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International Trade and Capital Movement under Financial Imperfection *

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Abstract

We construct a simple two-country model that enables us to examine the interactions between trade in goods and international capital movement under financial imperfection. We show that they are complements in the sense that trade in goods facilitates capital outflow from the South, which is either financially less-developed or endowed less capital than the North. This complementarity disappears if financial institution is perfect or almost perfect; trade in goods and capital movement are substitutes as traditional literature shows in such cases. We also show the possibility that capital account liberalization entails capital leakage from the manufacturing industries to an inferior investment opportunity.

JEL Classification: F12, F21, G20, G30

Keywords: Financial imperfection, complementarity, trade, capital movement

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1 Introduction

Whether a country should liberalize capital account has been a long-standing, important issue for policy makers, as well as for researchers.¹ A conventional wisdom suggests that countries should liberalize capital account to efficiently utilize capital worldwide. Even developing countries, which tend to be scarce in capital, are considered to benefit from being open to the world capital market since capital would flow into such capital-scarce countries, thereby achieving economic development. In practice, however, most developing countries are reluctant to liberalize capital account. They are afraid of exposing themselves to volatile capital market, for example. History suggests that their concern is legitimate. Developing countries sometimes experience sudden capital flight in a large scale; Indonesia, Thailand, and South Korea, for example, had severe economic crisis after sudden capital flight in 1997 (Asian economic crisis). Indeed, capital often flows from the South to the North, contrary to the traditional prediction, which is often called the Lucas Paradox (Lucas, 1990). It is far from clear that capital account liberalization leads to economic development for developing countries.

Causes of the Lucas Paradox has been extensively examined, and so has been the impact of capital account liberalization on economic growth.² However, researchers have not fully

¹Rodrik (1998) is skeptical about positive impact of capital account liberalization on economic growth, whereas Henry (2007), for example, finds evidence that financial globalization contributes to economic growth. Eichengreen (2001) provides insightful summary of the debate on the impact of capital account liberalization on economic development.

²Gertler and Rogoff (1990), Caballero, *et al.* (2008), Aoki, *et al.* (2010), for example, develop theories to explain the Lucas Paradox, emphasizing the role of some sorts of financial imperfection. Economic institutions, which include financial and legal institution in a broad sense, have been considered as a key factor that affects the effect of capital account liberalization on economic growth. Klein (2005) shows that countries with better (but not the best) institutions exhibit positive effects of capital account liberalization on economic growth. Kose, *et al.* (2006) argue that countries that meet threshold conditions (about institutional quality and trade openness, for example) are better able to reap the growth and stability benefits of financial globalization. Financial development itself depends on general institutional quality and political and economic environment. Chinn and Ito (2006) find evidence that capital account liberalization leads to equity market development only if a threshold level of legal development has been attained and that trade openness is a prerequisite for capital account liberalization. Rajan and Zingales (2003) and Do and Levchenko (2007) find that trade and international capital movement induce financial development. Indeed, the quality of financial institution has long been recognized to be critical to the economic prosperity. McKinnon (1973, 1993), for example, emphasizes that less-developed countries and countries in transition from socialism to democracy should develop reliable financial institution in order to achieve economic growth. He argues that countries should first improve their internal financial institutions before opening to trade in goods. Rajan and Zingales

explored the effect of capital account liberalization in conjunction with its interaction with openness of international trade in goods. It is often thought that trade openness is a key to attract foreign capital, which fosters economic growth. Emerging economies in the Southeast Asia, for example, have liberalized trade substantially in recent decades, attracting foreign capital to successfully grow. On the contrary, some countries in the Sub-Saharan Africa adopted import-substitution policy, and at the same time failed to attract foreign capital especially to their manufacturing industries (Overview and Chapter 4, Economic Commission for Africa, 2006). But can we conclude from these evidences that trade openness is necessary for attracting foreign capital and for achieving economic growth? It seems too early to reach this conclusion. Even those Asian countries that are relatively open to international trade suffered capital flight in a large scale and resulting economic downturn during the Asian economic crisis in 1997, for example. We need more studies on the relationship between the effect of capital account liberalization and trade openness in order to derive useful insights for countries (especially developing countries) to achieve sustainable growth. Does trade openness help countries attract foreign capital especially into manufacturing sectors, which contributes to economic growth? How does the answer to this question depend on economic structure and economic (and legal) institution of the country?

