market entry and then create rents for successful entrants. Furthermore, these rents take different forms depending on the nature of the entry barriers. Red-tape regulation, for example, imposes a burden on firms generating rents that accrue to bureaucrats and administrative employees.³

Under the assumption that entry barriers create rents, the article shows that entry barriers cause the market size to become endogenous. In particular, a country's income level depends on its number of domestic firms. The higher the number of domestic firms generating rents, the higher a country's income level. Because this number is endogenous, income levels and market sizes become endogenous variables. In addition, this paper shows that the endogeneity of market sizes has four important implications.

First, governments can increase their home incomes by increasing the number of domestic firms.⁴ Specifically, governments can raise domestic tariffs and induce entry into the domestic market. Furthermore, an increase in domestic tariffs deters entry into the foreign market and then reduces foreign income. Therefore, an endogenous market size makes the raising of tariffs a rent-shifting mechanism. This rent-shifting motivation is a standard result in industrial organization theory, as explained below.

¹As explained below, theoretical papers have studied the role of rents in partial equilibrium model. I refer to these model in the next subsection as the industrial organization theory from the 1980s.

²As noted above, profits are just one form of rents. This paper considers various forms.

³As indicated below, this has been shown by Djankov et al. (2002)[6].

⁴I 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.

Second, the endogeneity of the market size implies that countries with larger world labor shares have higher domestic rents. Furthermore, higher domestic rents induce entry into the domestic market and increase the number of domestic firms. Hence, the endogeneity of market size magnifies the standard home-market effect.

Third, the endogeneity of the market size disrupts the unambiguous Pareto optimality of trade agreements. In particular, a trade agreement reduces the market size in small countries, decreasing income and increasing the price index. Furthermore, if rents are sufficiently large and the country is sufficiently small, the income decrease and price index increase will be sufficiently strong. Therefore, under these conditions, trade agreements harm countries of a small size.⁵

Finally, the endogeneity of market size guarantees that an increase in the degree of entry barriers will have positive effects on countries of a large size. In particular, an increase in the extent of entry barriers will increase a large country's market size. The paper shows that for some parameter values, the increase in market size is so large that higher entry barriers aid the large country.⁶ These results challenge the idea that higher entry barriers are always related to lower welfare.

This paper incorporates entry barriers into a standard model and adds a realistic feature to international trade theory. This realistic feature has been proven empirically relevant in other fields of economics. Industrial organization and development economics researchers have shown a positive relationship between entry barriers and rents. In particular, industrial organization empiricists 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) considers estimations of the following entry equation: $E = (\Pi^e - F)\beta + \mu$, where E is entry, Π^e is expected post-entry profits, β measures the response of entry to profits and F is the entry costs. Several studies measure F as a function of observable proxies for entry barriers. In these estimations, regulation occurs through direct channels when the proxies are direct measures of regulation or through indirect channels when the regulation interacts with other barriers.^{7 8} Furthermore, other studies considered by Geroski (1995) model F as a fixed effect and thereby provide a generic estimate of the barriers.

One conclusion of Geroski's survey is that entry barriers are high. The author bases this conclusion on estimates of "limit profits", i.e., the profit level at which entry becomes zero in the entry equation. The author shows that most estimates are greater than zero, which indicates a high level of entry barriers. Furthermore, Geroski concludes that entry seems to react slowly to profits. In this capacity, Geroski's

⁵As shown in Section 3, this result requires that the elasticity of substitution is sufficiently large.

⁶As a preview, the economy must be sufficiently open to trade.

⁷See Geroski (1991)[12]. Many of these studies include capital raising requirements, which is a measure of entry barriers when access to credit is constrained.

⁸Geroski (1991)[10] gives many examples of the interaction.

argument is based on the β parameter, which is often small and imprecisely estimated.⁹ Hence, Geroski's comprehensive survey suggests that entry barriers are high and that entry is sufficiently slow.

Furthermore, Geroski refers to specific regulatory entry barriers such as patents and invokes the article of Caves et al.'s article (1991)[3].¹⁰ This article argues that agency problems within the physician-patient relationship and brand names create slow entry in the pharmaceutical sector. According to the authors, rent-seeking physicians prescribe branded drugs because they are persuaded by ex-patent holders or to minimize the probability of a lawsuit. Slow entry and rents then arise in the post-expiration patent period because physicians do not prescribe generics. In addition, Geroski relates patents to cost advantage to explain why they create rents. The author cites the example of the semiconductor industry, in which "first-coming" allows producers to develop cost advantage because of learning and experience.

Moreover, 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)[6]. Djankov et al. (2002) retrieve data on the number of procedures, official time, and official costs required for firms to start operating legally. The authors find high official costs in most countries and show that the rents created by excessive regulation accrue to bureaucrats and administrative employees. Ciccone et al. (2007) [4] examine the sectors considered in the article of Djankov et al. but enlarge their sample with additional requirements for firm operation.¹¹ The authors find that entry is slower in industries in which it is necessary to register land, build facilities, purchase equipment and procure specific licenses. They also show that the speed of entry decrease with the strength of these requirements. Hence, red tape imposes barriers to entry and is another source of rents.¹²

In summary, evidence from the fields of industrial organization and development economics suggests that entry barriers exist and create rents. Despite this evidence, international trade researchers have not introduced rents into their general equilibrium models. This paper makes a first attempt in that direction.

1.1 Connection With Other Literature And Structure Of The Paper

This paper relates closely to two theories of countries' incentives to raise domestic tariffs: Ossa's theory (2010)[22] and industrial organization models from the 1980s. Ossa (2010) takes Helpman and Krugman's setup (1985)[16] as a benchmark and study motivations for raising tariffs in a standard New Trade Theory model. The author shows that governments can increase the number of domestic firms in a country and

⁹In the paper, the author comments on the caveats associated with this stylized finding.

¹⁰Djankov et al. 's evidence is used with precaution as an empirical argument because in their sample, firms do not engage in trade.

¹¹Ciccone et al. (2007) used a New Trade Theory framework to model delayed entry. However, their dynamic environment was built to explain intersectorial labor reallocation, whereas my paper emphasizes the role of rents.

¹²I comment on the rest of the regulatory barriers in the next section, where I provide evidence on entry barriers using data from the World Bank.

reduce home-price indices by raising tariffs. Similar to Ossa (2010), I take Helpman and Krugman's setup (1985) as my benchmark and show that by raising tariffs, governments reduce home price indices in a model augmented with entry barriers. In contrast to Ossa's model, my model shows that by raising tariffs, governments also shift foreign rents to their home countries: entry barriers create rent-shifting.

The rent-shifting motivation was first described in industrial organization models from the 1980s. This theory assumes a negative relationship between entry barriers and the total number of firms. Using this relationship, the theory links rents, prices and welfare to entry barriers. Specifically, an increase in entry barriers reduces the total number of firms and increases income. However, increases in entry barriers raise prices and then reduce the consumer surplus. Furthermore, the reduction in the consumer surplus more than offsets the income increase: an increase in entry barriers reduces social welfare in the 1980s theory. These predictions regarding entry barrier increases are the predictions of my model.

