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Trade, Inequality, and the Political Economy of Institutions

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Trade, Inequality, and the Political Economy of Institutions

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Abstract

We analyze the relationship between international trade and the quality of economic institutions, such as contract enforcement, rule of law, and property rights. In our model, firms differ in their preferences for institutional quality, which is determined endogenously in a political economy framework. We show that trade opening can worsen institutions when it increases the political power of a small elite of large exporters who prefer to maintain bad institutions. The detrimental effect of trade on institutions is most likely to occur when a small country captures a sufficiently large share of world exports in sectors characterized by economic profits.

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I. Introduction

The quality of economic institutions, such as contract enforcement, property rights, and rule of law is increasingly viewed as a key determinant of economic performance. While it has been established that institutions are important in explaining income differences across countries, what in turn explains those institutional differences is still an open question, both theoretically and empirically.

In this paper we ask, how does opening to international trade affect a country's institutions? This is an important question because it is widely hoped that greater openness will improve institutional quality through a variety of channels, such as reducing rents, creating constituencies for reform, and inducing specialization in sectors that demand good institutions (Johnson, Ostry, and Subramanian, 2005; IMF, 2005). Although trade openness does seem to be associated with better institutions in a cross-section of countries,[2] the relationship between institutions and trade is likely to be nuanced. In the 1700's, for example, the economies of the Caribbean were highly involved in international trade, but trade expansion in that period coincided with the emergence of slave societies and oligarchic regimes (Engerman and Sokoloff, 2002; Rogozinski, 1999). During the period 1880–1930, Central American economies and politics were dominated by large fruit-exporting companies, which destabilized the political systems of the countries in the region as they jockeyed to install regimes most favorable to their business interests (Woodward, 1999). In the context of oil exporting countries, Sala-i-Martin and Subramanian (2003) argue that trade in natural resources has a negative impact on growth through worsening institutional quality rather than Dutch disease. The common feature of these examples is that international trade contributed to concentration of political power in the hands of groups that were interested in setting up, or perpetuating, bad institutions. Thus, it is important to understand under what conditions greater trade openness results in a deterioration of institutions, rather than their improvement.

The main goal of this paper is to provide a framework rich enough to incorporate both positive and negative effects of trade on institutions. We build a model in which institutional quality is determined in a political economy equilibrium, and then compare outcomes in autarky and trade. In particular, to address our main question, we bring together two strands of the literature. The first is the theory of trade in the presence of heterogeneous firms (Melitz, 2003; Bernard et al., 2003). This literature argues that trade opening creates a separation between large firms that export, and smaller ones that do not. When countries open to trade, the distribution of firm size becomes more unequal: the largest firms grow larger through exporting, while smaller non-exporting firms shrink or disappear. Thus, trade opening potentially leads to an economy dominated by a few large producers.

The second strand of the literature addresses firms' preferences for institutional quality. Increasingly, the view emerges that large firms are less affected by bad institutions than small

[2] See, for example, Ades and Di Tella (1997), Rodrik, Subramanian, and Trebbi (2004), and Rigobon and Rodrik (2005).

and medium size firms.[3] Furthermore, larger firms may actually prefer to make institutions worse, ceteris paribus, in order to forestall entry and decrease competition in both goods and factor markets.[4] In our model, we formalize this effect in a particularly simple form. Finally, to connect the production structure of our model to the political economy, we adopt the assumption that political power is positively related to economic size: the larger the firm, the more political weight it has.

We identify two effects through which trade affects institutional quality. The first is the foreign competition effect. The presence of foreign competition generally implies that each firm would prefer better institutions under trade than in autarky. This is the disciplining effect of trade similar to Levchenko (2004). The second is the political power effect. As the largest firms become exporters and grow larger while the smaller firms shrink, political power shifts in favor of big exporting firms. Because larger firms want institutions to be worse, this effect acts to lower institutional quality. The political power effect drives the key result of our paper. Trade opening can worsen institutions when it increases the political power of a small elite of large exporters, who prefer to maintain bad institutions.

When is the political power effect stronger than the foreign competition effect? Our comparative statics show that the foreign competition effect of trade predominates when a country captures only a small share of world production in the rent-bearing industry, or the country is relatively large. In this case, while the power does shift to larger firms, these firms still prefer to improve institutions after trade opening. On the opposite end, institutions are most likely to deteriorate when the country is small relative to the rest of the world, but captures a relatively large share of world trade in the rent-bearing industry. Intuitively, if a country produces most of the world's supply of the rent-bearing good, the foreign competition effect will be weakest. On the other hand, having a large trading partner allows the biggest exporting firms to grow unchecked relative to domestic GDP, giving them a great deal of political power. We believe our framework can help explain why, contrary to expectations, more trade sometimes fails to have a disciplining effect and improve institutional quality. Indeed, our comparative statics are suggestive of the experience of the Caribbean in the 18th century, or Central America in the late 19th through early 20th: these were indeed small economies that had much larger trading partners, and captured large shares of world trade in their respective exports. At the end of the paper, we describe in detail three cases that we believe our model captures well: the Caribbean sugar boom in the 18th century; the coffee boom in Latin America in the 19th; and the cotton and cattle boom in Central America in the mid-20th century.

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[3]For example, Beck, Demirguc-Kunt and Maksimovic (2005) find that bad institutions have a greater negative impact on growth of small firms than large firms.

[4]This view is taken, for example, by Rajan and Zingales (2003a, 2003b), who argue that financial development languished in the interwar period and beyond partly because large corporations wanted to restrict access to external finance by smaller firms in order to reduce competition.

Our environment is a simplified version of the Melitz (2003) model of monopolistic competition with heterogeneous producers. Firms differ in their productivity, face fixed costs to production and foreign trade, and have some market power. If the domestic variable profits cover the fixed costs of production, the firm enters. If the variable profits from serving the export market are greater than the export-related fixed cost, the firm exports. Variable profits depend on firm productivity, and thus in this economy only the most productive firms export. Melitz (2003) shows that when a country opens, access to foreign markets allows the most productive firms to grow to a size that would not have been possible in autarky. At the same time, increased competition in the domestic markets reduces the size of domestic firms and their profits. The distribution of profits thus becomes more unequal than it was in autarky: larger firms grow larger, while smaller firms become smaller or disappear under trade.

The institutional quality parameter in our model is the fixed cost of production. When this cost is high, institutions are bad, and fewer firms can operate. Narrowly, this fixed cost can be interpreted as a bureaucratic or corruption-related cost of starting and operating a business.[5] More broadly, it can be a reduced-form way of modeling any impediment to doing business that would prevent some firms from entering or producing efficiently. For example, it could be a cost of establishing formal property rights over land or other assets. Or, in the Rajan and Zingales (2003a) view of financial development, our institutional quality parameter can be thought of as a prohibitive cost of external finance.

In our model, every producer has to pay the same fixed cost. We first illustrate how preferences over institutional quality depend on firm size. We show that each producer has an optimal level of the fixed cost, which increases with firm productivity: the larger the firm, the worse it wants institutions to be. Why wouldn't everyone prefer the lowest possible fixed cost? On the one hand, a higher fixed cost that a firm must pay decreases profits one for one, and same for everyone. On the other hand, setting a higher fixed cost prevents entry by the lowest-productivity firms, which reduces competition and increases profits. This second effect is more pronounced the higher is a firm's productivity. More productive firms would thus prefer to set fixed costs higher.

As a last step in characterizing our model environment, we require a political economy mechanism through which institutional quality is determined. The key assumption we make here is that the larger is the size of a firm, the greater its political influence. There is a body of evidence that individuals with higher incomes participate more in the political process (Benabou, 2000). There is also evidence that larger firms engage more in lobbying activity (see, for example, Bombardini, 2004). We adopt the political economy framework of Benabou (2000), which modifies the median voter model to give wealthier agents a higher voting weight. These ingredients are enough to characterize the autarky and trade equilibria. Firms decide on the fixed costs of production common to all, a decision process in which larger firms receive a larger weight. Then, production takes place and goods markets clear. We use this framework to

[5] For example, Djankov et al. (2002) documents large differences in the amount of time and money it requires to start a business in a large sample of countries.

compare equilibrium institutions under autarky and trade, in order to illustrate the effects of opening that we discussed above.

Our paper is closely related to several contributions to the literature on trade and institutions. In a seminal article, Krueger (1974) argues that when openness to international trade is combined with a particular form of trade policy—quantitative restrictions—agents in the economy will compete over rents that arise from possessing an import license. In this setting, one of the manifestations of rent seeking will be greater use of bribery and thus corruption. Other papers have explored the effects of trade on institutions unrelated to distortionary trade policy. For instance, Acemoglu, Johnson, and Robinson (2005) argue that in some Western European countries during the period 1500–1850, Atlantic trade engendered good institutions by creating a merchant class interested in establishing a system of enforceable contracts. Thus, trade expansion affected institutions by creating a powerful lobby for institutional improvement. Levchenko (2004) argues that trade opening changes agents' preferences in favor of better institutions. When bad institutions exist because they enable some agents to extract rents, trade opening can reduce those rents. In this case, trade leads to institutional improvement by lowering the incentive to lobby for bad institutions. Our model exhibits both the foreign competition effect related to Levchenko (2004), and the political power effect of Acemoglu et al. (2005). However, in our framework, the more powerful groups need not favor better institutions under trade.

In focusing on the interaction of trade and domestic political economy, our paper is related to Bardhan (2003) and Verdier (2005). These authors suggest that trade may shift domestic political power in such a way as to prevent efficient or equitable redistribution. Finally, our work is also related to the literature on the political economy dimension of the natural resource curse. It has been argued that the presence of natural resources lowers growth through worsening institutions. This is because competition between groups for access to natural resource-related rents leads to voracity effects along the lines of Tornell and Lane (1999) (see also the discussion in Isham et al., 2005).

The rest of the paper is organized as follows. Section II describes preferences, production structure, and the autarky and trade equilibria. Section III lays out the political economy setup and characterizes the political economy equilibria under autarky and trade. Section IV presents the main result of the paper, which is a comparison between the autarky and trade equilibria. We start with an analytic discussion of the conditions under which institutions may deteriorate with trade opening. Then, we present the results of a numerical simulation of the model, and use it to discuss the comparative statics. Section V presents three case studies, in which we believe that the mechanisms described by our model were at work. Section VI concludes. Proofs of Propositions are collected in the Appendix.

II. Goods and Factor Market Equilibrium

A. The Environment[6]

Consider an economy with two sectors. One of the sectors produces a homogeneous good z, while the other sector produces a continuum of differentiated goods $x(v)$. Consumer preferences over the two products are defined by the utility function

$$U = (1-\beta)\ln(z) + \frac{\beta}{\alpha}\ln\left(\int_{v\in V} x(v)^{\alpha}\,dv\right). \tag{1}$$

Utility maximization leads to the following demand functions, for a given level of total expenditure E:

$$z = \frac{(1-\beta)E}{p_z}$$

And

$$x(v) = Ap(v)^{-\varepsilon} \tag{2}$$

$\forall v \in V$, where $\varepsilon = 1/(1-\alpha) > 1$, and we define $A \equiv \beta E / \int_{v\in V} p(v)^{1-\varepsilon}\,dv$ to be the demand shift parameter that each producer takes as given.

There is one factor of production, labor (L). The homogeneous good z is produced with a linear technology that requires one unit of L to produce one unit of z. We normalize the price of z, and therefore the wage, to 1.

There is a fixed mass n of the differentiated goods firms, each of whom is able to produce a unique variety of good x. Firms in this sector have heterogeneous productivity. In particular, each firm is characterized by a marginal cost parameter a, which is the number of units of L that the firm needs to employ in order to produce one unit of good x. Each firm with marginal cost a is free not to produce. If it does decide to produce, it must pay a fixed cost f common across firms, and a marginal cost equal to a. The firm then faces a downward-sloping demand curve for its unique variety, given by (2). As is well-known, isoelastic demand gives rise to a constant markup over marginal cost. The firm with marginal cost a sets the price $p(v) = a/\alpha$, total production at $x = A\left(\frac{a}{\alpha}\right)^{-\varepsilon}$ and its resulting profit can be written as:

$$\pi(a) = (1-\alpha)A\left(\frac{a}{\alpha}\right)^{1-\varepsilon} - f. \tag{3}$$

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[6] Our notation is borrowed from Helpman, Melitz, and Yeaple (2003).

The distribution of a across agents is characterized by the cumulative distribution function $G(a)$. In order to adapt our model to a political economy framework in the later sections, we need to obtain closed-form solutions in the goods and factor market equilibrium. We follow Helpman, Melitz, and Yeaple (2004) and use the Pareto distribution for productivity. The Pareto distribution seems to approximate well the distribution of firm size in the U.S. economy, and delivers a closed-form solution of the model. In the Appendix, we describe it in detail, and present solutions to the autarky and trade equilibria when $G(a)$ is Pareto.

B. Autarky

To pin down the equilibrium production structure, we need to find the cutoff level of marginal cost, a_A, such that all firms above this marginal cost decide not to produce. In this model, firm productivity takes values on the interval $(0, \frac{1}{b}]$. The following assumption on the parameter values ensures that the least productive firm does not operate in equilibrium, and thus the equilibrium is interior:

$$f > \frac{(1-\alpha)\beta\left[k-(\varepsilon-1)\right]L}{nk\left[1-(1-\alpha)\beta\frac{\varepsilon-1}{k}\right]}.$$

When the equilibrium cutoff is a_A, the demand shift parameter A can be written as:

$$A = \frac{\alpha^{1-\varepsilon}\beta E}{nV(a_A)}, \tag{4}$$

where we define $V(y) \equiv \int_0^y a^{1-\varepsilon} dG(a)$.[7] The firm with productivity a_A makes zero profit in equilibrium, a condition that can be written as:

$$\frac{(1-\alpha)\beta E}{nV(a_A)} a_A^{1-\varepsilon} = f. \tag{5}$$

The equilibrium value of E can be pinned down by imposing the goods market clearing condition that expenditure must equal income:

[7]It turns out that in the Dixit-Stiglitz framework of monopolistic competition and CES utility, the integral $V(y)$ is useful for writing the price indices and the total profits in the economy where the distribution of a is $G(a)$. Each firm with productivity a sets the price of a/α. Since only firms with marginal cost below a_A operate in equilibrium, we can write the denominator of A as: $\int_{v\in V} p(v)^{1-\varepsilon} dv = n\int_0^{a_A} (\frac{a}{\alpha})^{1-\varepsilon} dG(a) = \frac{n}{\alpha^{1-\varepsilon}} V(a_A)$, leading to equation (4).

$$E = L + n\int_0^{a_A} \pi(a)dG(a).$$

We do not have free entry in the model, that is, we have a fixed mass of producers. This means that total income, given by the equation above, is the sum of total labor income and the profits accruing to all firms in the economy.[8] We can use (3) and (5) to write this condition as:[9]

$$E = L - nf\left[a_A^{\varepsilon-1}V(a_A) - G(a_A)\right]. \tag{6}$$

The two equations (5) and (6) in two unknowns E and a_A characterize the autarky equilibrium in this economy, which we illustrate in Figure 1. On the horizontal axis is $a,$ which is the firm's marginal cost parameter (thus, the most productive firms are closest to zero). On the vertical axis is firm profit. The zero profit cutoff, $a_A,$ is defined by the intersection of the profit curve with the horizontal axis. All firms with marginal cost higher than a_A don't produce. For the producing firms, profit increases in productivity. Higher f means that in equilibrium fewer firms operate: $\frac{da_A}{df} < 0.$ That is, the higher is $f,$ the more productive a firm needs to be in order to survive. Bad institutions deter entry by the less productive agents.

