Foreign Firms, Distribution of Income, and the Welfare of Developing Countries*

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Abstract

I construct a tractable model to investigate the impact of the presence of foreign firms in economies where there exist financial frictions. The cross-country implications of the model are consistent with two facts I document using plant-level data: (i) foreign firms enter more in economies where domestic entrepreneurs are more financially constrained. (ii) the impact of foreign firms in the plants' size distribution of the host country is larger in countries where domestic entrepreneurs are more financially constrained. After calibrating the model to account quantitatively for these facts, I use it to evaluate a decrease of barriers to foreign entry. I find that welfare increase only in economies with sufficiently high level of labor income share.

JEL classification: O40; E23; L11; F23; G28

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1 Introduction

The recent literature studying the quantitative impact of FDI openness in developing economies finds large output and welfare gains, derived from the entrance of better technologies. McGrattan and Prescott (2007) provide a theoretical support for the view that gains from openness are large, showing the potential benefits of allowing multinationals to bring technological capital into a country to produce there. Burstein and Monge-Naranjo (2009) estimate the gains of reallocating managerial know-how across countries. Ramondo (2012) estimate the gains of lower barriers to foreign firms that bring its technological advantages to produce in the host economies.

There has been less attention to study the effects of FDI in economies where resources are not efficiently allocated. However, this is usually the case in poor countries. In this paper, I investigate the impact of the presence of foreign firms in economies where domestic entrepreneurs are financially constrained. In an economy where entrepreneurs can not produce at their optimal scale, the aggregate demand for labor is inefficiently low implying low equilibrium wages. These low wages allow untalented entrepreneurs to produce, implying an aggregate allocation of resources biased towards small establishments.

However, borrowing from their home countries, foreign firms are isolated from the financial frictions that affect domestic entrepreneurs.[1] In poor countries, foreign multinationals are usually financed in their home countries and hence are not affected by low access to credit of the host economies. Then, foreign firms can produce at their optimal scale, playing an important role in explaining how resources are allocated in developing countries.

I develop this idea in a very tractable model where constrained domestic entrepreneurs and unconstrained foreign firms coexist in the same economy. I use cross-country data to calibrate the parameters governing the financial frictions and the barriers to entry for foreign firms in around 100 countries. Then I test the cross-country implications of the model. In particular, I investigate whether the cross-country relationships implied by the model are consistent with two facts I document in the data: (i) foreign ownership is associated to a lower share of employment accounted by small plants, and this association is magnified in countries where financial frictions are large; (ii) ceteris paribus, foreign firms tend to account for a higher amount of domestic resources in economies where domestic entrepreneurs are financially constrained.

My model belongs to a big family of models widely used in the literature related to misallocation of resources and aggregate productivity. Under heterogeneity in a fixed factor and decreasing returns to scale, a size distribution of firms arises in equilibrium. Distorting the equilibrium size distribution of firms, financial frictions can generate high output and welfare losses.[2] In my model, the presence

[1] For direct evidence, see Harrison and McMillan (2003)

[2] See for instance Erosa and Hidalgo-Cabrillana (2008), Buera, Kaboski, and Shin (2011), and Midrigan and Xu (2012).

of foreign firms interact with these financial frictions in determining how resources are allocated. The presence of foreign firms can counteract the negative effects of financial frictions in the way resources are allocated.

In my model, domestic production takes place as in Lucas (1978). Under heterogeneity in talent, the domestic representative household has to choose which individuals are workers and which individuals are entrepreneurs. This framework allows to model both the domestic labor supply and the domestic distribution of firms in a very tractable way. My theoretical contribution is to extend this framework allowing entry of foreign firms: a set of foreign potential entrants decide whether or not to produce in the domestic market. As in Hopenhayn (1992), these potential entrants are ex-ante identical and have to pay a fixed cost to learn about their productivity and be able to enter. I interpret that fixed cost as a regulation cost that imposes barriers to foreign entry. The higher this regulation cost is, the lower the amount of foreign firms that attempt to enter and hence the lower the entry.

In my model, the amount of foreign entry depends also on the degree of financial frictions faced by domestic entrepreneurs. When domestic entrepreneurs are financially constrained, entry becomes more profitable for foreign firms because wages become potentially lower. Then, the higher the financial frictions, the higher the amount of foreign firms that enter in the economy.

The model also provides some novel insights about the distribution of income in developing countries. In a closed economy, higher financial frictions implies lower wages and a higher proportion of the population being entrepreneurs. In this situations, the domestic distribution of income become biased towards entrepreneurial income. However, if the possibility of foreign entry exists, this negative relationship between financial frictions and labor income share gets reverted. When financial frictions are higher, more foreign firms enter, preventing wages to fall. At the same time, financial frictions reduce entrepreneurial profits, forcing the least productive entrepreneurs to stop operating. These two things together imply a higher labor income share in the gross national income.

Using cross-country data, I calibrate the parameters governing the financial development and regulation entry costs. Assuming that countries differ only in these two parameters, I target two statistics for each economy: First, I target the differences in plant size between domestic and foreign plants. On average, the mean size of foreign plants is around 4 times higher than the mean size of domestic plants. Second, I target the share of employment allocated to foreign plants, which on average is around 26%.

Next, I conduct a policy counterfactual. I quantify the effect on welfare in host countries of lowering entry costs for foreign firms. I find that both the sign and the magnitude of this effect crucially depends on the composition of national income. When barriers to entry get reduced, a higher amount of foreign firms enter the host economy. This increase in entry is accompanied by an increase in the equilibrium wage, crowding out some domestic entrepreneurs who can not afford producing anymore. The model predicts that in some economies income losses derived from this crowding out effect is not fully compensated by the increase in wages, and hence gross national income and welfare fall. This is precisely the case in economies where labor income share in gross national income is not sufficiently high.

I abstract from possible positive externalities that the presence of foreign firms can generate in domestic entrepreneurs. Several empirical studies have estimated the impact of foreign entry in domestic plants' productivity, finding different results.[3] Notice that my model does not deal with the transmission of knowledge as a source of income and welfare gains.[4] In fact, I assume that the ex-ante distribution of domestic entrepreneurial talent and foreign firms' productivity is the same. Here, I focus on financial advantages as the source of gains.

My work is also related to a recent literature that emphasize misallocation of resources as the source of income differences across countries. According to these works, the existence of government policies that subsidize small production units distort the equilibrium size distribution of firms, generating high output and welfare losses.[5] Here, I focus on financial frictions as the source of misallocation, and study how foreign entry can minimize the extent of such misallocation in developing countries.

The paper is organized as follows. In section 2 documents two facts about the cross-country relationships between foreign ownership, financial frictions, and the size distribution of plants. Section 3 presents the model. In section 4 I characterize analytically some important properties of the equilibrium of the model. In section 5 I explain how the model is calibrated, I test its cross-country implications, and I present the policy counterfactual exercise. Section 6 concludes.

2 Facts

In this section I use standardized plant-level data to document two cross-country facts that motivate my study. First, I point out that the amount of foreign ownership is positively correlated to the share of labor in the economy allocated to large productive plants. I emphasize that this correlation is magnified when domestic entrepreneurs of the recipient country are financially constrained. Second, I show that, ceteris paribus, the presence of foreign firms is higher in economies where financial frictions are higher.

[3] For instance, Aitken and Harrison (1999) find that foreign investment negatively affects the productivity of domestic plants in Venezuela. Javorcik (2004), however, finds evidence of positive spillovers from FDI for domestic plants.

[4] See Burstein and Monge-Naranjo (2009) and Antràs, Garicano, and Rossi-Hansberg (2006) for frameworks in which developing countries benefit from importing know-how skills from developed countries.

[5] Restuccia and Rogerson (2008), Guner, Ventura, and Yi (2008), Hsieh and Klenow (2009), and García-Santana and Pijoan-Mas (2012) are some examples.

2.1 Foreign Ownership and the Plants' Size Distribution

In poor countries, higher amounts of resources are allocated to small unproductive plants.[6] However, even keeping constant the level of income, there is still a high cross-country variation in the amount of resources accounted for by small plants. The focus of this subsection is to show that the amount of foreign ownership and its interaction with financial frictions is crucial in understanding this unexplained variation. I use the Enterprises Survey of the World Bank (ESWB) 2006-2010. The goal of this survey is to collect information about business environment and how it affects plant performance. In particular, I use the Standardized data 2006-2010, whose main advantage is that questionnaires are completely standardized allowing cross-country comparisons.[7]

I compute sector-country measures of the share of employment accounted by small plants.[8] I am interested in measuring how efficiently resources are allocated across plants of different size, under the hypothesis that more employment in small plants implies higher levels of misallocation. In panel (A) of Table I, I show some descriptive statistics of this measure across different sectors. Not surprisingly, I observe that the share of employment allocated to small plants is lower in manufacturing than in services.[9] Consistenly with the findings by Liedholm and Donald (1987), I observe a high negative correlation between the share of employment in small plants and the level of income per capita.[10]

Table I
Descriptive Statistics

	(A) Share small plants			(B) Share foreign plants			(C) % Dom.plants with credit		
	Mean	S.D	Corr.Y	Mean	S.D	Corr.Y	Mean	S.D	Corr.Y
Manufacturing	0.131	0.122	-0.279	0.262	0.187	-0.100	0.379	0.205	0.533
Trade	0.306	0.208	-0.404	0.189	0.189	0.064	0.359	0.219	0.506
Other Services	0.258	0.220	-0.259	0.191	0.194	0.011	0.339	0.259	0.378
Construction	0.132	0.193	-0.225	0.132	0.198	-0.139	0.431	0.274	0.225

Table I shows the mean, standard deviation, and correlation to per capita GDP of the share of employment in small plants, the share of employment in foreign plants, and the percentage of domestic plants with access to credit.

In order to measure the amount of resources allocated to foreign plants, I compute the share of employment accounted for by them. Note that for each plant I know *"What percentage of the firm (to which the plant belongs) is owned by private foreign individuals, companies or organizations"*. I define a plant as foreign if that variable is equal or greater than fifty percent. Any reasonable choice

[6]See for instance Liedholm and Donald (1987) and Tybout (2000).

[7]See García-Santana and Ramos (2013) for a detailed description and external validations of the data.

[8]I define a small plant as a plant employing no more than 20 employees. This cutoff is the same as the one used by the World Bank. Note that results are quite robust to any reasonable choice of this definition.

[9]The fact of manufacturing having bigger scales of production has already been documented by Buera and Kaboski (2012), among others.

[10]In a recent work, Poschke (2012) documents a positive correlation between the average firm size and the level of GDP per capita.

of this cutoff point to identify foreign plants would generate the same distribution of domestic/foreign plants. The reason is that in the data almost all plants are one hundred percent domestic or one hundred percent foreign. In Panel (B) of figure I I show that the average share of employment in foreign firms is around 26% in manufacturing.[11] I find smaller numbers when looking at trade, other services and construction, being 18.9%, 19.1% and 13.2% respectively. With respect to the correlation to per capita GDP, I find a negative and small one for manufacturing and construction, and a positive and tiny correlation for trade and other services.

With the purpose of measuring the strength of financial frictions, I compute measures of the amount of domestic plants with access to credit. In particular, I will calculate the percentage of domestic plants with *"a line of credit or a loan in any kind of a financial institution"* as measured by the ESWB. I show some statistics in Panel (C) of figure I. There is not much variation across sectors, although it seems that the proportion of domestic plants with access to credit is a little bit higher in construction. Not surprisingly, I observe that there is a high positive correlation between the percentage of domestic plants with access to credit and the level of GDP per capita.

I now provide evidence about the relationship between the plants' size distribution and the amount of labor in foreign plants. I regress the share of employment in small plants against the my measure of foreign ownership, financial frictions and its interaction. I also include some controls. First, I control GDP per capita. Remind that the aim of this regression is to relate the presence of foreign firms with the degree of misallocation in the economy. Then, keeping constant the level of income per capita, I control for determinants of the size distribution other than distortions, i.e, availability of technologies, entrepreneurial skills distributions, etc. Second, I include a proxy for the size of the informal economy. Remind that the plants operating in the informal economy are not surveyed in the ESWB. Then, keeping constant the amount of this plants operating in the economy I control for the "unobserved" amount of employment in small plants. Of course, this is the case under the assumption that the "unregistered" plants are small. I exploit the plant-level data to measure the size of the informal economy. In particular, the proxy I use is the proportion of plants for which *"competition from the informal sector is a major or severe obstacle to growth"* as reported by the ESWB. Note also that I run the regressions at the country-sector level. The reason is that, as mentioned above, there is a dramatic variation in the scale of production across sectors. Then, carrying out the analysis at the sectoral level controls for variation in the sectoral composition which mechanically would affect the amount of resources in small plants.

I run the following regression:

[11] McGrattan (2012) computes the same measure averaged over 2000-2005 for some OCDE countries. Some examples are: Italy (around 12%), US (around 11%), France (around 27%), Sweden (around 33%), Ireland (around 50%).

