Market Imperfections, Wealth Inequality, and the Distribution of Trade Gains

Reto Foellmi and Manuel Oechslin*

July 20, 2007

Abstract

We explore the role of the ownership structure of capital in an economy that suffers from barriers to entry and an imperfect financial system. In such an environment, an unequal distribution of capital provides an explanation for trade flows and trade gains even when countries do not differ in relative factor endowments or available technologies. Moreover, an uneven asset distribution is associated with a large import-competing sector and only a small number of export-oriented entrepreneurs. Along these lines, we suggest that an unequal asset distribution may be key to understand why still many less developed countries protect their firms from foreign competition.

JEL classification: O11, F13, O16

Keywords: inequality, trade policy, economic development

*University of Zurich, Institute for Empirical Research in Economics, Bluemlisalpstrasse 10, CH-8006 Zürich, Tel: +41 1 634 36 09, Fax: +41 1 634 49 07, e-mail: oechslin@iew.unizh.ch, rfoellmi@iew.unizh.ch.

1 Introduction

We analyze how the asset distribution influences trade flows and patterns in an economy characterized by monopolistic goods markets and an imperfect financial system. The model developed here shows that - in such an environment - an unequal wealth distribution (among entrepreneurs) is associated with a large import-competing sector and only a small number of export-oriented entrepreneurs. Our analysis does not rely on differences in relative factor endowments or technology but explores the role of the ownership structure of capital in presence of imperfect markets.

Along these lines, we suggest that an unequal asset distribution may be key to understand why still many less developed countries (LDCs) protect their firms from foreign competition. While it is true that some developing countries reduced their tariffs during the last two decades or so, average tariffs are still high when compared to those in industrial countries.[1] In addition, only looking at changes in tariffs may be misleading because the use of non-tariff measures and "behind the border measures" is yet widespread or even on the rise in the developing world.[2]

Our analysis is based on three central assumptions. First, under autarky, there is imperfect competition on the goods markets in the integrating country (the South). Second, capital is unevenly distributed among entrepreneurs and the capital market is imperfect. Third, the economy of the integrating country is relatively *backward* in the sense that no firm or no sector has access to technologies allowing the production of varieties that have no perfect substitute counterparts on the Northern goods market. In contrast, there are Northern firms supplying - either competitively or monopolistically - "new" goods, i.e. goods that are only recently developed and exclusively produced in the North.

So, in our economy, an entrepreneur is endowed with two values simultane-

[1] For instance, average unweighted tariffs in Sub-Saharan Africa in 1998 were still four times as high as in developed countries (World Bank, 2001).

[2] For instance, Latin American countries that cut tariffs to a large extent during the nineties turned to antidumping laws in order to substitute for the tariff restrictions (World Bank, 2003).

ously. On the one hand, he owns a monopoly that is protected from competition by high trade barriers (foreign competitors) and, for instance, heavy regulation of entry (domestic competitors) but not because the monopolist produces at the world technology frontier. On the other hand, he holds productive resources that can be allocated to produce own goods but also other commodities. However, due to the monopolistic structure of the economy, an entrepreneur not intending to employ the whole endowment inside the firm can *only lend* the "excess" capital to other monopolists. Although we allow a monopolist only to produce a single good, the model can easily be extended to incorporate multi-product firms or conglomerates that seem to play an important role in the industrial sector of some developing countries.

We suggest that these elements of the model mirror crucial features of poorer economies. As discussed in detail by Rodrik (1988), limited competition seems to be of particular importance in developing countries since the absence of a serious antitrust policy and substantial administrative barriers to entry protect the incumbents also from domestic competitors. The prevalence of heavy regulation of entry in poor countries has only recently been documented by Djankov et al. (2002). Moreover, a large literature on corruption (e.g., De Soto, 1989) suggests that the administrative entry barriers are amplified by extensive bribery. In contrast, monopoly positions due to product innovations are scarce since, according to an empirical literature going back at least to Vernon (1966), innovations take place primarily in the North. Further, there is do doubt that a low per capita GDP and a low level of financial development go hand in hand (e.g., King and Levine, 1993; Beck et al., 2000) due to, for instance, imperfect enforcement of credit contracts or poor law enforcement in general (La Porta et al., 1998). The part of capital market imperfections in restricting firm sizes is documented in a number of empirical papers, among them Nugent and Nabli (1992), Banerjee and Duflo (2002) and Sleuwaegen and Goedhuys (2002).

Finally, there is empirical evidence suggesting that the wealth distribution - approximated by the income distribution or the land distribution - is more unequal in poor countries (e.g., Deininger and Squire, 1998; Deininger and Olinto,

2001), most of which lie in tropical regions. In a study on economic development in the Americas Engerman and Sokoloff (2002) put forth an explanation that has increasingly attracted attention in recent times. The hypothesis is that tropical endowment leads to commodity production, and that commodity production is associated with higher inequality in physical and human capital. This channel has been tested by Easterly (2001) who finds a large negative effect of commodity exporting (using tropical location as an instrument) on the middle class' share in aggregate income. In an earlier paper, Bourguignon and Morrisson (1990) find very similar correlations.

We show that in such an environment removing trade barriers increases the incomes of those entrepreneurs who own much capital relative to the size of their home market (export-oriented entrepreneurs) whereas those with a *relatively* small capital endowment (import-competing entrepreneurs) lose. In addition, we discuss how the size of the winning group and the trade flows depend on the level of financial development, the wealth distribution, and the extent of additional variety in the goods spectrum the integration causes.

The mechanism we focus on is simple. Suppose that there is a large number of entrepreneurs, each of which is a monopoly supplier of a single differentiated good. Assume further that capital, the only input in production, is unevenly distributed among these monopolists. Due to the limited size of the home market under autarky, a capital-rich entrepreneur will not have invested the whole capital endowment into the own firm. To escape strongly decreasing marginal returns and very low prices, he will lend some capital to entrepreneurs that have to rely more or less on external finance. Those poorly capitalized monopolists will indeed be induced to seek credit. Being restricted to small-scale production under financial autarky, they face high prices and marginal returns. Accordingly, it pays for them to increase production with borrowed and "cheap" capital to the extent the imperfect capital market allows.

Suppose now that the trade barriers are significantly cut back or removed at all such that *no monopolist* can sustain monopoly power. In this new situation, capital-rich entrepreneurs are no longer restricted to the small domestic demand

that forced them to charge low relative prices. Instead, they can sell now any quantity they like at the prevalent world market price. As a consequence, the capital-rich lenders increase their firm sizes - thereby driving up the interest rate - and become exporters. Accordingly, their incomes improve. The incomes of the borrowers are hit negatively by the opening. They not only face higher factor costs but also decreasing relative prices. The reason for the price collapse is that their goods are no longer "scarce" since they can be (and are indeed) imported from abroad. So, our model predicts that the capital-rich entrepreneurs - beside producing for the home market - will be the exporters whereas the capital-poor entrepreneurs have to share the home market with foreign suppliers after the liberalization has taken place.

The size of the individual gains and losses in income, respectively, depends on the extent capital can be directed from capital-rich to capital-poor entrepreneurs under autarky. Only when the banking system, whether private or state-owned, can attract "sufficient" funds to finance the capital-poor monopolist, the size-distribution of firms will resemble the efficient one. Under these circumstances, the wealthy capital holders gain only relatively little from a trade liberalization. In contrast, if the financial system is poorly developed or works temporary bad, the losers experience a small loss and the winners gain a lot.

The focus of our analysis is clearly on the *short-* (or medium) run effects of liberalization steps on the *entrepreneur's* incomes. The reason is that short-run effects seem to be particularly important for the feasibility of trade reforms. It should be noted, however, that we do not by any means ignore the large literature pointing into the direction that trade liberalizations - at least if supported by other policy measures - contribute positively to economic growth and incomes in the long run.[3]

Examples fitting well into our story can be found in recent economic history. For instance, after independence, many African countries not only protected their (urban) infant industry but started to tax heavily the exports of outward-oriented industries in the agricultural (export crops) and the mining sector (e.g.,

[3] For a recent survey of the literature see Winters (2004).

Bates, 1981, 1988). Taxation could either take place directly by the use of export marketing boards (that were established by the colonial powers to stabilize incomes in presence of fluctuating commodity prices) or indirectly by overvalued exchange rates. As noted by McMillan (2001), the taxation of some crops was so heavy that the government found itself on the decreasing part of the Laffer-Curve thereby discouraging investment by capitalist farmers. Remembering that the crop exporters and the miners were major owner of asset (Bourguignon and Morrisson, 1990; Easterly, 2001), we suggest that this (at first sight puzzling) policy choice must have been to the benefit of the urban manufacturers and industrialist. The reason is that the excess taxation was likely to direct "cheap" productive resources, i.e. capital, towards urban entrepreneurs operating in protected sectors. In this sense, excess taxation of exports was complementary to other policy measures taken at that time in order to benefit the members of the powerful urban groups of manufacturers and industrialist (and, perhaps, their workers).

Still today, an important stylized fact about the production system in poor countries is that the size-distribution of firms is dualistic. There is a large number of smaller and credit-rationed businesses producing mainly for the home market and small number of larger entrepreneurs,[4] reflecting - ceteris paribus - an uneven asset distribution in presence of an imperfect financial system. Even if there is now much less export taxation than half a century ago, the export barriers a (potential) Southern exporter faces are still high. Since reciprocity is an important element in international trade negotiations, the level of import barriers a home exporter faces in foreign markets is tied to the level of import barriers at home. Assume now that a typical poor country decides to join an integration agreement that *simultaneously* and *significantly* decreases the import barriers at home and those import barriers the exporters face in foreign markets. According to our model, the capital-rich entrepreneurs will experience an increase in the relative price for their goods and, consequently, employ more

[4] See, for instance, Liedholm and Mead (1999) or Tybout (2000) for a discussion of the size-distribution in the manufacturing sector.

capital inside their own firms thereby driving up the interest rate. As described above, this general equilibrium effect hurts the smaller entrepreneurs relying on external finance. Accordingly, free trade redistributes income from the large number of relatively small entrepreneurs towards the narrow group of large producers.