To answer to these questions and more broadly to find the relationship between the effect of capital account liberalization and trade openness, we build a simple model in which a manufacturing sector relies on external finance through an imperfect financial market. The difference in financial development across countries is a source of potential capital flight in this model, similarly to those by Gertler and Rogoff (1990), Caballero, *et al.* (2008), Aoki, *et al.* (2010). In addition, however, we design the model so as to be able to investigate the interaction between capital account liberalization and trade openness. Thanks to the additional feature of the model, we are able to find that the degree of financial development plays a critical role in the relationship between capital account liberalization and trade openness. More specifically, we find that under imperfect financial institution, freer international trade

(1998) find evidence that financial development contributes positively to the economic growth. Kose, *et al.* (2006, 2009) provide excellent surveys of the studies on the economic impacts of financial globalization.

induces capital to reallocate from the South to the North. International trade and capital movement are complements in the sense that trade induces (further) capital movement from the South to the North. If the financial institution is perfect or almost perfect, on the other hand, trade and capital movement are substitutes as the traditional literature predicts. This result gives an important lesson to policy makers in the South; globalization of the goods and capital markets should be accompanied by financial development in order to attract foreign capital or to avoid capital outflow. Our result is consistent with a commonly-held view that the development of economic institution is a key to an economic success of a country. The following quotes are suggestive.

The trend of overall private flows to Tunisia mirrors the East Asian experience in that substantial increases in capital flows seem to follow improvements in policies, institutions and physical and human infrastructure in an open export-oriented economy. (p. 145, Economic Commission for Africa, 2006)

Nigeria provides an example of a country which, because of policy failures, failed to achieve sustainable growth and economic transformation despite substantial FDI inflows combined with a sound human capital base. (p. 149, Economic Commission for Africa, 2006)

The case of Nigeria is worth further comments. Eichengreen (2001) points out that “capital may flow to sectors in which the country has a comparative disadvantage”. In the case of Nigeria, capital flows disproportionately into oil industry rather than manufacturing. Indeed, “the contribution of manufacturing to GDP fell sharply from a peak of 9 per cent in 1980-1984 to 4.1 per cent in 2000-2003” at least partly due to “severe constraints” that include “inadequate access to financing” (pp. 149-150, Economic Commission for Africa, 2006). Our model shows that financial under-development severely hinders capital inflow into manufacturing sectors.

We are not the first to theoretically examine the relationship between trade and capital movement under financial imperfection.³ Antràs and Caballero (2009) also show the

³More generally, international trade issues in the presence of financial imperfection have not been well

complementarity between international trade in goods and capital movement under financial imperfection. They show that trade in goods and capital movement are complements in the sense that trade in goods induces capital to flow *into* a financially-less-developed country (i.e., the South), the result that encourages (rather than discourages) the South to liberalize trade as well as its capital account. Their model and ours share a prediction that trade in goods induces international capital reallocation. But the direction of resulting capital movement is completely opposite; their result appears to contrast sharply with ours. Antràs and Caballero (2009) build a model with two sectors that have different degrees of financial dependence. The South, which is less financially developed, naturally has a comparative advantage in the financially-unconstrained sector. They show that after trade liberalization, capital flows into this financially-unconstrained sector in the South. In contrast, we build a model with one financially-dependent sector under monopolistic competition, which can be considered as manufacturing. The model is designed to capture a ‘competition effect’ *within* an industry, through which opening to trade affects returns to capital, thereby inducing capital reallocation. In such an environment, we show that after trade liberalization, capital flows *out* of the financially-dependent sector in the South to the one in the North. In summary, our analysis should be viewed as a complement to theirs, rather than a competing substitute. They predict that trade induces capital *inflow* to the financially-*unconstrained* sector in the South. On the other hand, we show a channel through which trade induces capital *outflow* from the financially-*dependent* sector in the South.

Our study here is also related to the one in the companion paper (Furusawa and Yanagawa

explored. Kletzer and Bardhan (1987), Beck (2002), Matsuyama (2005), Wynne (2005), Levchenko (2007), Ju and Wei (2011), and Antràs and Caballero (2009), for example, find that the cross-country differences in the quality of financial institutions significantly affect the structure of countries’ comparative advantage and trade patterns. Chaney (2005), Manova (2013), and Suwantaradon (2008) develop models in which heterogeneous firms are faced with credit-constraints when they finance trade costs. Their models predict that more-productive and wealthier firms engage in export, while others sell their products only domestically. Indeed, Manova (2008) and Chor and Manova (2012) find evidence that credit constraints are an important determinant of international trade flows. Foellmi and Oechslin (2010) also theoretically investigate the effect of international trade on exogenously-heterogeneous firms within an industry and show that rich entrepreneurs win while poor ones lose from opening to trade. Despite that these studies in the field of international trade reveal many important features and mechanisms that appear under financial imperfection, we have yet to analyze many aspects of international trade and capital movement in the economy with imperfect financial institutions.

2012), which investigates the impacts of trade and capital account liberalization on the productivity distribution of the industry that depends on external finance. The main purpose of the companion paper is to explore the relationship between the financial development and firm heterogeneity in their productivity (which is absent in this paper) and to show that trade and capital account liberalization leads to the global convergence in the productivity distribution in. This paper, on the other hand, examines the substitutability between trade in goods and international capital movement, a traditional and fundamental question in international trade.