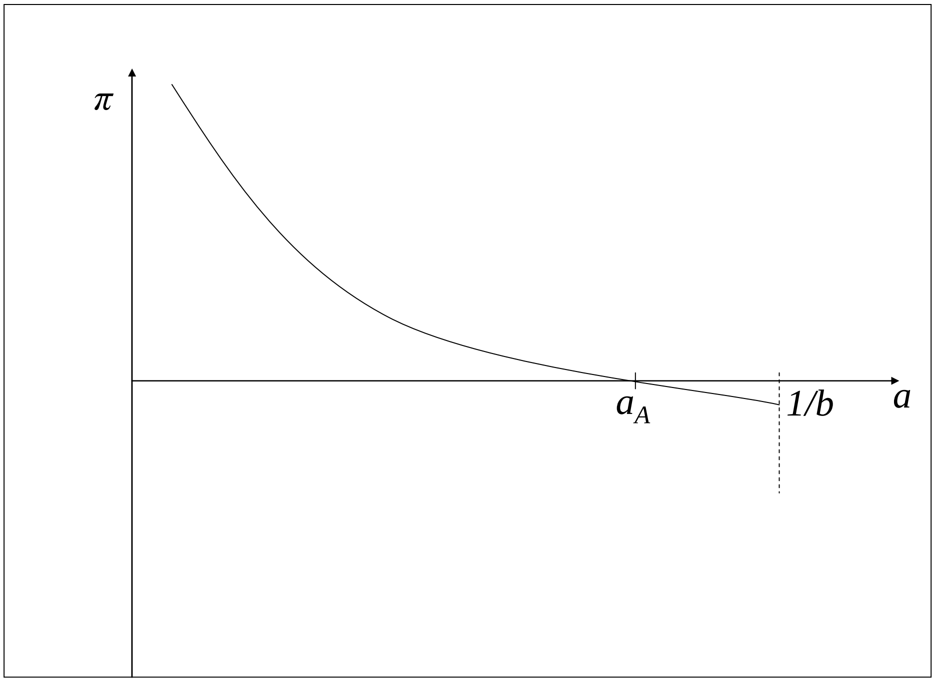
C. Trade

Suppose that there are two countries, the North (N) and the South (S), each characterized by a production structure described above. The countries are endowed with quantities L^N and L^S of labor, respectively, and populated by mass n^N and n^S entrepreneurs. Let f^S be the fixed cost of production in the South, and f^N in the North.

[8]The framework we use differs from the traditional Krugman-Melitz setup, in which there is an infinite number of potential entrepreneurs and free entry, and thus there are no pure profits in equilibrium. Our choice of keeping the mass of producers fixed is dictated by the need to adapt the model to the political economy setup. In our version of the model, all the conclusions are the same as in the more traditional Melitz framework with free entry, when it comes to the effects of trade.

[9]Using the expression for profits (3), and the zero cutoff profit condition (5), we can express the profit of a firm with marginal cost a as: $\pi(a) = f(a_A^{\varepsilon-1}a^{1-\varepsilon} - 1).$ Integrating the total profits for all $a \le a_A$ yields equation (6).

Figure 1. Profits as a Function of Marginal Cost



Good x can be traded, but trade is subject to both fixed and per unit costs.[10] In particular, in order to export, a producer of good x must pay a fixed cost f_X, and a per-unit iceberg cost τ. We assume that these trade costs are the same for the two countries. A firm in country i that produces a variety v faces domestic demand given by

$$x^i(v) = A^i p(v)^{-\varepsilon}, \tag{7}$$

where $A^i \equiv \beta E^i / \int_{v^i \in V^i} p(v)^{1-\varepsilon} dv$ is the size of domestic demand, $i = N, S.$ Note that the denominator aggregates prices of all varieties of x consumed in country $i,$ including imported foreign varieties. A firm with marginal cost a serving the domestic market in country i maximizes profit by setting the price equal to $p(v) = a/\alpha,$ and its resulting domestic profit can be written as:

$$\pi_D^i(a) = (1-\alpha)A^i \left(\frac{a}{\alpha}\right)^{1-\varepsilon} - f^i, \tag{8}$$

for $i = N, S.$

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[10]For the sake of tractability, we assume that z can be traded costlessly. This simplifies the analysis because as long as both countries produce some $z,$ wages are equalized in the two countries.

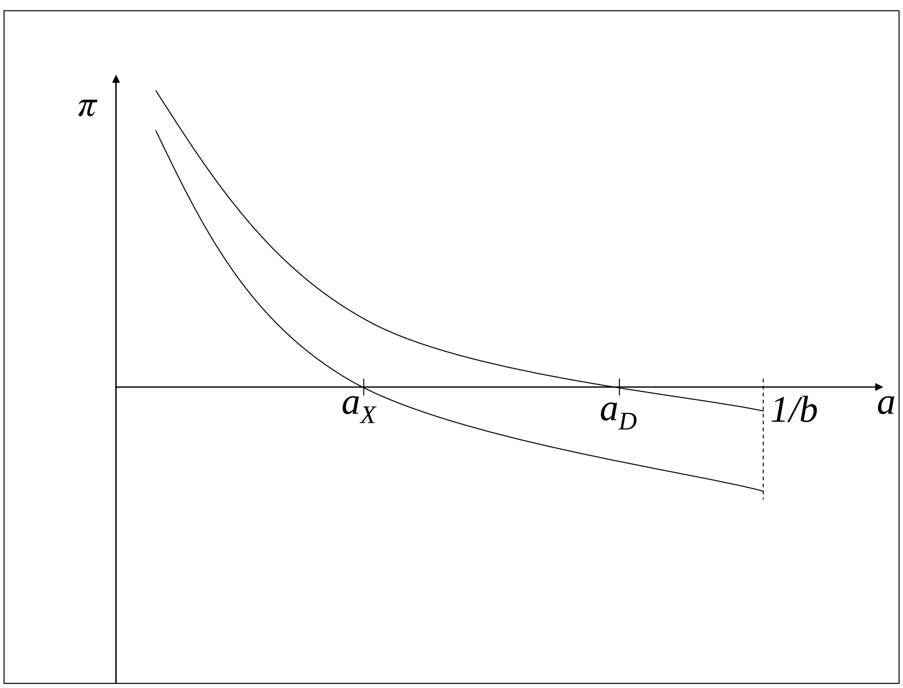
If the firm with marginal cost a decides to pay the fixed cost of exporting, its effective marginal cost of serving the foreign market is $\tau a,$ and thus it sets the foreign price equal to $\tau a/\alpha,$ and its profit from exporting is

$$\pi_X^i(a) = (1-\alpha)A^j\left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon} - f_X. \tag{9}$$

where $j \neq i$ designates the partner country, and $i = N, S.$

What determines whether or not a firm decides to export? A firm cannot export without first paying the fixed cost of production $f^i.$ We also assume that τ and f_X are large enough that not all firms which find it profitable to produce domestically find it worthwhile to export. Thus, only the higher-productivity firms end up exporting, which seems to be the case empirically. We illustrate the partition of firms into domestic and exporting in Figure 2. The two lines plot the domestic and export profits as a function of $a.$ As drawn, firms with marginal cost higher than a_D do not produce at all. Firms with marginal cost between a_X and a_D produce only for the domestic market, while the rest of the firms serve both the domestic and export markets.

Figure 2. Profits and Firms' Segmentation into Domestic and Exporting



To pin down the equilibrium, we must find the production cutoffs a_D^i, and the exporting cutoffs a_X^i, for the two countries $i = N, S.$ Similarly to the autarky case, given these cutoffs, the size of the domestic demands in the two countries can be written as:[11]

$$A^i = \frac{\alpha^{1-\varepsilon}\beta E^i}{n^i V(a_D^i) + n^j \tau^{1-\varepsilon} V(a_X^j)}, \tag{10}$$

where $i = N, S,$ and $j \neq i.$ Comparing these to the autarky demand (4), we see that the denominators in these expressions reflect the fact that some varieties of good x consumed in each country are imported from abroad. The cutoff values for production and export are characterized by:

$$\frac{(1-\alpha)\beta E^i}{n^i V(a_D^i) + n^j \tau^{1-\varepsilon} V(a_X^j)} \left(a_D^i\right)^{1-\varepsilon} = f^i, \tag{11}$$

$$\frac{(1-\alpha)\beta E^j}{n^j V(a_D^j) + n^i \tau^{1-\varepsilon} V(a_X^i)} \left(\tau a_X^i\right)^{1-\varepsilon} = f_X, \tag{12}$$

where $i = N, S,$ and $j \neq i.$ The model can be closed by imposing the condition that expenditure equals income in both countries. In particular, total income is the sum of labor income and all profits accruing to firms from selling in the domestic and export markets:

$$E^S = L^S + n^S \int_0^{a_D^S} \pi_D^S(a) dG(a) + n^S \int_0^{a_X^S} \pi_X^S(a) dG(a)$$

And

$$E^N = L^N + n^N \int_0^{a_D^N} \pi_D^N(a) dG(a) + n^N \int_0^{a_X^N} \pi_X^N(a) dG(a)$$

[11]Each firm with productivity a serving the domestic market sets the price of $a/\alpha.$ Foreign firms set the price $\tau a/\alpha.$ In the South, only firms with marginal cost below a_D^S operate in equilibrium, and only Northern firms with marginal cost below a_X^N sell in the South, we can write the denominator of the demand shifter A^S as:
$\int_{v^S \in V^S} p(v)^{1-\varepsilon} dv = n_S \int_0^{a_D^S} (\frac{a}{\alpha})^{1-\varepsilon} dG(a) + n_N \int_0^{a_X^N} (\frac{\tau a}{\alpha})^{1-\varepsilon} dG(a) = \frac{n_S}{\alpha^{1-\varepsilon}} V(a_D^S) + n_N \left(\frac{\tau}{\alpha}\right)^{1-\varepsilon} V(a_D^S)$ using our notation.

Using the expressions for profits in the two countries, (8) and (9), these can be rearranged to give two equations in E^S and E^N:[12]

$$E^S = L^S + n^S f^S \left[(a_D^S)^{\varepsilon-1} V(a_D^S) - G(a_D^S) \right] + n^S f_X \left[(a_X^S)^{\varepsilon-1} V(a_X^S) - G(a_X^S) \right] \tag{13}$$

And

$$E^N = L^N + n^N f^N \left[(a_D^N)^{\varepsilon-1} V(a_D^N) - G(a_D^N) \right] + n^N f_X \left[(a_X^N)^{\varepsilon-1} V(a_X^N) - G(a_X^N) \right]. \tag{14}$$

Equations (11)–(14) determine the equilibrium values of a_D^S, a_X^S, a_D^N, a_X^N, E^S, and E^N. How does the trade equilibrium differ from the autarky equilibrium for given levels of f^i? For the political economy effects we wish to illustrate, the most important feature of the trade equilibrium is that only the most productive firms export and grow as a result of trade opening. Under certain parameter restrictions, this model has the features of the Melitz (2003) framework, which we will use in discussing how trade affects institutions. The exact nature of the restrictions is detailed in the Appendix (Section 3) and will be henceforth implicit. Comparing autarky and trade, the following results hold: i) $a_A^i \geq a_D^i$: higher productivity is required to begin operating in the domestic market under trade than in autarky; ii) for firms that operate under trade, $\pi_D^i < \pi_A^i$: profits from domestic sales are lower under trade than in autarky. This implies, for instance, that firms which do not export in the trade equilibrium face lower total profits under trade. And, iii) there exists a cutoff $a_\pi^i < a_X^i$, below which a firm earns higher profits under trade than in autarky ($\pi_D^i + \pi_X^i > \pi_A^i$). Notice that simply being an export firm is not sufficient to conclude that total profits increase with trade, because of lower profits from domestic sales and fixed costs to be incurred in order to export. Thus, when countries open to trade, the least productive firms drop out, firms with intermediate productivity suffer a decrease in total profits, and the most productive firms experience an increase in profit. The distribution of profits becomes more unequal under trade.

III. Political Economy

In this paper, we think of the fixed cost of production, f, as the parameter that captures institutional quality. It can be interpreted narrowly as a corruption cost of starting or operating a business, or more broadly as any effect of poor institutions that acts to restrict entry. The quality of institutions, f, is determined endogenously through a political economy mechanism in which entrepreneurs participate; for simplicity we abstract from the participation of L in the

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[12] Using the expressions for profits, (8), (9), and the zero cutoff profit conditions (11), (12), we can express the profits of a firm with marginal cost a as: $\pi_D^S(a) = f\left(\left(a_D^S\right)^{\varepsilon-1} a^{1-\varepsilon} - 1\right)$ and $\pi_X^S(a) = f_X\left(\left(a_X^S\right)^{\varepsilon-1} a^{1-\varepsilon} - 1\right)$, if it exports. Integrating the total profits yields equation (13).

political process. In order to characterize the equilibrium outcome, we need to specify the agents' preferences, and the political economy mechanism through which institutional quality is determined. In our framework, preferences are equated with agents' wealth, and wealthier agents prefer to have worse institutions. For this, the connection to the production side of the model is essential. As we show below, when a firm's wealth is a positively related to its profits, it is indeed the case that larger firms prefer worse institutions.

When it comes to the political economy mechanism, the effect we would like to capture is that agents with higher incomes have a higher weight in the policy decision. For instance, Bombardini (2004) documents that larger firms are more involved in lobbying activity, and thus we would expect them to have a higher weight in the determination of policies. Rather than assuming a specific bargaining game, we adopt a reduced-form approach of Benabou (2000). This approach modifies the basic median voter setup to allow for a connection between income and the effective number of votes.

This section provides a general characterization of the political economy environment. We state the regularity conditions that must apply in our setting, define an equilibrium, and then prove a set of propositions showing its existence and stability. We then apply the general results to the case in which agents' preferences and voting weights come from the firms' profits in the autarky and trade equilibria. Finally, we present the main result of the paper, which is the comparison between the autarky and trade equilibrium institutions.

A. The Setup

Firms participate in a political game as an outcome of which the level of barriers $f \in [f_L, f_H]$ is determined.[13] An agent is characterized by a political weight, $\lambda(w)$, which is a function of the agent's wealth w. We assume that the political weight function $\lambda(w)$ is identical for every agent, and takes the following form:

$$\lambda(w) = \lambda_0 + w^{\lambda_1}.$$

For a given distribution of wealth $F(.)$, the pivotal voter is characterized by a level of wealth w_p defined by

$$2\int_0^{w_p} \left(\lambda_0 + w^{\lambda_1}\right) dF(w) = \int_0^{+\infty} \left(\lambda_0 + w^{\lambda_1}\right) dF(w). \tag{15}$$

We therefore assume that λ_1, λ_0, and $F(.)$ are such that $\int_0^{+\infty} \left(\lambda_0 + w^{\lambda_1}\right) dF(w) < \infty$.

[13]As will become clear below, we must restrict the quality of institutions, f, to a bounded interval in order to ensure that an equilibrium exists.

The parameter λ_1 can thus be seen as the wealth bias of the political system. Higher values of λ_1 give more political power to richer individuals, while $\lambda_1 = 0$ yields the median voter outcome, which we denote by w_m. It is then straightforward to see that for every possible political weight profile, the associated pivotal voter is always wealthier than the median voter as long as $\lambda_1 > 0$. The following Lemma characterizes pivotal voters at different levels of λ_0 and λ_1.

Lemma 1: *Defining by* $w_p(\lambda_0, \lambda_1)$ *the pivotal voter that prevails when the political weight schedule is* $\lambda(w) = \lambda_0 + w^{\lambda_1}$, *the following properties hold:*

- $w_p(\lambda_0, \lambda_1)$ is increasing in λ_1 and decreasing in λ_0;
- $w_p(\lambda_0, \lambda_1) \geq w_m$ for any $\lambda_0 > 0, \lambda_1 \geq 0$;
- $\lim_{\lambda_0 \to \infty} w_p(\lambda_0, \lambda_1) = w_m$.

For the rest of the paper, we assume that wealth is derived from profits, so that for any agent with marginal cost $a \in \left(0, \frac{1}{b}\right]$, it can be expressed as $w_r(a, f)$, where $r = A, T$ refers to a particular regime that occurs in the economy, that is, autarky or trade. We must put a set of regularity conditions on the function $w_r(a, f)$ in order to ensure that the political economy equilibrium is well-behaved. We detail these conditions formally in the Appendix. Aside from the usual assumptions about twice--continuous--differentiability with respect to a and f, we assume that the marginal impact of an increase in f on wealth, $\partial w_r(a, f)/\partial f$ is decreasing in f (concavity), but also decreasing in a: more productive entrepreneurs suffer relatively less from higher barriers to entry than their less productive counterparts do.

We now discuss the two ingredients necessary to find a political economy equilibrium: we need to know the identity of the pivotal voter, given by the marginal cost $a = p$, and we need to know what institutions that pivotal voter prefers. We start with the latter.