Note that our model differs in several dimensions from models relying on competitive goods markets, among them Mayer's (1984) median-voter model and Grossman and Helpman's (1994) special-interest group model, that contributed to the literature on "the political economy of trade policy". By assuming that capital is the only factor of production and that all firms have the same cost function we rule out redistribution on grounds of relative factor endowments or specific factor ownership. Instead, we are assuming production possibilities very similar to those in Krugman (1979). Yet, under autarky, we allow the Southern producers to have monopoly power that is, however, removed when switching to a free trade regime. The conjecture that firms face a higher elasticity of demand in the export markets (and, consequently, in the integrated world market after the trade liberalization has taken place) has been brought up by many authors, among them Rieber (1982) and Dixit (1984). Helpman and Krugman (1989) call the idea that international trade increases competition the oldest insight in the area of trade policy and imperfect competition. We stress that this pro-competitive effect is of particular relevance in developing countries and are then interested in redistribution within the class of entrepreneurs due to increased competitive pressure, i.e. in the change of the returns to the mobile and homogeneous factor (here capital).[5]

Consistent with this focus, we do not allow for industry-specific tariffs or subsidies. The analysis presented here is on a higher level of aggregation. Our aim is not to explain cross-industry variations in tariffs but to analyze the

[5] Trade policy cannot affect the return to the "mobile" factor in Grossman and Helpman (1994) because there is a freely traded numeraire good that is manufactured with constant returns to scale form the "mobile" factor alone. Mayer's (1984) analysis in Section III assumes that the "mobile" factor is equally distributed among the individuals.

distributional consequences of, for instance, the decision to join or to absent from an integration agreement that affects import or export restrictions for the whole manufacturing sector.

The organization of the paper is as follows. Section 2 sets up the basic model for a closed economy and shows existence and uniqueness of the equilibrium. The effects of trade liberalization on the income distribution and on the size-distribution of firms are explored in Section 3. In Section 4, we derive comparative static results. In particular, we discuss the impact of changes in the level of financial development or the wealth distribution on both the income distribution and the size-distribution of firms. Section 5 discusses the main results and concludes.

2 The Closed Economy

2.1 Preferences and the Industry Structure

The economy is populated by a continuum of individuals. The population size is normalized to 1. The individuals are heterogeneous with respect to their initial capital endowment $\omega_i, i \in [0,1]$, and their production possibilities. The initial wealth endowments are distributed according to the distribution function $G(\omega)$, which gives the measure of the population with wealth less than ω. We further assume that $g(\omega)$, the density function, is positive over the whole range $[0, \overline{\omega}]$, where $\overline{\omega}$ denotes the highest wealth level in the economy.

Each individual is a monopoly supplier of a single differentiated good and has access to a technology that allows to transform 1 capital unit into 1 unit of output. Capital is the only input into production. Throughout the whole analysis, we abstract from state-owned enterprises.

The assumption concerning the industry structure is motivated by the following observations that, however, are not explicitly built into the model. Typically, there are significant barriers to entry in poor countries. These barriers may either take the form of both time- and cost-intense official procedures as-

sociated with the set-up of new production facilities as described, for instance, by Djankov et al. (2002). Or they may consist of high corruption (De Soto, 1989) or both. In combination with a relatively small home demand, these barriers to entry protect the incumbents. Moreover, in very poor countries where *family businesses* account for the overwhelming part of economic activity (Bhattacharya and Ravikumar, 2001), specific business skills are transferred down through the generations and are not easily accessible for entrants. The model could be extended to allow for multi-product monopolists or conglomerates that play in important role in some developing countries (Leff, 1978). It should be noted, however, that a large part of the plants are owned by single plant firms.[6]

The utility function of the individuals is assumed to be of the familiar CES-form

$$U = \left[\int_0^1 c_j^{\frac{\sigma-1}{\sigma}} dj \right]^{\frac{\sigma}{\sigma-1}}, \ \sigma > 1, \tag{1}$$

where c_j is consumption of good j. Note that all goods produced in the closed economy enter the utility function symmetrically.[7] Hence, each monopolist faces the same isoelastic demand curve. Individual i maximizes the objective function (1) subject to the budget constraint

$$\int_0^1 p_j c_j dj = y(\omega_i), \tag{2}$$

where p_j is the price of good j. $y(\omega_i)$ is defined as individual i's nominal income that, of course, depends on the individuals initial capital endowment. The exact functional relationship between income and initial wealth is specified in Subsection 2.3. Under these conditions, individual i's demand for the jth good

[6] Clerides et al. (1998) report that, in semi-industrialized countries where the calculation is possible, 95 percent of the plants are owned by single-plant firms.

[7] In principle, the individuals have preferences over a larger spectrum of goods. However, since only goods in the range $[0, 1]$ are produced under autarky, all integrands $c_j^{(\sigma-1)/\sigma}$ with $j > 1$ are zero in equilibrium. So, we may think of equation (1) as a reduced form utility function.

is given by

$$c_j(y(\omega_i)) = \left(\frac{p_j}{P}\right)^{-\sigma} \frac{y(\omega_i)}{P}, \tag{3}$$

where $P = \left[\int_0^1 {p_j}^{1-\sigma} dj\right]^{1/(1-\sigma)}$ is the familiar CES price index. In a goods market equilibrium, aggregate demand for good j must be equal to its supply which is, due to the linear technology, equal to the capital invested into entrepreneur j's firm, k_j. As it is shown in the following subsection, k_j may depend on wealth endowment ω_j. The goods market equilibrium condition allows us to express the real price of good j as a function of the firm size and the real output:

$$\frac{p_j}{P} = \frac{p(k_j)}{P} \equiv \left(\frac{Y}{P}\right)^{\frac{1}{\sigma}} k_j^{-1/\sigma}, \tag{4}$$

where $Y \equiv \int_0^1 p(k_j) k_j dj$ is the nominal output in our economy. Note that, in a goods market equilibrium, the real price is strictly decreasing in the firm size k_j. The reason is simple. A larger investment translates one-to-one into higher output. Since the marginal utility from consuming a given good decreases in the quantity consumed, the consumers can only be induced to buy higher quantities by lower prices.

Later on, it will be helpful to have an expression for the real output (utility of an entrepreneur earning the average income) that depends only on the size-distribution of firms. Using equation (4) in the definition of the nominal output, we obtain

$$\frac{Y}{P} = \left[\int_0^1 k_j^{\frac{\sigma-1}{\sigma}} dj\right]^{\frac{\sigma}{\sigma-1}}. \tag{5}$$

Henceforth we use $P = 1$ as the numéraire. This implies that nominal output equals real output. In addition, for ease of notation, we do not distinguish between the indices for goods and the indices for individuals.

2.2 The Capital Market

Individuals may borrow on a capital market. Unlike the goods market, the capital market is competitive in the sense that both lenders and borrowers take the equilibrium rate as given. However, we assume that the capital market is

imperfect since borrowing at the equilibrium interest rate may be limited. Following Matsuyama (2000) in the modelling of the imperfection, credit-rationing arises from imperfect enforcement of (credit) contracts.[8] The way we model the credit market, although stylized, seems to be relevant in the context of developing countries. Many authors stress that access to debt is not limited because the lenders have significant monopoly power over clients but because of poor collateral law and weak judicial law, making it hard to enforce contracts in a court.[9] In the event of default, borrower i loses only a fraction $\lambda \in (0, 1]$ of his project output $p(k_i)k_i$. The parameter λ can be viewed as a measure for the level of financial development. A small λ means that creditor rights are poorly developed whereas a value close to 1 stands for strong creditor protection. Note that poor law enforcement prevents individuals in our model also from overcoming the credit market imperfection by pooling their wealth endowment and running, for instance, a two-product firm. La Porta et. al. (1998) provide some empirical evidence showing that poor legal protection results in high ownership concentration.

Taking into account the borrower's incentives, a lender will only give credit up to $\lambda p(k_i)k_i/\rho_i$ where ρ_i denotes the interest rate entrepreneur i faces. So, a borrower will never renege on his debt in equilibrium. Since there are no other individual-specific risks associated with entrepreneurship, the interest rate is the same for all borrowers: $\rho_i = \rho$, where $i \in [0, 1]$.

The maximum amount that entrepreneur i can invest is then determined by $\overline{k} = \omega_i + \frac{\lambda}{\rho} p(\overline{k})\overline{k}$.[10] Using equation (4) we get

$$\overline{k} = \omega + \frac{\lambda}{\rho} Y^{\frac{1}{\sigma}} \overline{k}^{\frac{\sigma-1}{\sigma}}. \tag{6}$$

Equation (6) implicitly determines $\overline{k}$ as a function of ω. We denote this function

[8] This type of credit market imperfections, also known as costly state verification, was first introduced by Townsend (1979).

[9] See, e.g., Ray (1998).

[10] Since the initial wealth is the only *individual specific* factor that determines the maximum firm size, the index for individuals will be dropped for the rest of this section. That is, we write ω in place of ω_i if convenient.

by $\overline{k}(\omega)$. In the lemma below we show that, in equilibrium, the maximum amount of credit and, consequently, the maximum investment depend positively on the initial capital endowment. That is, initial wealth plays the role of a collateral in our model. So, we get the intuitive result that wealthier individuals may run larger firms. However the impact of an additional wealth unit on the firm size decreases in the wealth level. This is because marginal return falls when the firm grows large.

