GLOBALIZATION, FINANCIAL DEVELOPMENT, 
AND INCOME INEQUALITY

HIROSHI DAISAKA  TAJI FURUSAWA*  NORIYUKI YANAGAWA
Hitotsubashi University  Hitotsubashi University  University of Tokyo

October 30, 2014

Abstract

Abstract. We analyze the effect of financial development and globalization (i.e., the reduction of trade costs) on income distribution when a financial institution is imperfect. Financial imperfection creates income inequality, by benefiting borrowers (entrepreneurs) and harming lenders through its effect of lowering the capital rental rate. We show among others that globalization changes income for both borrowers and lenders in the same direction. But its effect is greater for entrepreneurs and smaller for lenders, the poorer is the financial institution. We examine the effect of financial development and globalization also in an enriched model where individuals are different in their abilities as well as their capital endowments. We show that financial development mitigates capital misallocation while the reduction of trade costs will not improve efficiency.

*Address for Correspondence: Graduate School of Economics, Hitotsubashi University, 2-1 Naka, Kunitachi, 186-8601, Tokyo, Japan. E-mail: furusawa@econ.hit-u.ac.jp. We are grateful to Shuichiro Nishioka for a helpful suggestion. We also thank an anonymous referee for helpful comments and suggestions.
1 Introduction

As the “Occupy Wall Street” movement in 2011 represents, income disparity in the United States and other countries has recently attracted a lot of public attention. A large literature also has documented widening income inequality and job polarization, the phenomenon that labor demands expand for both high-wage and low-wage jobs while they shrink for middle-wage jobs (e.g., Acemoglu and Autor, 2011, and Autor et al., 2008). It has been argued that skill-biased technological changes (especially the information and communication technology revolution) are a major cause of the income disparity. Globalization (especially outsourcing inputs to firms in low-wage countries) has also been considered as an important factor. This paper theoretically examines how globalization (which we define as the reduction of trade costs in this paper) affects within-country income distribution when the financial institution is imperfect. In particular, we investigate the effect of globalization and financial development on income inequality between borrowers and lenders. Recent financial and economic crisis revealed that the financial institution is far from perfect. Thus, it is practically and academically important to uncover how globalization affects income inequality under financial imperfection. It is also of interest whether financial imperfection itself creates income inequality.


Some studies also discuss the relationship between international trade and income distri-
bution under financial imperfection. Amissah et al. (2011) examine how wealth distribution affects the pattern of international trade. Foellmi and Oechslin (2010) show that trade widens income inequality because rich entrepreneurs invest more and benefit more from globalization and poor ones lose due to the resulting increase in the capital rental rate. Ju and Wei (2011) derive an interesting result that trade liberalization generates unemployed capital and hence reduces aggregate income of the labor-abundant country with a poor financial institution.

In this paper, we examine the effect of globalization and financial development on income inequality between borrowers and lenders in a small-country model with a differentiated-good industry. We first argue that financial imperfection exacerbates income inequality. Figure 1 plots pairs of the quality of the financial institution (measured by the domestic credit provided by financial sector relative to GDP) and the within-country income inequality (measured by the Gini index) for 107 countries.\footnote{The data contain observations of 107 countries for which the domestic credit provided by financial sector relative to GDP and the Gini index are both available for 2010.} The data show a negative relationship between them: the better the financial institution, the smaller the income inequality. The first result that we obtain in our model is this negative relationship between financial devel-
development and income inequality. Then we ask what would happen if the trade costs decline. In addition, we explore how the impact of globalization on income inequality is different depending on the stage of financial development.

To address these questions, we build a basic small-country model in which there are two goods, one of which is a differentiated manufacture good whose production requires upfront investment. Individuals in the country are heterogeneous in their capital endowments. Individuals may finance the upfront investment by renting capital from others (i.e., lenders) in order to become entrepreneurs and run their own firms. We show that under financial imperfection such that individuals are faced with a borrowing constraint, wealthy individuals become even wealthier by running firms and obtaining rents (i.e., positive profits that they obtain due to the existence of financial friction). That is, a financial friction exacerbates income inequality. Next, we examine the impact of the reduction of variable export costs. The unilateral trade liberalization, which can be considered as an important aspect of globalization, intensifies competition in the domestic market. As a result, domestic firms’ profits decline, which in turn reduces income for entrepreneurs. Lenders’ income also decreases through a resulting decline of capital rental rate. In contrast, the reduction of variable export costs increases domestic firms’ profits, which in turn raises income for both entrepreneurs and lenders. What is interesting is whether these impacts of globalization fall mostly on entrepreneurs or mostly on lenders depends on the quality of the financial institution. We can show that the poorer the financial institution, the more does the impact of globalization fall on entrepreneurs. We also find that incentive for entrepreneurs to be against financial development diminishes if the variable import costs decline. This suggests that globalization may encourage financial development (Do and Levchenko, 2007, and Rajan and Zingales, 2003).