In the next section, we set out a two-country, one-sector model with financial friction in order to examine the relationship between trade and capital movement under financial imperfection. In Section 3, we examine the case in which two countries are different in their financial development. We show that capital flows from the South, which is financially less developed, to the North and that trade in goods amplifies this capital outflow from the South. In Section 4, we examine a more traditional case in which the two countries are different in their wealth (or equivalently capital) distributions across individuals such that the North has more rich individuals than the South, while the degrees of financial imperfection are the same between the two countries. Then, we show that although capital moves from the North to the South, i.e., from the capital-abundant country to the capital-scarce country, trade in goods induces capital reallocation from the South to the North also in this case. Therefore, we conclude that trade and capital movement are complements in the sense that trade induces capital reallocation from the South to the North in both cases.

Trade induces capital outflow from the South because trade benefits firms in the North and harms those in the South (the positive market expansion effect outweighs the negative competition enhancement effect for firms in the North but not for firms in the South) so that it pushes up the rental rate in the North but pushes down the rental rate in the South. That is, the key to our complementarity is the competition effect in the industry. Our competition effect is relevant and important especially for contemporary trade because the

proportion of intra-industry trade to inter-industry trade is higher than ever before.⁴ In Section 5, we examine why financial imperfection matters in the prediction of international capital flow induced by international trade, by showing that trade and capital movement are substitutes in the case where financial institution is perfect or almost perfect. A key to understand the difference in the prediction between the two cases is that capital moves internationally according to the difference in its returns between the countries under perfect financial institution, whereas pledgeability of its return critically matters under imperfect financial institution. Section 6 uses the basic model to show how the impact of financial crisis in the North varies with the wealth distribution in the South. Section 6 also extends the basic model by including an alternative investment opportunity and shows that capital account liberalization may induce part of capital to be used in a less-profitable investment opportunity in the North. Section 7 concludes the paper.

2 Model

There are two countries, which we call North (N) and South (S). In country $k \in \{N, S\}$, there is a mass m_k of individuals; we normalize the population such that $m_N + m_S = 1$. Each individual owns one unit of labor and a wealth (or capital) of ω that is distributed according to the cumulative distribution of F_k . All individuals share the same utility function over the two goods, a differentiated manufacture good X and a numeraire good Y , which is characterized by

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

where

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

denotes the subutility derived from the consumption of continuum varieties of good X , $\{x(i)\}_{i \in \Omega_k}$ (where Ω_k denotes the set of all varieties available in country k), and y denotes the consumption level of good Y . The numeraire good is competitively produced from labor

⁴Our result can be considered to be in contrast to Krugman's (1979) substitutability result, just as Antràs and Caballero's (2009) complementarity is in contrast to Mundell's (1957) substitutability result.

such that one unit of labor produces one unit of the good, so the wage rate equals 1.

Each individual chooses a consumption profile of good X to maximize u_x subject to $\int_{\Omega_k} p(i)x(i)di \leq E$, 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 $x(i) = p(i)^{-\sigma} E/P_k^{1-\sigma}$, where $P_k \equiv \left[\int_{\Omega_k} p(i)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}$ denotes the price index of good X . We substitute this result into (1) to obtain $u_x = E/P_k$, so that an individual's utility can be written as $u = \log E - \log P_k + y$. 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 the investment return from her wealth), we obtain $E = 1$. That is, each individual spends $E = 1$ on good X , so the country k 's aggregate expenditure on good X is m_k .

The differentiated-good industry is characterized by the monopolistic competition with free entry and free exit. When a firm enters, however, it incurs an initial investment of g units of capital. Each entrepreneur, therefore, needs to raise g units of capital to "finance" this investment before the operation. Once entrepreneurs have invested g units of capital, they operate 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 costs of c that is common to all firms. Let n_k denote the mass of firms in country k . Then, it is easy to see that the profits for any firm i in country k in autarky equal

$$\pi_k(n_k) = m_k/\sigma n_k, \quad (2)$$

which is the reciprocal of the per-capita mass of firms, n_k/m_k , divided by the elasticity of substitution, σ .

Individuals in country k decide whether or not they become entrepreneurs, who can finance part of the investment externally at a gross capital rental rate of R_k if necessary. If she decides not to be an entrepreneur or if part of her wealth is left after the investment for her firm, she will lend out her (remaining) wealth.

The critical feature of the model is that entrepreneurs are faced with a financial constraint. We assume that entrepreneurs in country k can only pledge themselves to repay only a

fraction $\theta_k \in (0, 1]$ of the profits that they will earn, and hence entrepreneur i in country k can borrow only up to the amount such that the repayment does not exceed $\theta_k \pi_k$. The fraction θ_k represents the quality of the financial institution of the country. (Matsuyama 2000, for example, adopts this formulation of financial imperfection.⁵) A financial institution is perfect if $\theta_k = 1$; any entrepreneur with any wealth level can finance the investment effectively without any constraint. A financial institution is imperfect if $\theta_k < 1$; individuals that are endowed with small amounts of wealth may not be able to finance the investment in this case. We assume, without loss of generality, that $\theta_N \geq \theta_S$.