Lemma 1 *In equilibrium, the maximum investment size is strictly increasing and concave in the initial capital endowment.*

Proof. *The proof is most easily done by a graphical argument. Whereas the left-hand side (LHS) of equation (6) increases one-for-one in $\overline{k}$ starting from zero, the right-hand side (RHS) starts at ω and its slope reaches zero as $\overline{k}$ grows very large. Thus, $\overline{k}$ is uniquely determined. An increase in ω shifts up the RHS such that the new intersection of the LHS and the RHS lies to the right of the old one. Having established that $\frac{d\overline{k}}{d\omega} = \left(1 - \frac{\lambda}{\rho} p(\overline{k}) \frac{\sigma-1}{\sigma}\right)^{-1} > 0$ and using equation (4), we see that $\frac{d^2\overline{k}}{d\omega^2} < 0$.* ■

If not restricted by the capital market imperfection, an entrepreneur increases his project size up to the point where the marginal revenue $\frac{d[p(k)k]}{dk} = \frac{\sigma-1}{\sigma} Y^{1/\sigma} k^{-1/\sigma}$ is equal to the equilibrium interest rate ρ (marginal costs). So, the optimal project size, denote it by $\widetilde{k}$, and the initial wealth endowment that allows exactly for this project size, denote it by $\widetilde{\omega}$, are given by

$$\widetilde{k} = Y \rho^{-\sigma} \left(\frac{\sigma - 1}{\sigma}\right)^{\sigma} \tag{7}$$

and

$$\widetilde{\omega} = \begin{cases} \left(1 - \lambda \frac{\sigma}{\sigma-1}\right) \widetilde{k} & : \quad \lambda < \frac{\sigma-1}{\sigma} \\ 0 & : \quad \lambda \geq \frac{\sigma-1}{\sigma} \end{cases} \tag{8}$$

respectively. As can be seen from equation (8), there exists a group of restricted entrepreneurs if and only if $\lambda < \frac{\sigma-1}{\sigma}$. Instead, if $\lambda \geq \frac{\sigma-1}{\sigma}$, even individuals with zero capital endowment can choose the optimal firm size and will produce at the point where marginal revenue equals marginal costs. Why? The smaller

σ (the elasticity of substitution), the higher is the constant mark-up $\frac{\sigma}{\sigma-1}$ over marginal costs ρ. So, even for poor individuals, the project output relative to the payment obligation is large if σ is small. This means that only a strong capital market imperfection (a very low λ) leads a borrower to renege on his debt. Put in other terms, the capital market imperfection is binding for some individuals in equilibrium if and only if the imperfection in the capital market is larger than the imperfection in the product market.

We are now ready to discuss the size-distribution of firms. The project sizes of individuals with initial endowment between 0 and $\widetilde{\omega}$ are implicitly determined by equation (6). Since they are not able to implement the monopoly solution $\widetilde{k}$ we refer to them as *credit-rationed* entrepreneurs. By Lemma 1, the firm sizes of these entrepreneurs increase in the initial wealth endowment ω. Individuals whose endowments lie in the range $[\widetilde{\omega}, \widetilde{k}]$ invest $\widetilde{k}$ and borrow the difference $\widetilde{k}-\omega$. Finally, very rich individuals ($\omega > \widetilde{k}$) manage a firm of size $\widetilde{k}$ and, in addition, act as lenders. So, given that the capital market imperfection is "more severe" than the goods market imperfection and given that there is a positive mass of credit-rationed individuals, an uneven distribution of initial wealth endowments and an uneven size-distribution of firms go hand in hand. The discussion so far is summarized in equation (9) and in Figure 1.

$$k(\omega) = \begin{cases} \overline{k}(\omega) & : \quad \omega < \widetilde{\omega} \\ \widetilde{k} & : \quad \omega \geq \widetilde{\omega} \end{cases} \tag{9}$$

Figure 1 here

Since each firm faces the downward-sloping demand curve (4), the prices across goods may differ as well. Larger firms charge lower prices - despite the fact that each good enters the utility function symmetrically. Note, however, that in case of $\widetilde{\omega} = 0$ (no credit-rationing) firm sizes will fully equalize since each firm has the same technology, faces the same demand curve and sets the same profit-maximizing price. So, in our model, full equity is the "natural" size-distribution, i.e. the size-distribution that would emerge on the basis of technology and market size alone. By equation (5), the "natural" size-distribution maximizes

real output.

In the lemma below, the highest price paid in an equilibrium with a positive mass of credit-rationed entrepreneurs is calculated.

Lemma 2 *In an equilibrium with a positive mass of credit-rationed individuals, the highest price is given by* $p(\overline{k}(0)) = \frac{\rho}{\lambda}$.

Proof. *By Lemma 1, individuals with a zero wealth endowment run the smallest firms and, consequently, charge the highest prices among the group of credit-rationed entrepreneurs. In case of* $\omega = 0$, $\overline{k}(0)$ *can be explicitly calculated as* $(\lambda/\rho)^{\sigma} Y$. *Using this expression in equation (4) results in* $p(\overline{k}(0)) = \frac{\rho}{\lambda}$. ■

The preceding discussion leads us directly to a specification of aggregate (gross-) capital demand which is simply the sum over all firm sizes:

$$K^D(\rho) = \int_0^{\infty} k(\omega) dG(\omega) = \int_0^{\widetilde{\omega}} \overline{k}(\omega) dG(\omega) + \int_{\widetilde{\omega}}^{\infty} \widetilde{k} dG(\omega), \tag{10}$$

Since the project sizes of both the restricted and unrestricted individuals depend on ρ, aggregate capital demand depends on ρ as well. In contrast, aggregate capital is exogenous and therefore inelastically supplied: $K^S = E[\omega] = \int_0^{\infty} \omega dG(\omega)$. The following proposition focuses on the capital market equilibrium. The equilibrium is shown in Figure 2.

Figure 2 here

Proposition 1 *There exists a unique capital market equilibrium.*

Proof. *(i) We first focus on the case* $\lambda < \frac{\sigma-1}{\sigma}$ *(credit-rationing). It is not possible to compute aggregate (gross-) capital demand explicitly. However, we can show that capital demand decreases uniformly in* ρ. *Since (gross-) capital demand is the sum over all individual project sizes, we have to determine how these project size depend on* ρ. *The two derivatives are given by*

$$\frac{d\overline{k}(\omega)}{d\rho} = \frac{-\frac{\lambda}{\rho^2} p(\overline{k}(\omega))\overline{k}(\omega) + \frac{\lambda}{\rho}\frac{1}{\sigma}\frac{\overline{k}(\omega)}{Y}\left(\frac{\overline{k}(\omega)}{Y}\right)^{-1/\sigma}\frac{dY}{d\rho}}{1 - \frac{\lambda}{\rho}\left(\frac{\overline{k}(\omega)}{Y}\right)^{-1/\sigma}\frac{\sigma-1}{\sigma}} < 0$$

and

$$\frac{d\widetilde{k}}{d\rho} = \frac{\widetilde{k}}{Y}\frac{dY}{d\rho} - Y\rho^{-\sigma-1}\sigma\left(\frac{\sigma-1}{\sigma}\right)^{\sigma} < 0,$$

respectively. By Lemma 1, the denominator of the first equation is positive. Holding Y constant, an increase in the interest rate decreases both the firm sizes of the credit-rationed entrepreneurs and $\widetilde{k}$. This means that $dY/d\rho$ must be negative (equation 5) as well. Thus, taking into account that Y adjusts endogenously reinforces the direct effect of the increase in the interest rate. To see that K^D monotonically decreases in ρ we show that $dY/d\rho$ is greater than minus infinity. Using equation (5), we have

$$\frac{dY}{d\rho} = \int_0^{\widetilde{\omega}} p(\overline{k}(\omega))\frac{d\overline{k}(\omega)}{d\rho}dG(\omega) + \int_{\widetilde{\omega}}^{\infty} p(\widetilde{k})\frac{d\widetilde{k}}{d\rho}dG(\omega)$$

Using the expression for $d\overline{k}(\omega)/d\rho$ and $d\widetilde{k}/d\rho$ in the above equation and rearranging terms results in

$$\frac{dY}{d\rho} = \left[\int_0^{\widetilde{\omega}} \frac{p(\overline{k}(\omega))\overline{k}(\omega)}{Y}x(\omega)dG(\omega) + \int_{\widetilde{\omega}}^{\infty} \frac{p(\widetilde{k})\widetilde{k}}{Y}dG(\omega)\right]\frac{dY}{d\rho} - \Delta,$$

where Δ and the term in brackets are positive constants. The factor $x(\omega)$ is given by

$$x(\omega) = \frac{\frac{\lambda}{\rho}\left(\frac{\overline{k}(\omega)}{Y}\right)^{-1/\sigma}\frac{1}{\sigma}}{1 - \frac{\lambda}{\rho}\left(\frac{\overline{k}(\omega)}{Y}\right)^{-1/\sigma}\frac{\sigma-1}{\sigma}}.$$

Note that $dY/d\rho$ is greater than minus infinity if and only if the term in brackets is strictly smaller than 1. Assume for a short while that $x(\omega)$ equals 1 for all ω. In this case, the term in brackets is exactly 1. Thus, a sufficient condition to establish that the term in brackets is smaller than 1 is $\frac{\lambda}{\rho}\left(\overline{k}(\omega)/Y\right)^{-1/\sigma}\frac{1}{\sigma} < 1 - \frac{\lambda}{\rho}\left(\overline{k}(\omega)/Y\right)^{-1/\sigma}\frac{\sigma-1}{\sigma}$ for some $\omega < \widetilde{\omega}$. This is equivalent to $\lambda p(\overline{k}(\omega))/\rho < 1$ for some $\omega < \widetilde{\omega}$. Since the price of goods of individuals with endowment zero is given by ρ/λ (Lemma 2) and the prices are decreasing in the firm size (equation 4), the latter inequality holds for all individuals with $\omega > 0$. Hence, we may conclude that capital demand decreases uniformly in ρ. It is

easy to see that K^D *reaches zero at* $\rho = \frac{\sigma-1}{\sigma}$. *In this situation, we have* $\widetilde{k} = Y = \left[\int_0^{\widetilde{\omega}} \overline{k}(\omega)^{(\sigma-1)/\sigma} dG(\omega) + (1 - G(\widetilde{\omega}))\widetilde{k}^{(\sigma-1)/\sigma}\right]^{\sigma/(\sigma-1)}$, *where the first equality follows from equation (7). Since* $\overline{k}(\omega) < \widetilde{k}\ \forall\ \omega < \widetilde{\omega}$ *and* $\widetilde{\omega} > 0$, *the only solution to the above equation is* $\widetilde{k} = \widetilde{\omega} = 0$ *which means that capital demand is zero. From equation (6) we know that* K^D *goes to infinity as* ρ *approaches* λ *from above. Since capital supply is constant, we can conclude that there exists a unique equilibrium.*

(ii) Assume now that $\lambda \geq \frac{\sigma-1}{\sigma}$ *(no credit-rationing). In this situation, capital demand can easily be computed and is given by* $\int_0^{\infty} \widetilde{k} dG(\omega) = Y\rho^{-\sigma}\left(\frac{\sigma-1}{\sigma}\right)^{\sigma}$. *Since all agents run a firm of the same size, (gross-) capital supply,* K^S, *can be written as* $\widetilde{k} = Y$. *Hence, the equilibrium interest rate, which can be calculated by equating capital demand and capital supply, is completely independent of capital supply and equals* $\frac{\sigma-1}{\sigma}$. *This means that the capital demand curve is horizontal at* $\frac{\sigma-1}{\sigma}$. ■

Finally, consider the case $\lambda = 0$, a situation characterized by absent creditor rights, in which default is not followed by sanctions. Under these circumstances, the equilibrium is easily derived as the capital market does not exist at all. No borrower would ever honour his debt and, consequently, there are no lenders. In this benchmark case, the firm size of each agent would be given by his initial capital endowment. By equation (5), real output is minimized.