Then, we extend the basic model by incorporating ability as another characteristic of individuals, which allows us to examine how financial friction leads to inefficient capital allocation and how this misallocation affects income inequality. In this extended model, individuals must be sufficiently able for them to be entrepreneurs, and the borrowing constraint
is relaxed for able entrepreneurs. Financial development alleviates capital misallocation; a fraction of capital is reallocated from less able, wealthy entrepreneurs to more able, less wealthy individuals. The biggest beneficiaries are indeed the relatively poor individuals who can newly be entrepreneurs thanks to financial development, followed by wealthy lenders because they can reap large benefits from the resulting increase in the capital rental rate. The greatest losers by financial development are the least wealthy entrepreneurs. As for the effects of globalization, the basic results in the basic model are still obtained in the extended model: the reduction of import costs decreases every individual’s income while the reduction of export costs benefits every individual. An additional interesting finding is that the impact of globalization is greater, the more able is an entrepreneur, because an able entrepreneur has a greater stake. We also examine how the quality of financial institution affects the impacts of globalization on income distribution, basically confirming the results that we obtain in the basic model.

To our knowledge, closest to our paper is Foellmi and Oechslin's (2010), which is mainly concerned with how wealth distribution affects trade gains that are distributed between lenders and borrowers. In contrast, we examine how the degree of financial imperfection affects income inequality. We are interested in how gains and losses of globalization are distributed to lenders and borrowers and how this depends on the degree of financial imperfection. We also build a model in which individuals are different in their abilities as well as their capital endowments to investigate the effect of financial development and globalization on efficiency of capital allocation.

Financial market plays a critical role in transferring individuals' saving to productive activities. As we show in the following, imperfect financial institution causes income inequality as well as inefficient capital allocation. Yano (2008, 2009) introduces the notion of “competitive fairness” to define the market quality. He defines 'market quality as a measure of “efficiency in allocation” and “fairness in dealing” ' (Yano, 2009). The imperfect financial market that we analyze in the paper can be considered as a market of low quality since

---

2Yano (2010) analyzes the 2008 financial crisis from the perspective of the market quality theory.
only the wealthy can effectively access to the financial market in our model so that “fair
competition” is not guaranteed. As he suggests, an improvement of financial institution is
needed for healthy growth of productive activities in the industry and also for mitigating
income inequality.

2 Model

We consider a small open economy populated by a continuum of individuals whose population
is normalized to 1. Each individual owns $\alpha$ units of labor and $\omega$ units of capital; individuals
are different in their endowments of capital such that $\omega$ is stochastically distributed according
to the cumulative distribution function of $F$. Individuals are different only with respect to
capital endowments in the basic model. There are two goods, a variety of a differentiated
good $X$ and a numeraire good $Y$. All individuals have the same utility function over the	wo goods, which is characterized by

$$u = \alpha \log u_x + y,$$  

(1)

where $\alpha > 0$ is a constant and

$$u_x = \left[ \int_{\Omega} x(i)^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{1}{\sigma}},$$  

(2)

denotes the subutility derived from the consumption of continuum varieties of good $X$,
represented by $\{x(i)\}_{i \in \Omega}$ (where $\Omega$ denotes the set of all varieties available in this country),
with $\sigma > 1$ being the elasticity of substitution and $y$ denotes the consumption level of good
$Y$. Each individual chooses a consumption profile of good $X$ to maximize $u_x$ subject to
$\int_{\Omega} p(i)x(i)di \leq E$, where $p(i)$ and $E$ denote the price for variety $i$ and the total expenditure
on all varieties of good $X$, respectively. It is immediate to obtain $x(i) = p(i)^{-\sigma}E/P^{1-\sigma}$, where
$P = \left[ \int_{\Omega} p(i)^{1-\sigma}di \right]^{\frac{1}{1-\sigma}}$ denotes the price index of good $X$. We substitute this result into (2) to
to obtain $u_x = E/P$, so that an individual’s utility can be written as $u = \alpha \log E - \alpha \log P + y$.
Maximizing the utility with the constraint $E + y \leq I$, where $I$ denote the individual’s income
(which is the sum of her labor income and capital return), we obtain $E = \alpha$. That is, each
individual spends $E = \alpha$ on good $X$, so the country’s aggregate expenditure on good $X$ is
α. To simplify the exposition, we henceforth assume that α = 1 except in the numerical simulations in Section 4.

The numeraire good is competitively produced from labor such that 1 unit of labor produces 1 unit of the good, so the wage rate equals 1. The differentiated-good industry, on the other hand, is characterized by the monopolistic competition with free entry and exit. When an entrepreneur establishes a firm, however, she incurs an initial investment of \( g \) units of capital. Once an entrepreneur has invested \( g \) units of capital, the firm operates under the standard monopolistic competition. Since there is a continuum of varieties, each firm’s pricing does not have an impact on the price index, so that firms select prices that are \( \sigma/(\sigma - 1) \) times their individual marginal costs, which we assume are labor cost of \( c \) that is common to all firms. We let \( n \) denote the mass of firms located in this country.

International environment of the differentiated-good industry is modeled similarly to Demidova and Rodríguez-Clare (2013). We assume for simplicity that there is no fixed costs of exporting, so all firms will export their products. Foreign demands for each of the domestic variety is given by \( x_x(i) = A p_x(i)^{-\sigma} \) where \( p_x(i) \) denotes the price for firm \( i \)'s products in the foreign market and the demand-shifter \( A \) is considered to be a constant because the domestic firms serve only a negligible fraction of the world market. The domestic firms are faced with an iceberg trade cost of \( \tau^* \geq 1 \) such that \( \tau^* \) units of the good must be shipped in order to supply 1 unit of the good in the foreign market. There are also \( n^* \) foreign firms that supply their products in the domestic market. We assume for simplicity that \( n^* \) is exogenously given and their marginal costs of production are also \( c \), the same as for the domestic firms. The foreign firms are faced with an iceberg trade cost of \( \tau \geq 1 \) in order to serve the domestic market.