B. The Preference Curve

The Preference Curve is the locus of all the points $(p, f) \in \left(0, \frac{1}{b}\right] \times [f_L, f_H]$ such that f is the preferred level of entry barriers of an entrepreneur with marginal cost $a = p$. We denote the Preference Curve by $f_r(p)$. We make the simplifying assumption that for all entrepreneurs, the preferred level of f is simply the one that maximizes their wealth.

Proposition 2: *When regularity conditions (A.6) through (A.10) are satisfied, there exist two thresholds* $f_r^{-1}(f_H)$ *and* $f_r^{-1}(f_L) \in (0, \frac{1}{b})$, *such that the Preference Curve is a well-defined piecewise continuously differentiable mapping given by:*

$$f_r(p) = \begin{cases} f_H & \text{if} \quad p \leq f_r^{-1}(f_H) \\ \left\{ f_r : \frac{\partial}{\partial f} w_r(p, f_r) = 0 \right\} & \text{if} \quad p \in \left[f_r^{-1}(f_H), f_r^{-1}(f_L) \right] \\ f_L & \text{if} \quad p \geq f_r^{-1}(f_L) \end{cases}$$

Furthermore, the Preference Curve $f_r(p)$ *is nonincreasing, and strictly decreasing for some values of* p*.*

The first part of the Proposition shows that when the wealth-maximizing level of f is interior, it can be obtained simply by taking the first-order condition of wealth with respect to f. When the profit-maximizing level of f is not interior, the entrepreneur prefers either f_H or f_L, and all entrepreneurs that are more (less) productive also prefer f_H (f_L). The second part states that wealthier agents prefer worse institutions. The non-standard assumption driving the latter result is that $\partial w_r(a, f)/\partial f$ is decreasing in a: the marginal benefits of raising entry barriers must be higher for higher productivity agents. Then, higher marginal cost entrepreneurs prefer lower levels of entry barriers, all else equal.

Let us now make the connection between the goods market equilibrium outcomes and the Preference Curve. In particular, suppose that the wealth functions take the following form:

$$w_A(a, f) = \begin{cases} \frac{\pi_A(a, f)}{P(f)} & \text{if} \quad a \leq a_A(f) \\ 0 & \text{if} \quad a \geq a_A(f) \end{cases} \tag{16}$$

in autarky, and

$$w_T(a, f) = \begin{cases} \frac{\pi_D(a, f) + \pi_X(a, f)}{P^S(f)} & \text{if} \quad a \leq a_X(f) \\ \frac{\pi_D(a, f)}{P^S(f)} & \text{if} \quad a \in \left[a_X(f), a_D(f) \right] \\ 0 & \text{if} \quad a \geq a_D(f) \end{cases} \tag{17}$$

under trade, where $P(f)$ and $P^S(f)$ are consumption-based price indices in autarky and under trade in the South, respectively. That is, agents' wealth is simply real profits.

Corollary 3: *When* $w_r(a, f)$ *is given by (16) or (17), it satisfies regularity conditions (A.6) through (A.10). Thus, both autarky and trade regimes are characterized by downward sloping Preference Curves.*

Why would any producer prefer to set f at any level higher than f_L? The fixed cost f affects real wealth through three channels. The first two have to do with nominal profits. The key trade-off is that while a higher level of fixed cost has a direct effect on every firm's nominal profits, a higher f also leads to less entry. With fewer producers operating in the economy, the active firms' variable profits are higher. Most importantly, this second effect is more pronounced for higher productivity firms, which implies that the more productive firms prefer to live with worse institutions. The third effect has to do with the price level. A higher value of f leads to fewer producers, and thus fewer varieties and a higher consumption price level. We can rewrite the expression for autarky real profits, (3), using (4):

$$\frac{\pi_A(a, f)}{P(f)} = \frac{a^{1-\varepsilon}\left[\frac{(1-\alpha)\beta E}{nV(a_A)}\right] - f}{P(f)}, \tag{18}$$

keeping in mind that P, E, and a_A are equilibrium values that are themselves functions of f. The first term in the numerator is the variable profits. It is true that raising f lowers the total profits one for one, because the firm must pay higher fixed costs. However, raising f also raises the nominal variable profits, because it pushes more firms out of production. Furthermore, variable profits are multiplicative in $a^{1-\varepsilon}$, a term that rises and falls with the firm's productivity. Thus, a firm with a higher productivity will reach maximum nominal profits at higher levels of f. In the Appendix (section A.4), we use the closed-form solutions of the model to show under what conditions this effect dominates the other two, and more productive firms indeed prefer worse institutions. It turns out that without the price level effect it is always the case that more productive firms prefer worse institutions. The price level effect, in turn, can be made weak enough not to overturn this pattern by lowering β, the share of the differentiated good CES composite, in the total consumption basket.

Figures 3 and 4 illustrate this Proposition. Figure 3 reproduces Figure 1 for two different levels of f. We can see that raising f forces the least productive firms to drop out. Furthermore, the slope of the profit line is higher in absolute value for higher f: variable profits are higher at each productivity. Thus, firms above a certain productivity cutoff actually prefer a higher f, as the variable profit effect is stronger than the fixed cost effect. To illustrate this point further, Figure 4 plots the profits of two firms as a function of f. The profits of each firm are non-monotonic in f, first increasing, then decreasing in it. A firm with a higher productivity attains maximum profits at a higher level of f. This heterogeneity in firm preferences over institutions is the key feature of our analysis.

Figure 3. Profits As a Function of Marginal Cost for Two Different Values of *f*

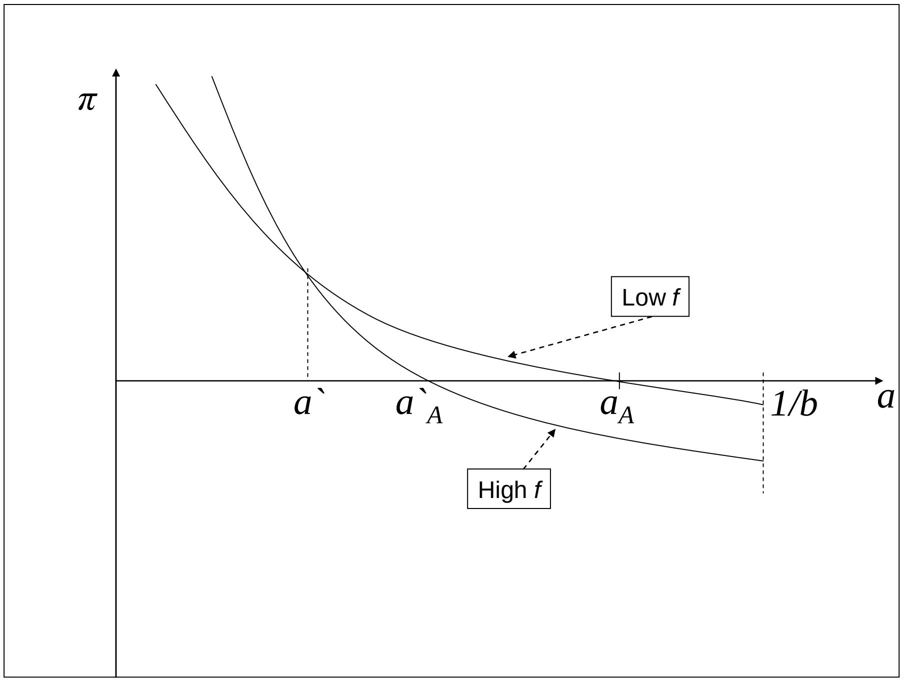
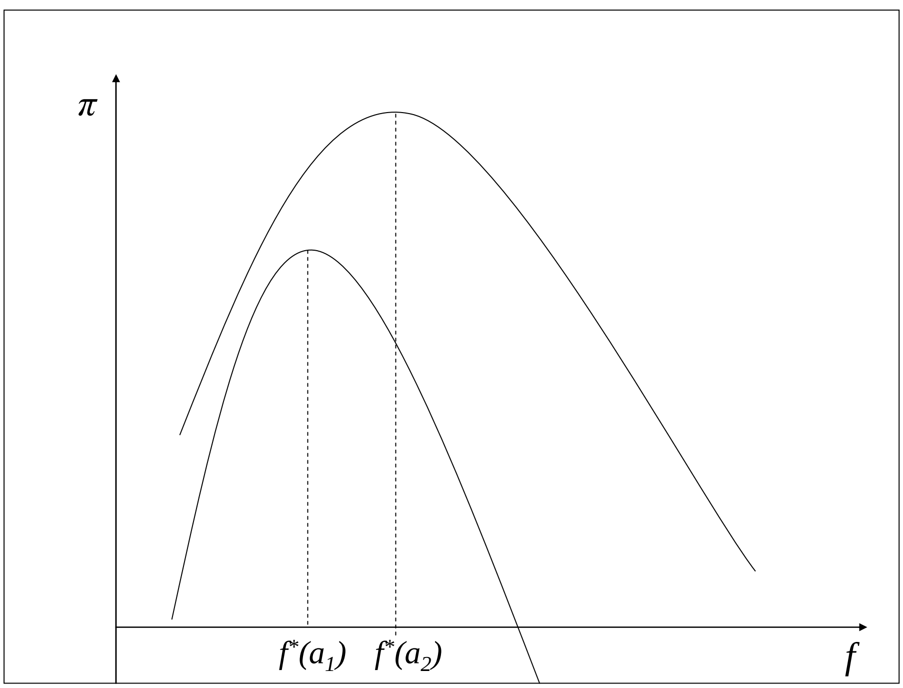


Figure 4. Profits As a Function of *f*



In the trade equilibrium, firms' preferences over institutional quality differ from those in autarky. This is because the level of f in the domestic economy affects both the domestic production and the pattern of its imports. Nonetheless, the essential trade-off remains unchanged. On the one hand, a higher f implies higher variable profits, an effect that is stronger for more productive firms. On the other, the higher fixed cost decreases profits one for one, and pushes the consumption price level up. Comparing to autarky, we must keep in mind that f may also affect the firms' decision whether or not to export, and its profits from exporting.

Having completed our description of firms' preferences, we now move to a discussion of the political economy mechanism.

C. The Political Curve

The Political Curve is defined by the set of points $(p, f) \in \left[0, \frac{1}{b}\right] \times \left[f_L, f_H\right]$, where p is the marginal cost of the pivotal voter in the economy characterized by the fixed cost equal to f. That is, the Political Curve $p_r(f)$ is defined implicitly by:

$$2\int_0^p \left[\lambda_0 + w_r^{\lambda_1}(a, f)\right] dG(a) = \int_0^{1/b} \left[\lambda_0 + w_r^{\lambda_1}(a, f)\right] dG(a), \tag{19}$$

when the pivotal voter thus defined is unique for every f. Here we express the identity of the pivotal voter in terms of marginal cost a rather than wealth w. Furthermore, we would like to equate wealth with profits in our analysis. In this formulation, for a unique mapping between wealth and productivity of the pivotal voter to exist, we must ensure that the pivotal voter always produces under autarky and under trade. In what follows, we assume that parameter values are such that this condition is always met. This can be achieved by either a low enough f_H or a high enough λ_1.

Proposition 4: *When regularity conditions (A.6) and (A.7) are satisfied, and* $\frac{\partial}{\partial a} w_r(a, f)\big|_{a=p} < 0 \;\; \forall f \in \left[f_L, f_H\right]$, *the Political Curve given implicitly by (19) is a well-defined and piecewise continuously differentiable function of* f. *Furthermore, the Political Curve is downward sloping almost everywhere.*

The first part of this Proposition formally establishes the equivalence between defining a pivotal voter by her wealth and by her marginal cost of production. This result comes from the assumption that there exists a one-to-one correspondence between wealth and marginal cost in the neighborhood of any potential pivotal voter. We can hence restate previous results in terms of marginal cost of production a rather than wealth, keeping in mind that the mapping between the two is decreasing.

The second part of the Proposition takes one extra step in characterizing the Political Curve. In particular, we would like to show that under certain conditions, the Political Curve is downward sloping. That is, we would like to restrict attention to cases in which a higher level of fixed cost results in a pivotal voter that is more productive. This is a sensible requirement: a higher level of f decreases the wealth of the least productive firms, and increases the wealth of the most productive firms, thus shifting the voting weight towards the higher productivity firms. We illustrate this in Figure 5, which plots the densities of profits for two values of fixed cost, $f_h > f_l$. Nonetheless, for this Proposition to hold, certain restrictions on the function $\lambda(w)$ must be satisfied: it must give enough weight to wealthier agents relative to less wealthy ones.

D. Equilibrium: Definition, Existence, Characterization

We now define the equilibrium that results from the agents' preferences and the voting. As the discussion above makes clear, there is a two-way dependence in our setup: the identity of the pivotal firm, p, depends on the level of f, while the level of f depends on the identity of the pivotal firm. Our equilibrium must thus be a fixed point.

Definition 5 (Equilibrium): *An equilibrium of the economy is a pair* (f_r, p_r) *such that* $f_r = f_r(p_r)$, *and* $p_r = p_r(f_r)$, *where* $f_r \in [f_L, f_H]$ *and* $p_r \in \left(0, \frac{1}{b}\right)$.

Proposition 6: *There exists at least one equilibrium.*

Given our characterization of the Preference Curve and the Political Curve above, the definition of equilibrium and its existence can be illustrated with the help of Figure 6. The proof of this Proposition shows that one of three cases are possible: f_L, f_H, or an interior value of f. The first two occur when the two curves intersect on the flat portion of the Preference Curve.

Having established existence, we now would like to characterize potential equilibria. We will not consider an explicitly dynamic setting to address issues of stability. We instead define the following functions: $\forall f \in [f_L, f_H]$,

$$\Phi_r(f) = f_r[p_r(f)]$$

and by induction, for $n \geq 1$,

$$\Phi_r^0(f) = f, \text{ and } \Phi_r^n(f) = \Phi_r\left[\Phi_r^{n-1}(f)\right]. \tag{20}$$

Similarly, we define for $p \in \left(0, \frac{1}{b}\right)$,

$$\Pi_r(p) = p_r[f_r(p)]$$

and for any $n \geq 1$,

$$\Pi_r^0(p) = p, \text{ and } \Pi_r^n(p) = \Pi_r\left[\Pi_r^{n-1}(p)\right]. \tag{21}$$

Figure 5. Densities of Distributions of Profits and the Pivotal Firms

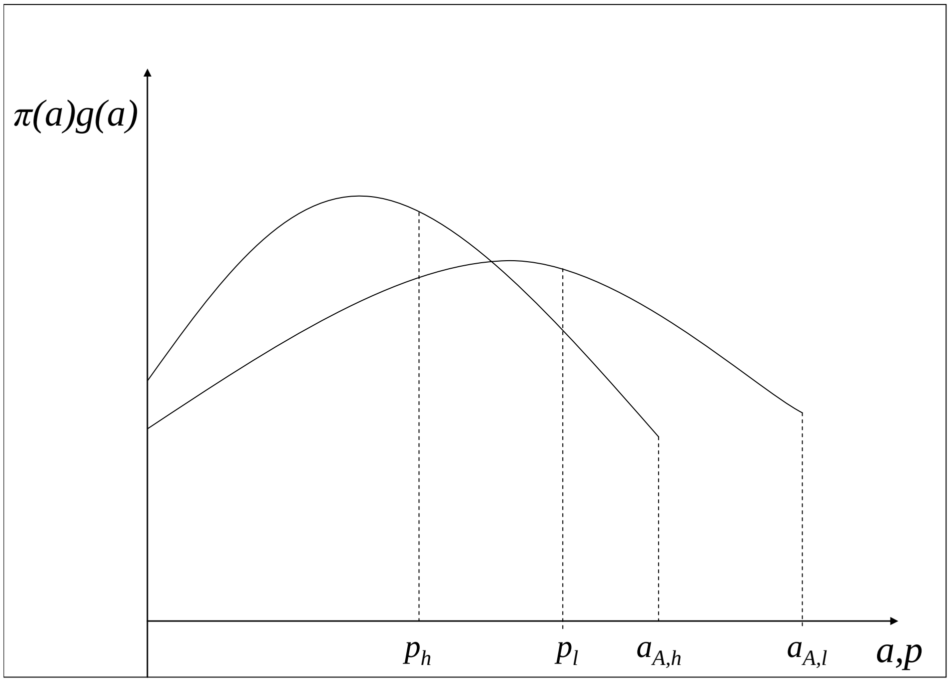
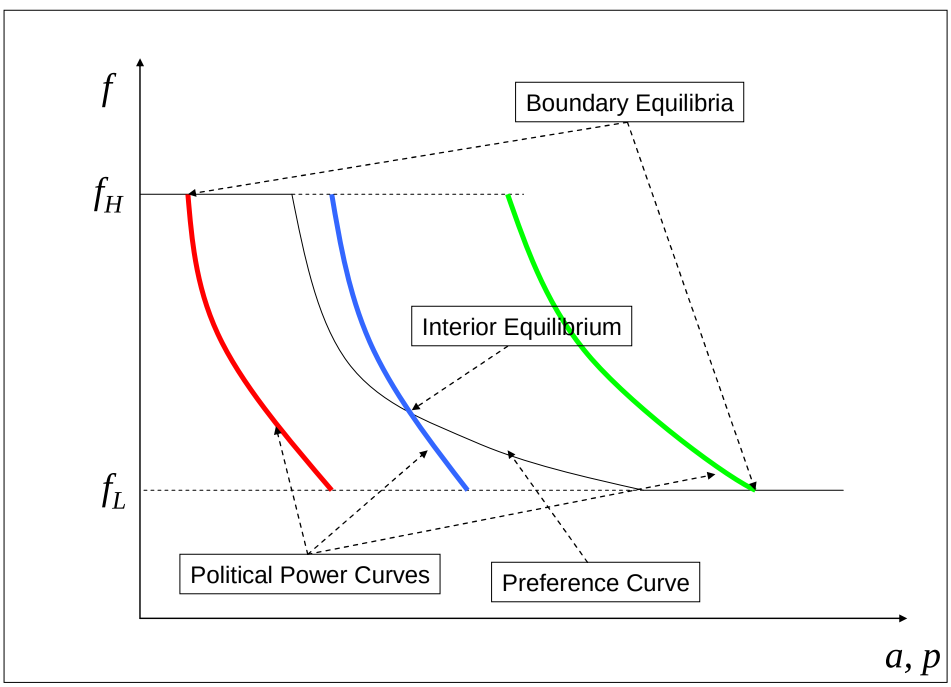