Table II

Relationship between the Size Distribution and Foreign Ownership

	Dep.Variable: Share of Emp. in Small Plants			
	(1)	(2)	(3)	(4)
GDPpc	-0.998***	-0.768***	-0.741***	-0.747***
	(0.222)	(0.180)	(0.180)	(0.178)
GDPpc ^{2}	0.1376***	1.121***	1.086***	1.023***
	(0.421)	(0.320)	(0.313)	(0.311)
% of Dom. Plants		-0.164***	-0.228***	-0.218***
		(0.042)	(0.055)	(0.056)
Share of Foreign		-0.174***	-0.288***	-0.262***
		(0.049)	(0.066)	(0.064)
Interaction			0.317***	0.286**
			(0.115)	(0.116)
Informal Economy				-0.012**
				(0.049)
Constant	0.225***	0.268***	0.290***	0.330
	(0.030)	(0.031)	(0.034)	(0.040)
Sector Dummies	YES	YES	YES	YES
Observations	438	419	419	419
Adj. R-squared	0.223	0.331	0.338	0.352

Table II shows the regressions of the share of employment accounted by small plants on per capita GDP, the share of employment in foreign firms, and the proportion of domestic plants with access to credit. In column (4) a proxy for the size of the informal sector is included as a control. Standard errors are in parenthesis, clustered at the country level. Significance levels: *: 10%; **: 5%; ***: 1%. All the results are robust to the inclusion of different measures of financial frictions as the *proportion of domestic firms using banks to finance investment* measured from the ESWB or the *Getting Credit Index* measured by the World Bank.

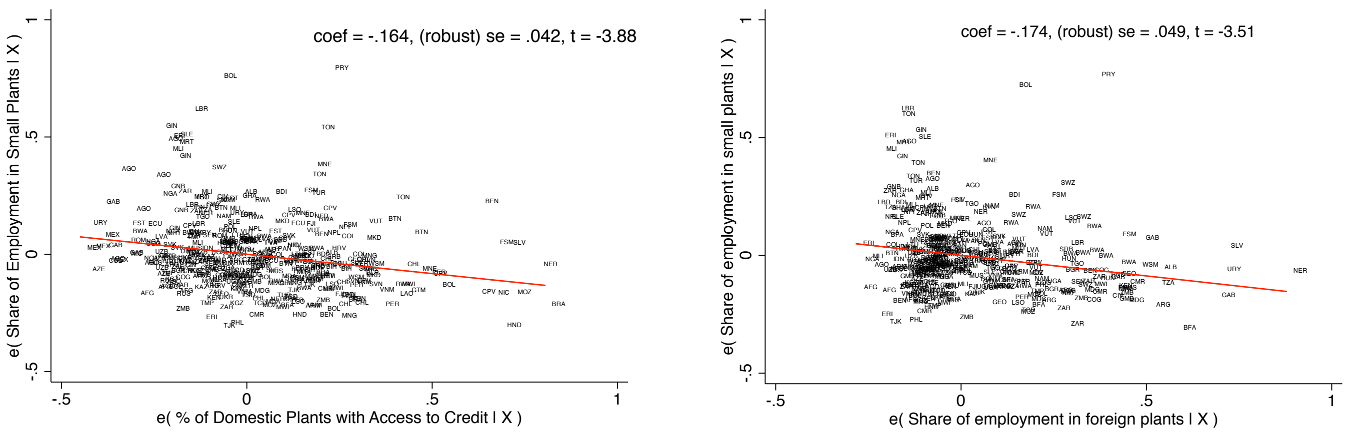
$$\begin{aligned} S^s_{a,j} &= \beta_0 + \beta_1 \text{GDPpc}_a + \beta_2 \text{GDPpc Square}_a + \beta_3 \text{Share Foreign} \\ &+ \beta_4 \text{Dom.Plants with Credit} + \beta_5 \text{Share Foreign}^* \text{Dom.Plants with Credit} \\ &+ \beta_3 \text{Informality}_{aj} + \sum_j \gamma_j + u_{aj} \end{aligned} \tag{1}$$

where $S^s_{a,j}$ is the share of employment accounted by small plants in country a and sector j; GDPpc_a is the level of per capita GDP relative to the US of country a; $\text{Share Foreign}_{a,j}$ is the share of employment accounted by foreign plants in country a and sector j; $\text{Dom.Plants with Credit}_{a,j}$ is the percentage of domestic firms with access to credit in country a and sector j; $\text{Informality}_{a,j}$ is the proportion of plants for which competition from the informal sector is a major or severe obstacle to growth as reported by the ESWB; u_{aj} are control dummies.

Figure I

Share of Employment in Small Plants against Access to credit and foreign ownership

Panel A Panel B



Panel A of Figure I shows the partial correlation between the share of employment in small plants and the percentage of domestic plants with access to credit. Panel B shows the partial correlation between the share of employment in small plants and the share of employment in foreign plants. Note this partial correlations come from the regression run in column 2 of Table II. Notice that excluding Bolivia and Paraguay from the regressions would increase the size of the coefficient of both panels, increasing also the t-statistic. In the case of the *"% of domestic plants with access to finance"* the coefficient would become -0.167 instead of -0.164. In the case of the *"share of employment in foreign plants"* the coefficient would be -0.205 instead of -0.174.

The results from the regression presented in equation 2 are reported in Table II. First, I find evidence about a strong negative relationship between the amount of employment in small plants and the level of income per capita. Notice that the coefficient associated to the quadratic term of GDPpc is also significant in all columns. Interestingly, this relationship becomes more convex after introducing the main explanatory variables. This suggest that after controlling for foreign ownership and financial distortions, the importance of GDP per capita in explaining the size distribution decreases over the level of development.

Recall that according with the working hypothesis of this paper, higher levels of financial frictions would be associated to higher levels of misallocation and would be reflected in a higher amount of resources in small plants. The *"percentage of domestic plants with access to credit"* is related to lower shares of employment in small plants. Under the same hypothesis, we expect that the presence of unconstrained foreign plants moves the plants' size distribution towards less employment allocated to small plants. Consistently with it, I find a robust negative relationship between *"share of employment allocated to foreign plants"* and the share of employment allocated to small ones.

More importantly, I observe in column (3) that the interaction between foreign ownership and financial frictions matters in explaining the plants' size distribution. I emphasize this finding because it sheds light on the channel through which foreign plants diminish the misallocation of resources. In economies where domestic entrepreneurs are very financially constrained, the presence of unconstrained foreign firms matters a lot in understanding how resources are allocated. In other words, countries with high levels of financial frictions are particularly benefited from the presence of foreign firms. Their presence prevents the aggregate allocation of labor being very biased toward small unproductive entrepreneurs. On the other hand, in countries where domestic entrepreneurs have access to credit and hence operate at their optimal size, the impact of foreign firms in the way resources are allocated in smaller. Let me show this argument in terms of the regression results of column (3). The coefficient of foreign ownership for countries which are around the 10th percentile in the distribution of access to finance (this is around 9% of domestic plants with access to credit which is the case in the manufacturing sector inIvory Coast), would be around -0.20. This means that, for instance in manufacturing, having a share of employment in foreign plants one standard deviation higher would be associated to around 0.05 lower share of employment in small plants. On the other hand, the coefficient of foreign ownership for countries which are around 90th percentile of the distribution (around 70% of domestic plants with access to finance which is the case in the manfacturing sector in Serbia) would be just around -0.01. This implies that the impact of foreign ownership in these economies is negligible.

2.2 Foreign Ownership and Financial Frictions

In this section I provide evidence about a positive cross-country relationship between the degree of financial frictions for domestic entrepreneurs and the presence of foreign firms in the economy. I interpret this evidence as foreign firms having a financial comparative advantage with respect to local entrepreneurs. Consequently, I expect that, ceteris paribus, foreign firms locate more in countries where this comparative advantage is larger.

Table III shows this evidence. In column (1) I simply regress the share of employment allocated to foreign plants against the *"% of domestic plants with access to finance"*. As this variable could be correlated to other determinants of the presence of foreign firms, in column (2) I control for the total *"number of procedures necessary to enforce contracts"*. Introducing this variable I aim to keep constant regulatory characteristics that can affect the entry decision of foreign firms. Not surprisingly, conditional on the level of financial frictions, the amount of labor in foreign plants is negatively correlated to the number of procedures necessary to enforce contracts. This suggests that, conditional on financial frictions, foreign firms prefer to operate in countries with a more developed regulatory environment. Notice also that, after controlling for the institutional environment, the coefficient associated development becomes larger in absolute value, indicating a negative correlation between

Table III
Relationship between Foreign Ownership and Financial Frictions

	(1)	(2)	(3)
Dep.Variable: Emp. in Foreign Firms (share)			
Dom. Plants with access to credit	-0.194**	-0.231***	-0.261**
	(0.075)	(0.077)	(0.101)
N of Procedures to Enforce Contracts		-0.004*	-0.005*
		(0.002)	(0.002)
GDPpc			0.001
			(0.152)
Constant	0.292***	0.488***	0.518***
	(0.035)	(0.116)	(0.121)
Observations	112	112	110
Adj. R-squared	0.055	0.075	0.089

Table III shows the regressions of the share of employment accounted by foreign plants on access to credit by domestic plants, the number of procedures to enforce contracts, per capita GDP. Robust standard errors are in parenthesis. Significance levels: *: 10%; **: 5%; ***: 1%.

financial development and the number of procedures necessary to enforce contracts.

In column (3) I introduce GDPpc in order to control for additional determinants of foreign entry that could correlate to the level of income. The coefficient associated to financial development and the number of procedures to enforce contracts remain significant and with a similar magnitude.

3 The Model

The economy is populated by two type of agents. (i) a domestic infinitely lived representative household and (ii) an unlimited mass of foreign firms.

The representative household contains a continuum of members that differ in entrepreneurial talent z, which is distributed according to a Pareto distribution with *pdf* $f(z)$. As in Lucas (1978), most talented members will become entrepreneurs and the rest will be workers. This means that every period domestic entrepreneurs have the outside option of being worker and receive the equilibrium wage. As in Lucas (1978), one entrepreneur can only run one production unit in a given period.[12] Note that it is the household who decides the occupational choice of its members, as well as the consumption and savings levels as in the standard Cass-Koopmans growth model. This assumption implies that the steady-state interest rate will be endogenous but perfectly elastic at the discount rate β ($r = \frac{1}{\beta} - 1$).

[12]Assuming no population growth, I normalized the mass of members of the household to 1

Figure II

Share of Labor Accounted by Foreign Plants

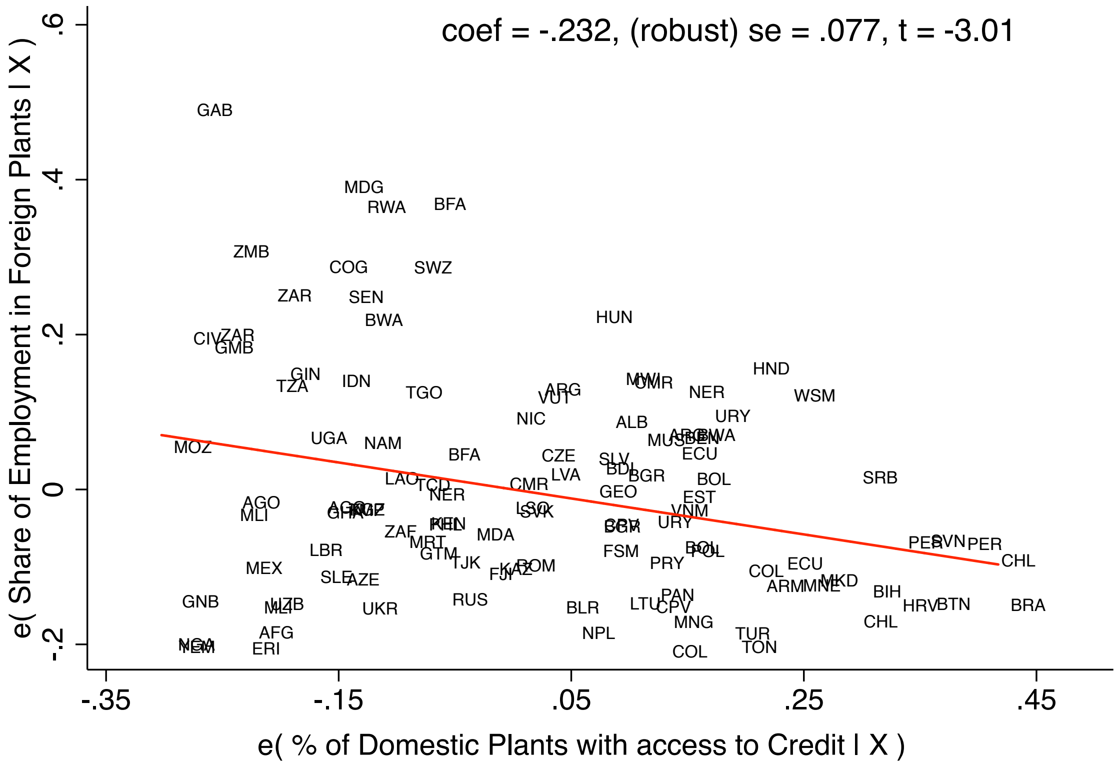


Figure II shows the partial correlation between the share of employment accounted by foreign plants and the % of domestic plants with access to credit. Note this partial correlation come from the regression run in column (2) of Table III.