Given that the total expenditure on the differentiated good equals 1, a domestic firm’s profits derived from the domestic market are given by

\[
\pi_d = \frac{1}{\sigma} \left( \frac{p}{P} \right)^{1-\sigma},
\]

where \( p \) and \( p^* \) respectively denote the prices of domestic and foreign products and \( P = [np^{1-\sigma} + n^*p^{1-\sigma}]^{1/\sigma} \). It follows from \( p = \sigma c/(\sigma - 1) \) and \( p^* = \sigma c/(\sigma - 1) \) that we can
rewrite (3) as

\[ \pi_d = \frac{1}{\sigma (n + n^* \tau^{1-\sigma})}. \]

A representative domestic firm’s export profits, on the other hand, can be written as

\[ \pi_x = B \tau^{1-\sigma}, \]

where

\[ B = \frac{A}{\sigma} \left( \frac{\sigma c}{\sigma - 1} \right)^{1-\sigma}. \]

Consequently, a domestic firm’s profits equal

\[ \pi = \pi_d + \pi_x = \frac{1}{\sigma (n + n^* \tau^{1-\sigma})} + B \tau^{1-\sigma}. \] (4)

Individuals decide whether or not they become entrepreneurs in the differentiated-good industry. They can use their own capital for setting up their firms, but must externally finance part of the investment if their individual endowments fall short of \( g \) at a (gross) rental rate of \( R \). If she decides not to be an entrepreneur or if part of her capital endowment is left after the investment for her own firm, she will lend out her (remaining) capital. The individuals whose capital endowments exceed \( g \) become entrepreneurs as well as lending out capital that is left after the investment. They play dual roles as entrepreneurs and lenders, unlike other entrepreneurs who need to externally finance part of their investment. Since such extremely wealthy individuals are rare in reality, we shall restrict our attention to the case in which the maximum wealth does not exceed \( g \) in order to simplify the exposition. So we use the terms entrepreneurs and borrowers interchangeably.

The critical feature of the model is that entrepreneurs are faced with a financial constraint. Following Matsuyama (2000, 2007), Furusawa and Yanagawa (2013a,b), and others, we assume that entrepreneurs can only pledge themselves to repay only a fraction \( \theta \in (0,1] \) of the profits that they will earn, and hence an entrepreneur can borrow only up to the amount such that the repayment does not exceed \( \theta \pi \). The fraction \( \theta \) represents the quality of the financial institution of the country which equally face all potential entrepreneurs.\(^3\)

\(^3\)Matsuyama (2007) describes various economic implications of the credit market imperfection of this type. See also Furusawa and Yanagawa (2013a) for discussions as to how the agency problem of the lender-borrower relationship or imperfect legal enforcement entails financial imperfection of this type.
Entrepreneurs are faced with the two constraints: the profitability constraint and the borrowing constraint. The profitability constraint

\[(PC) \quad \pi \geq Rg\]  

simply means that the net profits must be non-negative. The borrowing constraint, on the other hand, can be written as

\[(BC) \quad \theta \pi \geq R(g - \omega),\]  

which means that an entrepreneur endowed with \(\omega\) units of capital can rent capital only up to the amount such that the repayment does not exceed the fraction \(\theta\) of the profits. It is easy to see that the borrowing constraint is more likely to be tighter than the profitability constraint, the smaller is \(\theta\). The borrowing constraint also tends to be tighter for individuals endowed with a small amount of capital.

3 Globalization and its impact on income distribution

This section investigates the impact of globalization, i.e., the reduction of trade costs, and financial development on income distribution, and examines the interaction between the globalization and financial development. If the profitability constraint is binding while the borrowing constraint is slack, the economic environment would be the same as in the case of perfect financial institution. Since we are interested in how globalization affects income distribution under financial imperfection, we assume in this section that the borrowing constraint is binding for some critical individuals while the profitability constraint is slack. Let \(\hat{\omega}\) denote the capital endowment of the critical individuals who are just wealthy enough to be entrepreneurs. Then we find by substituting \(\pi = R(g - \hat{\omega})/\theta\) into (5) that the profitability constraint is slack if and only if

\[\theta < \frac{g - \hat{\omega}}{g} \equiv \hat{\theta}.\]

That is, we assume that \(\theta\) is smaller than the critical level \(\hat{\theta}\).

In such cases, all individuals whose capital endowment is greater than \(\hat{\omega}\) will become entrepreneurs, earning some rents by operating their firms (since the profitability constraint
is slack). Let $K \equiv \int_0^\infty \omega dF(\omega)$ denote the total capital endowment in this country. Since capital is used only for firms’ initial investment, the mass of firms, or equivalently mass of entrepreneurs, is determined as $n = K/g$. The critical individual’s capital endowment that satisfies the borrowing constraint with equality is given by $\hat{\omega} = F^{-1}(1 - (K/g))$ since the mass of individuals whose capital endowments are greater than $\hat{\omega}$ is $1 - F(\hat{\omega})$.