Figure 6. The Preference Curve, the Political Curve, and Possible Equilibria



Definition 7 (Stability): *An equilibrium* (f_r, p_r) *is stable if there exists* $\rho > 0$, *such that for any* $\eta > 0$, *there exists an integer* $\nu \geq 1$ *such that for any* $n \geq \nu$, $\tilde{p} \in (p_r - \rho, p_r + \rho)$, *and* $\tilde{f} \in (f_r - \rho, f_r + \rho)$,

$$\left|\Pi_r^n(\tilde{p}) - p_r\right| < \eta; \tag{22}$$

$$\left|\Phi_r^n(\tilde{f}) - f_r\right| < \eta. \tag{23}$$

In other words, an equilibrium will be considered stable if, after a small perturbation (of size ρ) around the equilibrium point, the system converges back to the equilibrium, with (20) and (21) characterizing the dynamic process. The definition of stability above corresponds to the concept of asymptotic stability in dynamic processes. Two generic cases of equilibria that violate the stability requirement that might arise are: (i) a "cycling" case, whereby the process is bounded but does not converge; (ii) the process diverges after a perturbation and reaches a corner solution. We prove the following proposition by considering these two cases. We first argue that cycling cannot occur as Preference and Political curves are downward sloping, and then establish that if there does not exist any stable interior equilibrium, then one of the two corners is an equilibrium, and corner equilibria are stable.

Proposition 8: *There exists a stable equilibrium.*

We can now apply the results proved in this section to the autarky and trade regimes. When wealth equals profits, and is thus defined by (16) and (17) in autarky and trade respectively, we have the following result:

Corollary 9: *Under regularity conditions, both autarky and trade regimes are characterized by downward sloping Preference and Political Curves. Furthermore there exists a stable equilibrium in both autarky and trade regimes.*

IV. Institutions in Autarky and Trade

We now compare the equilibrium institutions in the South that occur under autarky and trade. We assume all throughout that the North's institutions are exogenously given, and all adjustment in the North takes place on the production side. When an economy opens to trade, both the Preference Curve and the Political Curve shift. We investigate the behavior of Political and Preference Curves in turn.

A. The Political Power Effect

The reorganization of production due to trade opening leads the Political Curve to shift "inwards." In particular, at any f, the most productive firms begin exporting, and the distribution of profits becomes more unequal: relative wealth shifts towards the more productive firms. This means that the pivotal voter moves to the left, $p_T(f) \leq p_A(f) \;\; \forall f \in [f_L, f_H]$. We label this the political power effect: the power shifts towards larger firms under trade compared to autarky. Once again, while the notion that increased profit inequality leads the pivotal voter to shift in this direction is intuitive, the proof depends crucially on regularity conditions governing $\lambda(w)$: the political weight function must be sufficiently increasing in wealth.

Proposition 10: *Under regularity conditions on* $\lambda(w)$, *the Pivotal Voter curve moves inward as the economy opens to trade.*

B. The Foreign Competition Effect

We now need to make a statement about how the Preference Curve shifts. It turns out that for most parameter values, and for values of a high enough, a firm at a given level of a prefers to have better institutions under trade than in autarky. This very much related to the Melitz effect, and comes from the fact that domestic profits are lower under trade due to the increased foreign competition.[14] We label this inward shift of the Preference Curve the foreign competition effect. We must keep in mind that the most productive of the exporting firms may actually prefer worse institutions under trade, because as we saw above, export profits increase in f. It is also true that in principle, parameter values may exist under which the inward shift of the Preference Curve does not occur. This would happen, for example, is $\frac{n^N}{n^S}$ is sufficiently low.[15] When that is the case, the inward shift of the Political Curve unambiguously predicts a worsening of institutions as a result of trade. Otherwise, the two effects conflict with each other.

C. Comparing Institutions in Autarky and under Trade

In comparing the equilibria resulting under trade and autarky, we face the potential difficulty that the trade equilibrium may not be unique. Thus we must define an equilibrium selection process. We assume that the equilibrium resulting from trade opening is the one to whose basin of attraction the autarky equilibrium f_A belongs. To do so, we must define a basin of attraction with respect to f.

Definition 11: *The basin of attraction of a stable equilibrium* $\left(f_T, p_T\right)$ *is denoted* $B\left(f_T\right)$ *and is defined as*

$$B\left(f_T\right)=\left\{f \in\left[f_L, f_H\right],\ \forall \eta>0, \exists \nu>1, \forall n>\nu,\left|\Phi^n(f)-f_T\right|<\eta\right\}.$$

[14] See conditions (A.12) and (A.13) in Section 3 of the Appendix.

[15] In the most extreme case, suppose that there are no producers of the differentiated good in the North: $n_N=0$. Then, clearly, there is no reason for the foreign competition effect to occur, because there is no foreign competition in that sector.

We now show that there exist parameter values under which the transition from autarky to trade implies a worsening of institutions.

Proposition 12: *Consider an interior and stable autarky equilibrium* (f_A, p_A). *If* $p_T(f_A) < f_T^{-1}(f_A)$, *then there exists an equilibrium of the economy under trade* (f_T, p_T) *such that* $f_A \in B(f_T)$ *and* $f_A < f_T$.

The above Proposition shows that if the political power effect is large enough compared to the foreign competition effect, the economy will converge towards an equilibrium with worsening institutions. In order to compare the foreign competition and political power effects, let's compare the pivotal voter under trade starting from autarky institutions, $p_T(f_A)$, and the entrepreneur who prefers f_A under the trade regime, $f_T^{-1}(f_A)$. If $p_T(f_A) < f_T^{-1}(f_A)$, then the political power effect is stronger than the competition effect. When is this the case? We can consider the following difference:

$$\Delta = \int_0^{f_T^{-1}(f_A)} \lambda\left(w_T(a, f_A)\right) dG(a) - \int_{f_T^{-1}(f_A)}^{1/b} \lambda\left(w_T(a, f_A)\right) dG(a)$$

It is positive if and only if $p_T(f_A) < f_T^{-1}(f_A)$.[16] We can use the autarky pivotal voter to rewrite this expression as:

$$\Delta = \int_0^{p_A(f_A)} \lambda\left(w_T(a, f_A)\right) dG(a) - \int_{p_A(f_A)}^{\frac{1}{b}} \lambda\left(w_T(a, f_A)\right) dG(a)$$
$$-2\int_{f_T^{-1}(f_A)}^{p_A(f_A)} \lambda\left(w_T(a, f_A)\right) dG(a)$$

The first part of this expression represents the magnitude of the Political Power curve shift. It is positive, because $p_T(f_A) < p_A(f_A)$. The second term proxies for the strength of the foreign competition effect. It will be large in absolute value when there is a large difference between $p_A(f_A)$ and $f_T^{-1}(f_A)$: agents' preferences change strongly between autarky and trade. Note that if the integral of the second term is negative, $\Delta > 0$ unambiguously: the two effects reinforce each other, and institutions deteriorate. When foreign competition changes preferences in favor of better institutions, the two effects act in opposite directions.

We present the two cases graphically in Figure 7, starting from the same interior autarky equilibrium. The first panel illustrates a transition to a trade equilibrium in which institutions improve as a result of trade. For this to occur, the shift in the Political Curve must be sufficiently small, and the shift in the Preference Curve sufficiently large. The former would

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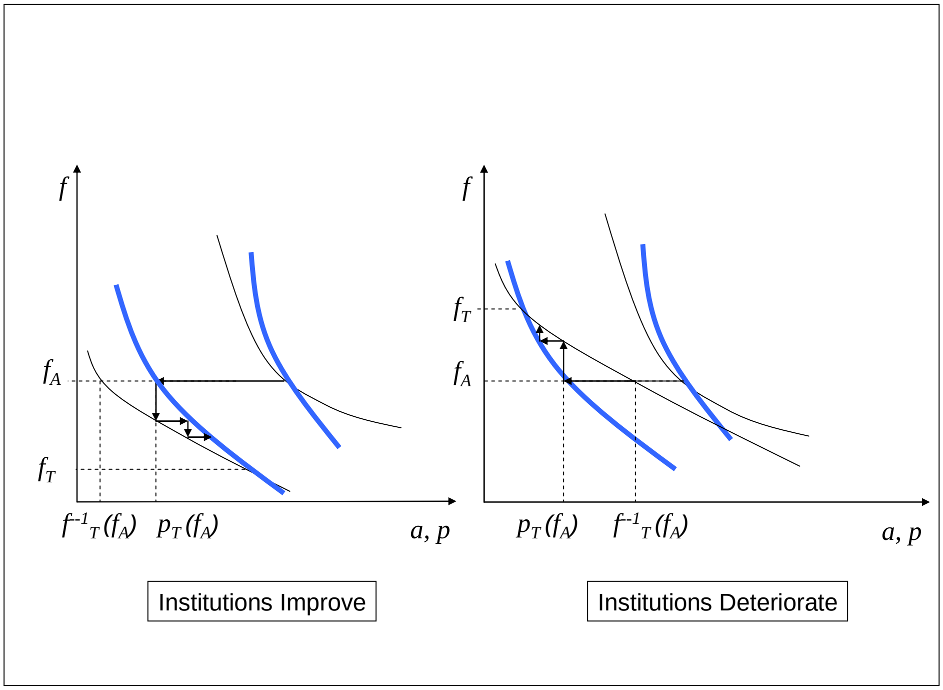
[16]Note that when $p_T(f_A) = f_T^{-1}(f_A)$, $\Delta = 0$, as $p_T(f_A)$ is the pivotal voter.

occur, for example, if the function $\lambda(w)$ was flat enough. The latter would occur if the foreign competition effect is sufficiently pronounced, that is, when n^N is large enough relative to n^S. The second panel illustrates a case in which institutions deteriorate as a result of trade. If the political power effect is strong enough, or the foreign competition effect is weak enough, institutions will worsen.

Figure 7. Comparing Institutions in Autarky and Trade



What are the conditions under which the two different scenarios are more likely to prevail? The model does not offer an analytical solution with which we could perform comparative statics with pencil and paper, due to both the algebraic complexity of the trade side of the model, and the fact that we cannot find closed-form expressions for the pivotal firm. Nonetheless, we can implement the solution numerically in a fairly straightforward manner. In order to focus especially on the South's market power and the resulting magnitude of the foreign competition effect, we compare changes in institutions for a grid of parameter values. Starting from an interior autarky equilibrium, we check how it changes in response to trade opening for a grid of L^N 's and n^N 's.[17]

[17]We adopt the following parameter values: $\beta = 0.5$; $\varepsilon = 3$; $k = 4$; $b = 0.1$; $L_S = 1000$; $n_S = 20$; $f_L = \frac{(1-\alpha)\beta\left[k-(\varepsilon-1)\right]L^S}{n_S k\left[1-(1-\alpha)\beta\frac{\varepsilon-1}{k}\right]}$; $f_H = 181$; $\tau = 1.1$; $f_X = 150$; $\lambda_0 = 1$; $\lambda_1 = 0.875$; $f^N = 48$. Details of numerical implementation and the MATLAB programs we used are available upon request.

The results are illustrated in Figure 8. It depicts ranges of L^S / L^N and n^S / n^N for which institutions improve and deteriorate as a result of opening. The shaded area represents parameter values under which institutions deteriorate. Trade is most likely to lead to a deterioration when the economy is both small in size (L^N is large compared to L^S), and captures a large share of world trade in the differentiated good (that is, n^S is large relative to n^N). Under these conditions, there is a large movement in the pivotal voter, while the movement in the Preference Curve is small, or can even be positive—that is, some range of firms may want worse institutions under trade than in autarky in some cases. Intuitively, when there are relatively few producers of the competing good in the North (n^N is low), the disciplining effect of opening up to foreign competition will be weak. On the other hand, when the size of the foreign demand is large relative to the home labor force, the incentive to push smaller firms out of the market in order to earn higher profits will be higher. In addition, for those firms that do export, larger size of the foreign export market means higher profits, ceteris paribus, and thus more political power at home. We can also highlight the conditions under which the opposite outcome obtains: the disciplining effect of trade predominates. When the number of domestic firms is small vis-a-vis its trading partner, foreign competition in the domestic market forces even the biggest firms to want to improve institutions in order to increase their profits. Thus, when domestic firms capture a very small share of the world market under trade, the shift in the Preference Curve is large. When this is the case, the economy is likely to retain good institutions or even improve them. This effect is more pronounced when the South is also relatively large—the mirror image of the previous case we analyzed. Figure 9 reports equilibrium trade institutions for the same grid of parameter values. The darkly shaded area represents all cases under which institutions deteriorate as a result of trade, while in the lightly shaded area institutions improve. We can see that the n^S / n^N dimension matters more than the L^S / L^N dimension: institutions always worsen more sharply when raising the latter than the former. We can also see that when the South's market power is sufficiently high, institutions deteriorate quite sharply.

V. Discussion

What evidence can we provide in support of the claims made in the model? As we saw, trade opening has an ambiguous effect on institutional quality, but can result in a deterioration under some circumstances. Since episodes of institutional change are relatively rare, and systematic data on economic institutions are available for only the last 20-30 years at best, regression analysis is not a promising way to illustrate our model. Nonetheless, trade opening episodes that took place farther back in time shaped institutions for decades if not centuries to follow, and thus remain relevant. Thus, we will proceed by illustrating our model with a number of case studies, fully acknowledging the usual caveats that come with that approach.