Industrial organization theory also indicates what induces rent-shifting. In this theory, firms from different countries interact strategically in a non-cooperative game. Governments then use trade policy to improve the position of domestic firms and alter the initial sub-game.¹³ Thus, a given number of domestic firms increases their profits and the raising of tariffs becomes a rent-shifting mechanism.

The difference between the 1980s theory and this model is the use of a general equilibrium model and a different rent-shifting mechanism. In particular, this model shows that an increase in domestic tariffs induces entry into the domestic market and deters entry into the foreign market. Therefore, rent-shifting occurs through a change in the numbers of domestic firms and not through an increase in rent per domestic firm.

In addition, there is a link between this paper and a set of models justifying the existence of the W.T.O. because this paper indicates a new motivation for setting high tariffs. In one such model, Bagwell and Staiger (1998)[1] identify terms of trade as a rationale for trade agreements. Furthermore, Mrazovak (2009)[20] extends the one-product paradigm to an n-good set-up with the goal of a better understanding of W.T.O. negotiations. The difference between the work of Mrazovak (2009) and my model is that the former does not function within a standard general equilibrium model of trade.

Furthermore, this paper is connected to Haufler and Wooton's article (1999)[15], which describes a rent-shifting mechanism similar to mine. In particular, the authors establish a link between public policy and a country's number of firms. In their model, policy is used to attract foreign firms and persuade them to achieve foreign direct investment. Rent-shifting then occurs as the government extracts foreign firms' profits via a lump sum tax. Although similar, this rent-shifting mechanism is different from mine.

Finally, this model relates to other attempts to introduce entry barriers into a general equilibrium setup. Neary (2002)[21] creates an oligopolistic competition model in a Ricardian environment with a

¹³See Brander and Spencer (1985)[2], who study the case of export subsidies and Dixit (1984)[5], who studies import tariffs, among other authors.

continuum of goods. In that model, entry barriers are conceived of as in the 1980s theory: a fixed number of firms exists in the market for each good. Neary's model is different from mine because I build upon a New Trade Theory environment. Furthermore, Neary's conception of entry barriers is different from mine because I relate entry barriers to rents created by individual firms. My conception of entry barriers allows me to follow international trade theorists and endogenously determine the total number of firms.

In the remainder of this paper, I present my New Trade Theory model. In the next section, I present the model setup and solve for the autarky equilibrium. I next show that my perception of entry barriers is consistent with Neary's model, the 1980s theory and other industrial organization standards. In Section 2, I also retrieve data from the World Bank and IMF and show that the commercial partners considered in my model exhibit similar degrees of regulation. Therefore, I assume the same measure of entry barriers for the two countries in Section 3. In that section, I solve for the trade equilibrium and show that entry barriers modify the Home-Market effect and the Pareto efficiency of trade agreements. In Section 3, I also study the welfare implications of a change in the entry barriers measure. Finally, in Section 4, I allow for trade policy and show the emergence of the rent-shifting motivation. Section 5 concludes.

2 Autarky Equilibrium

2.1 Model Setup

Consider the autarky equilibrium for a country called Home. The utility of the representative consumer depends on a single homogeneous "outside good" and a composite of differentiated manufacturing products. Preferences are represented using 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 denotes the consumption of a differentiated manufacturing product, y denotes the consumption of the homogeneous good, α denotes the share of expenditures 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 autocratic regime, all of these varieties are produced at Home.

Technology is represented by the following (inverse) production functions:

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

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. Manufacturers face increasing returns to

scale based on two components: b , the marginal labor requirement, and f , the fixed labor requirement. Monopolistic competition occurs in the manufacturing goods market, and perfect competition occurs in the market for the homogeneous good.

The regulatory environment in this economy is summarized by $E \in (0, \infty)$; a higher value of E indicates a higher level of entry barriers. The degree of entry barriers fully determines the rents associated with a manufacturer. The relationship is given by an increasing function $\pi : E \rightarrow c_E$, where $c_E \in (0, \infty)$ denotes individual rents.¹⁴ Consequently, for a given regulatory environment $\bar{E}$, the following equation must hold in equilibrium:

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

The rents displayed in (4) must take different forms. Furthermore, the form will depend on the nature of the entry barriers considered. For instance, if the entry barriers are environmental regulations, the rents are payments of permits for carbon emissions and accrue to the government. If the entry barriers are the costs considered by Djankov et al. (2002), the rents accrue to bureaucrats and administrative employees.

2.2 Autarky Equilibrium

An equilibrium is defined as a vector of prices and the total number of firms for which the maximizing agents clear the labor, homogeneous and manufacturing goods markets and individual rents are 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:

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

where W is the wage rate, p_h is the price of the outside homogeneous good and the number 1 indicates that this price is set as the numeraire ($p_h = 1$).

The maximization of the utility function displayed in (1) generates the following demand functions:

$$(6) \ y^d = (1 - \alpha)I \quad (7) \ z_i^d = \frac{p_i^{-\theta}}{P^{1-\theta}} \alpha I$$

where y^d denotes the demand for the outside good, z_i^d is the demand and p_i the price for manufac-

¹⁴I do not put any upper bound in the set of possible values because that is not required under an autarky regime.

turing product i , I denotes income and P is Home's price index. This index is determined via utility maximization and written as follows:

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

Furthermore, the indirect utility function is obtained by inputting the demand functions displayed in (6) and (7) into Equation (1). This function is written as follows:

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

Home's income is given by the household labor earnings and the rents generated by the entry barriers. The household labor earnings equal the labor supply because the wage rate is 1. The rents generated by the entry barriers accrue to the government, firms and households. In a one-period setup, the government's budget must be balanced, and household dividends must equal the value of the firms.¹⁵ Therefore, the representative consumer's income is summarized as follows:

$$(10) I = L + Nc$$

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 θ , firms charge a constant mark-up over the marginal cost:

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

As in Krugman and Helpman, the units chosen are such that $\frac{\theta-1}{\theta} = b$. This choice of units yields an equilibrium price for manufacturing products equal to 1; $p = 1$.

Equilibrium in the manufacturing goods markets is determined by the regulatory environment as summarized in Equation (4) and by the pricing rule displayed in (10). Appendix 1 shows that the equilibrium quantity is given by the following expression:

$$(12) z_i^s = z_i^d = z = \theta(f + c)$$

Equation (12) reflects the intuitive idea that firms are of a larger size in markets where higher entry barriers are higher.

¹⁵Under a balanced budget, the rents that accrue to the government take part of expenditure in consumption goods.

Finally, the total number of manufacturing producers is determined by market clearing in the homogeneous good market. I derive this number in Appendix 1 and display it in the following equation:

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

where $\bar{N}$ denotes the total number of firms under free entry. In an autarky equilibrium, the entry barriers affect firm size and the expenditure devoted to manufacturing products. Therefore, the entry barriers determine the total number of firms.