Therefore, the binding borrowing constraint can be written as

$$R = \frac{\theta \pi}{g - \hat{\omega}}, \quad (7)$$

where $\pi$ is rewritten from (4) as

$$\pi = \frac{1}{\sigma \left( \frac{K}{g} + n^* \tau^{1-\sigma} \right)} + B \tau^{1-\sigma}.$$

The binding borrowing constraint (7) determines the rental rate as long as $\theta$ is small enough that the borrowing constraint is binding for the critical individuals while the profitability constraint is slack, i.e., $\theta < \hat{\theta}$. As usual, the rental rate of capital is determined so as to clear the capital market. In the case where the borrowing constraint is binding in equilibrium, it is the borrowing constraint that determines who want to be entrepreneurs and hence the total demands for capital. The demands for capital are equated to the fixed supply of capital when the rental rate is determined such that the borrowing constraint is binding for the critical individuals whose capital endowment is $\hat{\omega}$.

One may think that financial development, i.e., an increase in $\theta$, invites more firms into the market, which makes the market more competitive. In this general equilibrium model with inelastic supply of capital, however, financial development raises demands for capital, which leads to an increase in the rental rate to offset the increased capital demands. Because some individuals are lenders while others are borrowers, therefore, it is the income distribution across individuals that is affected by financial development rather than the market structure of the industry.

Now, we are ready to thoroughly examine the impact of globalization and financial development on income distribution, or more specifically non-wage income distribution since the wage incomes are fixed to 1 for all individuals.
It follows from (7) that the non-wage income for entrepreneurs can be written as

\[ I_e = \pi - R(g - \omega) = \left[ 1 - \frac{\theta(g - \omega)}{g - \tilde{\omega}} \right] \pi. \]

(8)

Entrepreneurs’ non-wage income decreases with \( \theta \) because an increase in \( \theta \) raises the rental rate as shown in (7). Poor financial institution is a serious obstacle for market entry. But once an entrepreneur successfully finances the initial investment, she could enjoy an incumbent benefit from a poor financial institution, which is realized as a low rental rate. Financial development would erode this incumbent benefit. In addition, their income increases with \( \omega \); their rental earnings (or reduced borrowing) positively contribute to their income. Moreover, as \( n^* \) decreases, \( \tau \) increases, or \( \tau^* \) decreases, the profits \( \pi \) increase and so does their income.

On the other hand, the non-wage income for lenders can be written as

\[ I_l = R\omega = \frac{\theta\pi\omega}{g - \tilde{\omega}}. \]

(9)

Lenders’ non-wage income increases with \( \theta \) because again an increase in \( \theta \) entails a higher rental rate. It obviously increases with \( \omega \). A decrease in \( n^* \), an increase in \( \tau \), and a decrease in \( \tau^* \) all contribute positively to their income since the resulting increase in profits for the firms leads to an increase in the rental rate. Note that an increase in profits is beneficial for both entrepreneurs and lenders.

Figure 2 illustrates income distribution which is sorted according to individuals’ capital endowments. In the case of perfect financial institution, i.e., \( \theta = 1 \), or in the case of effectively perfect financial institution, i.e., \( \hat{\theta} < \theta < 1 \), the profitability constraint is binding while the borrowing constraint is slack for all entrepreneurs. It is easy to see from (5) that in such cases, the rate of return from capital equals \( R = \pi/g \) for every individual regardless of whether she is an entrepreneur or a lender. Thus, the income distribution becomes the one that is illustrated as a (broken) straight line from the origin. In contrast, under financial imperfection, i.e., \( \theta < \hat{\theta} \), entrepreneurs earn positive rents thanks to the entry barrier created by the poor financial institution. The income distribution exhibits this rent as a gap in income at the endowment level of \( \hat{\omega} \). As we can see from (8) and (9), the
common slope of the two straight lines that together show the income distribution under financial imperfection is $\theta \pi / (g - \hat{\omega})$. Thus, the smaller the $\theta$, the more unequal the income distribution is between lenders and entrepreneurs in the sense that the gap between the rates of return from capital is wider.\(^4\) The adverse effect of financial imperfection on income parity can also be confirmed from

$$\frac{\partial I_e}{\partial \theta} = -\frac{(g - \omega)\pi}{g - \hat{\omega}} < 0, \quad \frac{\partial I_l}{\partial \theta} = \frac{\pi \omega}{g - \hat{\omega}} > 0. \tag{10}$$

We have established the first proposition.