We show that the effects illustrated in our model were at work during the sugar boom in the Caribbean starting in the mid-18th century, coffee boom in Central and South America in the 19th, and the cotton and cattle booms in Central America in mid-20th century. These are cases of abrupt trade opening—as evidenced by sharp increases in volumes—that were due to

Figure 8. Ranges of Parameter Values Such that Institutions Deteriorate Under Trade

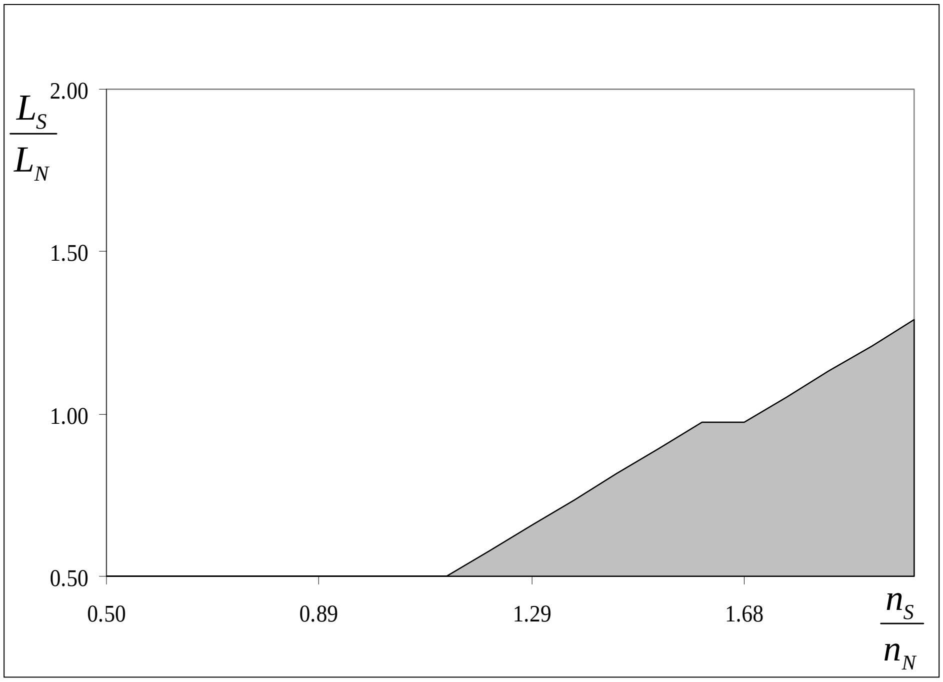
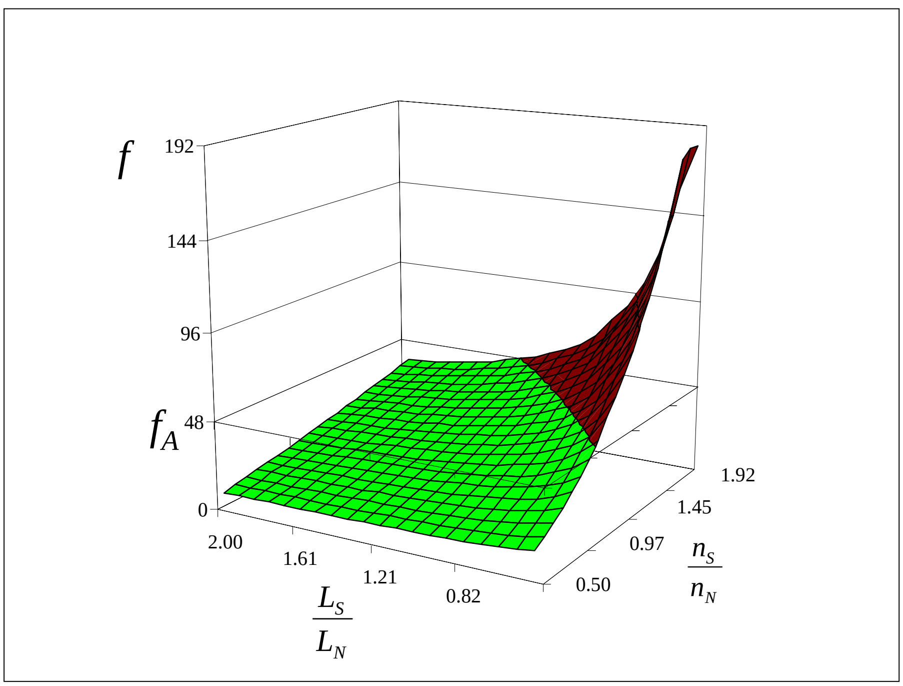


Figure 9. Institutions Under Trade As a Function of Parameter Values



conditions largely outside of the exporters' control. In all three, export markets were quite large relative to country size, and the affected countries enjoyed large market shares in their exports—conditions for institutional deterioration identified by the model. We then illustrate the Melitz effect: sharp changes in the production structure in favor of a smaller number of larger producers. We argue that these changes in production structure led to the political power effect described in our model. Finally we show that the large producers used their power to bring about a deterioration in institutions.

In connection to the last point, it may be worth highlighting an important caveat. While we would argue that our model describes the Melitz and the political power effects in these cases quite precisely, the parameter that captures institutional quality is reduced-form in our model. Though we formalize institutions as a fixed cost of production that acts to deter entry, clearly economic institutions are much more sophisticated objects than that. Thus, we would like to caution against interpreting our institutional quality parameter too literally when going to the case studies. That is, when we describe deteriorations in institutional quality, we necessarily interpret institutions more broadly than fixed entry costs. What we observe in our case studies are land expropriations, general deteriorations in property rights, and legal systems partial to those in power. We do find clear evidence, however, that deteriorations in institutions we describe were intended by their designers to increase the effective entry barriers that small producers face, in order to lower competition and raise profits for the largest producers.

A. Sugar in the Caribbean, 1650–1850

Beginning with Barbados in the 1650's, a sugar boom swept most of the Caribbean islands over a period of 200 years. Pre-sugar Caribbean islands were typically smallholder peasant societies, farming foodstuffs and perhaps tobacco for export. Some were sparsely populated, though others were quite successful. For instance, European settlement in Barbados started in 1641, and by 1655 it had 10,000 British settlers, resulting in a population density higher than most regions in England (Rogozinski, 1999, p. 71). By then, all of the island's arable land had been distributed to farmers.

When sugar was introduced to the islands, the transformation was typically quite rapid. In the most extreme cases, land use was given over almost entirely to sugar, so much so that many islands had to import food. Land ownership consolidation was swift as well, with islands going from smallholder patterns of land use to giant plantations. For instance, in 1750's Barbados, 74 families owned 305 out of 536 estates. On Nevis, the number of plantations went from over 100 to around 30 a century later. The dominance of sugar in the Caribbean economies was mirrored in the region's position as the primary exporter of sugar in the world. The Caribbean produced between 80 and 90 percent of sugar consumed by Western Europeans in the 18th century (Rogozinski, 1999, p. 107). It was also clear that power was derived from being a planter, and that economic power—the size of plantation and the resulting profits—was key to political power. For instance, Stinchcombe (1995) notes that "[plantation] size measures the main causal complex that produced and maintained slave societies, societies in which the main public good was reliable repression of all rights of slaves, and constraints on the rest of the society deemed necessary to the security of the slave regime." (p. 89).

The final piece of the argument concerns the way in which planters, once in power, changed institutions. Clearly, the most significant consequence of planter power was the slavery that was prevalent in the sugar-boom Caribbean. At the height of the sugar era, almost 9 out of 10 inhabinants of the Caribbean were slaves, a proportion of slave-to-free never before recorded in human history. The Caribbean slavery system was by all accounts the most extreme form practiced at the time. However, and more relevant to our model, planters also went to great lengths to curtail the property rights of the free members of society, such as farmers. In plantation economies, all of the land suitable for sugar cultivation was used for sugar. But even for unsuitable lands, the government policy was to explicitly discourage cultivation. Stinchcombe (1995) notes that "[t]hroughout most of the colonial period on most of the sugar islands, the formal government policy was to prevent peasant cultivation in the highlands, since that provided a peasant alternative to plantation labor for freedmen" (p. 104). This was apparently done at least in part through deliberately insecure property rights: "[m]any of the tenures on which small holdings have been held in the Caribbean have been legally precarious" (p. 93). The more planters were in control, the more precarious were peasant tenures, since secure tenures raised the "reservation wage" of free peasants in the free labor market, and provided a comparison point for slaves before emancipation. After emancipation, the governments of the islands attempted to keep the wages low and reduce earnings opportunities outside the plantations by restricting access to crown lands by either prospective planters or by peasants. (Stinchcombe, 1995, ch. 10). Thus, in the Caribbean we can see the essential outlines of our story. The export boom brought power to large exporters; those exporters used that power to reduce competition, in this case in the factor markets.

B. Coffee in Latin America 1850–1920

Coffee production started in the New World during the eighteenth century, and trade in coffee soared from 320 metric tons in 1770 to 90,000 in 1870 and 1.6 million in 1920. This increase is often attributed to rising demand, which was partly a result of aggressive marketing campaigns. Coffee consumption in the U.S. grew from 3 pounds per person in 1830 to 16 pounds per person in 1960. This explosion of coffee consumption in the U.S. and Europe was associated with a transformation of the economic, social and political landscape in coffee producing countries, especially in Latin America. As noted by Roseberry et al. (1995), "coffee is both a product of 'free trade' ideology and practice and the first 'drug food' not controlled by colonial or imperial trading blocs. For those newly independent countries from southern Mexico to southern Brazil with exploitable subtropical soils, coffee served as a principal point of linkage to an expanding world economy, the means by which they could turn toward an 'outwardly focused' model of development" (p. 10). Thus, we have reasons to believe that the environment described in our model fits well the conditions of coffee economies: trade as the driving factor behind economic, social, and political change, and a multitude of independent actors that nonetheless does not result in perfect competition. While there are important differences between the Latin American countries that turned to coffee production during the second half of the nineteenth century, they share some significant common patterns to which we now turn.

Increased profitability from coffee production induced prices of inputs to rise, leading to a sharp increase in land prices. Pico (1995) reports that in Roncador, one of Puerto Rico's highland regions, the average price of land rose from 3.41 pesos per cuerda in 1863 to 28.14 in 1877[18] (Table 4.3, p. 106). Consistent with the implications of our theory, increased land prices came with land ownership concentration: “coffee expansion in the Cordillera Central of Puerto Rico, while it was still a Spanish colony, entailed the progressive concentration of land ownership to the detriment of small farms in a process that was dominated by and consolidated the hold of immigrant merchants. (...) Whereas in the 1850’s about half of the population had access to land, by the 1870’s, this proportion had declined to 17 percent. Thus, although smallholders predominated numerically, most coffee was produced on large estates” (Stolcke, 1995, p. 73). As expected, concentration of economic power came hand in hand with concentration of political power, itself used to perpetuate economic dominance. Analyzing the experience of other coffee economies, Roseberry et al. (1995) note in the introduction to their book: “[g]iven the importance of the coffee sector within Costa Rica, the processors were able to establish themselves as an economic and political elite (...)” (p. 23). The political power effect was also observed in Brazil: “Here we could with reason point to the ‘oligarch pacts’ that emerged in the late nineteenth century, the way in which state policies and practices responded to or ‘expressed’ the needs of the planters and merchants, and the coffee planters who held positions of state power in the various republics. (...) as Holloway notes, ‘the economic dominance of coffee was unquestionable. Among the property-owning sectors of society the right of the planters to control the political system was unquestioned, and the mass of working people, slaves, freedmen, native Brazilian peasants, and immigrants, had no political voice. The government of Sao Paulo was itself the instrument of the coffee planters’” (Roseberry et al., 1995, p. 25).

Analyses of social transformation in Latin America and its economic and political origins have largely focused on labor-related conflicts. As the explosion of coffee exports pushed up wages, attempts to secure a source of cheap labor has always been a concern for coffee producers. Direct conflicts between landowners and workers in coffee economies have received a great deal of attention from historians and economists alike (see, e.g., De Janvry, 1981).[19] Nonetheless, other means were also used to secure the supply of cheap labor. In particular, another strategy for keeping labor costs down was to reduce competition from other potential sources of employment, which corresponds to the mechanism we describe in our model. This was done, for example, by raising “barriers to entry in the form of a tax in 1903 on new planting” (Greenhill, 1995, p. 192), or through restricting access to land, as emphasized by Rosewell et al. (1995): “[t]his is not to say that landholders were powerless and a free market prevailed: the monopolization of land in some regions was the most effective means for securing a labor force” (p. 8). Examples of land expropriation abound. “In Guatemala and El Salvador, (...) the state played a decisive role in creating the conditions for the development

[18]A cuerda is approximately equivalent to an acre.

[19]This literature describes exploitation of labor that at times fell just short of outright slavery. Stolcke (1995) explains that in Guatemala and El Salvador, “in order to ensure and control labor supply a Reglamento de Jornaleros was passed in the 1870’s which thereafter permitted forcible recruitment of labor from the indigenous communities, which were subjected, as were resident wage workers, to rigid discipline” (p. 75).

of a coffee economy based on large estates. Under the liberal reforms in Guatemala in the 1870's extensive church lands were confiscated and sold or distributed. In addition, a form of land rent in perpetuity was abolished, with renters being forced to purchase the land" (Stolcke, 1995, p. 74). The implication is then immediate: "In El Salvador, the massive and radical expropriation of the indigenous population and their displacement created a dispossessed population available for seasonal work on the coffee estates" (Stolcke, 1995, p. 75). This case thus provides a good illustration of the central point of the paper: property rights (of the indigenous population in this precise example) were revoked, thus freeing labor for large coffee growers.

C. Cotton and Beef in Central America, 1950-1980

Cotton production in Central America was minimal until 1950, and exports outside the region were virtually nil. The combination of a rise in foreign demand following the end of World War II and improvements in technology produced growth in the cotton sector that was nothing short of spectacular. The most important technological advance was the invention of insecticide DDT. Large scale attempts to grow cotton in Central America had failed in the past because there had been no effective means to combat insects in the area. That changed dramatically once DDT was invented in 1939.

During the 1940's, all of Central America produced only about 25,000 bales a year, most of it for textile mills within the region. Central American production exceeded 100,000 bales in 1952, 300,000 in 1955, and 600,000 in 1962. At that time, the region ranked 10th in the world in cotton production. By mid-1960's, production rose to more than 1 million bales, and by the late 1970's, Central America as a whole ranked third in the world in cotton production, below only the United States and Egypt. A key feature of this growth is that while at the beginning of the period virtually all of the cotton production was consumed within the region, from 1955 onwards 90% of it was exported outside Central America.

The cotton industry was characterized by significant dispersion in firm size, a prominent feature of our theory. The average size of a cotton plot over this period was 100 acres. Across the different Central American countries, between 25 and 60% of all growers planted an average of 5 acres of cotton. The overwhelming majority of land under cotton cultivation belonged to large producers. For example, in Guatemala, farms with fewer than 122 acres made up less than 2% of cotton-growing lands, while farms larger than 1100 acres produced 62% of the cotton. The picture is quite similar in other countries. These figures, however, do not reveal the full extent of concentration, because often the same family controlled multiple estates. Available evidence indicates that the large cotton growers were none other than the established landholding aristocracies in these countries. All in all, these were a few dozen families.

The cotton boom of such proportions naturally involved significant growth of the land area under cotton cultivation. While some of it came from deforestation, another major source of new cotton lands was through eviction of small farmers. This process came in two varieties. First, peasants were expelled from lands which were clearly titled to the landlord. This kind of eviction was usually regarded as benign, and did not produce much overt social conflict.

Second, landlords and other prospective cotton growers used their political power to get titles to the lands previously owned by the national government and municipalities. According to Williams (1986), “[u]ntitled lands lying near proposed roadways were quickly titled and brought under the control of cotton growers or others with privileged access to the land-titling institutions in the capital city.” (p. 56). Once the land was titled in this manner, peasants cultivating this land were promptly evicted. Some lands were owned by a municipality and cultivated by the peasants for a nominal fee. This was called the “ejidal” system, and represented something akin to communal ownership of land by peasants. Since in this case, the legal status of the lands was more clear than when the lands were untitled, more effort was required to expropriate them. Nevertheless, “[w]here ejidal forms came in the path of the cottonfields, the rights were transferred from municipalities to private landlords through all sorts of trickery and manipulation.” (Williams, 1986, p. 56).

The takeoff in the beef production and exports followed a path similar to cotton, albeit a few years later. As of the 1950’s, the Central American beef industry was still in a primitive state, with virtually no export activity. A combination of factors, once again largely outside Central American control, were behind the beef boom. First, the growth of the fast food industry in the United States increased demand for the cheaper, grass-fed beef normally produced in Central America. Second, the United States put in place the so called aftosa quarantine, in order to prevent hoof and mouth disease from entering North America. As it happens, the entire South American continent between the Panama Canal and Tierra del Fuego is subject to the quarantine, but Central America is not. Third, Central America was given preferential access to the highly protected U.S. market for geopolitical reasons. There were substantial rents to be had from access to the U.S. market, as the price of beef in the U.S. was more than double of world prices.

As a result of these developments, exports of beef soared. The first cow was exported in 1957. In 1960, exports totaled 30 million pounds of boneless beef, in 1973, 180 million pounds, and in 1978, 250 million pounds. In this period, the size of the Central American herd grew 250%. More than 90% of Central American beef exports went to the highly protected U.S. market.