On the one hand, an increase in entry barriers augments expenditures in manufacturing. This increase is represented by a rise in $c\alpha$ and a lower denominator in Equation (13). Therefore, an increase in entry barriers increments expenditures and thereby raises the total number of firms. On the other hand, an increase in entry barriers augments the size per firm $\theta(f + c)$ 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: the total number of firms is decreasing in the entry barrier measure. Hence, this number is lower in this model than it is under free entry, where there are no entry barriers.

2.3 Consistency Of The Entry Barrier Measure

In this subsection, I investigate the welfare effects of entry barriers in an autarky equilibrium. For this purpose, I compare autarky equilibria with different values for the entry barrier measure. This analysis will create a benchmark for use in Section 3, in which I analyze a change in the entry barrier measure for countries that are allowed to trade. Furthermore, the comparison across equilibria shows that my entry barrier measure is consistent with standards used by industrial organization economists.

I first present the equation for total rents (13), which I obtain from the total number of firms in equilibrium. Total rents are given as follows:

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

Note in Equation (14) that total rents are increasing in the entry barrier measure. Thus, the increase in individual rents more than offsets the decrease in the number of firms generated by higher 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 describe Home's indirect utility function in terms of the entry barriers measure:

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

Equation (15) makes it possible to disentangle the two effects of an entry barrier increase on welfare. 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 autocratic regime.

In summary, higher entry barriers imply fewer firms, a higher price index and total rents, and lower social welfare. Consequently, higher entry barriers generate the same results as a decrease in the number of firms in the industrial organization models. Hence, the choice of introducing entry barriers as a fixed level of per-firm rents in my setup is consistent with this literature. Moreover, because the market concentration is measured using the Herfindahl index, this choice is consistent with an increasing relationship between entry barriers and market concentration. I construct the Herfindahl index for this economy from Equations (12) and (13), which I display in the following:

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

Equation (16) shows that a higher value for the entry barrier measure increases the HH, which indicates higher market concentration. Hence, the entry barrier measure is consistent with research on industrial organization. I investigate the characteristics of this measure from an empirical perspective in the next section.

2.4 Evidence On Entry Barriers

In this subsection, I investigate two related issues. First, I investigate cross-country differences in degrees of entry barriers from an empirical perspective. Second, I decide the nature of the entry barriers measure. Because the empirical analysis shows no differences across countries, I set the measure as an exogenous variable.

A trade regime requires a prejudgment regarding differences in entry barriers. The reason is that a country's welfare depends on its own measure and the measures of its trading partners. In the following, I

study differences in entry barriers and derive an assumption on which to base my prejudgment. I compare degrees of entry barriers across the trading partners considered in my model: countries with similar labor productivity levels and different market sizes.

A preliminary, intuitive interpretation suggests that countries with similar productivity levels will have similar degrees of regulation. I test this idea using the Doing Business (DB) indicators from the World Bank and data from the IMF.¹⁶ 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.¹⁷

My sample includes the 174 countries that appear in the IMF estimates for GDP, which proxies for market sizes, and income per capita, which proxies for labor productivity. In all regressions, the dependent variable is the 2010 DB ranking, and the independent variables are the proxies for regulation. Table 1 refers to cases in which the income variables are expressed in U.S. dollars. 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 regressors with the same units. In Table 2, the income variables are expressed in terms of P.P.P., which corrects for any distortion introduced by the 2010 nominal exchange rates used in the income calculations.

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 it is by market size. Whereas only 6.4 % of the index variability is accounted for by the GDP, 38% of the same variability is accounted for by the income per capita. Furthermore, the G.D.P. loses its significance but the income per capita remains significant in Column (3).

Table 2 displays quantitatively stronger results than Table 1. The difference in R^2 between Columns (1) and (2) is greater when the P.P.P. results are considered. Furthermore, the absolute value of the R^2 in Column (2) is greater, even though I was forced to drop an observation because of a lack of information. Moreover, although this is not displayed in the tables, the already-significant p-value for G.D.P. in Column (3) is even more significant in Table 2.

Tables 1 and 2 both suggest that countries with similar labor productivity levels and different market sizes have similar regulatory environments. Following this suggestion, I make the following assumption:

$$(4') c_E = c_E^* = c$$

where c^* denotes the foreign country measure to which I refer in the next section. Assumption (4') states that the value of the entry barrier measure is the same for both trading partners. Imagine for a moment what would happen if this value changed in one of the countries. If assumption (4') were

¹⁶From the IMF Outlook Set.

¹⁷The indices are built from case studies.

to hold, this change should be accompanied by an equivalent change in the measure for the country's trading partner. Furthermore, the change in the entry barrier measure could be interpreted as exogenous or endogenous. If the change were interpreted as endogenous, it would denote a policy choice. Moreover, because the change would occur in both countries, it should denote a regional regulatory policy. However, regional regulatory policies are empirically irrelevant in this model: regions with a unique regulatory policy do not allow for different trade policies within their borders.¹⁸ Therefore, I sacrifice the endogeneity of the entry barrier measure with the goal of studying countries' incentives for raising tariffs.¹⁹

Table 1.

Dependant Variable	D.B. Ranking		
	I	II	III
Independent Variables			
gdp2010 (thousand U.S. Dollars)	-0.010*** (0.003)		-0.003 (0.002)
gdpercapita (Billion U.S. Dollars)		-0.002*** (0.000)	-0.002*** (0.000)
Constant	90.753*** (3.834)	108.311*** (3.641)	108.634*** (3.641)
Observations	174	174	174
R-squared	0.064	0.380	0.386

Standard errors in parentheses

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

One interesting question is how much realism I am losing by conceiving of the entry barrier measure as an exogenous variable. The answer depends on whether regulatory changes occur often and whether they are motivated by economic factors. On this subject, notice that the barriers that I consider are either technically difficult to change or not modified on a regular basis. Furthermore, several researchers have invoked the concept of the “punctuated equilibrium” in referring to this regulation. In the paragraphs that follow, I comment in greater depth on the frequency of change and the reasons for the changes in the entry barriers.

First consider credit constraints, which in the emerging literature have proven relevant in sectors involved in international trade.²⁰ This literature, along with standard microeconomics theory, shows that credit constraints are associated with large collateral requirements, which in turn are mostly caused by moral hazard and asymmetric information. Because these problems are technically difficult to resolve, the authorities have little influence on this aspect of credit constraints. Hence, little realism seems to be lost in assuming that entry barriers are exogenous.

¹⁸See the case of the E.U. for example.

¹⁹In Section 3.3. I study the implications for a change in the common measure; however, this change should be interpreted as an external shock, rather than as the result of a common policy. As noted above, this external shock could be thought as the TRIPS agreement, which was more “an imposition” than a common choice for low and middle income countries.

²⁰See Feenstra (2011)[8] for a review of this literature.

Table 2.