We can list several reasons why θ_k can be smaller than one. A natural cause of financial imperfection is the imperfection of legal enforcement.⁶ If the legal enforcement is perfect, as assumed in the traditional literature, a court can enforce a borrowing contract as long as the repayment under the contract does not exceed the profit from the project, which is denoted here by π . Empirical evidences show, however, the enforcement power is not perfect (La Porta, et al., 1998). Thus, in reality, a court may be able to force a borrower to pay only up to a fraction of the profits, i.e., $\theta_k \pi$ where $\theta_k < 1$, even though the realized profits are π . Hence, unless the non-pecuniary penalty for the default is large enough, the borrower is likely to refuse to pay more than $\theta_k \pi$ even if the promised payment exceeds this amount. This behavior is called the “strategic default”. A contract cannot be a perfect commitment device if the legal enforcement is imperfect; it is difficult for a lender to expect that a borrower will sincerely make a promised payment. Given that, lenders will not lend more than the amount such that the return from the lending equals $\theta_k \pi$. Another source of financial imperfection is the agency problem of the lender-borrower relationship, which is explained briefly in a simple model in the Appendix.

In the economy that we consider, there are two types of the constraints that must be satisfied: the profitability constraint and the borrowing constraint. The profitability constraint

$$(PC) \quad \pi_k - R_k g \geq 0 \tag{3}$$

⁵Matsuyama (2007) describes various economic implications of the credit market imperfection of this type.

⁶See for example Hart(1995).

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

$$(BC) \quad \theta_k \pi_k \geq R_k(g - \omega), \quad (4)$$

which means that in country k , an entrepreneur with a wealth of ω can rent capital only up to the amount such that the repayment does not exceed the fraction θ_k of the profits. It is easy to see that the profitability constraint is tighter than the borrowing constraint if θ_k is large, whereas the borrowing constraint is tighter if θ_k is small. The borrowing constraint also tends to be tighter for entrepreneurs endowed with a small amount of wealth.

We investigate the effects of trade and international capital movement under an imperfect financial institution on the economy and establish the main result that trade and international capital movements are complements in the sense that trade in goods facilitates capital outflow from the South. To this end, we always assume in the main analysis that θ_N and θ_S are small enough that the borrowing constraints are binding for some entrepreneurs in both countries, while the profitability constraints are slack. After all, if θ_N and θ_S are large such that it is the profitability constraint that binds, the economic performances are the same as in the case of perfect financial institution.⁷ Note that when the borrowing constraint is binding while the profitability constraint is slack for some entrepreneurs, individuals whose wealth is greater than or equal to the wealth of such threshold individuals choose to become entrepreneurs because in such cases they can enjoy extra profits as a rent if they become entrepreneurs.

For the clarity of exposition, we first analyze the case in which the two countries are different in the quality of financial institution, i.e., $\theta_N > \theta_S$, while they share all other aspects in common. Then, we analyze the case in which they are different only in their wealth distributions. We assume that the wealth distribution in North has first order stochastic dominance over that in South, i.e., $F_N(\omega) < F_S(\omega)$ for any ω . This assumption captures a traditionally-emphasized difference in the capital-labor endowment ratio between North and

⁷Section 5 analyzes the case of perfect financial institution in order to highlight the role of financial imperfection on the complementarity between trade in goods and international capital movement.

South, i.e., the capital endowment (or wealth) per-capita is greater in North than in South. It also represents a difference in the wealth distribution *per se*. That is, North has more rich individuals, who do not have to rely (or rely less) on external finance to establish their firms than South does.

We also note here that the numeraire good is always tradable in all cases that we consider, so “opening to trade in goods” here means opening to trade in the differentiated good as well as the numeraire good. We need this assumption in order to meaningfully analyze the effect of capital movement. In this static model, the balance-of-payment consideration requires some goods be traded in order for capital to flow from one country to the other.

3 Different qualities of financial institution

In this section, we assume that North and South are different only in the quality of financial institution, i.e., $\theta_N > \theta_S$ and $F_N = F_S$, and derive the result that trade in goods and international capital movement are complements such that capital flight from South is exacerbated if the countries are open to trade in goods. To establish this main result, we first derive the autarkic equilibrium and then analyze the impact of trade and capital movement.

International capital movement directly leads to relocation of firms between the two countries. Throughout the analysis, we emphasize this aspect by directly observing the effect of trade and capital movement on the mass of firms in each country rather than the effect on the amount of international capital movement.