As is the case with cotton, some the biggest beneficiaries of the cattle boom were the established landholding families, who expanded their cattle operations. On the other hand, smaller ranchers lost livestock in this period. Before the boom, smaller owners held 25% of the cattle. After the boom, the number of cattle held by small owners decreased by 20% in absolute terms, and accounted for less than 13% of the total. Thus, the Melitz effect, according to which the smallest producers don’t survive after trade opening, seems to have taken place here.

The path of cattle ranching expansion was similar to that of cotton. Forests were cleared, and peasants were evicted from lands that legally belonged to the would-be cattle ranching operations. Then, the boom extended into areas that were owned by the national government or the municipality (ejidal lands). Expulsion of peasants was often done through violent means, and led to unrest. The large numbers of dispossessed peasants were one of the factors behind the wave of guerrilla wars and instability that swept through the region in the 1980’s.

In summary, the remarkable growth in export opportunities in the cotton and beef industries both increased the political power of the largest producers, and provided them with a strong incentive to push smaller producers out. The result was a deterioration of institutional quality, evidenced by a wave of land expropriations, consistent with the effect we are illustrating in our model.

VI. CONCLUSION

What can we say about how trade opening changes a country's institutional quality? Country experiences with trade opening are quite diverse. In some cases, opening led to a diversified economy in which no firm had the power to subvert institutions, whereas in others trade led to the emergence of a small elite of producers captured all of the political influence and installed the kinds of institutions that maximized their profits. In this paper, we model the determination of equilibrium institutions in an environment of heterogeneous producers whose preferences over institutional quality differ. When it comes to the consequences of trade opening, we can separate two effects. First, trade will change each agent's preferences over what is the optimal level of institutions. In most cases, though not always, each firm will prefer better institutions under trade than in autarky. This is the well-known disciplining effect of trade.

The second effect, which is central to this paper, is that trade opening shifts political power toward larger firms. This is because profits are now more unequally distributed across firms, and thus economic and political power is more concentrated in the hands of a few large firms. This can have an adverse effect on institutional quality, because in our model large firms want institutions to be worse.

Which effect prevails depends on the parameter values. A large country that has a small share of world trade in the rent-bearing good will most likely see its institutions improve as a result of trade. On the other hand, a small country that captures a large part of the world market will likely experience a deterioration in institutional quality. Thus, our model is flexible enough to reflect a wide range of country experiences with liberalization, while revealing the kinds of conditions under which different outcomes are most likely to prevail.

Proofs of Propositions

1. The Pareto Distribution and the Closed-Form Solutions to the autarky and Trade Equilibria

The cumulative distribution function of a Pareto(b,k) random variable is given by

$$1-\left(\frac{b}{x}\right)^{k}$$

The parameter $b>0$ is the minimum value that this random variable can take, while k regulates dispersion. (Casella and Berger, 1990, p 628). In this paper we assume that $1/a$, which is labor productivity, has the Pareto distribution. It is straightforward to show that marginal cost, a, has the following cumulative distribution function:

$$G(a)=(ba)^{k}, \qquad (A.1)$$

for $0<a<1/b.$ It is also useful to define the following integral: $V(y)\equiv\int_0^y a^{1-\varepsilon}dG(a).$ It turns out that in the Dixit-Stiglitz framework of monopolistic competition and CES utility, the integral $V(y)$ is useful for writing the price indices and the total profits in the economy where the distribution of a is $G(a).$
Using the functional form for $G(a),$ we can calculate $V(a)$ to be:

$$V(a)=\frac{b^{k}k}{k-(\varepsilon-1)}a^{k-(\varepsilon-1)}, \qquad (A.2)$$

where we impose the regularity condition that $k>\varepsilon-1.$ When this condition is not satisfied, the total profits in this economy are infinite. Armed with this functional form assumption, we can characterize the goods market equilibria in autarky and trade.

A. Autarky Closed-Form Solution

We can use the functional forms of $G(a)$ and $V(a)$ in (A.1) and (A.2) to get the following expression for the cutoff a_A :

$$a_A=\left(\frac{(1-\alpha)\beta(k-(\varepsilon-1))L}{nb^{k}k\left(1-(1-\alpha)\beta\frac{\varepsilon-1}{k}\right)}\frac{1}{f}\right)^{\frac{1}{k}}\equiv\left(\frac{\Gamma}{f}\right)^{\frac{1}{k}} \qquad (A.3)$$

and the aggregate price is proportional to:

$$P\propto f^{\frac{\beta}{k}\frac{k-(\varepsilon-1)}{(\varepsilon-1)}} \qquad (A.4)$$

B. Trade Closed-Form Solution

Equations (11)-(14) determine the equilibrium values of a_D^S, a_X^S, a_D^N, a_X^N, E^S, and E^N. Using these 6 equations and the functional forms for $G(a)$ and $V(a)$, (A.1) and (A.2), we can obtain closed form solutions for the cutoffs in the South:

$$a_D^S = \left[\frac{1}{f^S} \frac{\mathsf{A}}{\mathsf{B} + \mathsf{C}(f^S)^{\frac{k-(\varepsilon-1)}{\varepsilon-1}}} \right]^{\frac{1}{k}}$$

and

$$a_X^S = \left[\frac{1}{f_X} \left(\mathsf{F} + \frac{\mathsf{DA}}{\mathsf{B}(f^S)^{-\frac{k-(\varepsilon-1)}{\varepsilon-1}} + \mathsf{C}} \right) \right]^{\frac{1}{k}},$$

while the aggregate price is proportional to:

$$P^S \propto \left(a_D^S\right)^{\beta \frac{k-(\varepsilon-1)}{1-\varepsilon}} \left[n_S + n_N \tau^{-k} \left(\frac{f^S}{f_X} \right)^{\frac{k-(\varepsilon-1)}{\varepsilon-1}} \right]^{\frac{\beta}{1-\varepsilon}} = \qquad (A.5)$$

$$= \left[\left(\frac{1}{f^S} \frac{\mathsf{A}}{\mathsf{B} + \mathsf{C}(f^S)^{\frac{k-(\varepsilon-1)}{\varepsilon-1}}} \right)^{\frac{k-(\varepsilon-1)}{k}} \left(n_S + n_N \tau^{-k} \left(\frac{f^S}{f_X} \right)^{\frac{k-(\varepsilon-1)}{\varepsilon-1}} \right) \right]^{\frac{\beta}{1-\varepsilon}}$$

where A, B, C, D, and F are positive constants. It is clear from these expressions that $\frac{da_D^S}{df^S} < 0$ and $\frac{da_X^S}{df^S} > 0$.[20]

2. Regularity Conditions on the Admissible Functions

$w_r(a, f)$

$w_r(a, f)$ is piecewise continuously differentiable with respect to (a, f);

For some marginal entrepreneur $a_r \leq \frac{1}{b}$ and any $f \in [f_L, f_H]$,

$$\frac{\partial}{\partial a} w_r(a, f) < 0 \text{ if } a \leq a_r \qquad (A.6)$$

$$\frac{\partial}{\partial a} w_r(a, f) \leq 0 \text{ otherwise} \qquad (A.7)$$

[20]Explicit expressions for these constants are available upon request.

That is, wealth is everywhere weakly increasing in firm productivity, and strictly increasing below a certain well-defined marginal cost cutoff a_r.[21] We further assume that: $w_r(a, f)$ is twice piecewise continuously differentiable with respect to f; uniformly continuous with respect to a; and

$$\frac{\partial}{\partial f} w_r(a, f) \text{ is decreasing in } f \tag{A.8}$$

$$\text{and } \frac{\partial}{\partial f} w_r(a, f) \text{ is decreasing in } a \tag{A.9}$$

while

$$\lim_{a\to 0} \frac{\partial}{\partial f} w_r(a, f) > 0 \text{ and } \lim_{a\to \frac{1}{b}} \frac{\partial}{\partial f} w_r(a, f) < 0 \tag{A.10}$$

Conditions (A.8) and (A.9) guarantee that the second-order conditions hold, and more productive entrepreneurs are less affected by higher levels of entry barriers. Inequalities (A.10) guarantee existence of an equilibrium.

We also impose some technical regularity assumptions regarding the asymptotic behavior of the wealth function: there exists a constant $\gamma > 0,$ and two continuously differentiable functions $\gamma_1(f), \gamma_2(f) > 0$ and

$$w_r(a, f) = a^{-\gamma}\gamma_1(f)\Big(1 + o\big(\gamma_2(f)\big)\Big) \tag{A.11}$$

This regularity condition implies that the wealth function can be approximated by a parabolic branch in the neighborhood of 0.[22]

3. From Autarky to Trade

The mechanisms at work in our paper rely on the impact of trade on the distribution of wealth. Two effects are driving our results: (1) The most productive entrepreneur ($a \to 0$) is wealthier under the trade regime than he is in autarky, and (2) domestic producers experience a drop in profits as a consequence of trade (this is the effect analyzed at length by Melitz, 2003).[23]

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[21] Specifically, a_r is the cutoff above which the firm does not produce, and thus presumably its wealth need only be weakly increasing in its productivity.

[22] The notation $o(1)$ in this context indicates that $\lim_{a\to 0}\left[w_S(a, f) - \gamma_1(f)a^{-\gamma}\right]/\gamma_2(f)a^{-\gamma} = 0.$

[23] The Melitz effect does not obtain for all parameter configurations because, unlike Melitz (2003), our model has asymmetric countries and fixed n^N and n^S. Nonetheless, we can show that the Melitz effect obtains unambiguously in our model when countries are symmetric.

Condition (1) corresponds to:

$$\frac{f a_A^{\varepsilon-1}(f)}{f a_D^{\varepsilon-1}(f)+f_X a_X^{\varepsilon-1}(f)}<1. \tag{A.12}$$

Condition (2) is satisfied when for any $f \in [f_L, f_H]$:

$$(1-\alpha)\beta(\varepsilon-1)\frac{L^N}{L^S}\frac{n^S}{n^N}<\left(\frac{f}{f_X}\right)^{\frac{k-(\varepsilon-1)}{\varepsilon-1}}\left\{k\frac{n^N}{n^S}\left(\frac{f_X}{f^N}\right)^{\frac{k-(\varepsilon-1)}{\varepsilon-1}}+\frac{k-(1-\alpha)\beta(\varepsilon-1)}{\tau^k}\right\}. \tag{A.13}$$

Let's also recall two assumptions that have been made to make the model interesting. The first one is the condition that the lowest-productivity entrepreneur does not produce in autarky, which requires that:

$$f_L>\frac{(1-\alpha)\beta\left[k-(\varepsilon-1)\right]L^S}{n^S k\left[1-(1-\alpha)\beta\frac{\varepsilon-1}{k}\right]}. \tag{A.14}$$

Condition (A.14) is also sufficient for the trade case when (A.13) holds: as producers experience a drop in profits after trade opening, the lowest-productivity entrepreneur will be even less willing to produce under trade than in autarky.

Finally, the second condition ensures that the pivotal voter is uniquely defined by its marginal cost a. A necessary and sufficient condition for this to be the case is that the pivotal voter produces, or $\frac{\partial}{\partial a} w_r(a, f_H)\big|_{a=p}<0,\ \forall f \in [f_L, f_H]$. A sufficient condition is that the median voter always produces. Under trade, this condition is:

$$\frac{1}{f_H}\frac{\mathsf{A}}{\mathsf{B}+\mathsf{C} f_H^{\frac{k-(\varepsilon-1)}{\varepsilon-1}}}>\frac{1}{2}\frac{1}{b^k} \tag{A.15}$$

which is sufficient in autarky as (A.13) holds.

4. Real Profit Functions

We adopt throughout the paper the convention that wealth is defined by (16) and (17) in autarky and under trade respectively. In this subsection, we determine sufficient conditions for real profits to verify conditions (A.6) to (A.11).

A. Autarky: The Preference curve is downward sloping as long as:

$$\frac{\beta}{\varepsilon-1}<\frac{1}{2}. \tag{A.16}$$

To see this, we can simply write out the expression for real profits for each entrepreneur, and check the conditions directly. Equations (3), (5), and (A.3), and the expression for the price level (A.4) imply that each firm's profits can be written as:

$$\frac{\pi_A(a,f)}{P}=\frac{\Gamma^{\frac{\varepsilon-1}{k}} f^{\frac{k-(\varepsilon-1)}{k}} a^{1-\varepsilon}-f}{f^{\frac{\beta}{k}\frac{k-(\varepsilon-1)}{k}}}$$

Using this expression, we can evaluate the first and second partial derivatives to obtain that as long as (A.16) holds, all the conditions (A.6) -- (A.11) are satisfied.

B. Trade: Under trade, we can write the expressions for profits,

$$\frac{\pi_T(a,f)}{P^S(f)}=\frac{f^S(a_D^S)^{\varepsilon-1}a^{1-\varepsilon}-f^S}{P^S(f)}$$

for a non-exporting firm, and

$$\frac{\pi_T(a,f)}{P^S(f)}=\frac{f^S(a_D^S)^{\varepsilon-1}a^{1-\varepsilon}-f^S+f_X(a_X^S)^{\varepsilon-1}a^{1-\varepsilon}-f_X}{P^S(f)}$$

for an exporting firm.

(i) conditions (A.6), (A.7), (A.10), and (A.11) are straightforward to verify.

(ii) condition (A.8): We first note that nominal profits from domestic production and exports are concave in f. Second, we note that in order to ensure concavity of the real profits, we must compare relative concavity of nominal profits and aggregate price with respect to f. Examining the expression for the price level, (A.5), we can see that because it ihas exponent $\frac{\beta}{1-\varepsilon}$, we can reduce the derivative of price level with respect to f to an arbitrarily small value as $\frac{\beta}{\varepsilon-1}\to 0$. Thus, the concavity of the aggregate price function can be made as small as necessary.
(iii) For the condition (A.9), the argument is very similar. First, we verify that (A.9) holds unambiguously for the nominal profits only. Then, we make the argument that the responsiveness of $P^S(f)$ to f can be made arbitrarily small as one decreases $\frac{\beta}{\varepsilon-1}$. We made the argument that the profit-maximising level of f is increasing with firm productivity for both domestic and exporting firms. It remains to check whether this monotonicity of $f_T(a)$ is preserved for those firms that export at some values of f, but do not export at other values. Let's denote $f_T\left(a\right)$ the level of fixed cost preferred by pivotal voter a. Consider the following values: $f^{**}\left(a\right)=\arg\max_{f^S,\pi_D^S(a)>0}\pi_D^S(a,f^S)$ and

$f^{***}(a) = \arg\max_{f^S, \pi_D^S(a)+\pi_X^S(a)>0} \pi_D^S(a, f^S) + \pi_X^S(a, f^S).$ As gross profits are a concave function of f, $f^{**}(a)$ and $f^{***}(a)$ are well-defined and positive. Furthermore, $\frac{\partial^2}{\partial a \partial f^S} \pi_D^S(a, f) < 0$ and $\frac{\partial^2}{\partial a \partial f^S} \pi_D^X(a, f) < 0$ which implies that $f^{**}(.)$ and $f^{***}(.)$ are nonincreasing functions of a as we just shown. Let us now consider the following trade-off function:

$\phi(a) = \pi_D^S(a, f^{**}(a)) - \left[\pi_D^S(a, f^{***}(a)) + \pi_X^S(a, f^{***}(a))\right]$ which is the difference of profits for pivotal voter with productivity level a between domestic production only, and domestic and exports-oriented production. We have $\phi(a) \geq 0 \Leftrightarrow f_T(a) = f^{**}(a).$ The Pareto distribution assumption implies that $\phi(a)$ is continuous and differentiable in $a.$ A look at the first-order conditions defining $f^{**}(a)$ and $f^{***}(a)$ shows that for any pivotal voter $a,$ $f^{**}(a) < f^{***}(a).$ To conclude the proof, we apply the envelope theorem to see that $\phi'(a) > 0,$ as $f^{**}(a) < f^{***}(a).$ Thus, $\phi(.)$ is a continuous and increasing function. If there exists $\overline{a} \in \left(0, \frac{1}{b}\right)$ such that $\phi(\overline{a}) = 0,$ then $\forall a < \overline{a},$ $\phi(a) > 0$ and $f_T(a) = f^{***}(a),$ and $\forall a > \overline{a},$ $\phi(a) < 0$ and $f_T(a) = f^{***}(a)$ and $f_T(a)$ is non-decreasing over $\left(0, \frac{1}{b}\right).$ If such value $\overline{a}$ does not exist, then monotonicity holds trivially.