Dependant Variable	D.B. Ranking		
Independent Variables	I	II	III
gdp (P.P.P.)	-0.007*** (0.003)		-0.003 (0.002)
gdp per capita (P.P.P.)		-0.002*** (0.000)	-0.002*** (0.000)
Constant	89.931*** (3.881)	115.692*** (3.916)	116.053*** (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

Consider now incomplete investor protection. In referring to this protection, Stanford professor J.A. Grundfest (2002)[14] has invoked the concept of “punctuated equilibrium.” In particular, Grundfest argues that capital market events stimulate sudden changes in the interpretation of U.S. securities law. Therefore, Grundfest suggests that securities regulations change discontinuously and disruptively rather than changing on a regular basis.

Furthermore, the concept of punctuated equilibria has been invoked with reference to health, safety and environmental regulation. This type of regulation seems to respond to the balance of political power and not to economic forces.²¹ According to Yale professor R. Repetto (2006)[23], only specific events that disrupt political resistance can trigger environmental reform. Hence, the frequency of change in environmental and securities law seems to be low and to be a function of the occurrence of specific events.

Finally, consider the entry barriers imposed by red tape. These entry barriers result from the number of procedures and the volume of paperwork required to start and operate a business. The number of procedures, the amount of paperwork and the amount of the payments made are difficult for federal governments to modify. Changing such regulations is complicated because rents accrue to bureaucrats and administrative employees as suggested by Djankov et al. Therefore, these entry barriers cannot be modified without political resistance from these beneficiaries. Furthermore, changes in these entry barriers are technically difficult to implement because of the high number of administrative organizations and agencies involved at the different levels of government.

In conclusion, the level of entry barriers seems to be similar across countries with similar labor productivity levels. Thus, I assume that the two countries in my model have the same entry barriers. This assumption conditions our interpretation of changes in the entry barrier measure, which is then conceived of as an exogenous variable. Furthermore, this conception of the measure does not seem

²¹For instance, cancer advisor Ralph Moss claims that Roche paid “hundreds of millions of dollars” to the FDA in exchange for the approval of Avastin. See <http://www.ralphmossblog.com/2010/12/fda-rules-against-avastin.html>.

to detract from the realism of the model; changes in entry barriers are not frequent or economically motivated. In the next section, I assume that there is no difference between the entry barriers across countries and solve for a trade equilibrium in terms of the entry barrier measure.

3 Trade Regime With Equal Trade Costs

3.1 Model Setup

I consider the case of two countries referred to as Home and Foreign. The variables that refer to Foreign are identified using a superscript asterisk (*). Domestic consumer utility is represented by the function displayed in (1). Preferences are identical across countries, so foreign consumer utility is summarized by a function analogous to (1).

Because technologies are identical across countries, 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, τ 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.²²

Finally, I make a set of assumptions to rule out the uninteresting case of complete specialization. To ensure that neither country produces all manufacturing products, 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 Γ so that we can write the assumptions as follows:

$$(17) \quad \bar{S}_l = \frac{\rho}{1+\rho} \left[1 + \frac{N(\Gamma)\bar{c}}{L^w} \right] < S_l < \left[1 - \frac{N(\Gamma)\bar{c}\rho}{L^w} \right] \frac{1}{1+\rho} = \underline{S}_l$$

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 world rents generated by manufacturing producers. Note in Equation (17) that $N(\Gamma)$ makes explicit the dependence of the number of firms on the vector of exogenous parameters.²³ In Appendix 2 I replace the equilibrium value for the total number of firms and display Equation (17) in terms of the exogenous parameters.

The restrictions on labor shares displayed in (17) are standard New Trade Theory assumptions. In particular, note that as $\bar{c} = 0$ is imposed in Equation (17), this equation converges with the restrictions

²²As Ossa, I abstract from tariff revenue to make the model tractable.

²³I follow Helpman et al. in [7] and treat N as a continuous variable.

imposed by Krugman and Helpman. Furthermore, notice that for the restrictions in (17) to be fulfilled, it is necessary to put an upper bound on the rents per worker. This bound is as follows:

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

Notice in Equation (18) that the upper bound on world rents becomes more restrictive as the economy approaches free trade. The logic governing these results 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 2 displays Equation (18) in terms of the exogenous parameters.

Finally, I assume that the homogeneous good is produced in both countries. A sufficient condition to produce this good is that the 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 share of expenditures associated with manufacturing products. A low value of this share reduces the labor required to produce these products and therefore makes the requirements on countries' labor supply less restrictive. Furthermore, these requirements are implied by Equation (17) if the following condition holds:

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

In the following, I make the set of assumptions composed by Equations (17) and (19). As noted above, these assumptions guarantee that at least one unit of both the homogeneous product and manufacturing product is produced in each country.

3.2 Trade Equilibrium

The equilibrium is characterized by a vector of prices, the total and domestic number of firms, under which the maximizing agents clear the markets. Individual rents are given by (4'). In a trade regime, there is an extra market clearing condition and an extra unknown affecting the equilibrium in Section 2. The extra condition is market clearing for foreign manufacturing products, and the extra unknown is the number of foreign entrants. 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 price of the good in the two countries. I set this price as the numeraire and write

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

The demand for the homogeneous good is derived from utility maximization as follows:

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

where (21) is the domestic demand for the homogeneous good. Among manufacturing products, Home-produced varieties are now consumed by foreign consumers, and foreign products are consumed by domestic consumers. The demand for Home and Foreign-produced manufacturing products is 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 (23) displays the demand for domestic products. Let me use these demands to obtain countries' indirect utility functions, which are then written as follows:

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

A country's welfare depends on its price index and incomes. These price indices are determined based on utility maximization and displayed in the following equations:

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

where n denotes the amount of domestic manufacturing products. A country's income is a product of labor earnings and of the rents generated by entry barriers. These incomes are written as follows:

$$(29) I = L + nc \quad (30) I^* = L^* + n^*c$$

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. Furthermore, these numbers are endogenous, so 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 generated by domestic firms. In reality, payments or rents generated by red tape undoubtedly accrue to residents: either to “the government” or to bureaucrats.²⁴ Profits, on the other hand, may accrue to investors whose portfolios contain a significant volume 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.²⁵ 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 use these definitions.²⁶

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 θ . Therefore, firms charge a constant mark-up over marginal cost. Making the same unit choice as in the autarky equilibrium, we can write:

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

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 a manufacturing product. This quantity is written as follows:

$$(32) z_i^s = z_i^d = z = \theta(f + c) \quad (33) z_i^{*s} = z_i^{*d} = z^* = z$$

Equations (32) and (33) state that firm size is the same across two countries with the same entry barriers. Furthermore, these equations and market clearing determine the number of domestic firms in equilibrium.²⁷ I next present this number in terms of Home's shares, following Krugman and Helpman closely. I call Home's share of firms S_n and write:

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

²⁴I 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.

²⁵The seminal paper in this literature is French and Poterba (1991)[9]. For recent evidence, see Lane and Molesi-Ferretti (2003)[17], Lutje and Menkhoff (2007)[18] and Strong and Xu (2003)[25], among other articles in this literature.

²⁶The 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.

²⁷I refer to manufacturing goods markets equilibrium.