As mentioned above, there also exist foreign firms heterogeneous in their productivity level s. Note that a central assumption is that s is distributed according to the same Pareto distribution distribution as domestic managerial talent, $f(s)$. As mentioned in the introduction, I want the ex-ante distribution of productivities for domestic entrepreneurs and foreign firms to be identical. However, I assume that foreign firms are uncertain about their productivity level. In order to learn their productivity, they have to pay a sunk entry cost f_e. This sunk entry cost can be interpreted as a cost that the firm has to incur in order to learn about the specific characteristics of the domestic market, which can be more favorable for some firms than for others. I also assume that, conditional of having paid the entry cost, foreign firms have to incur in an additional cost of operating f_o. This cost of operating can be seen as an outside option: if the foreign firm realizes its productivity level is so low that it would make negative profits, then it leaves the market and never produces. Note that while the entry cost f_e determines the actual mass of foreign firms M that learn about their productivity, the cost of operation f_o determines the minimum level of productivity necessary to produce in the domestic economy.

3.1 Working capital

I assume that there is need for working capital in the economy.[13] The need for working capital means that at the beginning of each period t, both domestic entrepreneurs and foreign firms are forced to deposit their entire wage bills in an storage technology. Once the wage bills are deposited, workers spend their time endowment working and collect their wages at the end of the period. As both domestic entrepreneurs and foreign firms do not have resources, they have to borrow the amount necessary to cover the wage bills at the beginning of each period. Domestic entrepreneurs do not have access to international capital markets and hence they borrow from the household. I assume that these borrowing contracts are not perfectly enforceable and hence under some circumstances domestic entrepreneurs will be financially constrained. Foreign firms can borrow from their home countries and hence are not affected by domestic financial frictions. For simplicity, I do not model the supply of working capital for foreign firms. I assume that they face the same steady-state interest rate as domestic entrepreneurs. Labor is not internationally mobile so all the labor used in the economy is supplied by domestic workers.

3.2 Production

There is only one good in this economy. This is a final good that can be used for consumption, for investment in working capital, and to cover the fixed costs. This final good can be produced by domestic entrepreneurs and foreign firms.

3.2.1 Production by domestic entrepreneurs

Each period, a domestic entrepreneur with ability z has access to the production function:

$$y_t^d = z^{1-\gamma} l_t^{\gamma} \qquad 0 < \gamma < 1 \tag{2}$$

where γ is the span of control parameter that measures the degree of returns to scale. Domestic managers choose labor to maximize profits:

$$\pi_t^d(z, w_t, r_t) = \max_{l_t} \{z^{1-\gamma} l_t^{\gamma} - (1 + r_t) w_t l_t\} \tag{3}$$

where w and r are the prices of labor and working capital respectively. The first order condition of this problem lead to the following optimal demand labor demand:

[13] In the absence of physical capital, this assumption makes the demands for labor sensitive to financial constraints. I will come back to this below.

$$l_t^d(z, w_t, r_t) = z\left[\frac{\gamma}{w_t(1+r_t)}\right]^{\frac{1}{1-\gamma}} \tag{4}$$

This equation shows that optimal demand of labor is increasing and linear on the entrepreneurial talent z. This will imply that both output $y_t^d(z, w_t, r_t)$ and profit $\pi_t^d(z, w_t, r_t)$ functions are also increasing and linear on z.[14]

Financial Frictions. As mentioned above, domestic entrepreneurs have to to deposit wages before production takes place. To do that, they borrow the entire wage bill from the domestic representative household at a given interest rate.[15] However, enforceability of these contracts is imperfect so domestic entrepreneurs can default, keeping a fraction of revenue. In particular, a working capital rental $w_t l_t$ by a entrepreneur with talent z is enforceable if and only if:

$$z^{1-\gamma} l_t^{\gamma} - (1+r_t) w_t l_t \quad \geq \quad (z^{1-\gamma} l^{\gamma})(1-\phi)$$

where ϕ represents the fraction of the revenue that the entrepreneur can not keep if default takes place. This implies that, in equilibrium, domestic firms cannot borrow so much that they would want to default. Next proposition state formally this resut.

Proposition 1. *The upper bound on working capital that is consistent with managers choosing not to default on their contracts will be implicitly determined by the following upper bound labor demand function:*

$$\hat{l}_t(z, w_t, r_t; \phi) = z\left[\frac{\phi}{w_t(1+r_t)}\right]^{\frac{1}{1-\gamma}} \tag{5}$$

Under some circumstances, this upper bound will be higher than the optimal labor demand and hence domestic entrepreneurs will be constrained:

Proposition 2. *For a given set of parameters Λ, two kind of situations can emerge in equilibrium:*

(a) If $\phi \geq \gamma$: no domestic entrepreneur is constrained

(b) if $\phi < \gamma$: all domestic entrepreneurs are constrained

[14] See appendix A for details.

[15] Note that the need of working capital can be seen as a distortion: domestic entrepreneurs only borrow what is necessary to start production up.

This result comes from the fact that both the upper and optimal labor demand are linear and monotonically increasing in entrepreneurial talent z. The intuition is quite simple: given the functional form of the production function, the remuneration for an entrepreneur who does not default in equilibrium is given the fraction of output $(1-\gamma)$. So, if the fraction that she keeps defaulting $(1-\phi)$ is grater than $(1-\gamma)$ the entrepreneur will always default.

3.2.2 Production by foreign firms

As mentioned above, there exists an unlimited mass of foreign potential entrants in this economy. Within them, there will be a mass M of them that will pay the sunk entry cost f_e and will learn about their productivity level in the domestic market. Then, within this mass M of entrants, only the most productive ones will finally produce due to the existence of a cost of operation f_o. I assume that at the end of each period all foreign incumbent firms die and a new set of potential entrants emerges. This means that the problem of foreign firms can be seen foreign firms face a sequence of static problems.

Production decision taking entry and operation as given At time t, a foreign firm with entrepreneurial talent s has access to the technology:

$$y_t^f = s^{1-\gamma} l_t^{\gamma} \qquad 0 < \gamma < 1 \tag{6}$$

where γ is the span of control parameter that measures the degree of returns to scale. Entrepreneurs that decide to enter and produce choose labor to maximize profits:

$$\pi(s, w_t, r_t) = \max_{l_t} \{ s^{1-\gamma} l_t^{\gamma} - (1 + r_t) w_t l_t \} \tag{7}$$

The first order condition of this problem lead to the following labor demand:

$$l_t^f(s, w_t, r_t) = s \Big[\frac{\gamma}{(1 + r_t) w_t} \Big]^{\frac{1}{1-\gamma}} \tag{8}$$

This equation shows that optimal demand of labor is increasing and linear on the entrepreneurial talent s. This will imply that both output $y_t^f(s, w_t, r_t)$ and profit $\pi_t^f(s, w_t, r_t)$ functions are also increasing and linear on s.[16]

Operation decision taking entry as given I assume that foreign firms have to pay a fixed cost f_o in order to operate. Given that f_o is constant over entrepreneurial talent s and $\pi_t^f(s, w_t, r_t)$ is monotonically increasing over s, there will be a cutoff $\tilde{s}$ such that for $s < \tilde{s}$ a foreign firm will not

[16]See appendix A for details.

produce and with $s > \tilde{s}$ a foreign firm will. Formally, every period this cutoff is determined by the following equation:

$$f_o = \pi_t^f(\tilde{s}, w_t, r_t) \tag{9}$$

Entry decision Every period, there will be a set of foreign potential entrants that have to pay a sunk fixed cost in order to make a productivity draw. The value of a potential entrant is determined by the following equation:

$$W_t^e = \int_{\tilde{s}_t}^{\infty} \Big[\pi_t^f\left(s, w_t, r_t\right) - f_o\Big] g(s)ds \tag{10}$$

Free entry implies that in equilibrium:

$$W_t^e \leq f_e \tag{11}$$

with equality if $M_t > 0$.

3.3 The domestic representative household

There is a representative household with a continuum of members who differ in entrepreneurial ability. Each period, the household decides how much to consume, how much to save and the occupational choice of its members. Savings will be used as working capital for those members that decide to be entrepreneurs.

Occupational choice. The occupational choice of the household requires to allocate each member into the two mutually exclusive jobs: worker or entrepreneur.[17] Domestic firms profits are monotonically increasing in entrepreneurial ability z and wages are constant over it. Then, as in Lucas (1978), those members of the household with $z \geq \tilde{z}_t$ will be entrepreneurs and those with $z < \tilde{z}_t$ will be workers. Formally, the cutoff $\tilde{z}_t$ will be given by the following expression:

$$w_t = \pi(\tilde{z}_t, w_t, r_t) \tag{12}$$

The dynamic problem The objective function of the household is given by,

$$\sum_{t=0}^{\infty} \beta^t log\left(c_t\right) \tag{13}$$

[17]Given that domestic and foreign firms pay the same wages, the household is indifferent about to which type of firm to send its workers. However, the fraction of domestic workers allocated to domestic and foreign firms will be determined in equilibrium

and the budget constraint,

$$c_t + a_{t+1} = I\left(\tilde{z}_t, w_t, r_t\right) + \left(1 + r\right) a_t \tag{14}$$

where

$$I\left(\tilde{z}_t, w_t, r_t\right) = w_t\, F\left(\tilde{z}_t\right) + \int_{\tilde{z}_t}^{\infty} \pi\left(z_t, w_t, r_t\right) f\left(z\right) dz \tag{15}$$

refers to labor and entrepreneurial income of the household. Note that a_{t+1} are units of the final good provided to the firms to finance working capital in $t+1$. At the end of $t+1$, after production takes place, domestic firms repay to the household the principal a_{t+1} plus interest $r_t a_{t+1}$. For simplicity, I assume working capital does not depreciate so aggregate stock of a_t evolves as,

$$a_{t+1} = a_t + x_t \tag{16}$$

where x_t is investment.

3.4 Steady State Equilibrium

Two kind of steady state equilibria can arise. First, if the financial frictions are not too high (enforcement is easy) no domestic entrepreneur will be affected and will demand labor according to $l_t^d(z, w, r)$. Second, if financial frictions are sufficiently high (enforcement is difficult) all entrepreneurs will be affected and will demand labor according to the upper bound imposed by the market $\hat{l}_t^d(z, w, r; \phi)$.

Definition 1 ($\phi \geq \gamma$)**.** *A steady state equilibrium is characterized by a set of prices $\{w, r\}$, labor demands for both domestic and foreign firms $\{l_d(z, w, r), l_f(s, w, r)\}$, an aggregate working capital stock a, an occupational and operation choice $\{\tilde{z}, \tilde{s}\}$, a mass of entrants M and household consumption and investment plans $\{c, x\}$ such that,*

1. *The household solves its optimization problem*
2. *Domestic firms solve their optimization problem*
3. *Foreign firms solve their optimization problem*
4. *The working capital,labor and final good markets clear,*

$$
\begin{aligned}
a &= w\int_{\tilde{z}}^{\infty} l^d(z,w,r)f(z)dz && (17)\\
F(\tilde{z}) &= \int_{\tilde{z}}^{\infty} l^d(w,z,r)f(z)dz + M\int_{\tilde{s}}^{\infty} l^f(w,s,r)g(s)ds && (18)\\
c+NX &= \int_{\tilde{z}}^{\infty} y^d(w,z,r)f(z)dz + M\int_{\tilde{s}}^{\infty}\Big[y^f(w,s,r)-f_o\Big]g(s)ds - Mf_e && (19)
\end{aligned}
$$

5. Balance of Payments holds,

$$
NX = M(1+r)w\int_{\tilde{s}}^{\infty} l_f(w,s,r)g(s)ds - Mw\int_{\tilde{s}}^{\infty} l_f(w,s,r)g(s)ds \qquad (20)
$$

Definition 2 ($\phi < \gamma$)**.** *The equilibrium description when labor demand upper-bouds are binding is identical to the one described above. I can rewrite the market clearing equations for working capital,labor and final good as,*

$$
\begin{aligned}
a &= w\int_{\tilde{z}}^{\infty} \hat{l}^d(z,w_t,r;\phi)f(z)dz && (21)\\
F(\tilde{z}) &= \int_{\tilde{z}}^{\infty} \hat{l}^d(z,w,r;\phi)f(z)dz + M\int_{\tilde{s}}^{\infty} l^f(w,s,r)g(s)ds && (22)\\
c+NX &= \int_{\tilde{z}}^{\infty} \hat{y}^d(z,w,r;\phi)f(z)dz + M\int_{\tilde{s}}^{\infty}\Big[y^f(w,s,r)-f_o\Big]g(s)ds - Mf_e && (23)
\end{aligned}
$$

4 Some Analytical Results

As mentioned in the introduction the model is very tractable, which allows to derive closed form solutions of the steady state prices and allocations. In this section I describe analytical results that shed light on how foreign entry is determined, how its presence affects the allocation of talent in the economy, and the differences in plant size between domestic entrepreneurs and foreign firms. All the results presented in this section are for situation in which financial frictions apply (that is $\gamma > \phi$) and $M > 0$, i.e, the entry condition is satisfied with equality.