2.3 The Income Distribution

This subsection explores how the distribution of the initial capital endowments and the income distribution are related. To this end we look at the function that relates initial capital endowment, ω, to income, y:

$$y(\omega) = \begin{cases} (1-\lambda)p(\overline{k}(\omega))\overline{k}(\omega) & : \quad \omega < \widetilde{\omega} \\ p(\widetilde{k})\widetilde{k} + (\omega - \widetilde{k})\rho & : \quad \omega \geq \widetilde{\omega} \end{cases} \tag{11}$$

The following lemma shows that income is a concave function of initial wealth. Hence the income distribution is more equal than the distribution of capital endowments.

Lemma 3 *In an equilibrium, an individual's income is strictly increasing and concave in his initial capital endowment.*

Proof. *The marginal return of initial capital endowment is given by*

$$\frac{dy(\omega)}{d\omega} = \begin{cases} (1-\lambda)\frac{\sigma-1}{\sigma}p(\overline{k}(\omega))\left[1-\frac{\lambda}{\rho}p(\overline{k}(\omega))\frac{\sigma-1}{\sigma}\right]^{-1} & : \quad \omega < \widetilde{\omega} \\ \rho & : \quad \omega \geq \widetilde{\omega} \end{cases} \tag{12}$$

The signs of both the upper and the lower expression in the above equation are positive (see proof of Lemma 1). Whereas ρ is constant in an equilibrium, the behaviour of $dy/d\omega$ remains to be discussed if $\omega < \widetilde{\omega}$. By Lemma 1, $\overline{k}$ is positively related to ω and by equation (4), the price decreases in the firm size. This means that the larger the initial capital endowment, ω, the smaller the numerator and the bigger the denominator. Hence, if $\widetilde{\omega} > 0$, the marginal return decreases until $\widetilde{\omega}$ is reached and then remains constant. ■

By showing that y is strictly concave as long as $\omega < \widetilde{\omega}$, the above lemma makes immediately clear that the income distribution must be more equal than the endowment distribution in the case where $\widetilde{\omega} > 0$. This statement remains true if $\lambda \geq \frac{\sigma-1}{\sigma}$ and, consequently, $\widetilde{\omega} = 0$. In that case, the income function takes the simple form $Y/\sigma + \frac{\sigma-1}{\sigma}\omega$. So, as long as the firms have monopoly power, the income distribution is more equal than the wealth distribution. This is an important point. Preventing trade in goods and capital benefits those monopoly producers who own only a relatively small capital endowment and, consequently, face a *relatively* large home demand under financial autarky. The monopolistic structure of the economy and the fact that capital and goods cannot go abroad allow them to acquire "cheap" productive resources and to sell, relative to financial autarky, additional units at high prices.

In contrast, entrepreneurs having the own resources to set up a large-scale production of their commodities suffer from being restricted to their *relatively* small home markets, i.e. from not being allowed to export parts of their production. In order to avoid driving down the prices at home too much they are forced to leave some of their capital endowment - at unfavorable conditions - to the smaller monopolists.

3 Integrating into the World Economy

This section explores the distributional consequences of scaling back trade barriers, i.e. the changes in manufacturers' incomes due to an integration into the North' competitive goods markets. In Subsection 3.2 the baseline case of competitive supply of all goods is considered whereas in Subsection 3.3 some Southern firms can sustain their monopoly power.

3.1 Assumptions

Until now it was assumed that the trade barriers were sufficiently high to make trade between the North and the South impossible. For analytical tractability we now simply focus on the opposite case, i.e. on the case where the tariffs or non-tariff barriers that prohibited either imports or exports or both are cut back to zero. Moreover, we assume that there are no other obstacles to trade such as transportation costs between the North and the South. So, the law of one price holds for every good. In addition to that we have to make assumptions concerning the world population, the industry structure that prevails in the integrated (world) market, the technology available in the North, and the level of financial development in the North.

Individuals. The world is populated by a continuum of individuals of size $L > 1$. The South consists of individuals on the interval $[0, 1]$. The remaining individuals are located in the North. Individuals elsewhere have the same preferences. The preferences are similar to those in equation (1) unless that we account for the fact that the integration may increase the spectrum of available goods in the South (and also in the North):

$$U = \left[\int_0^n c_j^{\frac{\sigma-1}{\sigma}} dj \right]^{\frac{\sigma}{\sigma-1}}. \tag{1'}$$

The above utility function indicates that the spectrum of available goods - which is the same for all individuals - is now given by $[0, n]$. Accordingly, the CES price index is now given by $P = \left[\int_0^n {p_j}^{1-\sigma} dj\right]^{1/(1-\sigma)}$. As in the previous section, the

price level is normalized to 1 such that nominal income measures utility derived from optimal consumption.

Industry Structure. The North *competitively* produces goods on the range $[m, n]$, where $0 \leq m < 1$ and $n \geq 1$. Two qualitatively different industry structures are considered in turn.

First, in Subsection 3.2, it is assumed that $m = 0$ so that the goods manufactured in the South form the subset $[0, 1]$ of the continuum of goods that is produced in the North. Thus, the South produces only *commodities* which can be (and are indeed) produced by a large number of Northern producers. As a consequence, the integration removes the monopoly power of the Southern manufacturers. To put it in other terms, no sector or no firm in the Southern economy has access to a technology that allows to produce goods that the North cannot produce. The reverse, however, does not hold. By assuming $n \geq 1$ we allow the North to have access to a broader set of technologies and therefore to have more variety. We may think of goods with a high index as recently developed goods ("new goods") that are exclusively produced in the innovating North. The remaining goods are developed some time ago ("old goods") and can - as a result of technology transfer - also be produced in the non-innovating South.[11] Note further that assuming competitive supply of the goods *exclusively* produced in North is just for convenience and is not crucial to our argument. Since we may interpret the goods close to n as the most recently developed ones we could assume that they are monopolistically supplied (due to, for instance, temporary patent protection) without altering the qualitative results.

Second, in Subsection 3.3, it is assumed that $m \in (0, 1)$ implying that a fraction $m > 0$ of Southern entrepreneurs (those who are located on the interval $[0, m)$) can sustain market power. Thus, their monopoly position is not granted by artificial barriers to entry (as it is the case for the remaining Southern firms under autarky) but, for instance, by innovative activities. The remaining firms in the South (as well as all Northern firms) behave competitively on the inte-

[11] In this sense, our assumptions concerning the production possibilities are very similar to that in Krugman (1979).

grated goods markets. Intuitively, we consider a country with a higher fraction of firms producing goods with no perfect substitute counterparts on the integrated market as (economically) more advanced.

Technology. We continue to assume that one unit of capital is required to produce one unit of a good. Accordingly, the firm producing the specific good $j \in [m, 1]$ in the South has access to the same technology as the large number of firms producing the same good in the North. This assumption is just to make things as simple as possible. The distributional consequences of a trade liberalization to be derived below do not hinge on this assumption.[12] Since technology is the same across regions, total output of good j is given by the sum of capital invested into its production, k_j^l. The superscript $l \in \{I, II]$ indicates whether we consider the case of competitive supply of all goods (Regime I) or the case of monopolistic supply of some Southern goods (Regime II). For the rest of this section we replace k_j in the equations (4) and (5) by k_j^l and add up over the range $[0, n]$ to calculate Y^l that refers now to worldwide real output.

Capital Markets and Capital Supply. We continue to assume that neither entrepreneurs nor capital is mobile across regions. As a consequence, the interest rates in North and the South may differ. The capital market in the North is assumed to be perfect whereas the South (possibly) suffers form an imperfect financial system. Finally, we presume that the aggregate capital endowment in the North is large relative to that in the South in a sense to be made precise below.

3.2 Removed Monopoly Power (Regime I)

In a competitive equilibrium, the price of a specific good must be equal to the marginal costs of producing that good. Since all firms in a given region, either the South or the North, face the same marginal costs, prices across goods must be equal as well. Given that the law of one price between the two regions

[12] In particular, if we assumed a lower productivity in the South, one can show that *relative change* in income due to an integration is the same in both situations.

holds, the goods prices in the South must adjust to the level that has already prevailed in the North. Since prices equal marginal costs and the technology is the same across regions the interest rates must also be the same. More formally, all goods prices p_j, $j \in [0, n]$, and the interest rate in the South take the value $p_j = p^I \equiv n^{\frac{1}{\sigma-1}} = \rho^I$ after the integration has been completed.[13] According to equation (4), for the prices to equalize, worldwide production of each good must equalize as well. Since we assume that aggregate capital endowment in the North is large, worldwide investment into the production of each good may equalize no matter what the level of financial development in the South is and no matter what the distribution of capital endowments in the South looks like. So, we have $k_j^I = k^I = \int_0^L \omega(i)di/n$ for all goods j in the range $[0, n]$. Worldwide aggregate output is given by $Y^I = \int_0^n p^I k^I dj = n^{\frac{\sigma}{\sigma-1}} k^I$. Real income in the South can be calculated as $\int_0^1 p^I \omega_i di = n^{\frac{1}{\sigma-1}} \int_0^1 \omega_i di = n^{\frac{1}{\sigma-1}} K^S$. According to equation (5), K^S is the maximum real output under autarky that can only be attained if $\lambda \geq \frac{\sigma-1}{\sigma}$. Thus, there are two channels through which the trade liberalization may increase real income in the South. First, if $\lambda < \frac{\sigma-1}{\sigma}$, the integration leads to a more even supply of goods. Second, if $n > 1$, free trade with the North brings more variety. To summarize (proof in the text),

Proposition 2 *A move from autarky to free trade that removes market power of all Southern monopolists increases aggregate income in the South if either* $\lambda < \frac{\sigma-1}{\sigma}$ *or* $n > 1$.