From Equation (34), we obtain two standard New Trade Theory results. First, Home's share of firms increases with its labor share: in large domestic markets, there are more consumers to serve freely, so these markets are more conducive to the creation of new businesses. Second, Home's share of firms becomes more sensitive to its labor share as the economy approaches free trade. Appendix 3 shows Home's share of firms in terms of the exogenous parameters. Furthermore, this Appendix shows that the equilibrium of the model is stable.

Finally, the total number of firms is determined by market clearing in the homogeneous good market. This number is written as follows:

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

Notice in Equation (35) that the total number of firms is independent of the trade cost parameter. As in the autarky case, this number depends on consumer expenditures on manufacturing products and on the size of the firms. Furthermore, Equation (35), along with Equation (34), describes the equilibrium of the model. Next, I use these equations to run comparative statics exercises.

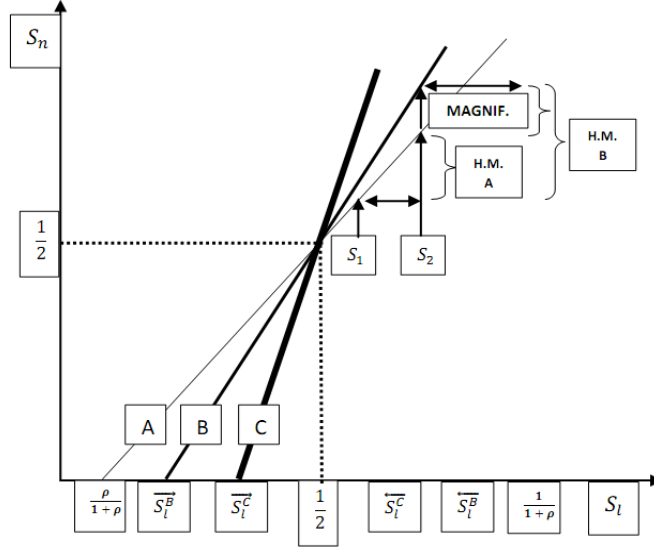
I first study the role of the Home-market effect, which is defined as firms' tendency to concentrate in large markets. In particular, I compare this model to existing New Trade Theory, which I represent with the seminal Krugman and Helpman model. In this model, the home-Market effect exists if a labor share increase raises the share of a country's firms more than proportionally— $\frac{\partial S_n}{\partial S_l} > 1$ —. The following proposition characterizes the home-Market effect in this model:

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

Proof. See Appendix 3

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 Krugman-Helpman model. As rents become positive, the A segment rotates counterclockwise over $(\frac{1}{2}, \frac{1}{2})$ so that the new relationship is represented by Segment B. Notice that B's slope is greater than A's slope: the existence of rents magnifies the Home-Market effect. Furthermore, as world rents increase, we should refer to segment C, whose slope is greater than B's slope. Hence, the strength of the Home-Market increases with world rents.

Figure 1.
Home Market Effect.



Notice that Proposition 1 refers to countries of any size. Figure 1 highlights cases in which Home's labor share is greater than $\frac{1}{2}$; in referring to these cases, I call Home a "large country." Note that Figure 1 compares two situations. In Situation 1, Home's labor share, denoted by S_1 , is lower than Home's labor share in Situation 2, which is denoted by S_2 .

Moreover, Home's market is relatively larger in Situation 2. One reason is its greater labor share, which indicates that there are relatively more domestic consumers. A relatively higher number of consumers induces entry into the domestic market. Therefore, an exogenous rise in Home's labor share increases its share of firms, as predicted by the standard home-market effect. However, the standard theory ignores an additional factor that increases Home's market size in situation 2.

The standard theory ignores that the rise in Home's share of firms increases the number of domestic firms and thus domestic rents. This model accounts for the increase in domestic rents and therefore generates an additional and endogenous increase in Home's market size. Furthermore, a larger Home market size induces the entry of a higher number of domestic firms. Hence, the Home-market effect is magnified, as denoted by the tag MAGNIF. in Figure 1.

I now run a comparative statics experiment on the expenditure share associated with manufacturing products. This experiment illustrates another contribution of this article with respect to the Krugman-Helpman 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 expenditures associated with manufacturing products. More formally, $\frac{\partial S_l}{\partial \alpha} > 0$ if and only if $S_l > \frac{1}{2}$.*

Proof. See Appendix 3

To develop the logic behind Proposition 2, I will show that a higher expenditure share increases world rents and that higher global rents raise a large country's share of firms.

Note in Equation (35) that in an economy with a higher expenditure share, the total number of firms is greater; given a regulatory environment proxied by $\bar{c}$, a higher expenditure share increases the profitability of entry so that the total number of firms becomes greater. Furthermore, the rise in the total number of firms increases the global rents.

Note in Equation (34) that the large country's share of firms increases with global rents. The governing logic is as follows: most firms are located in the large country, so that country captures the greatest portion of the global rents. Therefore, an increase in world rents increases the large country's relative market size. Furthermore, an increase in the relative market size of this country increases its share of firms.

Note the difference between the Krugman-Helpman model and the model in this article. In Krugman-Helpman's setup, countries' shares of firms are independent of industry characteristics such as expenditure shares, the elasticity of substitution or fixed production costs. In this paper, countries' shares of firms depend on the value of world rents and thus on industry characteristics.

In the following subsection, I use Equations (34) and (35) and the indirect utility functions displayed in (25) and (26) to investigate the welfare implications of a trade agreement. As in the first two comparative statics experiments, I use the Krugman-Helpman model as my benchmark.

3.3 Welfare Implications Of A Trade Agreement

In this subsection, I show that a trade agreement, when understood as a reduction of trade costs, has welfare redistribution effects. Furthermore, I show that a trade agreement will benefit a large country but harm a small country under some circumstances. This result distinguishes this model from existing New Trade Theory, in which trade agreements are Pareto improving. However, I build my results from a seminal New Trade Theory model, i.e., the Krugman and Helpman model.

In Krugman and Helpman's model, a small country's welfare depends on the only endogenous argument, its price index. Furthermore, 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 effective prices for a given set of importing products. This effect tends to reduce the price index and 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 reduce welfare. Although the agreement has opposing effects, it unambiguously improves the small country's welfare, as stated in the following:

Remark. *In the Krugman-Helpman setup, a trade agreement has two opposing effects on a small country's price index and welfare. However, the reduction in tariffs 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 considered, a small country might suffer from an agreement that is not Pareto improving. 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 a small country, and compare its situation in this model to its situation in the Krugman and Helpman setup.

In this model, the adverse effects are magnified because a trade agreement causes a greater reduction in Home's number of firms. Notice first that Home enjoys lower rents than its partner, which makes its relative market size smaller in this model. Therefore, a trade agreement that makes firm shares more sensitive to market size causes a greater reduction in the number of firms. The expansion of the imported product set and price index's tendency to rise are then stronger in this model than in Krugman-Helpman's setup. Hence, rents reinforce the adverse effects on a small country's price index.