\(^4\)For those who have higher capital endowments than $g$, the average rate of return from capital, i.e., $I_e/\omega$, decreases as $\theta$ decreases reflecting their position as lenders. The extremely wealthy entrepreneurs lose from the deterioration of the financial institution. In this paper, we measure the effect of financial development and globalization on income inequality by assessing the differential impacts on non-wage incomes of lenders and borrowers. This is a plausible measure because the poor become lenders while “most” of the wealthy become borrowers. But the above argument suggests that this may not be an excellent measure especially if there are many individuals whose capital endowments are greater than $g$. Moreover, even though we restrict our attention to the case where the maximum capital endowment falls short of $g$ so that all borrowers are wealthier than any lenders, the observation that all borrowers are better off while all lenders are worse off does not necessarily mean that income inequality worsens if a more conventional inequality measure, such as the Gini coefficient, is used; the Gini coefficient, for example, is affected by the distribution of capital endowment across individuals, so that it does not necessarily increase even when the incomes of the poor decrease while those of the wealthy increase as depicted in Figure 2.
Proposition 1  Financial imperfection benefits borrowers (entrepreneurs) and hurt lenders. Financial imperfection is a source of income inequality; it hinders entry into the industry so that it suppresses capital demands and lowers the capital rental rate. The poorer financial institution, the severer the income inequality between lenders and borrowers.

Usual arguments about financial imperfection tend to emphasize the effect on the efficiency in resource allocation (which we discuss in the next section). This basic model, however, shows an important link between the financial institution and income inequality. Financial imperfection benefits borrowers (entrepreneurs) while it hurts lenders.

What about the impact of globalization? It follows from (4), (8), and (9) that \( \tau \) and \( \tau^* \) affect individuals’ incomes only through a change in the firms’ profits. A decrease in \( \tau \) decreases the profits while a decrease in \( \tau^* \) increases the profits, as we can see from (4). Therefore, whether globalization benefits the domestic firms depend on whether the effect of a decrease in \( \tau \) is stronger than the effect of a decrease in \( \tau^* \). Now, we observe that

\[
\frac{\partial I_e}{\partial \tau} = 1 - \frac{\theta(g - \omega)}{g - \tilde{\omega}} > 0, \quad \frac{\partial I_l}{\partial \tau} = \frac{\theta \omega}{g - \tilde{\omega}} > 0.
\]

Thus, we have the following proposition regarding the impact of globalization on income distribution.

Proposition 2  A decrease in trade costs for foreign exporters reduces the domestic firms’ profits, which in turn lowers income for every individual. On the other hand, a decrease in trade costs of domestic firms’ export increases the domestic firms’ profits, which in turn increases income for every individual.

Although globalization affects lenders’ and borrowers’ income in the same direction, the size of the impact may be quite different between the two groups. It follows either from (10) or (11) that

\[
\frac{\partial^2 I_e}{\partial \theta \partial \tau} = -\frac{g - \omega}{g - \tilde{\omega}} < 0, \quad \frac{\partial^2 I_l}{\partial \theta \partial \tau} = \frac{\omega}{g - \tilde{\omega}} > 0.
\]

Entrepreneurs’ incomes increase with their profits. But this effect diminishes as \( \theta \) goes up. Lenders’ incomes also increase with the firms’ profits, and this effect is enhanced if \( \theta \) becomes larger. These observations give us the following important proposition.
Proposition 3 The lower the quality of the financial institution, the greater the impact of globalization on entrepreneurs while the smaller the impact on lenders.

Emerging market economies have been considered as beneficiaries of globalization. Large benefits of the growth of exports, however, mostly go to entrepreneurs rather than lenders in countries with undeveloped financial institutions.

Before closing this section, let us discuss a political-economy implication of the above results. Viewing (10) and (12) differently, we can argue that unilateral trade liberalization dissipates entrepreneurs’ resistance to financial development. The relationships expressed in (10) show that entrepreneurs have incentive to resist financial development (Proposition 1). As (12) indicates, however, this incentive diminishes if the profits are reduced due to the country’s unilateral liberalization, i.e., a reduction of $\tau$. More generally, entrepreneurs’ incentive to resist financial development becomes larger if globalization benefits their firms while it becomes smaller if globalization hurts their firms. We record this finding as a proposition.

Proposition 4 Entrepreneurs have incentive to resist the country’s financial development, and this incentive is affected by globalization. If globalization is beneficial to firms, their incentive to resist financial development is reinforced. If globalization is detrimental to firms, on the other hand, their incentive to resist financial development diminishes.

4 Globalization, inefficient capital allocation, and income distribution

This section enriches the basic model by introducing ability heterogeneity as well as capital-endowment heterogeneity among individuals to investigate the impact of globalization under financial imperfection on the efficiency of capital allocation as well as on income distribution. Financial imperfection creates inefficient capital allocation since capital endowment still plays a major role in determining who become entrepreneurs although it is individuals’ ability that should be a decisive factor. How is the capital allocation affected by globalization and
financial development? What about the impact of globalization on income distribution in this enriched model?

To answer to these questions, we extend the basic model such that an individual is characterized by her capital endowment and ability, denoted by $(\omega, a)$, which is jointly distributed according to a probability density function of $f : \mathbb{R}_+^2 \rightarrow \mathbb{R}$. Hence, the total capital endowment of this country is given by $K = \int \int_{\mathbb{R}_+^2} \omega f(\omega, a) d\omega da$. An individual’s ability will determine the quality of the product if she becomes an entrepreneur to run a firm in the differentiated-good industry $X$. Here, we simply assume that the quality of the products that a firm produces is equal to the ability of the entrepreneur that runs the firm. A representative consumer’s utility function is still given by (1) except that the subutility derived from the consumption of varieties of good $X$, given by (2), is replaced by

$$u_x = \left[ \int_{\Omega} a(i)^{\frac{1}{\sigma}} x(i)^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}},$$

where $a(i)$ denotes the quality of the variety $i$. We maintain the assumption that the mass of foreign firms that export their products is fixed at $n^*$. The foreign firms are also heterogeneous in their product quality such that the density of the firms that produce a product of quality $a$ is given by $n^* f^*(a)$, where $f^*$ denotes a probability density function. The rest of the model specifications are the same as in the basic model.