Thus, if $\frac{\beta}{\varepsilon-1}$ is small enough, real profit functions in autarky and under trade both satisfy (A.6) to (A.11). The intuition is simple: as nominal profits satisfy (A.6) to (A.11) for real profits to do the same, it is necessary that aggregate prices (in autarky and under trade) are not "too concave." It is easy to see and we will not show it, that there are enough degrees of freedom in terms of parameter values to make $\frac{\beta}{\varepsilon-1}$ sufficiently small while retaining the concavity of nominal profit functions.

A detailed treatment of the compatibility of the requirements (concavity of real profit functions, conditions (A.12) to (A.15)) is computationally involved, and does not present much interest here. We can intuitively see that we have enough degrees of freedom concerning parameter values for all the restrictions to hold simultaneously. A comprehensive derivation of sufficient conditions for propositions and corollaries to hold is available upon request.

5. Proofs

Proof of Lemma 1: Consider the pivotal voter $w_p(0, \lambda_1)$ defined by

$$\int_0^{w_p(\lambda_0, \lambda_1)} \left(\lambda_0 + w^{\lambda_1}\right) dF(w) = \int_{w_p(\lambda_0, \lambda_1)}^{+\infty} \left(\lambda_0 + w^{\lambda_1}\right) dF(w),$$

and take $\lambda_1^{'} > \lambda_1$. As

$$w_p^{\lambda_1^{'}-\lambda_1}\left(\lambda_0,\lambda_1\right)\int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1}dF\left(w\right) = w_p^{\lambda_1^{'}-\lambda_1}\left(\lambda_0,\lambda_1\right)\int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1}dF\left(w\right)$$

And $w < w_p\left(\lambda_0,\lambda_1\right)$ if and only if $w^{\lambda_1^{'}-\lambda_1} < w_p^{\lambda_1^{'}-\lambda_1}\left(\lambda_0,\lambda_1\right)$ so that

$$w_p^{\lambda_1^{'}-\lambda_1}\left(\lambda_0,\lambda_1\right)\int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1}dF\left(w\right) > \int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1^{'}}dF\left(w\right)$$
$$w_p^{\lambda_1^{'}-\lambda_1}\left(\lambda_0,\lambda_1\right)\int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1}dF\left(w\right) < \int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1^{'}}dF\left(w\right)$$

and hence

$$\int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1^{'}}dF\left(w\right) < \int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1^{'}}dF\left(w\right)$$

and

$$\int_0^{w_p(\lambda_0,\lambda_1)}\left(\lambda_0 + w^{\lambda_1^{'}}\right)dF\left(w\right) = \int_{w_p(\lambda_0,\lambda_1)}^{+\infty}\left(\lambda_0 + w^{\lambda_1^{'}}\right)dF\left(w\right).$$

This implies that $w_p\left(\lambda_0,\lambda_1^{'}\right) > w_p\left(\lambda_0,\lambda_1\right) \geq w_m$. Now take $\lambda_0^{'} > \lambda_0$.

$$\int_0^{w_p(\lambda_0,\lambda_1)}\left(\lambda_0^{'} + w^{\lambda_1}\right)dF\left(w\right) = \int_0^{w_p(\lambda_0,\lambda_1)}\left(\lambda_0 + w^{\lambda_1}\right)dF\left(w\right) + \left(\lambda_0^{'} - \lambda_0\right)\int_0^{w_p(\lambda_0,\lambda_1)} dF\left(w\right)$$
$$\int_{w_p(\lambda_0,\lambda_1)}^{+\infty}\left(\lambda_0^{'} + w^{\lambda_1}\right)dF\left(w\right) = \int_{w_p(\lambda_0,\lambda_1)}^{+\infty}\left(\lambda_0 + w^{\lambda_1}\right)dF\left(w\right) + \left(\lambda_0^{'} - \lambda_0\right)\int_{w_p(\lambda_0,\lambda_1)}^{+\infty} dF\left(w\right)$$

As $w_p\left(\lambda_0,\lambda_1\right) \geq w_m$, we thus have

$$\int_0^{w_p(\lambda_0,\lambda_1)} dF\left(w\right) \geq \int_{w_p(\lambda_0,\lambda_1)}^{+\infty} dF\left(w\right)$$

and hence

$$\int_0^{w_p(\lambda_0,\lambda_1)}\left(\lambda_0^{'} + w^{\lambda_1}\right)dF\left(w\right) \geq \int_{w_p(\lambda_0,\lambda_1)}^{+\infty}\left(\lambda_0^{'} + w^{\lambda_1}\right)dF\left(w\right)$$

so that $w_p\left(\lambda_0,\lambda_1\right) \leq w_p\left(\lambda_0^{'},\lambda_1\right)$. The second point comes from the observation that $w_m = w_p\left(\lambda_0,\lambda_1\right)$ for any $\lambda_0 > 0$. Finally, the third point is quite intuitive and can be established as follows: consider $w_p\left(\lambda_0,\lambda_1\right)$:

$$\int_0^{w_p(\lambda_0,\lambda_1)} dF(w) + \frac{1}{\lambda_0}\int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1} dF(w) = \int_{w_p(\lambda_0,\lambda_1)}^{+\infty} dF(w) + \frac{1}{\lambda_0}\int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1} dF(w)$$

and given the definition of the median voter:

$$\int_{w_m}^{w_p(\lambda_0,\lambda_1)} dF(w) + \frac{1}{\lambda_0}\int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1} dF(w) = \int_{w_p(\lambda_0,\lambda_1)}^{w_m} dF(w) + \frac{1}{\lambda_0}\int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1} dF(w)$$

Or

$$2\int_{w_m}^{w_p(\lambda_0,\lambda_1)} dF(w) = \frac{1}{\lambda_0}\left[\int_{w_p(\lambda_0,\lambda_1)}^{+\infty} w^{\lambda_1} dF(w) - \int_0^{w_p(\lambda_0,\lambda_1)} w^{\lambda_1} dF(w)\right]. \qquad (A.17)$$

The right-hand side of (A.17) converges to zero as λ_0 grows large, so that $\lim_{\lambda_0\to\infty} w_p(\lambda_0,\lambda_1) = w_m$.

Proof of Proposition 2: The first-order conditions imply that such value f is characterized by $\frac{\partial}{\partial f} w_r(p, f) = 0,$ if the solution is interior. Equation (A.8) implies that when necessary, the first-order condition is also sufficient and $f_r(p) = f_L$ if and only if $\frac{\partial}{\partial f} w_r(p, f_L) \geq 0$ and $f_r(p) = f_H$ if and only if $\frac{\partial}{\partial f} w_r(p, f_H) \leq 0.$ We will then define $f_r^{-1}(f_H) = \sup\left\{p \in \left[0, \frac{1}{b}\right], \frac{\partial}{\partial f} w_r(p, f_H) \leq 0\right\}$ and $f_r^{-1}(f_L) = \inf\left\{p \in \left[0, \frac{1}{b}\right], \frac{\partial}{\partial f} w_r(p, f_L) \geq 0\right\}.$ Conditions (A.10) imply that $f_r^{-1}(f_H) < f_r^{-1}(f_L).$ Finally, regularity assumptions imply that $f_r(p)$ is piecewise continuously differentiable with respect to $p.$

The Preference Curve is constant over $\left[0, f_r^{-1}(f_H)\right]$ and $\left[f_r^{-1}(f_L), \frac{1}{b}\right].$ Regularity conditions imply that we can differentiate the first-order condition with respect to f and $p,$ while (A.8) and (A.9) imply that $f_r(p)$ is nonincreasing, so that when it is differentiable, $f_r'(p) \leq 0.$ Furthermore, the first part of (A.10) ensures that for levels of $p = a$ small enough, the solution is interior, and thus for some range of p ‘s the Preference Curve is strictly decreasing.

Proof of Corollary 3: See discussion and derivation of conditions on parameter values in section A.4 above.

Proof of Proposition 4: To prove the first part, note that as $w_r(a, f)$ is nondecreasing, the left-hand side of (19) is increasing and continuous in $p,$ thus there exists a unique $p_r(f)$ that satisfies (19). We now need to verify that $p_r(f)$ corresponds to the pivotal voter with wealth w_p as defined in (15):

$$2\int_0^{w_p}\left(\lambda_0 + w^{\lambda_1}\right)dF(w) = \int_0^{+\infty}\left(\lambda_0 + w^{\lambda_1}\right)dF(w).$$

First, by definition of $F(.)$ we have

$$\int_0^{+\infty}\left(\lambda_0 + w^{\lambda_1}\right)dF(w) = \int_0^{1/b}\left(\lambda_0 + w_r^{\lambda_1}(a,f)\right)dG(a)$$

Given conditions (A.6) and (A.7) and the condition that $\frac{\partial}{\partial a} w_r(a,f)\big|_{a=p} < 0,$ the transformation $a \to w = w_r(a,f)$ is strictly monotonic for $a \leq p.$ We can hence change the variables of integration and write:

$$2\int_0^{p_r(f)}\left[\lambda_0 + w_r^{\lambda_1}(a,f)\right]dG(a) = 2\int_{+\infty}^{w_r(p_r(f),f)}\left(\lambda_0 + w^{\lambda_1}\right)dF(w).$$

By uniqueness of the pivotal voter defined by (15) we conclude that $w_r(p_r(f),f) = w_p.$ Differentiating the right-hand side of (19) with respect to f,

$$\int_{p_r(f)}^{\frac{1}{b}}\frac{\partial w_r(a,f)}{\partial f}\times\lambda_1 w_r^{\lambda_1 - 1}(a,f)\,dG(a) - \int_0^{p_r(f)}\frac{\partial w_r(a,f)}{\partial f}\times\lambda_1 w_r^{\lambda_1 - 1}(a,f)\,dG(a)$$

is well-defined as $w_r(a,f)$ is piecewise continuously differentiable, which implies that $p_r(f)$ is continuously differentiable with respect to f.

To prove the second part, we first state the following Lemma:

Lemma 13: *If* $p_r(f \mid \lambda_0, \lambda)$ *is the marginal cost of production of the pivotal voter that prevails when entry barriers are equal to* f *and political weights are given by* $\lambda(w) = \lambda_0 + w^{\lambda_1}$, *then*

- $p_r(f \mid \lambda_0, \lambda_1)$ is decreasing in λ_1 and increasing in λ_0
- $p_r(f \mid \lambda_0, \lambda_1) \geq p_m$ for any $\lambda_0 > 0, \lambda_1 \geq 0$ and $f \in [f_L, f_H]$
- $\lim_{\lambda_0 \to \infty} p_r(f \mid \lambda_0, \lambda_1) = p_m$ for any $\lambda_0 > 0, \lambda_1 \geq 0$ and $f \in [f_L, f_H]$

Furthermore, if $w(a,f)$ satisfies (A.11), then in order to ensure that the integral for the total number of votes does not diverge, $\int_0^{1/b}\left[\lambda_0 + w_r^{\lambda_1}(a,f)\right]dG(a) < \infty,$ it must be the case that $\lambda_1 < k/\gamma.$

Proof of Lemma 13: The first three points are immediate consequences of Lemma 1, and given that there is a one-to-one decreasing correspondence between wealth levels and marginal costs of production. Finally, the Pareto distribution with parameter k assumption implies that the integral $\int_0^{+\infty} a^{-\lambda_1\gamma} dG(a)$ converges if and only if $\lambda_1\gamma < k$.

Returning to the proof, differentiating equation (19) implicitly with respect to f, we obtain the following expression:

$$2\left(\lambda_0 + w_r^{\lambda_1}\left(p_r(f)\right)\right)\times p_r'(f)\times g\left(p_r(f)\right) = \int_{p_r(f)}^{\frac{1}{b}} \frac{\partial w_r(a,f)}{\partial f}\times\lambda_1 w_r^{\lambda_1-1}(a,f)\,dG(a)$$
$$-\int_0^{p_A(f)} \frac{\partial w_r(a,f)}{\partial f}\times\lambda_1 w_r^{\lambda_1-1}(a,f)\,dG(a)$$

The sign of $p_r'(f)$ is the same as the sign of the left-hand side of this expression, which we call Δ:

$$\Delta \equiv \int_{p_r(f)}^{\frac{1}{b}} \frac{\partial w_r(a,f)}{\partial f}\lambda_1'\left(w_r(a,f)\right)dG(a) - \int_0^{p_r(f)} \frac{\partial w_r(a,f)}{\partial f}\lambda_1'\left(w_r(a,f)\right)dG(a),$$

Let's consider $f_r^{-1}(f)$, the entrepreneur who would prefer f. The first-order conditions imply that $\frac{\partial w_r(a,f)}{\partial f} > 0$ if and only if $a < f_r^{-1}(f)$.

There are two cases:

- If $f_r^{-1}(f) < p_r(f)$, we can rewrite

$$\Delta = \int_{p_r(f)}^{\frac{1}{b}} \frac{\partial w_r(a,f)}{\partial f}\times\lambda_1 w_r^{\lambda_1-1}(a,f)\,dG(a)$$
$$-\int_0^{f_r^{-1}(f)} \frac{\partial w_r(a,f)}{\partial f}\lambda_1 w_r^{\lambda_1-1}(a,f)\,dG(a)$$
$$-\int_{f_r^{-1}(f)}^{p_r(f)} \frac{\partial w_r(a,f)}{\partial f}\lambda_1 w_r^{\lambda_1-1}(a,f)\,dG(a)$$

and a sufficient condition for Δ to be negative is that

$$\int_0^{f_r^{-1}(f)} \frac{\partial w_r(a,f)}{\partial f} w_r^{\lambda_1-1}(a,f)\,dG(a) > \int_{f_r^{-1}(f)}^{p_r(f)} -\frac{\partial w_r(a,f)}{\partial f} w_r^{\lambda_1-1}(a,f)\,dG(a).$$

- If $f_r^{-1}(f) > p_r(f)$, we can rewrite

$$\Delta = \int_{f_r^{-1}(f)}^{\frac{1}{b}} \frac{\partial w_r(a,f)}{\partial f} \lambda_1 w_r^{\lambda_1 - 1}(a,f)\,dG(a) + \int_{p_r(f)}^{f_r^{-1}(f)} \frac{\partial w_r(a,f)}{\partial f} \lambda_1 w_r^{\lambda_1 - 1}(a,f)\,dG(a) - \int_0^{p_r(f)} \frac{\partial w_r(a,f)}{\partial f} \lambda_1 w_r^{\lambda_1 - 1}(a,f)\,dG(a)$$

and a sufficient condition for Δ to be negative:

$$\int_0^{p_r(f)} \frac{\partial w_r(a,f)}{\partial f} w_r^{\lambda_1 - 1}(a,f)\,dG(a) > \int_{p_r(f)}^{f_r^{-1}(f)} \frac{\partial w_r(a,f)}{\partial f} w_r^{\lambda_1 - 1}(a,f)\,dG(a)$$

Let's now consider $\tilde{p}_r(f) = \min\left\{p_r(f), f_r^{-1}(f)\right\}$, so that we can restrict ourselves to the following unique sufficient condition:

$$\int_0^{\hat{p}_r(f)} \frac{\partial w_r(a,f)}{\partial f} w_r^{\lambda_1 - 1}(a,f)\,dG(a) > \int_{p_r(f)}^{f_r^{-1}(f)} \frac{\partial w_r(a,f)}{\partial f} w_r^{\lambda_1 - 1}(a,f)\,dG(a)$$

or equivalently,

$$\int_0^{\hat{p}_r(f)} \frac{\partial \ln w_r(a,f)}{\partial f} w_r^{\lambda_1}(a,f)\,dG(a) > \int_{p_r(f)}^{f_r^{-1}(f)} \frac{\partial \ln w_r(a,f)}{\partial f} w_r^{\lambda_1}(a,f)\,dG(a) \quad (A.18)$$

Condition (A.11) implies that $\frac{\partial \ln w_r(a,f)}{\partial f}$ is bounded away from zero, so that there exists $u > 0$ such that

$$\int_0^{\hat{p}_r(f)} \frac{\partial \ln w_r(a,f)}{\partial f} w_r^{\lambda_1}(a,f)\,dG(a) \geq u \int_0^{\hat{p}_r(f)} w_r^{\lambda_1}(a,f)\,dG(a).$$