In addition, a trade agreement reduces a small country's income. In Krugman-Helpman's model, this income is not affected by a trade agreement because it is exogenous and only composed of labor earnings. In my setup, income levels depend on the number of domestic firms, so they are affected by a trade agreement. In particular, the agreement reduces a small country's number of firms and thus its rents and income level. Hence, rents create negative effects on a small country's welfare in addition to influencing its price index.

Because rents reinforce and create channels through which an agreement reduces a small country's welfare, the agreement might harm this country. Furthermore, it can be proved that this effect occurs for a reasonably large set of parameters. In particular, Proposition 3 describes a subset within this large set. Thus, this proposition 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 θ are sufficiently large, the agreement will harm a sufficiently small country and create a conflict of interest. Formally, if $\theta > \theta^{TA} < 2$ and $\bar{c} > c^{TA}$, there is an S_l^p such that $\bar{S}_l < S_l^p < \frac{1}{2}$ and $\frac{\partial V(S_l^p)}{\partial \rho} < 0$.*

Proof. See Appendix 4.

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 is a considerably mild restriction, as this parameter only takes values greater than 1. The bound ensures that any price index reduction is sufficiently small. Second, Proposition 3 requires that the small country be sufficiently small. As noted above, the reduction in this country's number of firms decreases with its market size. Therefore, a sufficiently small size guarantees that the reduction in the number of firms is sufficiently large. Finally, Proposition 3 requires sufficiently large entry barriers and rents. Higher rents guarantee that this model is sufficiently different from the setup of Krugman and Helpman.

Proposition 3 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. Note that the welfare gains for large countries are greater in this model than they are in the model of Krugman and Helpman. 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 with a decrease in tariffs. I will also show that changes in entry barriers may not be Pareto improving in the following subsection.

3.4 Welfare Implications Of A Change In The Extent Of Entry Barriers

In this subsection, I study the welfare implications of an increase in entry barriers. As noted in Section 2, the increase should not be interpreted as the result of a common regulatory policy but should instead be understood as an exogenous shock to regulation. The effect of the TRIP agreement on low- and middle-income countries can be seen as an example of this phenomenon. The agreement established international standards for intellectual property protection, forcing these countries to adjust their patent and IPR systems.

For illustrative purposes, I have divided my analysis into two steps. First, I link the changes in aggregate variables triggered by the increase in entry barriers 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 under autarky, which I discussed in Section 2. Specifically, an increase in entry barriers reduces the total number of firms and thus increases price indices and world income in terms of the homogeneous good. Furthermore, the price index increase more than offsets the income increase; therefore, an entry barrier

increase tends to reduce welfare, as in the autarky equilibrium. I call this negative effect on countries' welfare the "autarky effect" throughout this section. I make two comments regarding this concept.

First, if the "autarky effect" were the only welfare implication of the increase, the two countries would be harmed as a result of the change in regulations. Second, in the "autarky effect", an increase in the level of entry barriers increases market concentration, rents and price indices while reducing welfare. These are the effects of higher entry barriers illustrated in the 1980s industrial organization literature and associated with strengthened intellectual property protection in several articles.²⁸

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

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

As noted in our discussion of Proposition 2, the large country's share of firms increases with world rents. If this share increase is sufficiently large, an increase in entry barriers increases the large country's number of firms.²⁹ Furthermore, this increase tends to raise the large country's income and tends to reduce the 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 might benefit a sufficiently large country. Formally, there is a $S_l^c(\Gamma_{EB})$ such that $\frac{1}{2} < S_l^c(\Gamma_{EB}) < \overleftarrow{S}_l$ and $\frac{\partial V(S_l^c(\Gamma_{EB}))}{\partial c} > 0$ for a set of parameters Γ_{EB} .*

Proof. See Appendix 5

Proposition 4 disentangles the welfare effects of an increase in entry barriers for a large country and provides a set of parameters under which this country benefits. Note that Proposition 4 partially

²⁸For 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.

²⁹Firms exits in the small country could be thought of as firm infringement on the patents and IPR systems imposed by the TRIP agreement.

characterizes this set. The large country must be sufficiently large that the “size-dependent effects” are sufficiently large and compensate for the “autarky effect.” Furthermore, Appendix 5 stipulates that if the economy is sufficiently open to trade, the “size-dependent effects” are magnified.

Figure 2.
Welfare Effects For A Large Size-Country.

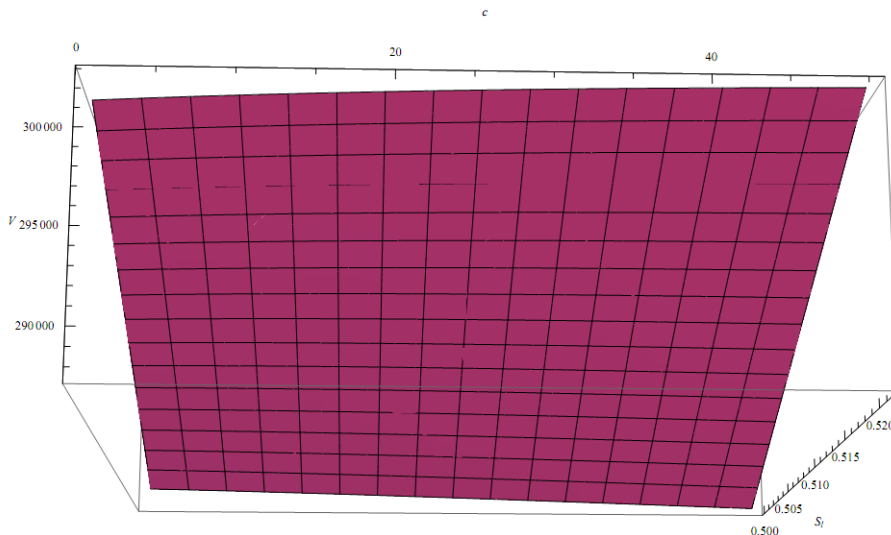


Figure 2 illustrates that a large country must be sufficiently large that it benefits from the increase in entry barriers, as stated in Proposition 4. The horizontal axis measures the entry barriers, which range from $c=0$ to $c=50$, the vertical axis displays the indirect utility, and the remaining axis displays a large country’s labor share. Home’s labor share ranges from 0.5 to 0.522. For illustrative purposes, let me concentrate on the case in which Home is a relatively smaller large country such that its labor share is approximately 0.5. Notice that this country’s utility is now greater when $c=0$ than when $c=50$. However, the opposite is true for a country with a sufficiently large labor share, as shown by Figure 2’s hyperplane for a country whose share is 0.522.

4 Trade Regime With Different Trade Costs

4.1 Model Setup

In this section, I let trade costs vary across countries and study their those countries’ incentives to raise tariffs unilaterally. ForTo this purpose, let me takeI use Ossa’s model (2010) as my benchmark. In Ossa’s model, a government that increases raising tariffs government succeeds into increaseincreasing its number of firms and reducinges its price index. This motivation for raising tariffs is present in mythis modell, as well. Furthermore, rents create a new motivation for raising tariffs because a larger number of domestic

firms guarantees a larger income.³⁰ This desire to raise tariffs with the goal of raising increasing domestic income reflects the rent-shifting motivation from discussed in the 1980's, as noted in the motivation. Theory.