Profits for the domestic firms are similarly obtained as in the basic model. The domestic demands for variety $i$ equals $x(i) = a(i)p(i)\sigma / P^{1-\sigma}$, and hence we can write the domestic profits for a firm that produces a product of quality $a$ as $\pi_d = (a/\sigma)(p/P)^{1-\sigma}$. Letting $\Gamma$ denote the set of entrepreneurs, the quality-adjusted price index in the domestic market can be written as

$$P = \left[ \int_{\Gamma} a p^{1-\sigma} f(\omega, a) d\omega da + n^* \int_0^\infty a p^{1-\sigma} f^*(a) da \right]^{\frac{1}{\sigma-1}}.$$

Since all firms have the same marginal cost of production, $c$, and hence $p = \sigma c / (\sigma - 1)$ and $p^* = \sigma c / (\sigma - 1)$, the domestic profits for the firm whose product quality is $a$ is given by

$$\pi_d(a) = \frac{a}{\sigma (Q + Q^*)},$$
where

\[ Q \equiv \int_{\Gamma} \omega f(\omega, a) d\omega da, \quad Q^* \equiv n^* \int_{0}^{\infty} a^\tau f^*(a) da. \]

Defining \( \hat{\pi}_d \equiv 1/[\sigma(Q + Q^*)] \), we can write the domestic profits as \( \pi_d(a) = \hat{\pi}_d a \). Domestic firms also derive profits from foreign sale. Foreign demands for each domestic variety \( i \) is given by \( x_x(i) = Aap_x(i)^{-\sigma} \). Similarly to the case of the basic model, the profits for a firm whose product quality is \( a \) is given by \( \pi_x(a) = Ba^\tau x^{-1-\sigma} \), where the constant \( B \) is the same as in the basic model. Defining \( \hat{\pi}_x \equiv B\tau x^{-1-\sigma} \), we can write \( \pi_x(a) = \hat{\pi}_xa \). The total profits for a domestic firm is the sum of the profits from the domestic market and those from the foreign market:

\[ \pi(a) = \pi_d(a) + \pi_x(a) = (\hat{\pi}_d + \hat{\pi}_x)a. \]

Now, the set of entrepreneurs, \( \Gamma \), is the set of \( (\omega, a) \) that simultaneously satisfies the profitability constraint (PC) and the borrowing constraint (BC). The profitability constraint, expressed by (5), can be rewritten as

\[ \pi(a) \geq Rg \]
\[ a \geq \frac{Rg}{\tilde{\pi}_d + \tilde{\pi}_x}, \tag{13} \]

while the borrowing constraint, expressed by (6), is rewritten as

\[
\begin{align*}
\theta \pi(a) & \geq R(g - \omega) \\
a & \geq \frac{R(g - \omega)}{\theta(\tilde{\pi}_d + \tilde{\pi}_x)}. \tag{14}
\end{align*}
\]

The set \( \Gamma \) is depicted in Figure 3, in which the binding profitability constraint is shown as the horizontal line \( PC \) while the binding borrowing constraint is shown as the downward-sloping line \( BC \). We see from the figure that the capital endowment constraint for being an entrepreneur is relaxed for those who have high ability and that even sufficiently rich individuals cannot be entrepreneurs if their ability is quite low. As for an analytical note, we observe that \( \Gamma \) is completely characterized by \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \) since the height of the \( PC \) line is this value times the constant \( g \) while the slope of the \( BC \) line is this value multiplied by \(-1/\theta\) and its intercept on the \( \omega\)-axis equals \( g \). Indeed, the set of entrepreneurs \( \Gamma \), or equivalently \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \) that completely characterizes \( \Gamma \), is determined by the country’s capital constraint:

\[
\int \int_{\Gamma} f(\omega, a) d\omega da = \frac{K}{g}. \tag{15}
\]

That is, (13), (14), and (15) (with \( PC \) and \( BC \) satisfied with equality) determine \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \).

Having identified \( \Gamma \), or equivalently \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \), we can determine equilibrium values of all the remaining endogenous variables. First, once \( \Gamma \) is identified, we can calculate

\[
Q = \int \int_{\Gamma} a f(\omega, a) d\omega da.
\]

Then, we can compute \( \tilde{\pi}_d = 1/[\sigma(Q + Q^*)] \) because \( Q^* \) is in effect exogenously given. Since \( \tilde{\pi}_x \) is also exogenously given and the value of \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \) has been derived, we can determine \( R \).