An immediate corollary of the analysis so far is that the function relating real income to the initial capital endowment takes now the particularly simple form $y^I(\omega_i) \equiv p^I \omega_i = n^{\frac{1}{\sigma-1}} \omega_i$. Comparing this function with equation (11) we see how the integration changes the income distribution in the South. In Figure 3, income under autarky as a function of capital endowment is shown for three different levels of financial development.

Figure 3 here

[13] To see that p^I equals $n^{1/(\sigma-1)}$ remember that the choice of the numéraire implies that $1 = \left[\int_0^n (p^I)^{1-\sigma} dj\right]^{1/(1-\sigma)}$.

Whereas the curve OD represents a situation with inexistent capital markets, the curves OC and OB are drawn for an intermediate level of λ and for $\lambda \geq \frac{\sigma-1}{\sigma}$, respectively. The radiant OA represents $y^I(\omega_i)$, i.e. the situation after the integration has taken place. The figure shows that, with respect to changes in real income, the trade liberalization divides the class of entrepreneurs into two different groups. Entrepreneurs with a capital endowment above ω^*, where ω^* is defined by $y(\omega^*) = y^I(\omega^*)$, win whereas the poorer manufacturers lose. The exact size of the winning and the losing group, respectively, depends on how much additional variety the integration generates, on the level of financial development and on the distribution of initial capital endowments. The latter two determinants are discussed in detail in the following section. However, the central result that there are two groups whose members are affected differently is independent of the three determinants.

Proposition 3 *Consider a move from autarky to free trade that removes market power of all Southern monopolists. Then there exists always an endowment level $\omega^* \in (0, \overline{\omega})$ such that the incomes of entrepreneurs with $\omega < \omega^*$ decrease and the incomes of entrepreneurs with $\omega > \omega^*$ increase.*

Proof. *Suppose first that $\lambda > 0$. The properties of $y(\omega_i)$ derived in Lemma (3) ensure that there is exactly one crossing (from above) with the radiant $y^I(\omega_i)$. Since $y(0) > 0$ and $n < \infty$ the threshold level ω^* is strictly bigger than 0. To derive an upper bound for ω^*, assume that $n = 1$. Under autarky, from equations (4) and (7), we have $p(\widetilde{k}) \leq 1$ or, equivalently, $y(\widetilde{k}) \leq \widetilde{k}$. Note that $y^I(\widetilde{k})$ equals $\widetilde{k}$ so that $y(\widetilde{k}) \leq y^I(\widetilde{k})$. Since $\widetilde{k} < \overline{\omega}$ for any non-degenerate distribution of capital endowments we conclude that $\omega^* \leq \widetilde{k} < \overline{\omega}$.*

Suppose now that $\lambda = 0$. In this case, we have $y(0) = 0$ and $\lim_{\omega \to 0} \frac{dy(\omega)}{d\omega} \to \infty$ which leads us to the conclusions that $y(0) = y^I(0)$ and that $y(\omega) > y^I(\omega)$ for ω close to zero (note that the individuals with $\omega = 0$, which are only of measure 0, are unaffected). To derive an upper bound for ω^*, let's again assume that $n = 1$. Then, under autarky and given a non-degenerate distribution of initial capital endowments, we have $p(\overline{\omega}) < 1$ or, equivalently, $y(\overline{\omega}) < \overline{\omega} = y^I(\widetilde{k})$. ■

Intuitively, under autarky, the entrepreneurs face downward sloping demand and marginal return curves in the home market. In addition, they cannot export capital or parts of their production. To avoid very low relative prices for their goods at home and due to the lack of other business opportunities, capital-rich individuals are forced to lend resources to other monopolists who face - relative to their own production possibilities - a large home demand. The removal of trade barriers alters the situation completely. It is true that also the wealthy lose their monopoly power but, at the same time, they no longer suffer from the low returns on the capital that cannot be employed in their own firms under autarky. So, they face better business opportunities in the sense that they can serve a larger demand. In addition, they benefit from more variety (if $n > 1$) and from a more even supply of goods (if $\lambda < \frac{\sigma-1}{\sigma}$). The benefits turn out to have a stronger impact on real income than the loss of the monopoly power if the capital endowment lies above some threshold level. The poorer individuals, in contrast, lose because the monopoly position offered them high returns on their relatively small wealth endowment and rents on each capital unit borrowed.

How does the size-distribution of firms in the South change in response to this type of integration? As a result of the loss of monopoly power, the maximum amount of individual investment under free trade, $\overline{k}^I(\omega)$, is given by $\frac{1}{1-\lambda}\omega$. Since

$$\left.\frac{d\overline{k}(\omega)}{d\omega}\right|_{\omega<\widetilde{\omega}} > \left.\frac{d\overline{k}(\omega)}{d\omega}\right|_{\omega=\widetilde{\omega}} = \frac{1}{1-\lambda} = \frac{d\overline{k}^I(\omega)}{d\omega}$$

and since $\overline{k}(0) > \overline{k}^I(0)$ we know that the firm sizes of individuals with wealth endowment in the range $[0, (1-\lambda)\widetilde{k}]$ are larger under autarky than they can be in a free-trade regime (see Figure 4).

Figure 4 here

Accordingly, individuals with a relatively small wealth endowment have to scale down their firm sizes whereas some of the substantially endowed entrepreneurs will employ more capital. The exact production structure under free trade, however, remains indeterminate as a result of perfect competition and CRS-technology.

Note further that there are trade flows even in the absence of differences in relative factor endowments or technology. The trade flows are determined by the wealth distribution. The capital-rich entrepreneurs tend to be the exporters. Perfect substitutes of goods produced by capital-poorer entrepreneurs will be imported.

3.3 Sustained Monopoly Power (Regime II)

Very similar to the case above, worldwide production as well as the prices of the *competitively* supplied goods must equalize in the new equilibrium. Thus, we have $k_j^{II} = k_C^{II}$ and $p_j^{II} = p_C^{II}$ for $j \in [m, n]$, where the subscript C identifies a competitively supplied commodity. These adjustments of quantities and prices are accompanied by an adjustment of the interest rate both in the North and the South. The interest rate will be equal to the price of the competitively supplied goods: $\rho^{II} = p_C^{II}$. Things change when it comes to the Southern producers (those on the interval $[1, m)$) who can sustain market power.

For a monopolistic supplier j marginal revenue is still given by $\frac{\sigma-1}{\sigma}p(k_j)$. Such an entrepreneur produces a quantity $\widetilde{k}^{II} < k_C^{II}$ that equates marginal revenue with marginal cost, ρ^{II}, if he has enough own resources or, alternatively, if he has sufficient access to the capital market. Otherwise, he will produce the largest possible quantity, $\overline{k}^{II}(\omega) < \widetilde{k}^{II} < k_C^{II}$, where the definitions of $\overline{k}^{II}(\omega)$ and $\widetilde{k}^{II}$ are analogous to that in the equations (6) and (7). Given this production structure, the marginal return on capital of those entrepreneurs who lose their monopoly power will be lower than in the case considered above: $p_C^{II} < p^I = n^{\frac{1}{\sigma-1}}$. However, for the rest of this subsection, we assume that n is large relative to m so that p_C^{II} lies above 1 and only slightly below p^I.

How do the distributional consequences differ from that discussed in Subsection 3.2? Again, the liberalization divides the group of entrepreneurs whose monopoly power is *removed* into a losing and into a winning subgroup. The poorer of them lose whereas the richer win. Clearly, very capital-rich entrepreneurs with *sustained* market power win. They not only face higher prices due

to a larger demand but also higher returns on capital not employed in the own firm. The effect on the incomes on the relatively poor monopolists, however, is ambiguous. On the one hand, they benefit also from a larger demand. On the other hand, capital costs go up. The net effect will be positive if the increase in market size is "large enough". To see this, we consider the situation of an entrepreneur that is credit-rationed both in the old and the new equilibrium. Remember that the income of a credit-rationed entrepreneur is given by $(1-\lambda)p\left(\overline{k}^{II}(\omega)\right)\overline{k}^{II}(\omega) = (1-\lambda)\left(Y^{II}\right)^{1/\sigma}\left(\overline{k}^{II}(\omega)\right)^{(\sigma-1)/\sigma}$. Since Y^{II} will be larger than the real output that prevailed in the South under autarky, the income of a credit-rationed entrepreneur will rise if the maximum amount of investment decreases not to strong or if it even rises. But this will be the case if the aggregate capital endowment in the North is large and, consequently, the ratio $\left(Y^{II}\right)^{1/\sigma}/\rho^{II}$ (that determines $\overline{k}^{II}(\omega)$) is big relative to the situation in autarky. We conclude that there is - beside the group of capital rich entrepreneurs - another group of entrepreneurs that is likely to win. This group consists of smaller entrepreneurs who are at the world technology frontier in the sense that they can sustain monopoly power in the integrated market.

Whereas in the case of $0 < m < 1$ the number of winners of a trade liberalization is likely to be larger than in the case considered above, there are no losers whatsoever if all monopolist in the South can sustain their market power ($m = 1$). It can be shown that in such a situation the firm sizes as well as the mark-ups are unaffected by the change in the trade regime. The intuition behind this result is easy to see. The integration into the Northern goods market shifts up the demand curves of the Southern monopolists. Given the interest rate, access to external finance of the credit-rationed individuals improves and the unrestricted individuals are induced to manage larger firms. The capital demand curve shifts to the right whereas capital supply remains constant since we assume that capital is immobile between the two regions. So, the interest rate rises. The jump in the interest rate has exactly the opposite effect on the firm sizes as the rise in the prices, and it turns out that the net effect is identically zero for *all firms*. This is because the CES-preferences imply that each firms

experiences the same increase in the market size when we move to a free trade regime. As a consequence of these adjustments, the incomes of all entrepreneurs rise relatively to the same extent and no distributional conflicts emerge.