4.1 How is the amount of foreign entry determined?

In this subsection I show that the amount of labor allocated to foreign firms depends positively on the financial frictions affecting domestic entrepreneurs, and negatively on the entry cost. To this end, I proceed as follows. First, I show that the equilibrium wage is determined by the degree of competition between foreign firms, i.e, the entry condition. Second, I define the domestic excess labor supply as the difference between the aggregate labor supply and the amount labor demanded by domestic entrepreneurs. I show that this excess becomes larger when financial frictions are higher or entry costs are lower. Third, I show that the amount of foreign ownership is such that that aggregate labor supply becomes satisfied.

The possibility of free foreign entry provides high tractability to the model. The two equations representing the optimal behavior of foreign firms are the entry and the productivity cutoff condition (equations 9 and 49). These equations represent two different relationships between the equilibrium wage w and the cut-off for foreign firms $\tilde{s}$. These two variables are the only unknowns in these equations so a unique solution can be found. The solution of this system is stated in the following proposition:

Proposition 3. *If the entry condition is satisfied with equality, i.e, $M > 0$, then the steady state equilibrium wage and the productivity cutoff for foreign firms are given by:*

$$\tilde{s} = \left[\frac{f_o}{(k-1)f_e}\right]^{\frac{1}{k}} \tag{24}$$

$$w = \frac{\Gamma^{\frac{1-\gamma}{\gamma}}}{(1+r)\left[(k-1)f_e\right]^{\frac{1-\gamma}{k\gamma}} f_o^{-\frac{(1-k)(1-\gamma)}{k\gamma}}} \tag{25}$$

where $\Gamma = \gamma^{\frac{\gamma}{1-\gamma}} - \gamma^{\frac{1}{1-\gamma}}$.

Notice that in this economy the equilibrium wage is determined by parameters affecting only the behavior of foreign firms. More importantly, lower operation cost f_o and entry cost f_e are associated to lower equilibrium wages in this economy. This is precisely the channel through which the barriers to entry affect the optimal decisions of domestic entrepreneurs. Under higher equilibrium wages the aggregate demand of labor by domestic entrepreneurs gets reduced in both the extensive and the intensive margin. Higher wages affects the occupational choice, increasing the income as a worker and reducing entrepreneurial profits for a given level of talent. This implies that higher wages are associated to higher cutoffs level of talent. Furthermore, those individuals that still remain as entrepreneurs demand less labor due to increase in labor cost. In the following propositions I present formally the equilibrium domestic labor demand and aggregate supply of labor.

Proposition 4. *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state aggregate labor supply is given by:*

$$L_d^d \;=\; \frac{f_o^{\frac{k-1}{\gamma}} f_e^{\frac{1}{\gamma}}(1+r)^{k-1}k(k-1)^{\frac{1-\gamma}{\gamma}}\phi^{\frac{1}{1-\gamma}}\Phi^{k-1}}{\Gamma^{\frac{k}{\gamma}}} \tag{26}$$

Proposition 5. *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state aggregate labor supply is given by:*

$$L^s \;=\; 1 - \frac{f_o^{\frac{k-1}{\gamma}}(1+r)^k\Phi^k\left[(k-1)f_e\right]^{\frac{1}{\gamma}}}{\Gamma^{\frac{k}{\gamma}}} \tag{27}$$

As mentioned above, higher entry costs f_e are associated to lower wages, which generates a higher domestic labor demand and a lower labor supply. With respect to financial development, the higher ϕ is, the higher the domestic labor demand and the lower the labor supply.

I next define the domestic excess of labor supply. It is simply the difference between the labor supplied by domestic individuals and the labor demanded by domestic entrepreneurs. Formally, this is:

Definition 3 (Domestic excess of labor supply)**.** *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state domestic excess of labor supply is defined as:*

$$L^s_{excess} = 1 - \frac{f_o^{\frac{k-1}{\gamma}}(1+r)^k\Phi^k\left[(k-1)f_e\right]^{\frac{1}{\gamma}}}{\Gamma^{\frac{k}{\gamma}}} - \frac{f_o^{\frac{k-1}{\gamma}} f_e^{\frac{1}{\gamma}}(1+r)^{k-1}k(k-1)^{\frac{1-\gamma}{\gamma}}\phi^{\frac{1}{1-\gamma}}\Phi^{k-1}}{\Gamma^{\frac{k}{\gamma}}}$$

Using the labor market clearing condition (equation 23) it can be shown that the amount of labor demanded by foreign firms is equal L^s_{excess}. Then, the steady state mass of foreign firms that pay the fixed cost to learn about their productivity is given by:

$$M \;\propto\; L^s_{excess} \tag{28}$$

The intuition of this result is straightforward. When entry costs are lower or financial frictions for domestic entrepreneurs are higher, entering in the market is more profitable and hence a higher mass of foreign firms make a productivity draw. In terms of the mechanics of the model, lower entry costs and higher financial frictions imply a larger gap between the labor supply and domestic entrepreneurs labor demand. Being the equilibrium wage determined by the entry condition, the mass of foreign firms trying to enter in the economy is such that it clears the labor market.

4.2 Foreign Entry and the Misallocation of talent

We have seen above how foreign entry is determined. In this subsection I investigate how the presence of foreign firms affects the misallocation of domestic talent due to the existence of financial frictions. In particular I show that the presence of foreign firms can diminish this misallocation. The reason is that the possibility of foreign entry keeps high the equilibrium wage, preventing the existence of small untalented entrepreneurs.

In order to present this mechanism clearly I first show that, in the absence of foreign entry, the cutoff of entrepreneurial talent that separates workers from managers is decreasing in the level of financial frictions. If high talented entrepreneurs are financially constrained, the aggregate demand for labor and wages are inefficiently low. Under low wages, low talented individuals have incentives to become entrepreneurs. This results is formally stated in the following proposition:

Proposition 6. *Under autarky, the cutoff $\tilde{z}$ that determines the occupational choice of domestic individuals is decreasing in the level of financial frictions, i.e, increasing in ϕ. In particular:*

$$\tilde{z}^{Aut} = \left(\frac{\phi^{\frac{1}{1-\gamma}}}{\phi^{\frac{\gamma}{1-\gamma}} - \phi^{\frac{1}{1-\gamma}}} \frac{k}{k-1} + 1 \right)^{\frac{1}{k}} \tag{29}$$

However, when there is possibility for foreign entry the equilibrium wage is determined by the entry condition. Intuitively, when domestic entrepreneurs are financially constrained, the equilibrium wage becomes potentially lower but this makes entry more profitable for foreign firms. Then, under higher financial frictions more foreign firms enter and hence the equilibrium wage keeps high. Additionally, constrained domestic entrepreneurs operate sub-optimally implying lower profits for a given level of talent. These two things together imply that the higher the financial frictions the more talented a domestic entrepreneur needs to be to operate in equilibrium.

Proposition 7. *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state equilibrium talent cutoff which determines the optimal occupational choice of domestic individuals is given by:*

$$\tilde{z} = \frac{\Gamma^{\frac{1}{\gamma}}}{(1+r)\Phi\left[(k-1)f_e\right]^{\frac{1}{k\gamma}} f_o^{\frac{(k-1)}{k\gamma}}} \tag{30}$$

where $\Phi = \phi^{\frac{\gamma}{1-\gamma}} - \phi^{\frac{1}{1-\gamma}}$.

This result will be crucial when understanding one of the findings in the quantitative exercise. In particular, this result implies that under possibility of foreign entry, the labor income share in the economy becomes increasing in the level of financial frictions.

4.3 Average size of domestic and foreign plants

In this subsection I present analytical expressions for plants' average size of domestic and foreign firms. The average plants' size of domestic firms is determined by technological parameters and financial frictions. Notice that the equilibrium wage and hence the entry costs for foreign firms does not affect the average plants' size of domestic entrepreneurs. The intuition is straightforward. Imagine that the equilibrium wage increases. Then, the number of domestic entrepreneurs get reduced which would imply a higher average size. However, as mentioned above, those entrepreneurs that remain operating demand less labor. These two effects going in opposite directions cancel out under the assumption of domestic talent being distributed according to a Pareto distribution. This result is formally stated in the following proposition:

Proposition 8. *If the entry condition is satisfied with equality, i.e,* $M > 0$*, domestic entrepreneurs are financially constrained, i.e,* $\gamma > \phi$*, and the domestic talent is Pareto distributed, then the steady state average plant size of domestic entrepreneurs is given by:*

$$Average\ Plant\ Size^{dom} = \frac{k}{k-1}\frac{\phi}{1-\phi}\frac{1}{1+r} \tag{31}$$

On the other hand, the average plants' size of foreign firms is determined also by the fixed costs, as stated by the following proposition:

Proposition 9. *If the entry condition is satisfied with equality, i.e,* $M > 0$*, and the foreign productivity is Pareto distributed, then the steady state average plant size of foreign firms is given by:*

$$Average\ Plant\ Size^{For} = k(k-1)^{\frac{1-\gamma-\gamma k}{k\gamma}} f_o^{\frac{k+\gamma-1}{k\gamma}} f_e^{\frac{1-\gamma}{\gamma k}} \gamma^{\frac{1}{1-\gamma}} \Gamma^{\frac{-1}{\gamma}} \tag{32}$$

These two propositions together imply that the difference between the average plant size of foreign firms and the average plant size of domestic entrepreneurs is decreasing in the level of financial development ϕ and increasing in the entry cost for foreign firms. This difference in size between foreign and domestic plants will be one of the targets in my calibration in section 5.

5 Quantitative Analysis

In this section I use the cross-country data described in section 2 to calibrate the parameters governing the financial development and barriers to foreign entry for all countries in the sample. I next compare the cross-country relationships implied by the steady-state equilibrium of the model with those observed in the data. Notice that, Since I only have one sector in my model, all the data used in this section is from the manufacturing sector in the ESWB.

5.1 Parameter Values

Each economy is characterized by 6 parameters: (i) the discount factor β, (ii) the span of control governing the decreasing returns to scale γ, (iii) the Pareto shape parameter k, (iv) the operation cost for foreign firms f_o, (v) the entry cost for foreign firms f_e, (vi) and the parameter governing the financial development ϕ.

I assume that countries only differ in the entry cost for foreign firms f_e and in the level of financial development ϕ. I choose the value of the rest of parameters as follows. I take β and γ from outside the model. I set β to 0.96 which implies $r = 0.041$. I set γ to 0.85. This value is in the same range as estimates for the US economy.[18] The operation cost f_o for foreign firms determines the minimum level of productivity required to produce. I assume this value is the same for every country and set to 1.

For the Pareto shape parameter k, I target the cross-country average of the share of employment in small plants, which in ESWB data gives 0.13. This means that the cross-country average of the share of employment in small plants in my simulated economies will be similar to the one we observe in the data. Keeping k constant across countries, I exploit the variation in financial frictions and barriers to foreign entry to generate variation in the size distribution of plants. In section 5.2 I will check whether the relationships between financial frictions, foreign ownership and the size distribution are similar to the ones we observe in the data.

As mentioned above, I assume that countries differ in financial development and entry costs for foreign firms. In order to estimate values of ϕ and f_e, I target the the following statistics for every country i:

$$\text{Rat}_i^{aps} = \frac{\text{Average Plant Size Foreign plants}_i}{\text{Average Plant Size Domestic plants}_i} \tag{33}$$

$$\text{Share}_i^{for} = \frac{\text{Employment in Foreign plants}_i}{\text{Total Employment}_i} \tag{34}$$

As shown in section 4, the value of these statistics in the model will depend both on the financial frictions and the entry costs. Then, for each country, I will have a pair $\{f_e, \phi\}_i$ that makes the model reproduce values of the ratio of plants' size and the share of employment in foreign plants similar to

[18]See for instance Atkeson and Kehoe (2005) and Guner, Ventura, and Yi (2008).

those computed in the data.[19]

Table VI shows a very good fit of the calibration targets for most countries. The average value of the implied ϕ is 0.54 with a standard deviation of 0.14. With respect to the entry cost, the average value is 9.57 times the GDPpc with a standard deviation of 33.76. Notice that this high average is driven by some countries with very high levels of implied entry costs. This is for instance the case of Nepal where the ratio of the average plants' size of foreign plants to the one of domestic plants is 24. At the same time the presence of foreign plants is very low: 5%. To match these statistics the model implied a low level of financial development ($\phi = 0.23$) and a high level of barriers to entry (243 times the per capita GDP in Nepal).

More importantly, the model predicts a high negative cross-country correlation between f_e and ϕ: -0.49. The reason is that in the model foreign ownership is more sensitive to financial development than in the data. Then, for instance, when matching a low foreign/domestic size ratio, the model needs a low entry cost in order to generate the amount of foreign ownership in the data. In other words, the model predicts that countries with high levels of financial development are usually associated to higher lower barriers to foreign entry. This correlation will be crucial when interpreting the cross-country differences in labor income and its relationship with the level of financial development.

5.2 Cross-Country Implications of the model

In this subsection I first study whether some important cross-country relationships implied by the model are consistent with those presented in section 2. Then, I present some insights of the model related to the distribution of national income. Finally, I study the impact on gross national income of a decrease in barriers to foreign entry.

5.2.1 Size Distribution of Plants, foreign ownership, and financial frictions

Here I present the relationships between the plants' size distribution, the presence of foreign firms, and financial frictions, that emerge from my simulated data. To this end, I run the same regressions as in section 2.1 but using as observations the equilibrium allocations from my artificial economies.