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 still is remains monopolistically competitive, and the homogeneous good market is perfectly competitive.

Trade costs apply only to manufacturing goods and represent tariffs or any impediment to trade resulting from a public choice. For concreteness, I refer to these costs as tariff in the following. 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 parameters Γ so that the following assumption guarantees that manufacturing goods are produced in the two countries:

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

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. Notice that when the lower bound becomes more restrictive, a higher labor share is required; as Home's tariffs fall $-\rho_H$ increases-. The governing logic here is as follows: a decrease in domestic tariffs makes domestic entry less profitable; as a result, Home's market size must increase so that at least one producer will enter the market. Furthermore, for Equation (36) to hold, an upper bound on rents per worker must exist. This bound is written as follows:³¹

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

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

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

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

³⁰I refer to income in terms of the homogeneous good.

³¹Appendix 6 displays equation (37) in terms of the exogenous parameters.

The set of assumptions displayed in (38) guarantees that the homogeneous and manufacturing products are produced in both countries under Assumption (36). In the following, I make these two sets of assumptions and derive the equilibrium of the model.

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. Individual rents are given by (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.

Notice that neither the world supply nor the world demand for the homogeneous good is altered by differences in trade costs. Therefore, market clearing is given by the price and 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:

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

Consider the concept of equilibrium in markets for manufacturing products. The supply of varieties remains unchanged. In particular, the constant elasticity of substitution and wage equalization guarantees that equilibrium prices are equal to 1. However, the demand for manufacturing products is modified by the existence of different tariffs. This demand is now written as follows:

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

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

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:

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

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

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

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

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

Notice in Equation (45) that larger domestic markets are still more conducive to starting a business: Home's share of firms increases with its proportion of the world labor supply. Furthermore, the share increases with domestic tariffs and decreases with foreign trade costs, as shown in Appendix 7.

Equation (45), along with Equation (35), defines the equilibrium in the model. I next use these equations to perform comparative statics exercises and investigate countries' incentives to raise tariffs. I first study how rents, the distinctive characteristic of this model, affect Home's share of firms. The following proposition summarizes the results:

Proposition 5. *If $\bar{c} > 0$ and Conditions (36), (37) and (38) hold, then $\frac{\partial S_n}{\partial \bar{c}} > 0$ 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 higher rents increase the large country's share of firms, as in the previous section. Furthermore, the Proposition provides a novel definition of a large country. This definition argues that if Home's tariffs are larger than foreign tariffs— $\rho_f > \rho_c$ —, Home might be a large country with a labor share lower than one half— $\bar{S}_n < \frac{1}{2}$ —. Thus, an increase in Home's tariffs increases its market size and then its number of firms. The logic behind this concept is as follows: the increase in tariffs increases the price of foreign products for domestic consumers. These consumers then substitute foreign for Home-produced varieties, which increases expenditures on domestic products and thereby enlarges Home's market size. Therefore, an increase in Home's tariffs increases the number of firms entering the domestic market.

Furthermore, because an increase in tariffs increases a country's number of firms, an increase in tariffs allows governments to shift foreign rents towards their home-countries. This rent-shifting mechanism is different from existing rent-shifting channels and is consistent with current debates, as noted in the Introduction. In particular, this mechanism is consistent with the questioning of Russia's accession to the W.T.O. In 2010, the Russian prime minister admitted an increase in tariffs on imported cars to "promote investment" in the domestic market.³² Furthermore, this increase in tariffs was followed by an increase in the number of domestic varieties as Russian firms started to manufacture new models of cars. This example suggests that Russia might have used trade policy with the goals of increasing the number of Russian varieties and increasing domestic income.^{33 34}

In addition to the rent-shifting motivation, existing models have described other incentives for raising tariffs. In particular, Ossa's New Trade Theory model (2010) shows that governments can use trade policy to reduce domestic price indices. The author shows that a tariff increase has two opposing effects on a country's price index. On the one hand, the number of domestic firms increases, which shrinks the set of imported products and tends to reduce the price index. On the other hand, the tariff increase also increases the price of imported products, which tends to increase the price index. As proven by Ossa (2010), the former effect is stronger than the latter; governments can reduce their home-countries' price indices by raising tariffs. Moreover, Ossa's result (2010) holds in this framework, in which entry barriers and rents are considered. The following proposition states this result more formally:

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, $\frac{\partial q}{\partial \rho_H} < 0$ and $\frac{\partial q}{\partial \rho_F} > 0$, or equivalently, $\frac{\partial P}{\partial \rho_H} > 0$ and $\frac{\partial P}{\partial \rho_F} < 0$.*

Proof. See Appendix 7.

Proposition 6. states the comments from the previous paragraphs and that a country's price index increases with its commercial partner's tariffs. The reason is that an increase in foreign tariffs increases the market size of the foreign country and its number of firms. The increase in the number of foreign firms increases the intensity of competition and makes entry to the domestic market less profitable. Hence, a rise in foreign tariffs reduces the number of domestic firms and increases the domestic price index.

I now more thoroughly compare the motivations for raising tariffs described by Ossa to those described in this model. This model adds the motive of rent-shifting to the motive of price index reduction,

³²The pipeline: <http://thepipeline.pbn.ru/2010/09/02/car-tariffs-a-threat-to-Russia%E2%80%99s-wto-accession/>

³³<http://www.bsr-russia.com/en/automotive/item/586-avtovaz-returns-to-profit-launches-modernization-programme-financed-by-new-shares.html>

³⁴The example corresponds to the appearance of new products. In my model, both interpretations are suitable

reconciling the 1980s industrial organization literature with Ossa's framework. Another interesting question 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.³⁵

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 $\ddot{g}^{ossa}$ denote 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, which attracts more firms to the market. 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 income increase in terms of the homogenous good that does not occur in Ossa's model. Hence, the motivation for increase tariffs is stronger in this model.

In the next section, I summarize the results of the model and conclude.

³⁵Because 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.

5 Conclusion and Further Research

This paper adds entry barriers to an international trade setup and investigates its implications for trade patterns and welfare. The article shows that rents generated by entry barriers modify the results of standard international trade theory. In particular, the framework builds upon New Trade Theory, which is one of the three predominant streams of international trade models. The relative market size is particularly relevant because it determines the number of domestic firms and ultimately determines countries' welfare.

This article shows that entry barriers increase the relevance of market size as highlighted by Krugman and Helpman (1985). In particular, I show that 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 demonstrates that rents magnify 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 a trade agreement may harm small countries, contradicting standard New Trade Theory assertions. This outcome challenges the Pareto optimality of trade agreements in other streams of models and opens up space for further research.

It would be particularly interesting to determine whether Pareto optimality resists the introduction of rents in a factor proportion model. In these models, small countries benefit from trade agreements because a decrease in tariffs eliminates price distortions for consumers and producers. These positive effects of trade agreements are not considered in this paper, so Pareto optimality should also be studied using an augmented version of the model. In this sense, a setup similar to Romalis's model (2004)[24], which combines characteristics of the New Trade Theory and factor proportion models, would be an appropriate choice.