We conclude that a - in terms of production possibilities - more advanced country is more prone to adopt a free trade policy since the number of losing entrepreneurs is likely to be small. To put it another way, we expect in countries with a larger number of firms close to the world technology frontier - ceteris paribus - more political support for a trade liberalization.

4 Comparative Static Results

In this section we explore how variations in the level of financial development (Subsection 4.1) and variations in the distribution of initial capital endowments (Subsection 4.2) affect the incomes under autarky and, consequently, the threshold level ω^* that separates winners form losers. This exercise provides insights into political feasibility of trade liberalizations since it allows us to discuss the determinants of both the size of the losing group and the changes in income. For simplicity of exposition we assume that the North produces the same continuum of goods as the South ($n = 1$) so that income as a function of initial wealth is given by the 45-degree radiant under free trade.

In the subsequent discussion we use the *Dalton Principle* (Dalton, 1920) to rank the income distributions and the size-distributions of firms with respect to inequality. That is, if one distribution can be achieved from another by constructing a sequence of regressive transfers, i.e. transfers from a set of poorer individuals (smaller firms) to a set of richer individuals (bigger firms), then the former distribution is more unequal than the latter. Note that, because of decreasing marginal contribution to real output with respect to individual firm sizes (equation 5), a more uneven size-distribution of firms translates into a lower real output, Y.

4.1 Variation in the Capital Market Efficiency

How the incomes under autarky (and therefore ω^*) depend on the initial capital endowments is easily discussed in case of $\lambda \geq (\sigma - 1)/\sigma$ or in case of $\lambda = 0$. As noted earlier, $y(\omega)|_{\lambda \geq (\sigma-1)/\sigma}$ equals $Y/\sigma + \frac{\sigma-1}{\sigma}\omega$, where $\frac{\sigma-1}{\sigma}$ is the equilibrium interest rate. If capital markets are absent ($\lambda = 0$), income is simply given by the revenue generated by running a firm of size ω: $y(\omega)|_{\lambda=0} = Y^{1/\sigma}\omega^{(\sigma-1)/\sigma}$.[14] Note that the function $y(\omega)|_{\lambda \geq (\sigma-1)/\sigma}$ does not depend on the distribution of initial capital endowments whereas $y(\omega)|_{\lambda=0} = Y^{1/\sigma}\omega^{(\sigma-1)/\sigma}$ clearly does. It is obvious that any $y(\omega)|_{\lambda>0}$-curve must lie everywhere above the $y(\omega)|_{\lambda=0}$-line. Clearly, all individuals are better off with $\lambda > 0$ since demand is higher compared to a situation with $\lambda = 0$ (see Lemma 4 below). In addition, wealthy entrepreneurs can escape strongly diminishing returns to investment by becoming lenders on the credit market. This allows the small entrepreneurs to increase their firm sizes (it is exactly this channel through which real output increases) and to generate additional income on each capital unit borrowed.

This discussion gives us the basic relationship between the number of losers and the level of financial development. Given the distribution of initial capital endowments, there are few losers if the capital market does not exist (ω^* is relatively low) compared to a situation with a near perfect capital market where ω^* is relatively high (Figure 3). In addition, in the former case the negative impact on the income of the poor is small whereas the income of the wealthier entrepreneurs rises dramatically when we move from autarky to free trade. In the latter case, exactly the opposite is true.

What happens to the incomes (and therefore to the threshold level ω^*) under autarky if λ is increased from some arbitrary positive level? In order to discuss the correlation between λ and ω^* we have to figure out the relationship between λ on the one hand and Y and ρ on the other hand first.

Lemma 4 *If $\lambda < \frac{\sigma-1}{\sigma}$, a rise in λ leads to a more even size-distribution of*

[14] Of course, the output Y depends on λ and on the distribution of capital endowments (if $\lambda < \frac{\sigma}{\sigma-1}$).

firms and increases Y and ρ.

Proof. *The firm sizes of the restricted and the unrestricted entrepreneurs are determined by $\overline{k}(\omega_i) = \omega_i + \lambda X \overline{k}(\omega_i)^{(\sigma-1)/\sigma}$ and $\widetilde{k} = X^{\sigma}\left[(\sigma-1)/\sigma\right]^{\sigma}$, respectively, where $X \equiv Y^{1/\sigma}/\rho$. It is immediately clear that X may not rise when λ increases since, in such a case, both the restricted and unrestricted entrepreneurs would invest more, and, consequently, capital demand would exceed capital supply. It is also obvious that λX must be larger in the new equilibrium than in the old. Otherwise, each entrepreneur would invest less than before and capital supply would exceed capital demand. Since X must fall and λX must rise, the firm sizes in the new equilibrium are larger up to a certain $\widehat{\omega}$ and are smaller above this threshold level (see Figure 5).*

Figure 5 here

According to our definition, the size-distribution of firms is more equal in the new equilibrium. By equation (5), the marginal contribution to real output of a $high-k$ firm is lower than that of a $low-k$ firm. Hence, real output increases. Now, we can immediately conclude that the interest rate must rise as well. ■

There are (at most) three effects influencing the incomes of the borrowers and, consequently, the threshold level ω^*. First, there is the positive effect that stems from the upward-shift of the individual demand functions due to a rising Y. Second, with λ and Y higher, individuals can borrow more. Accordingly, credit-rationed entrepreneurs increase their firm sizes (given ρ) which, in turn, increases their incomes (as marginal revenue exceeds marginal costs for constrained agents). However, there is a third effect. A better working legal system leads to a higher interest rate. Due to the rise in ρ, the repayment obligations increase as well. This negative influence on the borrower's incomes may be stronger than the positive demand effect. This is exactly the reason why the threshold level

$$\omega^* = \begin{cases} (1-\lambda)\left[(1-\lambda)+\frac{\lambda}{\rho}\right]^{\sigma-1} Y & : \quad \omega^* < \widetilde{\omega} \\ \left(\frac{1}{\sigma-1}\right)\left(\frac{\sigma-1}{\sigma}\right)^{\sigma} \frac{\rho^{1-\sigma}}{1-\rho} Y & : \quad \omega^* \geq \widetilde{\omega} \end{cases}$$

that separates winners from losers may locally fall in λ.[15] Consequently, despite the *globally* positive relationship between the number of losers and the level of financial development, the number of losers may fall *locally* at some intermediate levels of λ. However, it can be shown that this may not happen when λ is close to 0 or close to $\frac{\sigma-1}{\sigma}$, i.e. ω^* shifts to the right when λ is increased from 0 to some arbitrary positive level and ω^* approaches ω_B^* (see Figure 4) from the left as λ goes to $\frac{\sigma-1}{\sigma}$. So, we conclude that - given the wealth distribution - a higher level of financial development is (apart from local non-monotonies) associated with a higher number of losers of a trade liberalization.

4.2 Wealth Inequality

To discuss the relationship between the degree of inequality in the distribution of initial capital endowments and the threshold level ω^* we have to discuss the link between the former and the size-distribution of firms (which, in turn, determines Y) first.

Inequality and the size-distribution of firms. If the capital markets are near-perfect ($\lambda \geq \frac{\sigma-1}{\sigma}$), all firms are of equal size. Hence the distribution of initial capital endowments has no influence on the size-distribution of firms. In contrast, under inexistent capital markets ($\lambda = 0$), the size-distribution of firms coincides with the wealth distribution.

For intermediate levels of λ, we have to distinguish two case. First, a regressive transfer (that leads unambiguously to more uneven distribution of capital endowments) from one set of *unrestricted* individuals to another will not affect the size-distribution of firms. The former group of individuals decreases its net capital supply exactly to the same extent as the latter increases net capital supply. Thus, the firm sizes remain unaffected. This is also true for all aggregate variables. This argumentation becomes more complicated in the second case

[15] As long as $\frac{\sigma-1}{\sigma} > \rho(1-\lambda)+\lambda$, the first regime is relevant. Note that, at $\lambda = 0$, the LHS is larger than the RHS whereas at $\lambda \geq \frac{\sigma-1}{\sigma}$ the LHS is smaller than the RHS. In addition, the RHS is monotonically increasing in λ. So, as λ moves from 0 to $\frac{\sigma-1}{\sigma}$ we switch from the first to the second regime.

where we redistribute from *restricted* individuals.

Lemma 5 *If $\lambda < \frac{\sigma-1}{\sigma}$, a regressive transfer that takes away capital from restricted entrepreneurs decreases ρ.*

Proof. *The regressive transfer decreases - given ρ and Y - (gross-) capital demand. The restricted recipients may increase their capital demand only to a smaller extent than the poor donors are forced to decrease their capital demand (Lemma 1) and the unrestricted recipients even leave their capital demand unchanged (equation 7). Assume now that ρ remains constant or increases. Given this assumption and the preceding argumentation, we know that the real output Y must fall. However, this decline decreases capital demand again. Hence, capital supply exceeds capital demand. We conclude that ρ must fall to restore the equality of capital demand and supply.* ■

Since any endowment transfer from a set of *restricted* poorer individuals to a set of richer individuals (whether restricted or not plays no role) decreases the interest rate, some poor individuals - who are possibly not involved into the transfer - may increase their firm size. Due to this general equilibrium effect, the new size-distribution of firms cannot be deemed more unequal than the original size-distribution. For the same reason, we may not conclude that an arbitrary regressive transfer decreases real output. The indirect interest rate effect - leading to bigger project sizes of the non-involved poor - can outweigh the direct negative effect of a regressive transfer.[16] Put in other terms, redistribution from individuals with high marginal returns to investment to individuals with a low marginal return does not necessarily reduce output because the interest rate falls. Hence, the central intuition of models characterized by absent capital markets (e.g. Bénabou, 1996) does, in general, not go through if we consider intermediate levels of capital market imperfections.[17]

[16] This can be shown, for example, in a simple case where the population is divided into two classes and a certain share of the population is assumed to have no wealth endowment at all.

[17] It can be shown that an unambiguous prediction about the impact of a regressive transfer on the real output can be made if the transfer involves the set of the poorest restricted individuals (no matter how large this set is).