3.1 Autarky

To find the autarkic equilibrium, we rewrite the borrowing constraint, expressed by (4), as a function of n_k . To this end, we first recall the profits for a firm in country k in autarky can be written as a function of n_k , i.e., $\pi_k(n_k) = m_k/\sigma n_k$ as shown in (2). Next, we derive the threshold wealth of individuals who become entrepreneurs as a function of n_k . Let ω_k denote the threshold wealth such that the borrowing constraint (4) is satisfied with equality. Since individuals choose to be entrepreneurs if and only if their wealth exceeds ω_k , the mass

of firms must be equal to the mass of such wealthy individuals, i.e., $n_k = m_k[1 - F(\omega_k)]$. Then, we solve this equation for ω_k to obtain

$$\omega_k(n_k) = F^{-1}\left(1 - \frac{n_k}{m_k}\right). \quad (5)$$

The function ω_k , represented by (5) is decreasing; the larger the mass of firms, poorer the threshold entrepreneurs. Now, we can write the binding borrowing constraint (see (4)) as

$$R_k = \frac{\theta_k \pi_k(n_k)}{g - \omega_k(n_k)}. \quad (6)$$

Figure 1 illustrates the relationship, expressed by (6), between the mass of firms and the rental rate of capital in autarky. The BC curve that depicts this relationship is downward-sloping: the larger the mass of firms, the lower the rental rate that satisfies the borrowing constraint with equality. There are two factors that contribute to this negative relationship. The first one is the *competition effect*. If the mass of firms grows, the market environment becomes more competitive so that the pledgeable profits for each firm fall. Then, the rental rate must also fall so that the threshold entrepreneur can still finance the project. The second one is the *threshold wealth effect*. Given a wealth distribution, the threshold wealth must decline as the mass of firms increases. Then, the rental rate must also fall for the less-wealthy threshold entrepreneurs to be able to finance the project. The rental rate of capital naturally depends on the profitability of the project that is financed, or the profitability for the firms. Indeed, as the profitability constraint (3) shows, the competition effect is the only factor that affects the rental rate if financial institution is perfect. Under financial imperfection, however, the threshold wealth effect also plays an important role in determining the rental rate and hence the international flow of capital. Note further that the BC curve shifts up if θ_k increases. Thus, the BC curve for North is located above that for South if $n_N = n_S$, for example.

The equilibrium mass of firms is determined from the capital market clearing condition. The total demand for capital equals $n_k g$ since capital is used only for the initial investment by entrepreneurs, while the total supply of capital in country k equals $m_k \bar{\omega}$, where $\bar{\omega} \equiv \int_0^\infty \omega dF(\omega)$ denotes the average wealth. Thus, we obtain the autarkic mass of firms as

$n_k^A = m_k \bar{\omega} / g$ for $k = N, S$. While the mass of firms is determined solely in the capital market, the rental rate of capital is determined from both the capital market clearing condition and the borrowing constraint. As Figure 1 shows, once the mass of firms is determined in the capital market, the rental rate is determined from the borrowing constraint. Indeed, we substitute $n_k^A = m_k \bar{\omega} / g$ into (2) to obtain

$$\pi_k(n_k^A) = \frac{g}{\sigma \bar{\omega}}. \quad (7)$$

Then, it follows from (5) and (6) that

$$R_k^A = \frac{\theta_k g}{\sigma \bar{\omega} [g - F^{-1}(1 - (\bar{\omega} / g))]}.$$

Note that R_k^A / θ_k is a constant so that $R_N^A / \theta_N = R_S^A / \theta_S$. Thus, it follows from $\theta_N > \theta_S$ that $R_N^A > R_S^A$: in autarky, the rental rate is higher in North than in South because the effective demands for capital are higher in North that has a better financial institution.

Figure 2 depicts the BC curves of both countries in one diagram. The length of the line segment $O_N O_S$ equals $n_N + n_S = (m_N \bar{\omega} + m_S \bar{\omega}) / g = \bar{\omega} / g$, the total mass of firms in the world. Note that the worldwide mass of firms is constant in the basic model, since (i) capital is used only for firms' initial investment in the differentiated-good industry, (ii) initial capital requirement equals g for any firm in the world, and (iii) the worldwide capital endowment is fixed.⁸

The mass of firms in South is measured from O_S to the left; the BC curve for South is therefore upward-sloping. The figure shows the autarkic equilibrium points, A_N for North and A_S for South, as the intersections between the individual BC curves and the vertical line at the equilibrium allocation of firms (shown by z), which is determined by the allocation of capital endowment between the two countries (i.e., the length of $O_N z$ equals $m_N \bar{\omega} / g$). As we have seen, the BC curve for North is located above that for South at the firm allocation point z , such that $R_N^A > R_S^A$.

⁸In Section 6.2, we relax the assumption (i).