Table IV shows the result of these regressions. As consistent with the data, the model predicts that countries with a higher level of financial development and higher presence of foreign firms allocate a lower amount of labor to small plants. More importantly, the simulated data is able to capture the importance of the interaction term in explaining the variation in the size distribution. In the model, as in the data, foreign ownership matters in explaining the importance of small plants, and so does more in economies where domestic entrepreneurs are financially constrained.

[19] Notice that the correlation between the measure of financial frictions used in the empirical part and the ratio of foreign/domestic average plants' size is negative and very high. For instance, conditional on GDPpc, economies where the proportion of domestic plants is 0.25 higher are associated to a ratio of foreign/domestic average plants' size a 17% lower.

Table IV
Relationship between the Size Distribution and Foreign Ownership Implied by the model

	(1)	(2)
Dep.Variable: Share of Emp. in Small Plants		
Financial Development (ϕ)	-0.11***	-0.190***
	(0.006)	(0.001)
Share Emp. Foreign Plants	-0.057***	-0.196***
	(0.004)	(0.002)
Interaction		0.285***
		(0.005)
Constant	0.194***	0.235***
	(0.004)	(0.001)
Observations	107	107
Adj. R-squared	0.749	0.991

Table IV shows the regressions of the equilibrium share of employment accounted by small plants on calibrated value of financial development ϕ and the equilibrium share of employment in foreign plants. Significance levels: *: 10%; **: 5%; ***: 1%.

In column (2) we see that when include the interaction term in the regression, the percentage of variation explained by the explanatory variables is almost one ($Adj.R^2 = 0.98$). Not surprisingly, this percentage is considerably higher than the one found in the data regressions. This suggests that there are additional determinants of the size distribution which are not included in the model.

It is important to have in mind that the dependent variable has not been targeted in my calibration. As mentioned above, this means that all the variation in the share of employment accounted by foreign plants is driven by variation in financial frictions and entry costs. Thus, the mapping between financial frictions and foreign ownership, and the size distribution that the model generates is consistent with the cross-country data.

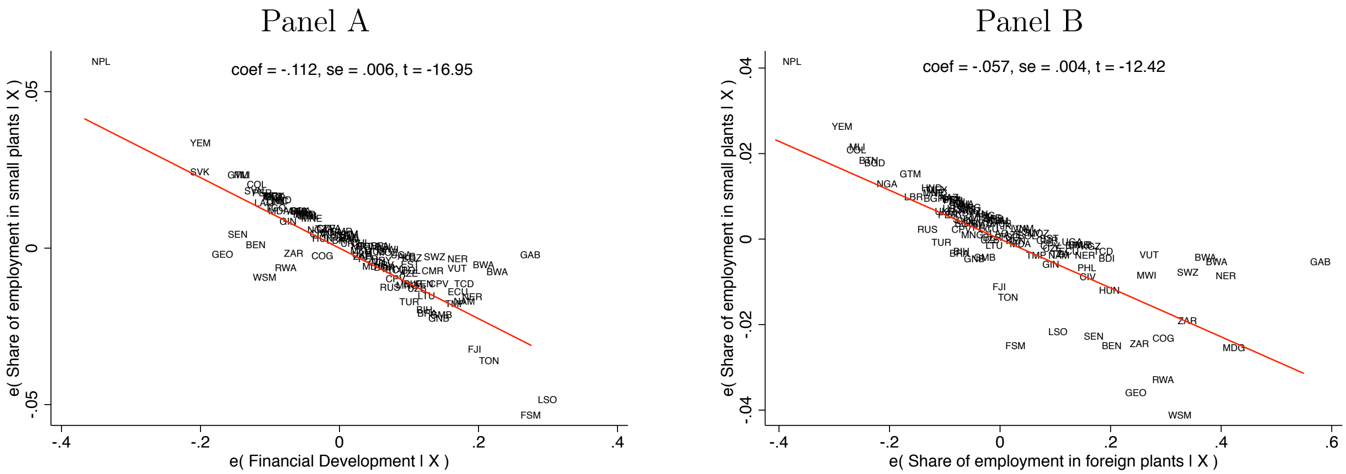
Notice that in these simulated data regressions I do not control for the level of income per capita. In the empirical part, the aim of keeping constant the level of income was to control for determinants of the size distribution other than distortions, i.e, availability of technologies, human capital endowments, etc. The equivalent of these alternative determinants in the model are the technological parameter γ, the operation cost for foreign firms f_o, and the parameter governing the distribution of both domestic talent and foreign productivity k. As I am assuming that all these parameters are the same for every country, I am implicitly controlling for these additional determinants of the size distribution.

5.2.2 Foreign Ownership, financial frictions, and the distribution of national income

This subsection aims to present some insights of the model related to the distribution of national income. Here I emphasize that both the presence of foreign firms and the level of financial frictions

Figure III

Model: Share of Employment in Small Plants against Access to credit and foreign ownership



Panel A of Figure III shows the partial correlation between the share of employment in small plants and the calibrated level of financial development as measured by ϕ. Panel B shows the partial correlation between the share of employment in small plants and the share of employment in foreign plants. Note this partial correlations come from the regression run in column 1 of Table IV.

are crucial to understand the distribution of national income in the model.

I define Gross National Income (GNI) as the total income produced in the economy minus the resources that foreign firms have to pay back to the foreign investors. These outflows are expressed as NX in the steady state equilibrium definition in section 3.4. Notice that GNI is used for consumption and to cover fixed costs of foreign firms. Formally, GNI can be expressed as:

$$GNI = C + M\left(f_o \int_{\tilde{s}}^{\infty} g(s)ds + f_e\right) \tag{35}$$

where

$$C = wF(\tilde{z}) + \int_{\tilde{z}}^{\infty} \hat{\pi}^d(z, w, r; \phi) f(z)dz + ra \tag{36}$$

The first term of the right hand side of equation 36 represents the labor income. This is all the income received by workers employed in both domestic and foreign firms. The second term represents the entrepreneurial profits of domestic entrepreneurs. The third term represents the interest payment of working capital, i.e, capital income.

The model predicts that, conditional on the entry cost f_e, higher levels of financial development are associated to lower labor income shares in GNI. Under possibility of foreign entry, higher amount of credit in the economy implies that domestic entrepreneurs are less constrained, achieving a size closer to the optimal and making more profits for a given level of talent z. Through the occupational choice condition, this will generate a higher amount of domestic entrepreneurs and hence a lower aggregate labor force. Since wages are determined by the entry condition, this decrease in the labor force reduces the aggregate labor income, increasing the entrepreneurial income. Under working capital income and fixed costs representing a tiny proportion og GNI (2% on average in my calibration exercise), this implies that higher levels of financial development are associated to lower labor income shares.

Conditional on the level of financial development, the model predicts that lower entry costs are associated to higher labor income shares. When entry costs are lower, there is more competition between foreign firms to enter and hence the equilibrium wage becomes higher. Under this higher equilibrium wage, a higher proportion of domestic individuals become workers. This means that labor income get increased through two margins. First, more individuals become workers. Second, those that are workers receive higher wages. Then, the lower the entry costs, the higher the labor share in GNI.

FIGURE IV

LABOR SHARE IN GROSS NATIONAL INCOME

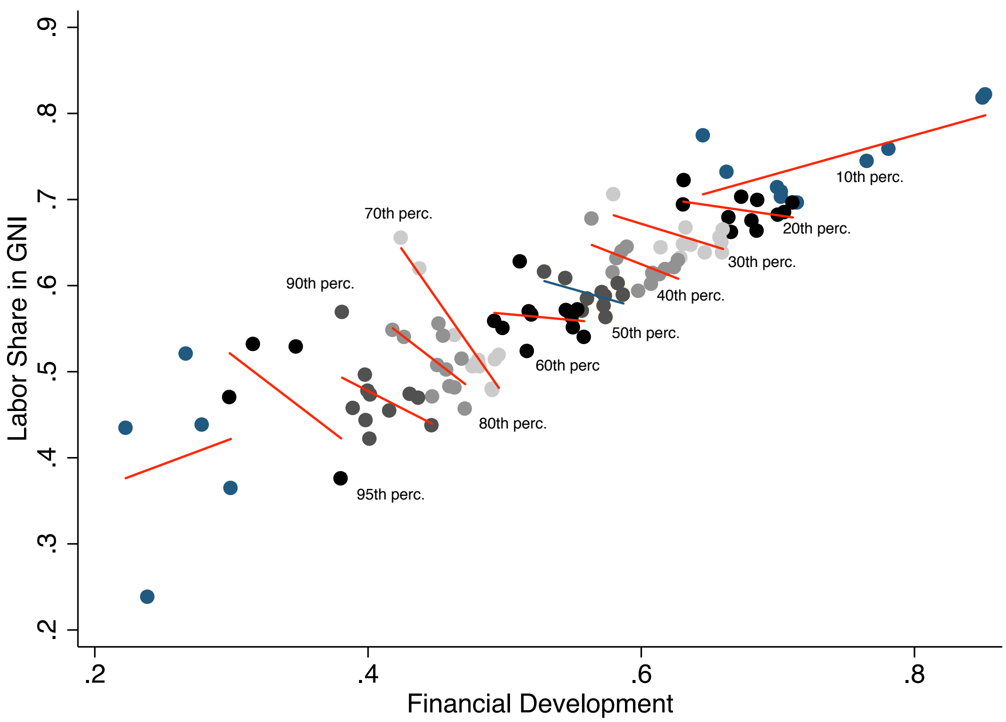


Figure IV shows the relationship between the level of the financial development as measured by the calibrated ϕ and the labor share in national income across different levels of the calibrated entry cost f_e. The groups have been constructed taking into account the different percentiles of the distribution of the entry costs.

Figure IV shows the relationship between the calibrated levels of financial development and the labor income shares for the artificial economies. When looking at all economies together we observe a clear positive correlation between the level of financial development ϕ and the importance of labor in the GNI. However, these artificial economies also differ in their levels of barriers to entry. In particular, as mentioned above, the calibration exercise generates a strong negative correlation between ϕ and f_e. This means that the positive correlation between financial development and labor income share that we observe in figure IV is driven by the fact that the economies with high levels of financial development have also low levels of barriers to foreign entry. The effect of lower entry costs dominates and hence a positive correlation between financial development and labor income share emerges in the cross-section.

In order to have a better understanding, I have divided the artificial economies in groups depending on their levels of barriers to entry. In particular, I have grouped them by percentiles of the distribution of the calibrated f_e. As we observed from figure IV, once we control for the level of entry costs, the correlation between financial development and labor income share becomes negative, as predicted by the theory. Notice that the economies in the 10th percentile of entry costs are an exception. The reason is that within the 10th percentile, the variation in entry costs is still high enough to dominate in explaining the variation in labor income.

5.2.3 Policy Experiment

In this subsection I run a policy experiment in all my artificial economies. In particular, I investigate the impact on welfare of a decrease in barriers to foreign entry. I reduce a 90% the entry cost f_e in all my artificial economies. With this experiment I try to measure the impact of a extreme liberalization policy. In fact, after that decrease in entry costs, the importance of foreign firms becomes very high and similar across countries. After the reform, the average share of employment accounted by foreign plants is 0.952, with a median share of 0.949, a 25th percentile of 0.943, and a 75th percentile of 0.978. Expressed differently, in this subsection I try to investigate the impact of a policy that makes most of domestic labor force be allocated to foreign firms.

In table V I show a summary of the results. In particular, I show some characteristics of countries with different consumption gains after the reform. Column (1) presents different positions in the distribution of gains. Column (2) shows the name of the country in that position. Column (3) shows the share of employment accounted by foreign plants before the reform. Column (4) shows the labor share in consumption before the reform. Columns (5) and (6) shows the share of employment in foreign plants after the reform and the actual consumption gain.

I find a high variation in consumption gains. Those countries for which the model predicts a high labor share in GNI are the ones which benefit the most from the reform. In fact, as becomes apparent in table V, there is a monotonic positive relationship between the share of labor in GNI and the consumption gain.

As an example of high gains let us take Madagascar which is in the 10th percentile in the distribu-

Table V

Consumption gains of an openness reform (countries ordered according to their position in the distribution of gains)

	Country	Share For. before	Labor Share in GNI	Share For.After	% change
Minimum	Nepal	0.05	0.23	0.95	-52.48
10th percentile	Colombia	0.02	0.45	0.94	-23.91
25th percentile	Argentina	0.22	0.51	0.95	-16.45
Median	Mauritania	0.18	0.58	0.95	-5.34
75th percentile	Madagascar	0.73	0.65	0.98	10.28
Maximum	Gabon	0.75	0.77	0.98	29.75

Table V shows the share of labor in foreign plants before the reform, the labor share in GNI before the reform, the share of employment in foreign plants after the reform, and the actual percentage change in aggregate consumption due to the reform. The countries selected represent the minimum, the 10th, 25th, 50th and 75th percentile, and the maximum consumption gain due to the reform.

tion. The model predicts an income gain for Madagascar of 10.28%. The reason is that, as implied by the calibration exercise, the labor income share in GNI is very high: 0.65%. In order to target a high ratio of foreign/domestic plants' size the model needs a low level of financial development ($\phi = 0.42$). Under this high level of financial frictions for domestic entrepreneurs, and if the share of employment in foreign firms was high in Madagascar, the model would need a super high level of the entry cost f_e. Then, even if the level of financial frictions are high, the implied labor share would not be as high, and hence the consumption gains would be low. However, this is not the case in Madagascar, where the share of employment in foreign plants is one of the highest in the sample (0.73). In other words, even with a very low level of financial development, the entry cost is sufficiently low such that the labor share in income remains high.