Inequality and the number of losers. Under near-perfect capital markets ($\lambda \geq \frac{\sigma-1}{\sigma}$), the function relating initial capital endowment to income, $y(\omega)|_{\lambda \geq (\sigma-1)/\sigma}$, remains unaffected by a regressive transfer since demand does not change. Under inexistent capital markets ($\lambda = 0$), the reduction in aggregate demand leads to a reduction in the incomes of the same relative magnitude. Accordingly, we conclude that in the former case ω^* remains unaffected whereas in the latter case ω^* decreases in consequence of a regressive transfer. For intermediate levels of capital market imperfection, a clear-cut prediction how the threshold level ω^* behaves cannot be made. Consider first case in which redistribution adversely affects output. Two effects going in opposite directions influence the incomes of the borrowers in this situation. First, demand for each product decreases. Second, the fall in the interest rate (Lemma 5) reduces the interest payments of the borrowers. Accordingly, it is in general not clear whether the incomes in the neighborhood of the "old" ω^* shift down or up or, to put it in other terms, it is not clear whether ω^* shifts to the left or to the right. The situation becomes clearer if, as a consequence of a regressive transfer, output increases. In this situation, the incomes of the borrowers improve for sure since they not only face lower costs of capital but demand has shifted up as well. Hence, ω^* shifts to the right.

We are now ready to discuss how a regressive transfer, i.e. more inequality in the distribution of initial capital endowments, affects the number of losers of a trade liberalization. With respect to the group sizes, we have to distinguish two effects. First, there is a *direct effect* if the individuals suffering from the transfer had an endowment above ω^*_{old} before the transfer and below ω^*_{new} after the transfer. So, the direct effect increases the number of losers. Put differently, the more the distribution is skewed to the left (for a given ω^*) the higher is the number of entrepreneurs with capital endowment below ω^*. Second, there is an *indirect effect* that results from a change in ω^* and whose direction is unclear. The strength of the indirect effect, i.e. how many entrepreneurs switch from losers to winners (or vice versa) due to a change in the threshold level ω^*, depends of course on the density of the wealth distribution at ω^*_{old}. Note,

however, that, given ω^*_{old} lies somewhere in between the relatively capital-poor entrepreneurs running smaller establishments and the capital-rich producers, the indirect effect may not play a particular important role - at least not in developing countries. As mentioned above, both the wealth distribution and the size-distribution of firms are characterized by a missing middle suggesting that the mass of individuals at ω^* is small. Based on this argumentation we expect the number of entrepreneurs that oppose a trade liberalization to be high if the wealth distribution (and therefore the size-distribution of firms) is strongly polarized.

How does a regressive transfer affect the incomes of the group members (that are not involved into the transfer) under autarky? Again assuming that the transfer has a negative impact on Y, we have to distinguish between the incomes of the borrowers and the lenders.[18] Since both the interest rate and the aggregate demand (by assumption) fall, the lenders which form the largest part of individuals with capital endowment above ω^* are clearly worse off. This suggests that most of the winners of trade liberalization benefit more from this liberalization when the distribution is more unequal. The income of individuals with a capital endowment below ω^* (which are all borrowers) is hit by two competing effects. First, as it is the case with the lenders, the fall in Y decreases the demand for their products. Second, the fall of the interest rate decreases interest payments and therefore improves their income position. Even though it is in general not clear, we see that there are good reasons to expect that the losers of a trade liberalization lose more when the distribution is polarized. Based on this we suggest that the distributional conflicts arising from a trade liberalization are enforced by a more unequal distribution of capital endowments.

[18] Note that the relatively rich borrowers and all lenders have a capital endowment above ω^*, i.e. it is always true that $\omega^* \leq \widetilde{k}$.

5 Discussion and Conclusions

The model developed here incorporates some key elements of the economic environment in poor countries. Under autarky, firms are protected from competition because of high administrative barriers to entry and not due to, for instance, producing innovative goods. Furthermore, the distribution of wealth among entrepreneurs is polarized and the level of financial development is low.

We show that, in such an environment, the asset distribution provides an explanation for trade flows even in the absence of differences in relative factor endowments and comparative advantages in technology. Moreover, we highlight that the distributional consequences of major trade liberalization steps differ from those that would prevail in more advanced countries. The aim is to gain a better understanding of why so many poor countries still protect their producers from foreign competition by high trade barriers.

A key element of our analysis is that, under autarky, high administrative barriers to entry reduce the incentives (or, as it is modeled here, make it impossible) to diversify into other industries even for the typically small number of capital-rich entrepreneurs. To escape strongly decreasing marginal returns on the small home markets, they are willing to lend some of their assets. This improves the credit conditions for the larger number of smaller entrepreneurs. To what an extent the latter can seek credit depends in turn on the level of financial development. Given that the poor country produces only goods that can already be bought on the world market, a significant step towards free trade will reduce the monopoly power of the Southern producers. This pro-competitive effect has an asymmetric impact on the incomes of the two groups of producers mentioned above. Capital-rich entrepreneurs will no longer lend parts of their capital endowment at low rates. Instead, they will produce more and sell parts of their production on the world market, thereby inducing the interest rate to rise. It is exactly this adjustment that hurts the poorer entrepreneurs relaying more or less on external finance under autarky. In more advanced countries, however, this type of redistribution is less likely to take place. The reason is

that for a larger number of firms, among them also relatively small ones, the pro-competitive effect of a trade liberalization is small since they produce goods that are at the technology frontier and do not (yet) have a perfect substitute counterpart.

The analysis so far leads us the conclusion that, in poor countries, the number of entrepreneurs opposing significant integration steps, i.e. the size of the import-competing sector, hinges crucially on the wealth distribution. As further important determinants we identify the level of financial development and the extent of addition variety the integration brings. If capital cannot be direct towards firms with high marginal returns because the lenders have only little hope to get their funds back, aggregate output (and hence aggregate demand) is low. Consequently, only entrepreneurs with a very low capital endowment are in favor of autarky. Similarly, a small number of varieties under autarky is associated with a small winning group and large number of losers.

A very polarized distribution that gives rise to a large number of entrepreneurs with only minor asset ownership is associated with a large number of opposers and only a small winning group. To return to the African example made in the introduction, this situation corresponds to an economy in which - determined by history - most capital is owned by capitalist farmers and miners (or the entrepreneurs processing cash crops and mineral resources) whereas entrepreneurs in the urban manufacturing and industrial sector possess only relatively little capital. Of course, the way the division into winners and losers translates into policy outcomes depends on the different group's relative strength in the political process. One of these groups - beside capital-richer and capital-poorer entrepreneurs - comprises the workers. Although the latter have not been considered so far, it seems reasonable to assume that the workers share - at least in the short run - the interests (with respect to trade policy) of their employers. Thus, whether a typical poor country is open or closed depends on whether the small number of capital-rich entrepreneurs (and, perhaps, their workers) exert an important influence on the government or, in contrast, whether the large number of capital-poorer manufacturers and small urban industrialist determine

policy. The latter situation was certainly relevant for many developing countries in Africa during the era of decolonialization when political power moved towards the capital cities allowing the urban manufactures and industrialists (and, perhaps, their workers) to exert disproportionate lobbying influence. There is few evidence that this pattern has systematically changed in recent times.

We are well aware of the fact that there exist many factors that adversely affect particularly or solely entrepreneurs running smaller firms. For instance, the costs of dealing with dense regulatory or an inefficient banking system are fixed giving rise to significant economies of scale. But we challenge the view that a protectionist trade regime in a monopolistic environment necessarily favors capital-rich entrepreneurs. If those who run large enterprises are also "major" owners of productive resources, whereas "major" is relative to home demand in the particular sector the entrepreneur is confined to, then the removal of trade barriers benefits the large. To put it another way, in the short-run, the trade liberalization makes it even harder for smaller firms to get external finance.

References

Banerjee, Abhijit and Esther Duflo (2003); "Do Firms Want to Borrow More? Testing Credit Constraint Using a Directed Lending Program," BREAD Working Paper Number 2003-5.

Bates, Robert (1981); *Markets and States in Tropical Africa: The Political Basis of Agricultural Policies.* Berkeley: University of California Press.

Bates, Robert (1988); "Government and Agricultural Markets in Africa," in R. Bates, ed., *Toward a Political Economy of Development.* Berkeley and Los Angeles, CA: University of California Press.

Beck, Thorsten, Ross Levine and Norman Loayza (2000); "Finance and the Sources of Growth," *Journal of Financial Economics,* 58, 261-300.

Bénabou, Roland (1996); "Inequality and Growth," in B. S. Bernanke and J. Rotemberg, eds., *NBER Macroeconomics Annual* 11. Cambridge, MA: MIT Press.

Bhattacharya, Utpal and B. Ravikumar (2001); "Capital Markets and the Evolution of Family Businesses," *Journal of Business*, 74, 187-219.

Bourguignon, François and Christian Morrisson (1990); "Income Distribution, Development and Foreign Trade: A Cross-Section Analysis," *European Economic Review*, 34, 1113-1132.

Clerides, Sofronis, Saul Lach, and James Tybout (1998); "Is Learning by Exporting Important? Micro-Dynamic Evidence from Columbia, Mexico, and Marocco," *The Quarterly Journal of Economics*, 113, 903-947.

Dalton, Hugh. (1920); "The Measurement of the Inequality of Incomes," *Economic Journal*, 30, 348-.61.

Deininger, Klaus and Pedro Olinto (2001); "Asset Distribution, Inequality, and Growth," World Bank Working Paper Number 2375.

Deininger, Klaus and Lyn Squire (1998); " New Ways of Looking on Old Issues: Inequality and Growth," *Journal of Development Economics,* 57, 259-87.

De Soto, Hernando (1989); *The Other Path: The Invisible Revolution in the*

Third World, New York: Harper and Row.

Dixit, Avinash (1984); "International Trade Policy for Oligopolistic Industries," *Economic Journal Conference Paper*, 94, 1-16.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer (2002); "The Regulation of Entry," *Quarterly Journal of Economics*, 117, 1-37.

Easterly, William (2001); "The Middle Class Consensus and Economic Development," *Journal of Economic Growth*, 6, 317-35.

Engerman, Stanley and Kenneth Sokoloff (2002); "Factor Endowments, Inequality, and Paths of Development Among New World Economies," NBER Working Paper 9259.