3.2 International capital movement

Since the rental rate of capital is greater in North than in South in autarky, capital moves from South to North if it is internationally mobile. The total capital endowment is redistributed between the two countries, and so are the firms. Relocation of firms caused by the international capital movement is depicted in Figure 2. If capital is perfectly mobile internationally, the equilibrium distribution of firms between the countries is given by the intersection of the two BC curves, which is illustrated by K in the figure. Capital flight from South reduces the size of the industry in South and expands it in North. As is well documented, a country with poor financial institution has a risk of losing capital and hence experiences contraction of industry, if it liberalize the capital account without financial development.

In equilibrium when capital is perfectly mobile internationally, the rental rates are equalized between the two countries, and hence we have from (6) that

$$\frac{\theta_N \pi_N(n_N^K)}{g - \omega_N(n_N^K)} = \frac{\theta_S \pi_S(n_S^K)}{g - \omega_S(n_S^K)}, \quad (8)$$

where n_k^K denotes the mass of firms in country k in equilibrium under perfect capital mobility. Capital movement from South to North increases n_N and decreases n_S , which causes decreases in π_N and ω_N and increases in π_S and ω_S (see (2) and (5)). Since $\pi_N(n_N^A) = \pi_S(n_S^A)$ in autarky as (7) shows, these induced changes implies that $\pi_N(n_N^K) < \pi_S(n_S^K)$. International capital movement makes the market in North more competitive than before and than in South. Consequently, the profits for firms in North decline and those for firms in South increase from the common autarkic level, so that firms in North have smaller profits than those in South in equilibrium under perfect capital mobility.

Lemma 1 *Suppose North has a better quality of financial institution than in South. Then, if capital is perfectly mobile internationally, capital moves from South to North, which changes the competition environment in both countries so that firms in North earn smaller profits than those in South.*

3.3 International trade in goods

We turn to the case in which capital is immobile between the countries but goods can be traded without any costs.

In free trade, all firms compete in a level field in the world market, so firms earn the same profits regardless of their locations. Their profits are

$$\pi_w \equiv \frac{m_N + m_S}{\sigma(n_N + n_S)} = \frac{g}{\sigma\bar{\omega}},$$

where we have used $m_N + m_S = 1$ and $n_N + n_S = \bar{\omega}/g$. It is readily seen that the profits in free trade are the same as those in autarky. The competition environment for firms can be measured by the per-capita mass of firms in the market. In this section, we consider a situation in which the wealth distributions (and hence the average wealth) are the same between North and South. But this means that the worldwide average of the wealth is the same as the average wealth of North and South, so the worldwide per-capita mass of firms is also the same as those in North and South in autarky. That is why the profits for any firm do not change by trade liberalization. For any firm in any country, benefits from penetrating the foreign market are completely offset by losses from foreign firms' penetration into its own market.

The borrowing constraint in free trade can be written as

$$R_k = \frac{\theta_k \pi_w}{g - \omega_k(n_k)}. \quad (9)$$

In comparison with (6), we immediately recognize that the competition effect is now shut down. With only the threshold wealth effect remaining, the BC curves are flatter than those in autarky; Figure 3 depicts the BC curves in free trade as dotted curves, which are flatter than the corresponding solid curves that indicate the BC curves when goods are not traded. Comparing the borrowing constraints, (6) and (9), we immediately find that for each country, the BC curve in free trade intersects with that in the case of no trade when $\pi_k(n_k) = \pi_w$. As we have seen, this happens when firms are allocated as they were in autarky, i.e., $n_k = n_k^A$. Since π_k is decreasing in n_k , moreover, the rental rate that satisfies the borrowing constraint

(9) is smaller (greater) than the one that satisfies the autarkic counterpart (6) if and only if $n_k < (>)n_k^A$ and they are equal when $n_k = n_k^A$. This critical observation is illustrated in Figure 3 as the rotation of the BC curves; the BC curve for country k in free trade is located below (above) the autarkic counterpart if and only if $n_k < (>)n_k^A$.

In the absence of international capital movement, opening the countries to trade will not change international firm allocation. Then, it follows immediately that the equilibrium points, illustrated by T_N and T_S in Figure 3, coincide with those in autarky, illustrated by A_N and A_S , respectively. That is, we have $n_k^T = n_k^A$ and $R_k^T = R_k^A$, where the superscript ‘ T ’ signifies the variables in free trade equilibrium without capital movement.

Lemma 2 *In the case where countries are different only in the quality of financial institution, opening the countries to trade will not change the international firm allocation nor the profits for each firm. The rental rates of capital also remain the same as their individual autarkic levels.*

In general, opening to trade can change the profits for firms, and hence affect the borrowing constraints for both countries. This is not the case, however, when the average wealth levels are the same between the countries and so are the per-capita masses of firms as a consequence. Since the international firm allocation does not change by opening to trade, this means that the rental rates of capital will also be unaffected. Each individual’s income also does not change, whether an individual is an entrepreneur or not, because neither the profits nor the rental rate changes as a result of international trade. Despite this fact, however, each individual’s utility increases because international trade allows each consumer to enjoy more varieties of the manufacture good.