Similarly, $\frac{\partial \ln w_r(a,f)}{\partial f}$ is bounded above uniformly with respect to a so that there exist $v > 0$ such that

$$\left| \int_{p_r(f)}^{f_r^{-1}(f)} \frac{\partial \ln w_r(a,f)}{\partial f} w_r^{\lambda_1}(a,f)\,dG(a) \right| \leq v \left| \int_{p_r(f)}^{f_r^{-1}(f)} w_r^{\lambda_1}(a,f)\,dG(a) \right|$$

Putting the two inequalities together, a sufficient condition for (A.18) to hold is that

$$u\int_0^{\hat{p}_r(f)} w_r^{\lambda_1}(a,f)\,dG(a) > v\left|\int_{p_r(f)}^{f_r^{-1}(f)} w_r^{\lambda_1}(a,f)\,dG(a)\right|. \qquad (A.19)$$

If the political weight function is "convex enough," then (A.19) eventually holds as more political weight is moved towards lower marginal cost entrepreneurs. To see this, let's consider $\lambda_0^{'} > 0, \lambda_1^{'} > 0,$ and consider the following inequality, where we change the parameters of the political weight function, keeping the pivotal voter constant:

$$u\int_0^{\hat{p}_r(f)} w_r^{\lambda_1^{'}}(a,f)\,dG(a) > v\left|\int_{p_r(f)}^{f_r^{-1}(f)} w_r^{\lambda_1^{'}}(a,f)\,dG(a)\right|$$

Then, as (A.11) holds, there exists a threshold $\overline{\lambda}_1 < \frac{k}{\gamma},$ such that for any $\lambda_1^{'} > \overline{\lambda}_1,$ (A.19) holds. Actually, the integral $\int_0^{\tilde{p}_r(f)} a^{-\lambda_1^{'}\gamma}dG(a)$ diverges as $\lambda_1^{'}\gamma$ converges to $k.$ Finally, Lemma 13 implies that there exists $\overline{\lambda}_0\left(\lambda_1^{'}\right) > 0$ such that for any $\lambda_0^{'} > \overline{\lambda}_0\left(\lambda_1^{'}\right),$ $p_r\left(f \mid \lambda_0^{'}, \lambda_1^{'}\right) \geq \tilde{p}_r(f).$ We can thus conclude that there exists $\overline{\lambda}_1 < \frac{k}{\gamma}$ such that for any $\lambda_1^{'} > \overline{\lambda}_1,$ there exists $\overline{\lambda}_0\left(\lambda_1^{'}\right) > 0$ such that for any $\lambda_0^{'} > \overline{\lambda}_0\left(\lambda_1^{'}\right),$ (A.19) holds for the economy characterized by a political weight function $\lambda(w) = \lambda_0^{'} + w^{\lambda_1^{'}}.$ To conclude the argument, we remark that $f \in [f_L, f_H]$ is a compact set, so that the intersection of all the constraints is non-empty. We have hence identified a set of parameters characterizing the political weight function for which the Political Curve is downward sloping.

Proof of Proposition 6: If $p_r(f_H) \leq f_r^{-1}(f_H),$ then $(f_H, p_r(f_H))$ is one such point. Symmetrically, if $p_r(f_L) \geq f_r^{-1}(f_L),$ then $(f_L, p_r(f_L))$ is one such point. Otherwise, by continuity, there exists $f \in (f_L, f_H)$ such that $p_r(f) = f_r^{-1}(f),$ so that the political and preference curves intersect in $(f, p_r(f)).$

Proof of Proposition 8: There exists an equilibrium. We prove stability by first stating two Lemmas, one that rules out cycling equilibria, and another that shows corner solution equilibria to be stable.

Lemma (no cycling): The functions $\Phi_r(.)$ and $\Pi_r(.)$ are increasing so that for any $f \in [f_L, f_H]$ and any $p \in \left(0, \frac{1}{b}\right),$ the sequences $\left\{\Phi_r^n(f)\right\}_{n\geq 1}$ and $\left\{\Pi_r^n(f)\right\}_{n\geq 1}$ are monotonic.

Proof: $f_r(.)$ and $p_r(.)$ are both decreasing functions, so that $\Phi_r(.)$ and $\Pi_r(.)$ are increasing. The previous lemma shows that there is no cycling possible. The sequences $\left\{\Phi_r^n(f)\right\}_{n\geq 1}$ and $\left\{\Pi_r^n(f)\right\}_{n\geq 1}$ are monotonic and are bounded, so that they converge. Either they converge to an interior solution, and such solution is stable, or they converge to the boundaries. The latter case is addressed below:

Lemma (corner solutions): If the political curve intersects the preference curve in either f_L or f_H, then the resulting equilibrium is stable.

Proof: Let's consider $\left(f_H, p_r(f_r)\right)$ such intersection point. A corner solution is thus characterized by $p_r(f_H) < f_r^{-1}(f_H)$. We hence set $\rho = \frac{1}{2}\left|p_r(f_H) - f_r^{-1}(f_H)\right|$. Then take any $\tilde{p} \in \left(p_r(f_H) - \rho; p_r(f_H) + \rho\right)$. $\tilde{p} < f_r^{-1}(f_H)$ so that $f_r(\tilde{p}) = f_H$, and $p_r\left[f_r(\tilde{p})\right] = p_r(f_H)$. Convergence to $\left(f_H, p_r(f_H)\right)$ occurs after the first loop: $\Pi(\tilde{p}) = p_r(f_H)$. The same argument holds for an intersection of the type $\left(f_L, p_r(f_L)\right)$.

Coming back to the proof of the main theorem, if there exists a corner-solution equilibrium, the previous lemma showed that such candidate is stable. Otherwise, suppose that such equilibrium is an interior equilibrium. The Lemma above shows that it is not a cycling one. The absence of corner solutions implies that $p_A(f_H) > f_A^{-1}(f_H)$, while $p_A(f_L) < f_A^{-1}(f_L)$. The intersection of the Political and Preference curves is such that the Political curve needs to be downward sloping at the intersection, so that $f_A^{-1}(f_H) < f_A^{-1}(f_L)$. If there are two intersections, then one is a stable equilibrium. Suppose now that there is only one intersection $\left(f, p_A(f)\right)$, with $f \in (f_L, f_H)$ and let's compare the slopes of the Political and Preference curves at that intersection. If both curves are differentiable with respect to f, then $p_A'(f) < \left(f_A^{-1}\right)'(f)$ if and only if $p_A(f_L) < f_A^{-1}(f_L)$, so that $p_A'(f) < \left(f_A^{-1}\right)'(f)$ and $\left(f, p_A(f)\right)$ is a stable equilibrium. Otherwise, we are in the presence of a kink in f for either or both curves, and the same argument holds:

$\lim_{\tilde{f}\to f^-} \frac{p_A(\tilde{f}) - p_A(f)}{\tilde{f} - f} < \lim_{\tilde{f}\to f^-} \frac{f_A^{-1}(\tilde{f}) - f_A^{-1}(f)}{\tilde{f} - f}$ if and only if $p_A(f_L) < f_A^{-1}(f_L)$, and
$\lim_{\tilde{f}\to f^+} \frac{p_A(\tilde{f}) - p_A(f)}{\tilde{f} - f} < \lim_{\tilde{f}\to f^+} \frac{f_A^{-1}(\tilde{f}) - f_A^{-1}(f)}{\tilde{f} - f}$, if and only if $p_A(f_H) > f_A^{-1}(f_H)$ so that
$\lim_{\tilde{f}\to f^-} \frac{p_A(\tilde{f}) - p_A(f)}{\tilde{f} - f} < \lim_{\tilde{f}\to f^-} \frac{f_A^{-1}(\tilde{f}) - f_A^{-1}(f)}{\tilde{f} - f}$ and $\lim_{\tilde{f}\to f^+} \frac{p_A(\tilde{f}) - p_A(f)}{\tilde{f} - f} < \lim_{\tilde{f}\to f^+} \frac{f_A^{-1}(\tilde{f}) - f_A^{-1}(f)}{\tilde{f} - f}$:
$\left(f, p_A(f)\right)$ is a stable equilibrium.

Proof of Corollary 9: See discusion on the real profit functions in the section above.

Proof of Proposition 10: Define the following difference:

$\Delta \equiv \int_0^{p_A(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) - \int_{p_A(f)}^{\frac{1}{b}} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a)$ The pivotal voter shifts to the left, that is, $p_T(f) < p_A(f)$ if and only if $\Delta > 0.$ Consider the entrepreneur whose profits in autarky are the same as under trade, and denote that entrepreneur by $\overline{a}(f).$ There are two possibilities, i) $\overline{a}(f) < p_A(f),$ and ii) $\overline{a}(f) < p_A(f).$ We consider each in turn.

(i) We can rewrite Δ as:

$$
\begin{aligned}
\Delta \equiv & \int_0^{\overline{a}(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) + \\
& + \int_{\overline{a}(f)}^{p_A(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) \\
& - \int_{p_A(f)}^{\frac{1}{b}} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a)
\end{aligned}
$$

The last term is unambiguously positive. Therefore, the sufficient condition for $\Delta > 0$ is:

$$
\int_0^{\overline{a}(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) > \int_{\overline{a}(f)}^{p_A(f)} - \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a)
$$

(ii) We can rewrite Δ as:

$$
\begin{aligned}
\Delta \equiv & \int_0^{p_A(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) - \\
& \int_{p_A(f)}^{\overline{a}(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) - \\
& \int_{\overline{a}(f)}^{\frac{1}{b}} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a)
\end{aligned}
$$

The last term is unambiguously positive. Therefore, the sufficient condition for $\Delta > 0$ is:

$$
\int_0^{p_A(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a) > \int_{p_A(f)}^{\overline{a}(f)} \left[\lambda\left(w_T\left(a,f\right)\right) - \lambda\left(w_T\left(a,f\right)\right) \right] dG(a)
$$

Let's now consider $\tilde{p}_A(f) = \min\left\{ p_A(f), \overline{a}(f) \right\},$ so that we can restrict ourselves to the following unique sufficient condition:

$$\int_0^{\tilde{p}_A(f)}\left[\lambda\left(w_T(a,f)\right)-\lambda\left(w_T(a,f)\right)\right]dG(a)>\int_{p_A(f)}^{\bar{a}(f)}\left[\lambda\left(w_T(a,f)\right)-\lambda\left(w_T(a,f)\right)\right]dG(a)$$

Now, suppose $\lambda(w)=\lambda_0+w^{\lambda_1}$. Then, λ_0 's cancel out, and we get:

$$\int_0^{\tilde{p}_A(f)}\left[w_T^{\lambda_1}(a,f)-w_A^{\lambda_1}(a,f)\right]dG(a)>\int_{p_A(f)}^{\bar{a}(f)}\left[w_T^{\lambda_1}(a,f)-w_A^{\lambda_1}(a,f)\right]dG(a)$$

which we can rewrite

$$\int_0^{\tilde{p}_A(f)}w_T^{\lambda_1}(a,f)\left[1-\left(\frac{w_A(a,f)}{w_T(a,f)}\right)^{\lambda_1}\right]dG(a)>\int_{p_A(f)}^{\bar{a}(f)}\left[w_T^{\lambda_1}(a,f)-w_A^{\lambda_1}(a,f)\right]dG(a)\quad (A.20)$$

The integral on the right hand side is bounded from above. Suppose that $\lim_{a\to 0}\frac{w_A(a,f)}{w_T(a,f)}<1.$ When this is true, the term in brackets on the left hand side does not go to zero as $a\to 0.$ We know that $\pi_A(a)=fa_A^{\varepsilon-1}a^{1-\varepsilon}-f$, $\pi_D(a)=fa_D^{\varepsilon-1}a^{1-\varepsilon}-f$, and $\pi_X(a)=f_X a_X^{\varepsilon-1}a^{1-\varepsilon}-f_X$. Thus this condition will be satisfied when:

$$\lim_{a\to 0}\frac{w_A(a,f)}{w_T(a,f)}=\lim_{a\to 0}\frac{fa_A^{\varepsilon-1}a^{1-\varepsilon}-f}{fa_D^{\varepsilon-1}a^{1-\varepsilon}-f+f_X a_X^{\varepsilon-1}a^{1-\varepsilon}-f_X}=\frac{fa_A^{\varepsilon-1}}{fa_D^{\varepsilon-1}+f_X a_X^{\varepsilon-1}}<1,$$

as assumed in (A.12). For each f, consider $\lambda_0^{'}>0$, $\lambda_1^{'}\geq 0$ and the following inequality, whereby we change the parameters of the political weight function, keeping the pivotal voter constant:

$$\int_0^{\tilde{p}_A(f)}w_T^{\lambda_1}(a,f)\left[1-\left(\frac{w_A(a,f)}{w_T(a,f)}\right)^{\lambda_1}\right]dG(a)>\int_{p_A(f)}^{\bar{a}(f)}\left[w_T^{\lambda_1}(a,f)-w_A^{\lambda_1}(a,f)\right]dG(a)\quad (A.21)$$

The integral on the right hand side is bounded from above. Then, as (A.11) holds, there exists a threshold $\overline{\lambda}_1<\frac{k}{\gamma}$, such that for any $\lambda_1^{'}>\overline{\lambda}_1$, (A.21) holds. Actually, the integral $\int_0^{\tilde{p}_r(f)}a^{-\lambda_1^{'}\gamma}dG(a)$ diverges as $\lambda_1^{'}\gamma$ converges to k. Finally, Lemma 13 implies that there exists $\overline{\lambda}_0\left(\lambda_1^{'}\right)>0$ such that for any $\lambda_0^{'}>\overline{\lambda}_0\left(\lambda_1^{'}\right)$, $p_A\left(f\mid\lambda_0^{'},\lambda_1^{'}\right)\geq\tilde{p}_A(f)$. We can thus conclude that there exists $\overline{\lambda}_1<\frac{k}{\gamma}$ such that for any $\lambda_1^{'}>\overline{\lambda}_1$, there exists $\overline{\lambda}_0\left(\lambda_1^{'}\right)>0$ such that for any $\lambda_0^{'}>\overline{\lambda}_0\left(\lambda_1^{'}\right)$, (A.20) holds for the economy characterized by a political weight function $\lambda(w)=\lambda_0^{'}+w^{\lambda_1^{'}}$. To conclude the argument, we remark that $f\in\left[f_L,f_H\right]$ is a compact set, so that the intersection of all the constraints is non-empty. We have hence identified a set of parameters characterizing the political weight function for which the Pivotal Voter curves unambiguously moves inward as a consequence of trade.

Proof of Proposition 12: Note that for any entry barrier level f, $f_r\left[\Pi^n\left(p_r\left(f\right)\right)\right]=\Phi^{n+1}\left(f\right)$, and $p_r\left[\Phi^n\left(f_r\left(p\right)\right)\right]=\Pi^{n+1}\left(p\right)$, so that by continuity of $f_r\left(.\right)$ and $p_r\left(.\right)$, the two requirements (22) and (23) are redundant. We will thus restrict ourselves to condition (22). $f_T^{-1}\left(f_A\right)$ is the pivotal voter who prefers f_A under the trade regime. Since $f_T^{-1}\left(f_A\right)>p_T\left(f_A\right)$, we know that $\Pi_T\left[f_T^{-1}\left(f_A\right)\right]>\Pi_T\left[p_T\left(f_A\right)\right]$ as $\Pi_T\left(.\right)$ is the combination of two decreasing functions, hence is increasing. Note then that $\Pi_T\left[f_T^{-1}\left(f_A\right)\right]=p_T\left(f_A\right)$. Thus, we have $p_T\left(f_A\right)>\Pi_T\left[p_T\left(f_A\right)\right]$. Applying $\Pi_T\left(.\right)$ sequentially, for any $n>1$,

$$p_T\left(f_A\right)>\Pi_T\left[p_T\left(f_A\right)\right]>\Pi_T^2\left[p_T\left(f_A\right)\right]...\geq\Pi_T^n\left[p_T\left(f_A\right)\right]$$

Taking the limit, and defining $p_T=\lim_{n\to\infty}\Pi_T^n\left[p_T\left(f_A\right)\right]$ and $f_T=\lim_{n\to\infty}\Phi^n\left(f_A\right)$, f_A belongs to the basin of attraction of $\left(f_T,p_T\right)$ and the inequality above implies that $f_A<f_T$.

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