Grossman, Gene, and Elhanan Helpman (1994); "Protection for Sale," *The American Economic Review*, 84, 833-850.

Helpman, Elhanan and Paul Krugman (1989); Trade Policy and Market Structure. Cambridge, MA: MIT Press.

King, Robert and Ross Levine (1993); "Finance and Growth: Schumpeter Might Be Right," *The Quarterly Journal of Economics*, 108, 717-37.

Krugman, Paul (1979); "A Model of Innovation, Technology Transfer, and the World Distribution of Income," *Journal of Political Economy*, 87, 253-266.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny (1998); "Law and Finance," *Journal of Political Economy*, 106, 1113-1155.

Leff, Nathaniel (1978); "Industrial Organization and Entrepreneurship in the Developing Countries: The Economic Groups," *Economic Development and Cultural Change*, 26, 661-75.

Liedholm, Carl and Donald Mead (1999); *Small Enterprises and Economic Development. The dynamics of micro and small enterprises*, New York: Routledge.

Matsuyama, Kiminori (2000); "Endogenous Inequality," *Review of Economic Studies,* 67, 743-59.

Mayer, Wolfgang (1984); "Endogenous Tariff Formation," *The American*

Economic Review, 74, 970-985.

McMillan, Margaret (2001); "Why Kill the Golden Goose? A Political-Economy Model of Export Taxation," *Review of Economics and Statistics*, 83, 170-184.

Nugent, Jeffrey and Mustapha Nabli (1992); "Development of Financial Markets and the Size Distribution of Manufacturing Establishments: International Comparisons," *World Development,* 20, 1489-99.

Ray, Debraj (1998); *Development Economics.* Princeton, NJ: Princeton University Press.

Rieber, William (1982); "Discriminating Monopoly and International Trade," *Economic Journal*, 92, 365-376.

Rodrik, Dani (1988); "Imperfect Competition, Scale Economies, and Trade Policy in Developing Countries," in R. Baldwin, ed., *Trade Policy Issues and Empirical Analysis.* Chicago, IL: University of Chicago Press.

Sleuwaegen, Leo and Micheline Goedhuys (2002); "Growth of Firms in Developing Countries, Evidence from Côte d'Ivoire," *Journal of Development Economics*, 68, 117-135.

Townsend, Robert (1979); "Optimal Contracts and Competitive Markets with Costly State Verificatioin," *Journal of Economic Theory*, 21, 265-293.

Tybout, James (2000); "Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?" *Journal of Economic Literature*, Vol. XXXV, 11-44.

Vernon, Raymond (1966); "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics*, 80, 190-207.

Winters, L Alan (2004); "Trade Liberalisation and Economic Performance: An Overview," *Economic Journal*, 114, F14-F21.

World Bank (2001); *Global Economic Prospects*, unpublished proofs. Washington, D.C.: The World Bank.

World Bank (2003); "Trade for Development in Latin America and the Caribbean", Trade Note 9, International Trade Department.

***Figure* 1 – Borrowers and Lenders**

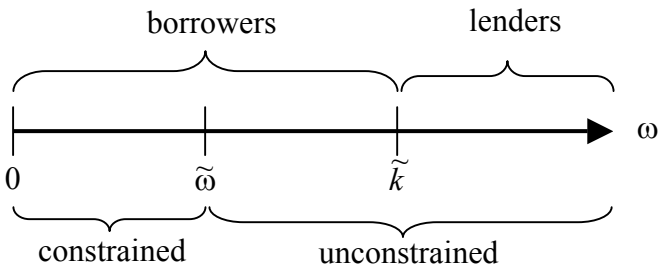

***Figure* 2 – Capital Market Equilibrium**

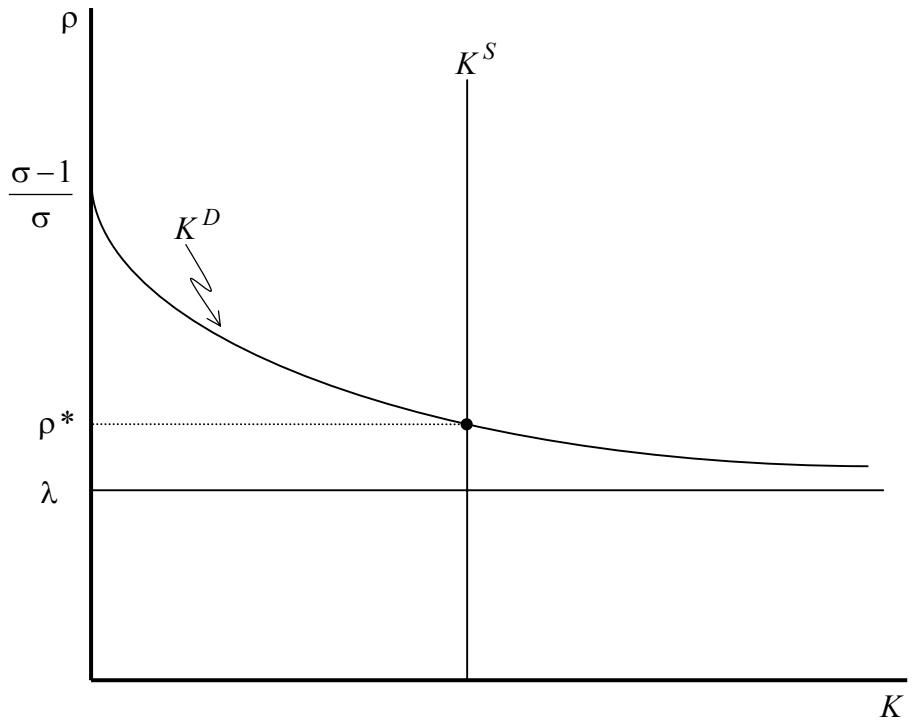

***Figure* 3 – Winners and Losers of a Trade Liberalization**

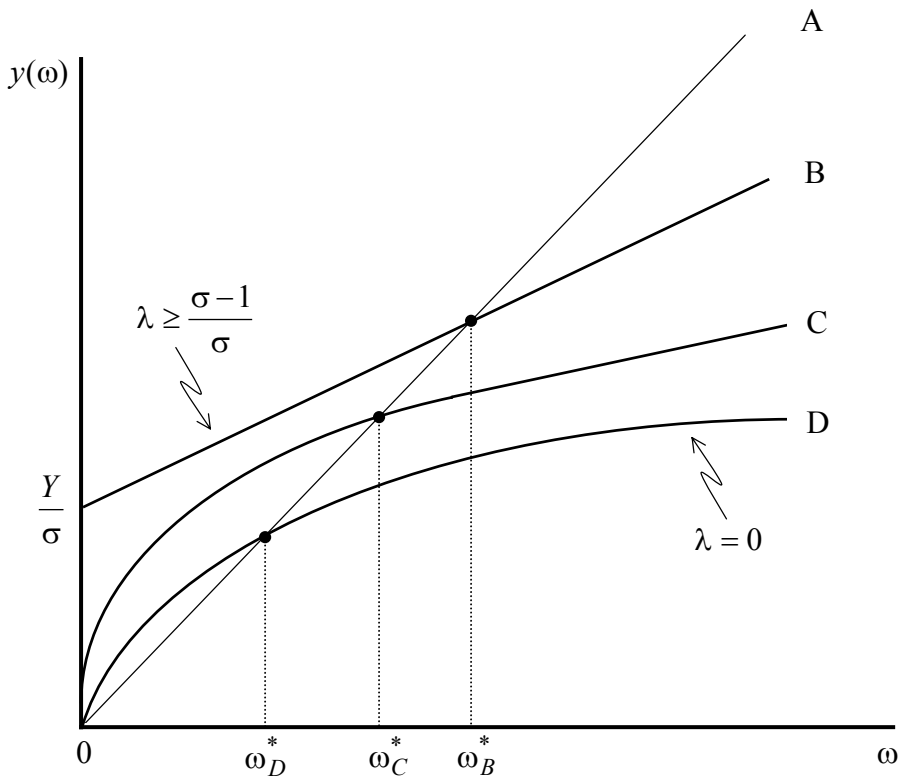

***Figure* 4 – Trade Liberalization and Firm Sizes**

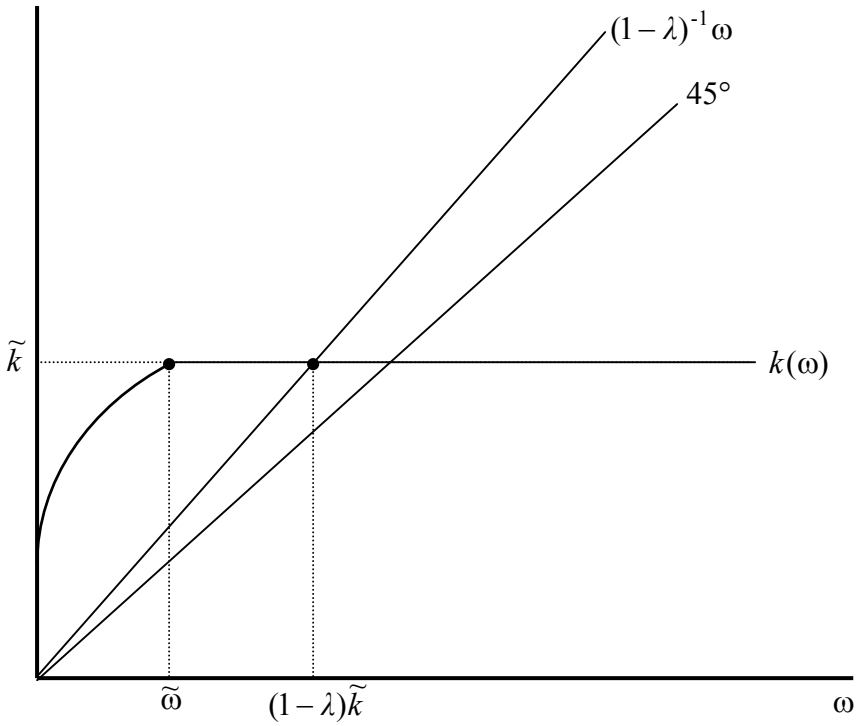

***Figure* 5 – Decrease in the Level of Financial Development and Firm Sizes**