3.4 International trade in goods and capital movement

Since the rental rate is higher in North than in South in free trade equilibrium, capital moves from South to North if capital is allowed to move internationally, as in the case where capital becomes internationally mobile while goods continue to be immobile. We will show shortly that the amount of capital that moves out from South is greater in the presence of

international trade in goods than otherwise; capital flight from South is exacerbated if trade in goods has been liberalized.

It is readily seen that the borrowing constraint when both goods and capital are internationally mobile is the same as the one in the case of free trade in goods without capital movement, i.e., the borrowing constraint is given by (9). Indeed, whether the borrowing constraint is written as (6) or (9) hinges on whether goods are allowed to be traded internationally. Capital mobility does not affect the formula for the borrowing constraint, but induces firm relocation through international capital movement, which is reflected as a change in n_k in the borrowing constraint.

As the borrowing constraint (9) applies to this case, equilibrium is illustrated as TK (which signifies ‘trade and capital movement’), the intersection between the two dotted curves, in Figure 3. We find immediately that this equilibrium point is located to the right of K , which describes the equilibrium when capital is perfectly mobile while goods are not; capital flight from South is exacerbated when trade in goods, as well as capital, has been liberalized.

To show this main proposition of the paper more rigorously, we derive the condition that determines the equilibrium allocation of firms by equating the rental rates, R_N and R_S , which are given by (9):

$$\frac{\theta_N}{g - \omega_N(n_N)} = \frac{\theta_S}{g - \omega_S(n_S)}. \quad (10)$$

Then, it follows from (8) and (10) together with $\pi_N(n_N^K) < \pi_S(n_S^K)$ that

$$\frac{g - \omega_N(n_N^{KT})}{g - \omega_N(n_N^K)} > \frac{g - \omega_S(n_S^{KT})}{g - \omega_S(n_S^K)}.$$

Since $n_N + n_S$ is constant, this inequality implies that $n_N^K < n_N^{KT}$ and $n_S^K > n_S^{KT}$, i.e., firm relocation to North is greater when goods and capital are both internationally mobile than in the case where only capital is mobile between the countries.

Proposition 1 *Suppose North has a better quality of financial institution than South. Then, capital flight from South to North is exacerbated if trade in goods has been liberalized. Trade*

in goods and capital movement are complements in the sense that trade induces further capital movement from South to North.

When capital is internationally mobile, capital naturally flows from the financially less-developed country, South, to the financially developed country, North, since the rental rate tends to be higher in the financially developed country where the effective demands for capital is higher. Capital movement, however, entails firm relocation from South to North, which decreases the profits for firms in North and increases those in South when firms are restricted to selling their products only domestically. This in turn tends to lower the rental rate in North and raise it in South, suppressing the capital flight from South. When goods can be traded internationally, however, firms' profits will not change with the firm relocation, so that the factor that counters capital flight from South disappears in this case. Capital flight from South is exacerbated in the presence of trade in goods as a consequence.

Antràs and Caballero (2009) show that trade and capital mobility are complements in the sense that trade induces capital *inflow* to South, while we show that they are complements in the sense that trade induces capital *outflow* from South. In their model, trade liberalization raises the relative price for the good produced in the financially-unconstrained sector in South and thereby raises the return to capital that has effectively become specific (due to the financial constraint) to that sector. That is, capital *inflow* to South in their model is a consequence of an *inter-industry* effect of trade. Whereas in our model, trade liberalization benefits firms in North and harms those in South, which tends to raise the rental rate of capital in North and lower the rate in South. That is, capital *outflow* from South in our model is a consequence of an *intra-industry* effect of trade. Our model should be viewed as a complement to their model (as argued in the Introduction) also regarding the mechanism of complementarity between trade and capital mobility.

Is capital flight bad for South? Consider the case in which trade has already been liberalized. Capital account liberalization will not change the profits for firms while it raises the rental rate in South. Thus, entrepreneurs' income decreases while lenders' increases. Although this observation suggests that the welfare impact of capital flight is inconclusive

in South, capital flight from South unambiguously decreases the mass of entrepreneurs in South, which is certainly bad news to South since entrepreneurs still earn some rents over lenders. The prediction that trade in goods exacerbates capital flight from South can also be interpreted more broadly beyond the framework of this model. Capital inflow is very important for developing countries to build industry, which in turn leads to economic growth. At the same time, trade openness is also an important factor for growth, as it attracts foreign direct investment, for example. But the prediction of our model suggests that unless developing countries develop better financial institution, capital account liberalization together with freer trade can lead to capital flight which depletes capital from industry and hence hampers their economic growth.