The opposite case is Nepal. The implied level of financial development is very low ($\phi = 0.24$). However, the share of employment accounted by foreign firms is also very low in the data (0.05). In order to match this number, the model predicts a super high entry cost in Nepal (around 243 times the income per capita). Then, even if the financial frictions are very high, the high entry cost prevent competition by foreign firms, implying a low share of labor income in the economy.

6 Conclusions

Here I have studied the impact of the presence of foreign firms in presence of financial frictions in the host economy. I have shown evidence about the importance of foreign firms in explaining how resources are allocated in developing countries. I have also shown that foreign firms, being isolated from domestic financial frictions, allocate more resources in countries where domestic entrepreneurs are financially constrained.

FIGURE V

CONSUMPTION GAINS FROM A DECREASE IN ENTRY COSTS

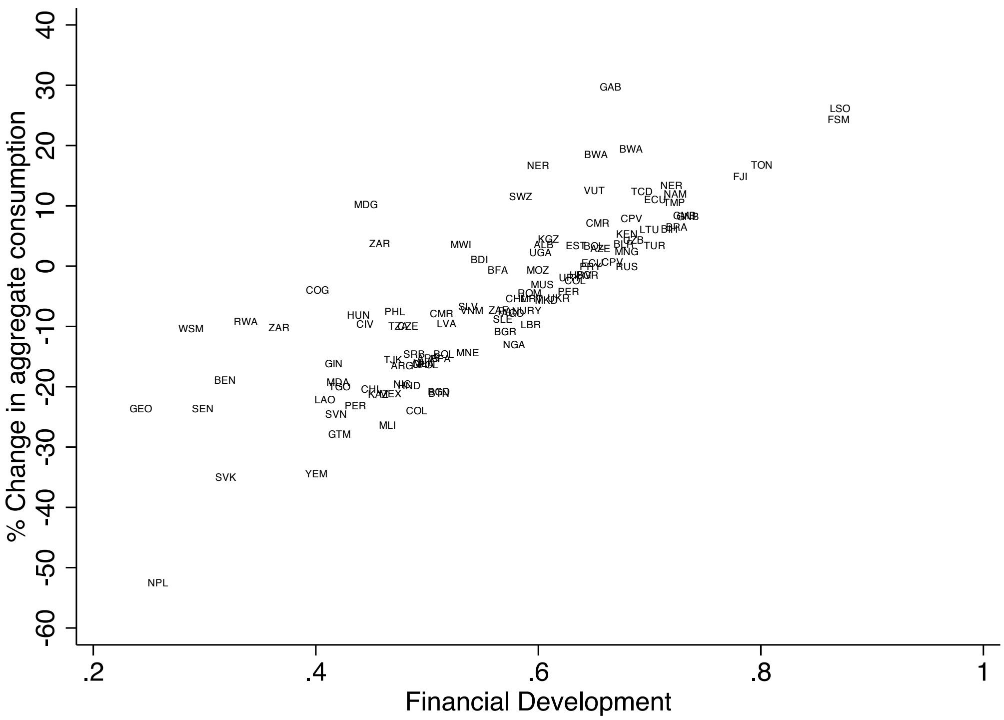


Figure V shows the relationship between the level of the financial development as measured by the calibrated ϕ and the consumption gains after reducing the entry cost f_e a 90%.

I have presented a very tractable model that allows to study the interaction between financial frictions and foreign entry and its implications for the allocation of resources, distribution of income, and welfare in developing countries. After calibrating the model to cross-country data, I have evaluated the impact of a decrease in barriers to entry for foreign firms. The model predicts that the distribution of national income is the main determinant of the sign and size of the gains. Only countries in which labor share in national income is sufficiently high have welfare gains from the openness reform.

There have been many examples of countries carrying out FDI openness, specially since the beginning of the 90's. According to Shatz (2000), several developing countries experienced a liberalization in foreign ownership restrictions.[20]. The model developed in this paper opens new insights under which we can look at the effects of openness to FDI. In particular, it would be crucial to study whether or not different levels of labor income shares are associated to differences in the effects of the liberalization on national income across countries. This is left for further research.

[20]Some examples are Argentina (1990), Colombia (1992), Ecuador (1991), Peru (1992), etc.

Table VI
Calibration Targets and Parameter Values

Country	Code	Year	RatioData	RatioModel	ϕ	SforData	SforModel	f_e	$\frac{f_e}{GDPpc}$
Afghanistan	AFG	2008	0.99	0.99	0.73	0.02	0.00	0.57	0.37
Albania	ALB	2007	2.16	2.16	0.59	0.36	0.36	1.32	0.92
Angola	AGO	2006	2.65	2.65	0.56	0.17	0.17	2.20	1.52
Angola	AGO	2010	0.44	0.44	0.84	0.02	0.00	0.25	0.16
Argentina	ARG	2006	4.11	4.11	0.48	0.22	0.22	4.89	3.50
Argentina	ARG	2010	4.71	4.71	0.46	0.26	0.26	6.27	4.58
Armenia	ARM	2009	1.02	1.02	0.72	0.04	0.00	0.57	0.38
Azerbaijan	AZE	2009	1.66	1.66	0.64	0.20	0.20	0.98	0.66
Bangladesh	BGD	2007	3.99	3.99	0.49	0.04	0.04	5.16	3.52
Belarus	BLR	2008	1.48	1.48	0.66	0.15	0.15	0.86	0.57
Benin	BEN	2009	13.05	13.05	0.30	0.59	0.59	46.42	44.32
Bhutan	BTN	2009	3.98	3.98	0.49	0.03	0.03	5.17	3.51
Bolivia	BOL	2006	3.78	3.78	0.50	0.19	0.19	4.23	2.99
Bolivia	BOL	2010	1.71	1.71	0.63	0.23	0.23	1.01	0.68
Bosnia	BIH	2009	1.16	1.16	0.70	0.07	0.07	0.64	0.43
Botswana	BWA	2006	1.32	1.32	0.66	0.53	0.53	0.50	0.33
Botswana	BWA	2010	1.57	1.57	0.63	0.57	0.57	0.62	0.42
Brazil	BRA	2009	1.13	1.13	0.70	0.06	0.06	0.63	0.42
Bulgaria	BGR	2007	2.78	2.78	0.55	0.11	0.11	2.50	1.71
Bulgaria	BGR	2009	1.81	1.81	0.62	0.12	0.12	1.19	0.80
BurkinaFaso	BFA	2006	2.74	2.74	0.54	0.37	0.37	2.00	1.43
BurkinaFaso	BFA	2009	3.85	3.85	0.49	0.18	0.18	4.42	3.11
Burundi	BDI	2006	2.95	2.95	0.53	0.44	0.44	2.14	1.56
Cameroon	CMR	2006	1.66	1.66	0.63	0.32	0.32	0.89	0.61
Cameroon	CMR	2009	3.74	3.74	0.49	0.35	0.35	3.67	2.70
CapeVerde	CPV	2006	1.59	1.59	0.65	0.10	0.10	0.99	0.66
CapeVerde	CPV	2009	1.40	1.40	0.66	0.25	0.25	0.73	0.49
Chad	TCD	2009	1.30	1.30	0.67	0.34	0.34	0.61	0.40
Chile	CHL	2006	5.58	5.58	0.43	0.25	0.25	9.01	6.64
Chile	CHL	2010	2.57	2.57	0.56	0.22	0.22	2.01	1.40
Colombia	COL	2006	4.50	4.50	0.47	0.02	0.02	6.64	4.52
Colombia	COL	2010	1.92	1.92	0.61	0.13	0.13	1.30	0.88
Congo	COG	2009	7.01	7.01	0.38	0.63	0.63	10.30	9.06
Croatia	HRV	2007	1.87	1.87	0.62	0.14	0.14	1.24	0.84
CzechRepublic	CZE	2009	4.43	4.43	0.46	0.38	0.38	5.03	3.78
DRC	ZAR	2006	4.81	4.81	0.44	0.64	0.64	4.46	3.68
DRC	ZAR	2010	8.93	8.93	0.35	0.61	0.61	18.40	16.70
Ecuador	ECU	2006	1.75	1.75	0.63	0.16	0.16	1.10	0.74

Table VI
Calibration Targets and Parameter Values (Continued)

Country	Code	Year	RatioData	RatioModel	ϕ	SforData	SforModel	f_e	$\frac{f_e}{GDPpc}$
Ecuador	ECU	2010	1.23	1.23	0.69	0.27	0.27	0.60	0.40
ElSalvador	SLV	2006	3.24	3.24	0.52	0.31	0.31	2.88	2.06
Eritrea	ERI	2009	0.39	0.81	0.76	0.01	0.00	0.45	0.30
Estonia	EST	2009	1.86	1.86	0.61	0.28	0.28	1.11	0.76
Fiji	FJI	2009	0.76	0.76	0.77	0.10	0.10	0.38	0.25
FyrMacedonia	MKD	2009	2.24	2.24	0.59	0.13	0.13	1.69	1.15
Gabon	GAB	2009	1.34	1.34	0.65	0.75	0.75	0.34	0.22
Gambia	GMB	2006	1.08	1.08	0.71	0.10	0.10	0.57	0.38
Georgia	GEO	2008	25.05	25.05	0.22	0.68	0.68	211.49	242.40
Ghana	GHA	2007	4.23	4.23	0.48	0.21	0.21	5.22	3.73
Guatemala	GTM	2006	6.85	6.85	0.40	0.16	0.16	14.87	10.76
Guinea	GIN	2006	6.65	6.65	0.40	0.42	0.42	11.53	9.19
GuineaBissau	GNB	2006	1.06	1.06	0.71	0.08	0.08	0.57	0.38
Honduras	HND	2006	4.61	4.61	0.46	0.16	0.16	6.42	4.55
Hungary	HUN	2009	5.70	5.70	0.42	0.51	0.51	7.55	6.11
Indonesia	IDN	2009	40.84	40.84	0.11	0.41	1.00	24.45	35.11
IvoryCoast	CIV	2009	5.46	5.46	0.43	0.47	0.47	7.17	5.69
Kazakhstan	KAZ	2009	5.40	5.40	0.44	0.21	0.21	8.64	6.27
Kenya	KEN	2007	1.45	1.45	0.66	0.19	0.19	0.81	0.54
KyrgyzRepublic	KGZ	2009	2.11	2.11	0.59	0.37	0.37	1.26	0.88
LaoPDR	LAO	2009	7.21	7.21	0.39	0.33	0.33	14.85	11.51
Latvia	LVA	2009	3.64	3.64	0.50	0.30	0.30	3.63	2.62
Lesotho	LSO	2009	0.36	0.39	0.85	0.16	0.15	0.20	0.13
Liberia	LBR	2009	2.44	2.44	0.57	0.06	0.06	2.04	1.38
Lithuania	LTU	2009	1.29	1.29	0.68	0.14	0.14	0.71	0.47
Madagascar	MDG	2009	5.04	5.04	0.42	0.73	0.73	4.22	3.62
Malawi	MWI	2009	3.21	3.21	0.51	0.52	0.52	2.30	1.73
Mali	MLI	2007	4.21	4.21	0.48	0.21	0.21	5.17	3.69
Mali	MLI	2010	5.21	5.21	0.45	0.04	0.04	8.87	6.10
Mauritania	MRT	2006	2.40	2.40	0.57	0.18	0.18	1.83	1.26
Mauritius	MUS	2009	2.26	2.26	0.58	0.21	0.21	1.62	1.11
Mexico	MEX	2006	5.09	5.09	0.45	0.18	0.18	7.78	5.57
Micronesia	FSM	2009	0.27	0.40	0.85	0.07	0.07	0.21	0.14
Moldova	MDA	2009	6.67	6.67	0.40	0.36	0.36	12.21	9.51
Mongolia	MNG	2009	1.48	1.48	0.66	0.11	0.11	0.88	0.59
Montenegro	MNE	2009	3.38	3.38	0.52	0.13	0.13	3.55	2.45
Mozambique	MOZ	2007	2.28	2.28	0.58	0.28	0.28	1.56	1.08
Namibia	NAM	2006	1.11	1.11	0.70	0.24	0.24	0.53	0.35

Table VI
Calibration Targets and Parameter Values (Continued)