In addition, the article shows that market size is determined not only by labor forces but also by domestic and foreign tariffs. Higher domestic tariffs are associated with a higher demand for a country's products and thus with larger markets. Because larger markets sizes are correlated with a higher number of firms and domestic rents, this paper reconciles the rent-shifting theory from the 1980s with Ossa's setup.

Moreover, this paper investigates the implications of a change in the degree of entry barriers. The article proves that a change in the degree of entry barriers may create welfare redistribution effects. In this respect, this paper is linked with an emergent line of research investigating the consequences of market failure and credit constraints. Rather than pursuing this line of research, I chose a more general approach to addressing entry barriers.

Furthermore, 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.

References

- [1] K. Bagwell and R.W. Staiger. An economic theory of gatt. 1998.
- [2] J.A. Brander and B.J. Spencer. Export subsidies and international market share rivalry. *Journal of international Economics*, 18(1-2):83–100, 1985.
- [3] R.E. Caves, M.D. Whinston, M.A. Hurwitz, A. Pakes, and P. Temin. Patent expiration, entry, and competition in the us pharmaceutical industry. *Brookings papers on economic activity. Microeconomics*, 1991:1–66, 1991.
- [4] A. Ciccone and E. Papaioannou. Red tape and delayed entry. *Journal of the European Economic Association*, 5(2-3):444–458, 2007.
- [5] A. Dixit. International trade policy for oligopolistic industries. *The Economic Journal*, 94:1–16, 1984.
- [6] S. Djankov, R. La Porta, F. Lopez-de Silanes, and A. Shleifer. The regulation of entry*. *Quarterly Journal of Economics*, 117(1):1–37, 2002.
- [7] P.D. Fajgelbaum, G.M. Grossman, and E. Helpman. Income distribution, product quality, and international trade, 2009.
- [8] R.C. Feenstra, Z. Li, and M. Yu. Exports and credit constraints under incomplete information: Theory and evidence from china. Technical report, National Bureau of Economic Research, 2011.
- [9] K.R. French and J.M. Poterba. Investor diversification and international equity markets. *The American Economic Review*, 81(2):222–226, 1991.
- [10] P.A. Geroski. *Market dynamics and entry*. B. Blackwell, Oxford, UK; Cambridge, Mass., USA, 1991.
- [11] P.A. Geroski. What do we know about entry? *International Journal of Industrial Organization*, 13(4):421–440, 1995.
- [12] P.A. Geroski and J. Schwalbach. *Entry and market contestability: An international comparison*. Blackwell, Oxford, UK; Cambridge, Mass., 1991.
- [13] GM Grossman and E.L.C. Lai. International protection of intellectual property. *American Economic Review*, 94(5), 2004.
- [14] J.A. Grundfest. Puncuated equilibria in the evolution of united states securities regulation. *Stan. JL Bus. & Fin.*, 8:1, 2002.
- [15] A. Haufler and I. Wooton. Country size and tax competition for foreign direct investment. *Journal of Public Economics*, 71(1):121–139, 1999.
- [16] E. Helpman and P.R. Krugman. *Market structure and foreign trade*. MIT press, 1985.
- [17] P.R. Lane and G.M. Milesi-Ferretti. International financial integration. *IMF Staff Papers*, pages 82–113, 2003.

- [18] T. L. "utje and L. Menkhoff. What drives home bias? evidence from fund managers' views. *International Journal of Finance & Economics*, 12(1):21–35, 2007.
- [19] M. Melitz. The impact of trade on aggregate industry productivity and intra-industry reallocations. *Econometrica*, 71(6):1695–1725, 2003.
- [20] M. Mrázová. Trade negotiations when market access matters. 2009.
- [21] J.P. Neary. International trade in general oligopolistic equilibrium. *University College Dublin, mimeo*, 2002.
- [22] R. Ossa. A new trade theory of gatt/wto negotiations. Technical report, National Bureau of Economic Research, 2010.
- [23] R.C. Repetto. *Punctuated equilibrium and the dynamics of US environmental policy*. Yale Univ Pr, 2006.
- [24] J. Romalis. Factor proportions and the structure of commodity trade. *American Economic Review*, pages 67–97, 2004.
- [25] N. Strong and X. Xu. Understanding the equity home bias: Evidence from survey data. *Review of Economics and Statistics*, 85(2):307–312, 2003.

6 Appendices

• APPENDIX 1.

This Appendix shows that the equilibrium quantity and total number of firms displayed in equation (13) and (14) fulfill equation (4) and clear the homogenous good market, respectively. Furthermore, the Appendix shows that utility decreases with the entry barriers measure in an autarky regime. Let me start with the manufacturing products equilibrium quantity. Given the profit maximization price displayed in (11), equation (4) is written as follows:

$$\pi = \frac{z_i^s}{\theta} - f = c$$

; therefore, the output level that solves fulfilling equation (4) is the following:

$$z = \theta(f + c)$$

This results proves results displayed in equation (13). In order to set equilibrium in the homogenous good market, let me state the labor usage per firm under the equilibrium quantity displayed above. This labor usage per firm is the following:

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

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

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

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

$$H^d = (1 - \alpha)(L + Nc)$$

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

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

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:

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

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

• APPENDIX 2.

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:

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

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

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

which requires the following condition to hold:

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

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

• APPENDIX 3.

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:

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

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:

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

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:

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

where the last inequality results from assumption (18).

Furthermore, taking the expression for Home's share of firms displayed in this Appendix, we obtain the following result:

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

; therefore:

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

• APPENDIX 4.

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:

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

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

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

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.

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

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

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

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

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*:

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

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 $c < \hat{c} = \frac{f\theta(1-\rho)}{\alpha(1+\rho)-\theta(1-\rho)}$. However, we have: $\hat{c} > c^{TA}$. This proves Proposition 3.

Q.E.D.

• APPENDIX 5.

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:

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

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 $c \in [0, 50]$ and $S_l \in [0.5, 0.522]$, so Home is a large size-country. In particular, I choose the middle point of the c -interval $c = 25$. Let me distinguish two cases for these parameter values.

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

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

This proves Proposition 4.

• APPENDIX 6.

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:

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

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

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

which requires the following condition to hold:

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

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

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:

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

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

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

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 7.

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:

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

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

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

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:

$$\frac{\partial g}{\partial \rho_H} = \frac{-[S_l(1 - \rho_H) - \frac{CN}{LW}\rho_H]\rho_F}{[1 - \rho_H\rho_F - (\rho_H + \rho_F - 2\rho_H\rho_F)(1 + \frac{CN}{LW})]} + \frac{[-(1 - S_l)(1 - \rho_F) - \frac{CN}{LW}\rho_F][1 - \rho_H\rho_F]}{[1 - \rho_H\rho_F - (\rho_H + \rho_F - 2\rho_H\rho_F)(1 + \frac{CN}{LW})]^2} < 0$$

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 8.

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:

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

This proves Proposition 7.