Now, let us examine the impact of financial development and globalization on income distribution in this extended model. Letting \( \tilde{a} \) denote the equilibrium ability that satisfies the profitability constraint (13) with equality, we express the rental rate as \( R = (\tilde{\pi}_d + \tilde{\pi}_x)\tilde{a}/g \).
Then, the non-wage income for an entrepreneur with the characteristic of $(\omega, a)$ is given by

\[
I_e(\omega, a) = (\hat{\pi}_d + \hat{\pi}_x)a - R(g - \omega)
\]

\[
= (\hat{\pi}_d + \hat{\pi}_x) \left[ a - \frac{R}{\hat{\pi}_d + \hat{\pi}_x}(g - \omega) \right]
\]

\[
= (\hat{\pi}_d + \hat{\pi}_x) \left[ a - \frac{\hat{a}(g - \omega)}{g} \right],
\]

(16)

while the non-wage income for a lender can be written as

\[
I_l(\omega, a) = R\omega = \frac{(\hat{\pi}_d + \hat{\pi}_x)\hat{a}\omega}{g}.
\]

(17)

Comparing (17) and (18) with (8) and (9), respectively, we notice the similarity of the expressions for non-wage incomes between the two models. Especially, it appears that $\hat{a}$ in (17) and (18) plays a role of $\theta$ in (8) and (9). Indeed, we can establish that $\hat{a}$ increases with $\theta$. As Figure 3 indicates, the $PC$ and $BC$ lines intersect each other at $\omega = (1 - \theta)g$. If $\hat{a}$ remains the same while $\theta$ increases, therefore, the slope of $BC$ curve becomes flatter and hence the set $\Gamma$ expands, which in turn violates (15). Thus, $\hat{a}$ increases as $\theta$ rises to preserve the equality in (15). This change in $\Gamma$ as a consequence of financial development, represented
by an increase of $\theta$ to $\theta'$, is shown in Figure 4. As we can infer from the relationship between $\hat{a}$ and $\theta$, Proposition 3 still holds even in this extended model. The lower the quality of the financial institution, the greater the impact of globalization (through a change in $\hat{\pi}_d$ and/or $\hat{\pi}_x$) on entrepreneurs while the smaller the impact on lenders.

Figure 4 is also informative as to the effect of financial development on the efficiency of capital allocation. Suppose that the quality of financial institution improves. Then, those who fall into region A in Figure 4 will become lenders rather than entrepreneurs, while those who fall into region B will become entrepreneurs rather than lenders. Individuals in region A are not good enough to run firms in the better financial institution, while those in region B can now finance a large amount of capital thanks to the financial development. Since every individual in region B has a higher ability than any individual in region A, we have established the following proposition.

**Proposition 5** As the financial institution improves, individuals’ ability becomes more important than their capital endowments for them to become entrepreneurs to run firms. As a consequence, financial development improves the average product quality.

We have shown in the basic model that financial development entails an increase in the rental rate. In this extended model, however, we have not been able to analytically rule out the possibility that financial development entails a lower rental rate. Proposition 5 implies that an increase in $\theta$ leads to an increase in $Q$. Since $Q^*$ is fixed, this means that $\hat{\pi}_d$ decreases and so does $\hat{\pi}_d + \hat{\pi}_x$ (because $\hat{\pi}_x$ is unchanged). Thus, although $R/(\hat{\pi}_d + \hat{\pi}_x)$ increases (i.e., $\hat{a}$ rises) as a result of financial development, we cannot rule out that $R$ decreases as a consequence. That is, the effect of financial development on the non-wage incomes for lenders cannot be unambiguously determined. However, we see from (16) that since $\hat{\pi}_d + \hat{\pi}_x$ falls while $R/(\hat{\pi}_d + \hat{\pi}_x)$ rises, the non-wage incomes for those who are entrepreneurs both before and after the financial development unambiguously decrease as the financial institution improves. Even in this extended model, financial development hurts all the entrepreneurs.

We can also show that the basic impact of globalization on the non-wage incomes for both entrepreneurs and lenders are the same as in the basic model (Proposition 2). First, it is
easy to see from Figure 3 that unless \( \theta \) changes, \( \Gamma \) will not change. This observation implies that neither a decrease in \( \tau \) nor a decrease in \( \tau^* \) will change \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \). Consider first the case in which the country unilaterally liberalizes trade, i.e., \( \tau \) declines. Foreign firms benefit from this liberalization such that \( Q^* \) increases as a result of a fall in \( \tau \). Since \( Q \) remains the same (because \( \Gamma \) is not affected), \( \tilde{\pi}_d \) declines reflecting the intensified competition with the foreign firms. Therefore, we know that \( \tilde{\pi}_d + \tilde{\pi}_x \) decreases and so does \( R \) because \( \tilde{\pi}_x \) and \( R/(\tilde{\pi}_d + \tilde{\pi}_x) \) remain the same. Then, it follows from (16) and (18) that all individuals lose from the unilateral reduction of \( \tau \). Similarly, the unilateral reduction of \( \tau^* \) increases \( \tilde{\pi}_x \) while \( \tilde{\pi}_d \) remains the same. Thus, \( R \) increases and all individuals, regardless of whether entrepreneurs or lenders, benefit from it.

We record these findings as a proposition.

**Proposition 6** The reduction of trade costs do not affect the allocation of capital. But the unilateral reduction of the variable import costs reduces every individual’s non-wage income, while the unilateral reduction of the variable export costs increases every individual’s non-wage income.