Country	Code	Year	RatioData	RatioModel	ϕ	SforData	SforModel	f_e	$\frac{f_e}{GDPpc}$
Nepal	NPL	2009	24.58	24.58	0.24	0.05	0.05	326.65	243.37
Nicaragua	NIC	2006	4.71	4.71	0.46	0.18	0.18	6.63	4.72
Niger	NER	2005	2.08	2.08	0.58	0.62	0.62	0.91	0.65
Niger	NER	2009	1.12	1.12	0.70	0.29	0.29	0.52	0.34
Nigeria	NGA	2007	2.69	2.69	0.56	0.02	0.02	2.49	1.67
Panama	PAN	2006	2.69	2.69	0.55	0.19	0.19	2.23	1.54
Paraguay	PRY	2006	1.77	1.77	0.63	0.15	0.15	1.13	0.76
Peru	PER	2006	2.00	2.00	0.61	0.10	0.10	1.42	0.96
Peru	PER	2010	6.15	6.15	0.42	0.23	0.23	11.25	8.29
Philippines	PHL	2009	4.68	4.68	0.45	0.45	0.45	5.28	4.08
Poland	POL	2009	4.11	4.11	0.48	0.19	0.19	5.00	3.54
Romania	ROM	2009	2.42	2.42	0.57	0.21	0.21	1.82	1.26
Russia	RUS	2009	1.49	1.49	0.66	0.03	0.03	0.94	0.63
Rwanda	RWA	2006	11.03	11.03	0.32	0.67	0.67	27.86	27.22
Samoa	WSM	2009	16.15	16.15	0.27	0.73	0.73	64.20	70.73
Senegal	SEN	2007	15.50	15.50	0.28	0.57	0.57	72.31	69.93
Serbia	SRB	2009	4.39	4.39	0.47	0.27	0.27	5.39	3.93
SierraLeone	SLE	2009	2.77	2.77	0.55	0.17	0.17	2.38	1.65
SlovakRepublic	SVK	2009	13.87	13.87	0.30	0.32	0.32	68.40	56.05
Slovenia	SVN	2009	6.87	6.87	0.40	0.25	0.25	14.13	10.57
SouthAfrica	ZAF	2007	2.81	2.81	0.55	0.22	0.22	2.36	1.65
Swaziland	SWZ	2006	2.33	2.33	0.56	0.56	0.56	1.21	0.87
Tajikistan	TJK	2008	4.86	4.86	0.45	0.30	0.30	6.50	4.81
Tanzania	TZA	2006	4.64	4.64	0.46	0.40	0.40	5.44	4.14
TimorLeste	TMP	2009	1.12	1.12	0.70	0.20	0.20	0.56	0.37
Togo	TGO	2009	6.62	6.62	0.40	0.34	0.34	12.20	9.42
Tonga	TON	2009	0.68	0.68	0.78	0.10	0.10	0.33	0.22
Turkey	TUR	2008	1.28	1.28	0.68	0.04	0.04	0.75	0.50
Uganda	UGA	2006	2.22	2.22	0.58	0.34	0.34	1.41	0.99
Ukraine	UKR	2008	2.11	2.11	0.60	0.10	0.10	1.56	1.05
Uruguay	URY	2006	2.43	2.43	0.57	0.13	0.13	1.94	1.32
Uruguay	URY	2010	1.97	1.97	0.61	0.16	0.16	1.33	0.90
Uzbekistan	UZB	2008	1.41	1.41	0.67	0.14	0.14	0.81	0.54
Vanuatu	VUT	2009	1.63	1.63	0.63	0.45	0.45	0.76	0.52
Vietnam	VNM	2009	3.22	3.22	0.52	0.29	0.29	2.89	2.06
Yemen	YEM	2010	8.01	8.01	0.38	0.05	0.05	22.35	15.68

Table VI show the targets and parameters values. Column (1) shows the name of the countries by alphabetical order. Column (2) shows the code of these countries as they appear in the graphs. Column (3) shows the year in which the ESWB was carried out. Column (4) shows the ratio foreign-domestic average plants' size measured in the data. Column (5) shows the ratio foreign-domestic average plants' size measured in the model. Column (6) shows the value of the calibrated parameter governing financial development ϕ. Column (7) shows the share of employment in foreign plants measured in the data. Column (8) shows the share of employment in foreign plants measured in the model. Column (9) shows the calibrated value of the entry cost f_e. Column (10) shows the value of the calibrated f_e relative to the per capita GDP measured in the model. Notice that the model has not been able to match the statistics in the case of Indonesia (IDN) properly, and hence this country has been dropped out from the quantitative analysis.

A Model Equations

A.1 Unconstrained domestic entrepreneurs

The solution of the problem presented in equation 3 is given by:

$$l_t^d(z, w_t, r_t) = z\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}} \tag{37}$$

Then, the output of an entrepreneur with managerial ability z at time t will be:

$$y_t^d(z, w_t, r_t) = z^{1-\gamma} l_t^d(z, w_t, r_t)^{\gamma} \Longrightarrow y_t^d(z, w_t, r_t) = z\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} \tag{38}$$

And profits will be given by:

$$\begin{aligned}
\pi_t^d(z, w_t, r_t) &= y_t^d(z, w_t, r_t) - (1+r_t)w_t l_t^d(z, w_t, r_t) \\
&= z\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} - (1+r_t)w_t z\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}} \\
&= z\Big[\frac{1}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} \left(\gamma^{\frac{\gamma}{1-\gamma}} - \gamma^{\frac{1}{1-\gamma}}\right)
\end{aligned}$$

Defining $\Gamma = \gamma^{\frac{\gamma}{1-\gamma}} - \gamma^{\frac{1}{1-\gamma}}$ we have that:

$$\pi_t^d(z, w_t, r_t) = z\Big[\frac{1}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}}\Gamma \tag{39}$$

A.2 Constrained domestic entrepreneurs

As mentioned above, constrained domestic entrepreneurs will demand the upper-bound of labor given by proposition 1. Then, the output for an entrepreneur with managerial ability z at time t will be given by:

$$\hat{y_t}^d(z, w_t, r_t; \phi) = z^{1-\gamma}\hat{l}_t(z, w_t, r_t; \phi)^{\gamma} \Longrightarrow y_t^d(z, w_t, r_t) = z\Big[\frac{\phi}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} \tag{40}$$

And profits will be given by:

$$\begin{aligned}
\hat{\pi_t}^d(z, w_t, r_t; \phi) &= \hat{y_t}^d(z, w_t, r_t; \phi) - (1+r_t)w_t \hat{l_t}^d(z, w_t, r_t; \phi) \\
&= z\Big[\frac{\phi}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} - (1+r_t)w_t z\Big[\frac{\phi}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}} \\
&= z\Big[\frac{1}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} \left(\phi^{\frac{\gamma}{1-\gamma}} - \phi^{\frac{1}{1-\gamma}}\right)
\end{aligned}$$

Defining $\Phi = \phi^{\frac{\gamma}{1-\gamma}} - \phi^{\frac{1}{1-\gamma}}$ we have that:

$$\hat{\pi}_t{}^d(z, w_t, r_t; \phi) = z\Big[\frac{1}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}}\Phi \tag{41}$$

A.3 Foreign firms

The solution of the problem presented in equation 3 is given by:

$$l_t^f(s, w_t, r_t) = s\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}} \tag{42}$$

Then, the output of a firm with managerial ability s at time t will be:

$$y_t^f(s, w_t, r_t) = s^{1-\gamma} l_t^f(s, w_t, r_t)^{\gamma} \Longrightarrow y_t^f(s, w_t, r_t) = s\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} \tag{43}$$

And profits will be given by:

$$\begin{aligned}
\pi_t^f(s, w_t, r_t) &= y_t^f(s, w_t, r_t) - (1+r_t)w_t l_t^f(s, w_t, r_t) \\
&= s\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} - (1+r_t)w_t s\Big[\frac{\gamma}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}} \\
&= s\Big[\frac{1}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}} \left(\gamma^{\frac{\gamma}{1-\gamma}} - \gamma^{\frac{1}{1-\gamma}}\right)
\end{aligned}$$

Then we have that:

$$\pi_t^f(s, w_t, r_t) = s\Big[\frac{1}{w_t(1+r_t)}\Big]^{\frac{\gamma}{1-\gamma}}\Gamma \tag{44}$$

B Propositions and proofs

Proposition 1. *The upper bound on working capital that is consistent with managers choosing not to default on their contracts will be implicitly determined by the following upper bound labor demand function:*

$$\hat{l}_t(z, w_t, r_t; \phi) = z\Big[\frac{\phi}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}} \tag{45}$$

Proof: This upper-bound will be given by the amount of labor such that the entrepreneur is indifferent between paying back and defaulting in her loans. That is:

$$
\begin{aligned}
z^{1-\gamma}\hat{l}_t(z,w_t,r_t;\phi)^\gamma - (1+r_t)w_t\hat{l}_t(z,w_t,r_t;\phi) &= z^{1-\gamma}\hat{l}_t(z,w_t,r_t;\phi)^\gamma(1-\phi) \Longrightarrow \\
\Longrightarrow (1+r_t)w_t\hat{l}_t(z,w_t,r_t;\phi) &= \phi z^{1-\gamma}\hat{l}_t(z,w_t,r_t;\phi)^\gamma \Longrightarrow \\
\Longrightarrow \hat{l}_t(z,w_t,r_t;\phi) &= z\Big[\frac{\phi}{w_t(1+r_t)}\Big]^{\frac{1}{1-\gamma}}
\end{aligned}
$$

■

Proposition 2. *For a given set of parameters Λ, two kind of situations can emerge in equilibrium:*

(a) If $\phi \geq \gamma$: no domestic entrepreneur is constrained

(b) if $\phi < \gamma$: all domestic entrepreneurs are constrained

Proof: Canceling terms in both sides and reordering, the borrowing constraint (equation 5) can be rewritten as:

$$
(1+r_t)w_tl_t \quad \leq \quad z^{1-\gamma}l^\gamma\phi
$$

The first order condition from the maximization problem of the entrepreneur (equation 3) states that:

$$
\gamma z^{1-\gamma}l_t^{\gamma-1} = (1+r_t)w_tl_t \Longrightarrow \gamma z^{1-\gamma}l_t^\gamma = (1+r_t)w_tl_t
$$

Then, substituting back into equation 46:

$$
\gamma z^{1-\gamma}l_t^\gamma \leq z^{1-\gamma}l^\gamma\phi \Longrightarrow \phi \geq \gamma
$$

■

Proposition 6. *Under autarky, the cutoff $\tilde{z}$ that determines the occupational choice of domestic individuals is decreasing in the level of financial frictions, i.e, increasing in ϕ. In particular:*

$$
\tilde{z}^{Aut} \quad = \quad \left(\frac{\phi^{\frac{1}{1-\gamma}}}{\phi^{\frac{\gamma}{1-\gamma}} - \phi^{\frac{1}{1-\gamma}}}\frac{k}{k-1} + 1\right)^{\frac{1}{k}} \tag{46}
$$

Proof: When there is not possibility of foreign entry, the equilibrium wage and the cutoff level $\tilde{z}^{Aut}$ are jointly determined by the market clearing and the occupational choice condition:

$$
\begin{aligned}
F(\tilde{z}^{Aut}) &= \int_{\tilde{z}^{Aut}}^{\infty} \hat{l}^{d}(z,w,r;\phi) f(z)dz \\
w &= \pi(\tilde{z}^{Aut}, w, r)
\end{aligned}
$$

These two equations can be expressed as:

$$
\begin{aligned}
1-\tilde{z}_{Aut}^{-k} &= \left(\frac{\phi}{(1+r)w}\right)^{\frac{1}{1-\gamma}} \frac{k}{k-1}\tilde{z}_{Aut}^{1-k} \\
w &= \tilde{z}_{Aut}\left(\frac{1}{(1+r)w}\right)^{\frac{\gamma}{1-\gamma}} \Phi \\
\Longrightarrow 1 &= w^{-\frac{1}{1-\gamma}}\left(\frac{\phi}{(1+r)}\right)^{\frac{1}{1-\gamma}} \frac{k}{k-1}\tilde{z}_{Aut}^{1-k} + \tilde{z}_{Aut}^{-k} \\
w &= \tilde{z}_{Aut}^{1-\gamma}\Phi^{1-\gamma}(1+r)^{-\gamma} \\
\Longrightarrow \tilde{z}_{Aut} &= \left(\frac{\phi}{\Phi}\frac{k}{k-1}(1+r)^{-1}+1\right)^{\frac{1}{k}} \\
w &= \left(\frac{\phi}{\Phi}\frac{k}{k-1}(1+r)^{-1}+1\right)^{\frac{1-\gamma}{k}} \Phi^{1-\gamma}(1+r)^{-\gamma}
\end{aligned}
$$

■

Proposition 3. *If the entry condition is satisfied with equality, i.e, $M>0$, then the steady state equilibrium wage and the productivity cutoff for foreign firms are given by:*

$$
\tilde{s} = \left[\frac{f_o}{(k-1)f_e}\right]^{\frac{1}{k}} \tag{47}
$$

$$
w = \frac{\Gamma^{\frac{1-\gamma}{\gamma}}}{(1+r)\left[(k-1)f_e\right]^{\frac{1-\gamma}{k\gamma}} f_o^{-\frac{(1-k)(1-\gamma)}{k\gamma}}} \tag{48}
$$

where $\Gamma = \gamma^{\frac{\gamma}{1-\gamma}} - \gamma^{\frac{1}{1-\gamma}}$.

Proof: The entry condition with equality in the steady state is given by:

$$
\int_{\tilde{s}}^{\infty}\left[\pi^f(s,w,r)-f_o\right]g(s)ds = f_e \tag{49}
$$

The above equation can be expressed as:

$$
\int_{\tilde{s}}^{\infty}\pi^f(s,w,r)\,g(s)ds = f_e + f_o\int_{\tilde{s}}^{\infty} g(s)ds
$$

and using equation 44 we are able to represent the entry condition as a function of w and $\tilde{s}$:

$$[(1+r)w]^{-\frac{\gamma}{1-\gamma}}\,\Gamma\int_{\tilde{s}}^{\infty} sg(s)ds = f_e + f_o\int_{\tilde{s_t}}^{\infty} g(s)ds \Longrightarrow [(1+r)w]^{-\frac{\gamma}{1-\gamma}}\,\Gamma\frac{k}{k-1}\tilde{s}^{1-k} = f_e + f_o\tilde{s_t}^{-k} \tag{50}$$

Making use of equation 44 again, we can do the same with the productivity cutoff condition for foreign firms (9):

$$f_o = \pi^f(\tilde{s}, w, r) \Longrightarrow \tilde{s} \;\; = \;\; f_o\,[(1+r)w]^{\frac{\gamma}{1-\gamma}}\,\Gamma^{-1} \tag{51}$$

Then, the equations 50 and 51 form a system of two equations with two unknowns whose solution is represented by equations 47 and 48 ■

Proposition 7. *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state equilibrium talent cutoff which determines the optimal occupational choice of domestic individuals is given by:*

$$\tilde{z} = \frac{\Gamma^{\frac{1}{\gamma}}}{(1+r)\Phi\,[(k-1)f_e]^{\frac{1}{k\gamma}}\,f_o^{\frac{(k-1)}{k\gamma}}} \tag{52}$$

where $\Phi = \phi^{\frac{\gamma}{1-\gamma}} - \phi^{\frac{1}{1-\gamma}}$.

Proof: Taking the equation 41 and plugging it into equation 12 we obtain the following expression for the occupational choice condition:

$$w \;\; = \;\; \tilde{z}\left(\frac{1}{w(1+r)}\right)^{\frac{\gamma}{1-\gamma}}\Phi \Longrightarrow w^{\frac{1}{1-\gamma}} = \tilde{z}(1+r)^{\frac{-\gamma}{1-\gamma}}\Phi \Longrightarrow w^{\frac{1}{1-\gamma}}(1+r)^{\frac{\gamma}{1-\gamma}}\Phi^{-1} = \tilde{z}$$

Then, taking the expression for the equilibrium wage (equation 48), and substituting it the previous equation:

$$\tilde{z} \;\; = \;\; \left[\frac{\Gamma^{\frac{1-\gamma}{\gamma}}}{(1+r)\,[(k-1)f_e]^{\frac{1-\gamma}{k\gamma}}\,f_o^{-\frac{(1-k)(1-\gamma)}{k\gamma}}}\right]^{\frac{1}{1-\gamma}}(1+r)^{\frac{\gamma}{1-\gamma}}\Phi^{-1} = \frac{\Gamma^{\frac{1}{\gamma}}\,f_o^{\frac{(1-k)}{k\gamma}}}{(1+r)\Phi\,[(k-1)f_e]^{\frac{1}{k\gamma}}}$$

■

Proposition 5. *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state aggregate labor supply is given by:*

$$L^s \;\; = \;\; 1 - \frac{f_o^{\frac{k-1}{\gamma}}(1+r)^k\Phi^k\,[(k-1)f_e]^{\frac{1}{\gamma}}}{\Gamma^{\frac{k}{\gamma}}} \tag{53}$$

Proof: We know that each worker supplies one unit of labor. This implies that labor supply in this economy is given by:

$$L^s = F(\tilde{z})$$

And under the assumption of z being distributed according to a Pareto distribution and the solution for $\tilde{z}$ given by equation 52:

$$L^s = 1 - \tilde{z}^{-k} \Longrightarrow L^s = 1 - \left[\frac{\Gamma^{\frac{1}{\gamma}} f_o^{\frac{(1-k)}{k\gamma}}}{(1+r)\Phi \left[(k-1)f_e\right]^{\frac{1}{k\gamma}}} \right]^{-k} \Longrightarrow L^s = 1 - \frac{f_o^{\frac{k-1}{\Phi}} (1+r)^k \Phi^k \left[(k-1)f_e\right]^{\frac{1}{\Phi}}}{\Gamma^{\frac{k}{\Phi}}}$$

■

Proposition 4. *If the entry condition is satisfied with equality, i.e, $M > 0$, and domestic entrepreneurs are financially constrained, i.e, $\gamma > \phi$, then the steady state aggregate labor supply is given by:*

$$L_d^d = \frac{f_o^{\frac{k-1}{\gamma}} f_e^{\frac{1}{\gamma}} (1+r)^{k-1} k(k-1)^{\frac{1-\gamma}{\gamma}} \phi^{\frac{1}{1-\gamma}} \Phi^{k-1}}{\Gamma^{\frac{k}{\gamma}}} \tag{54}$$

Proof: The total amount of labor demanded by domestic entrepreneurs can be obtained integrating the $\hat{l}^d(z, w, r; \phi)$ over all domestic entrepreneurs. This is:

$$L_d^d = \int_{\tilde{z}}^{\infty} \hat{l}^d(z, w, r; \phi) f(z) dz \Longrightarrow L_d^d = \left(\frac{\phi}{w(1+r)} \right)^{\frac{1}{1-\gamma}} \int_{\tilde{z}}^{\infty} z f(z) dz \Longrightarrow L_d^d = \left[\frac{\phi}{w(1+r)} \right]^{\frac{1}{1-\gamma}} \frac{k}{k-1} \tilde{z}^{1-k} \tag{55}$$

Using the solution for w and $\tilde{z}$ stated in equation 48 and 52:

$$\begin{aligned}
L_d^d &= \left(\frac{C_o^{\frac{(1-k)(1-\gamma)}{k\gamma}} \Gamma^{\frac{1-\gamma}{\gamma}} \left[(k-1)f_e\right]^{-\frac{1-\gamma}{k\gamma}}}{(1+r)} \right)^{-\frac{1}{1-\gamma}} \left(\frac{\phi}{(1+r)} \right)^{\frac{1}{1-\gamma}} \frac{k}{k-1} \left(\frac{\Gamma^{\frac{1}{\gamma}} f_o^{\frac{(1-k)}{k\gamma}}}{(1+r)\Phi \left[(k-1)f_e\right]^{\frac{1}{k\gamma}}} \right)^{1-k} \Longrightarrow \\
L_d^d &= f_o^{\frac{k-1}{k\gamma}} \Gamma^{\frac{-1}{\gamma}} \left[(k-1)f_e\right]^{\frac{1}{\gamma k}} (1+r)^{\frac{1}{1-\gamma}} \left[\frac{\phi}{(1+r)} \right]^{\frac{1}{1-\gamma}} \frac{k}{k-1} \left[\frac{\Gamma^{\frac{1}{\gamma}} f_o^{\frac{(1-k)}{k\gamma}}}{(1+r)\Phi \left[(k-1)f_e\right]^{\frac{1}{k\gamma}}} \right]^{1-k} \Longrightarrow \\
L_d^d &= f_o^{\frac{k-1}{k\gamma}} \Gamma^{\frac{-1}{\gamma}} \left[(k-1)f_e\right]^{\frac{1}{\gamma k}} \phi^{\frac{1}{1-\gamma}} \frac{k}{k-1} \left[\frac{\Gamma^{\frac{1}{\gamma}} f_o^{\frac{(1-k)}{k\gamma}}}{(1+r)\Phi \left[(k-1)C_e\right]^{\frac{1}{k\gamma}}} \right]^{1-k} \Longrightarrow \\
L_d^d &= f_o^{\frac{k-1}{\gamma}} \Gamma^{\frac{-k}{\gamma}} \left[(k-1)f_e\right]^{\frac{1}{\gamma}} (1+r)^{k-1} \phi^{\frac{1}{1-\gamma}} \frac{k}{k-1} \Phi^{k-1} \Longrightarrow \\
L_d^d &= f_o^{\frac{k-1}{\gamma}} \Gamma^{\frac{-k}{\gamma}} f_e^{\frac{1}{\gamma}} (1+r)^{k-1} \phi^{\frac{1}{1-\gamma}} k(k-1)^{\frac{1-\gamma}{\gamma}} \Phi^{k-1} = \frac{f_o^{\frac{k-1}{\gamma}} f_e^{\frac{1}{\gamma}} (1+r)^{k-1} k(k-1)^{\frac{1-\gamma}{\gamma}} \phi^{\frac{1}{1-\gamma}} \Phi^{k-1}}{\Gamma^{\frac{k}{\gamma}}}
\end{aligned}$$

■

Proposition 8. *If the entry condition is satisfied with equality, i.e, $M > 0$, domestic entrepreneurs are financially* *constrained, i.e, $\gamma > \phi$, and the domestic talent is Pareto distributed, then the steady state average plant size of domestic entrepreneurs is given by:*

$$\textit{Average Plant Size}^{dom} = \frac{k}{k-1}\frac{\phi}{1-\phi}\frac{1}{1+r} \tag{56}$$

Proof: The average plants size is defined as the total amount of labor divided by the number of production units. For domestic firms this is:

$$\text{Average Plant Size}^{Dom} = \frac{\int_{\tilde{z}}^{\infty}\hat{l}^d(z,w,r;\phi)f(z)dz}{1-F(\tilde{z})} \tag{57}$$

Using equations 52 and 54:

$$\begin{aligned}\text{Average Plant Size}^{Dom} &= \frac{\frac{f_o^{\frac{k-1}{\gamma}} f_e^{\frac{1}{\gamma}}(1+r)^{k-1}k(k-1)^{\frac{1-\gamma}{\gamma}}\phi^{\frac{1}{1-\gamma}}\Phi^{k-1}}{\Gamma^{\frac{k}{\gamma}}}}{\tilde{z}^{-k}} = \frac{\frac{f_o^{\frac{k-1}{\gamma}} f_e^{\frac{1}{\gamma}}(1+r)^{k-1}k(k-1)^{\frac{1-\gamma}{\gamma}}\phi^{\frac{1}{1-\gamma}}\Phi^{k-1}}{\Gamma^{\frac{k}{\gamma}}}}{\left(\frac{\Gamma^{\frac{1}{\gamma}}}{(1+r)\Phi[(k-1)f_e]^{\frac{1}{k\gamma}}f_o^{\frac{(k-1)}{k\gamma}}}\right)^{-k}} \\ &= \frac{(1+r)^{k-1}k(k-1)^{\frac{1-\gamma}{\gamma}}\phi^{\frac{1}{1-\gamma}}\Phi^{k-1}}{\left((1+r)\Phi(k-1)^{\frac{1}{k\gamma}}\right)^k} = (1+r)^{-1}\frac{k}{k-1}\frac{\phi}{\Phi} = (1+r)^{-1}\frac{k}{k-1}\frac{\phi}{1-\phi}\end{aligned}$$

■

Proposition 9. *If the entry condition is satisfied with equality, i.e, $M > 0$, and the foreign productivity is Pareto distributed, then the steady state average plant size of foreign firms is given by:*

$$\textit{Average Plant Size}^{For} = k(k-1)^{\frac{1-\gamma-\gamma k}{k\gamma}} f_o^{\frac{k+\gamma-1}{k\gamma}} f_e^{\frac{1-\gamma}{\gamma k}}\gamma^{\frac{1}{1-\gamma}}\Gamma^{\frac{-1}{\gamma}} \tag{58}$$

Proof: The average plants size is defined as the total amount of labor divided by the number of production units. For foreign firms this is:

$$\text{Average Plant Size}^{For} = \frac{M\int_{\tilde{s}}^{\infty} l^f(z,w,r)f(s)ds}{M[1-F(\tilde{s})]} = \frac{\left(\frac{\gamma}{w(1+r)}\right)^{\frac{1}{1-\gamma}}\frac{k}{k-1}\tilde{s}^{1-k}}{\tilde{s}^{-k}} = \left(\frac{\gamma}{w(1+r)}\right)^{\frac{1}{1-\gamma}}\frac{k}{k-1}\tilde{s}$$

Using equations 48 and 47:

$$\begin{aligned}\text{Average Plant Size}^{For} &= \left(\frac{\Gamma^{\frac{1-\gamma}{\gamma}}}{[(k-1)f_e]^{\frac{1-\gamma}{k\gamma}} f_o^{-\frac{(1-k)(1-\gamma)}{k\gamma}}}\right)^{\frac{-1}{1-\gamma}}\gamma^{\frac{1}{1-\gamma}}\frac{k}{k-1}\left[\frac{f_o}{(k-1)f_e}\right]^{\frac{1}{k}} = \\ &= \Gamma^{\frac{-1}{\gamma}} f_e^{\frac{1}{k\gamma}} f_o^{\frac{1-k}{k\gamma}}(k-1)^{\frac{1}{k\gamma}}\gamma^{\frac{1}{1-\gamma}}\frac{k}{k-1}\left[\frac{f_o}{(k-1)f_e}\right]^{\frac{1}{k}} = \\ &= k(k-1)^{\frac{1-\gamma-\gamma k}{k\gamma}} f_o^{\frac{k+\gamma-1}{k\gamma}} f_e^{\frac{1-\gamma}{\gamma k}}\gamma^{\frac{1}{1-\gamma}}\Gamma^{\frac{-1}{\gamma}}\end{aligned}$$

■

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