Having derived the above results analytically, we now turn to numerical simulations in order to observe detailed effects of globalization and financial development on income distribution. In the following basic simulations, we assume that \((\omega, a)\) is jointly distributed according to the multivariate lognormal distribution such that \((\log \omega, \log a)\) is distributed according to the multivariate normal distribution with mean \((0, 0)\) and variance-covariance matrix \(\Sigma = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\). The quality of foreign products is distributed according to the lognormal distribution such that the distribution of \(\log a\) is the standard normal distribution. We set \(\alpha = 300\) only for an exposition purpose and set \(g = 5, B = 20, n^* = 5, \theta = 0.5, \tau = \tau^* = 1.2\) unless stated otherwise.

Figure 5 illustrates the non-wage income distribution and Figure 6 shows the contour map of this income distribution. Generally, the wealthier an individual is, the higher her non-wage income. In addition, the higher the ability, the higher the income if she is an entrepreneur. We see clearly that there is a large income gap between entrepreneurs and
Figure 5: Income distribution in the extended model

Figure 6: Contours of income distribution
lenders for those who are not wealthy. There is a huge jump on the $BC$ line where $\omega$ is small; a small change in wealth or ability will make a big difference around the threshold.

We have mentioned that we are not able to analytically rule out the possibility that an increase in $\theta$ entails a decrease in $R$. But we can infer from the simulation results illustrated in Figure 7 that an increase in $\theta$ entails an increase in $R$ also in the extended model.

If an increase in $\theta$ does lead to an increase in $R$, financial development benefits the lenders and harms the entrepreneurs. This observation is confirmed in Figure 8, which illustrates changes in income when $\theta$ increases from 0.25 to 0.5. The figure also indicates
that the positive effect for lenders is large for wealthy lenders, while the adverse effect for entrepreneurs is large for poor entrepreneurs, as expected. The biggest beneficiary are relatively poor but able individuals who are lenders when $\theta = 0.25$ but are entrepreneurs when $\theta = 0.5$. The benefits that they derive from financial development are greater, the poorer and the more able they are. The solid kinked-line in Figure 8 is the threshold as to whether financial development is beneficial. The downward-sloping segment coincides with the $BC$ line for $\theta = 0.25$ because those who are directly above the line are the entrepreneurs both before and after the financial development so that they lose from the induced increase in the rental rate while those who are just below the line are the biggest beneficiaries. The threshold is upward-sloping for the wealthy individuals who are entrepreneurs when $\theta = 0.25$ but are lenders when $\theta = 0.5$. On one hand, they reap benefits from an increase in the rental rate as a result of financial development, and this benefit is greater, the larger is the capital endowment. On the other hand, the higher the ability, the greater the loss from changing her status from an entrepreneur to a lender. That is why the slope of the threshold in this region is upward-sloping.

The effect of the reduction of import costs on income distribution is shown in Figure 9. As shown in Proposition 6, the reduction of import costs decreases every individual’s income. Within the group of entrepreneurs, the effect is stronger for those who have higher
abilities, as Figure 9 illustrates, since the profits are proportional to the entrepreneur’s ability. The impact for lenders is greater, the larger is the capital endowment because the wealthy experience a proportionately large effect from an induced drop in the rental rate. The effect of the reduction of export costs is similar except that the effect is in the opposite direction. As shown in Proposition 6, the reduction of export costs increases every individual’s income. The impact is large for entrepreneurs with high ability and wealthy lenders.

Finally, let us turn to the analysis of how the impact of globalization is different depending on the degree of financial development. Figure 10 shows the income change as a result of the reduction of $\tau$ from 1.2 to 1.1 when $\theta = 0.5$ minus the income change as a result of the same reduction of the import tariff when $\theta = 0.2$. That is, it shows how the impact of globalization on income distribution changes if the financial institution improves. As in the basic model (Proposition 3), the negative impact of the reduction of import costs is mitigated for entrepreneurs (shown as positive differences in the effects) while it is exacerbated for lenders (shown as negative differences). Those who are lenders when $\theta = 0.25$ but entrepreneurs when $\theta = 0.5$ experience a greatest increase in loss from the reduction of the import costs. When the quality of financial institution is low, they are relatively poor lenders so they have not experienced a large drop of income caused by the reduction of import costs. After the financial development, however, they become entrepreneurs who suffer greatly from the
reduction of import costs in a relatively better financial institution (under which a relatively large portion of the negative effect falls on entrepreneurs).

5 Conclusion

We have analyzed the effect of financial development and globalization on income distribution when a financial institution is imperfect. Financial imperfection creates income inequality, by benefiting borrowers (entrepreneurs) and harming lenders through its effect of lowering the capital rental rate. We have shown among others that globalization changes income for both borrowers and lenders in the same direction. But its effect is greater for entrepreneurs, the poorer is the financial institution. We have examined the effect of financial development and globalization also in the enriched model in which individuals are different in ability as well as their capital endowments. We have found that financial development mitigates capital misallocation while the reduction of trade costs will not improve efficiency.

The obvious but challenging extension would be to build a dynamic trade model with financial friction such that capital distribution across individuals evolves over time. Is income (or wealth) inequality bound to be persistent in countries with poor financial institution as Figure 1 suggests? How does financial development contribute to mitigating income inequality over time? A proper extension of this model should be able to address these important questions.
References