4 Different wealth distributions

We have shown in the case where North has a better financial institution than South, that capital movement from South to North is exacerbated if trade in goods has been liberalized. Does this complementarity between trade and capital movement arise because the two countries are in different stages of financial development? Or does it arise merely because their financial institutions are imperfect? To answer to this question, we investigate here the complementarity between trade and capital movement in the case where the two countries have imperfect financial institutions of the same degree, i.e., $\theta_N = \theta_S \equiv \theta < 1$, but have different wealth distributions such that the wealth distribution in North has first order stochastic dominance over that in South, i.e., $F_N(\omega) < F_S(\omega)$ for any ω . We will show shortly that more capital is allocated in North as a consequence of international capital movement if trade in goods has been liberalized than otherwise. That is, the complementarity between trade and capital movement in the sense that trade induces capital outflow from South exists even in the case where the two countries are in the same stage of financial development; the complementarity is a consequence of the financial imperfection *per se*.

Since this section can be considered to establish the robustness of Proposition 1, we do not attempt here to discuss in detail the equilibrium features for each of the four cases

that we have analyzed in the previous section. Instead, our aim here is to show, mainly graphically, the complementarity between trade and capital movement.

Let us first consider the case in which there is no international trade in goods. The borrowing constraint that faces country k in this case can be written as

$$R_k = \frac{\theta \pi_k(n_k)}{g - \omega_k(n_k)}, \quad (11)$$

where $\pi_k(n_k)$ is as given in (2) and

$$\omega_k(n_k) = F_k^{-1} \left(1 - \frac{n_k}{m_k} \right), \quad (12)$$

is slightly different from (5) reflecting the difference in the assumptions about the international difference in wealth distribution (though we use the same notation for simplicity). The corresponding BC curves are drawn in Figure 4.

Figure 4 shows the autarkic equilibrium points, A_N and A_S , with the firm allocation, depicted by z , under the original capital allocation between the two countries. The figure illustrates the case in which the autarkic rental rate is smaller in North than in South. In general, however, this may not be the case. The rental rate tends to be smaller in North because the per-capita capital endowment (and so is the per-capita mass of firms) is greater in North than in South. But, on the other hand, there are more rich individuals in North than in South so that the threshold entrepreneurs in North need not rent as much capital as those in South to start the business. Consequently, the threshold entrepreneurs in North can afford a higher rental rate than those in South if other things being equal. Figure 4 shows the case in which the former effect outweighs the latter. It can be shown that this is indeed the case if F_k is the uniform distribution on the support $[0, \omega_k^{max}]$ such that $\omega_N^{max} > \omega_S^{max}$.

Having drawn the BC curves, which express the borrowing constraints (11) of the individual countries, in Figure 4, it is immediate to find the equilibrium point when capital is internationally mobile while goods are not. In equilibrium with capital movement, the rental rates must be equalized between the two countries. That is, we have from (11) that

$$\frac{\pi_N(n_N)}{g - \omega_N(n_N)} = \frac{\pi_S(n_S)}{g - \omega_S(n_S)}. \quad (13)$$

In Figure 4, the equilibrium point in this case is illustrated by K , the intersection between the two BC curves. Capital moves from capital-abundant North to capital-scarce South in the case that Figure 4 depicts.⁹

Regardless of the direction of capital movement, however, we can derive from (13) an important observation about the profits for the firms in equilibrium with capital movement: $\pi_N(n_N^K) < \pi_S(n_S^K)$, and hence $\omega_N(n_N^K) > \omega_S(n_S^K)$. To show this, let us suppose for now that $\pi_N(n_N^K) = \pi_S(n_S^K)$ and hence $n_N^K/m_N^K = n_S^K/m_S^K$ from (2). Then it follows from (12) and $F_N < F_S$ that $\omega_N(n_N^K) > \omega_S(n_S^K)$. Consequently, we find from the borrowing constraint, expressed by (11), that $R_N > R_S$, so that capital should (further) flow into North. Thus, in equilibrium, more capital than the assumed level should be allocated in North. That is, we have $n_N^K/m_N^K > n_S^K/m_S^K$ and hence $\pi_N(n_N^K) < \pi_S(n_S^K)$.

Lemma 3 *Suppose North is capital-abundant in the sense that the wealth distribution in North has first order stochastic dominance over that in South. Then, in equilibrium under perfect capital mobility without international trade in goods, firms in North earn smaller profits than those in South.*

Recall from Lemma 1 that profits are also smaller for firms in North than those in South in equilibrium under perfect capital mobility when the two countries are different in the degree of financial development. In that case, the financial institution of better quality attracts capital to North, so that the market environment there becomes more competitive since more firms operate locally without the possibility of exporting. The reason for the depressed profits for firms in North is different in this case; the threshold entrepreneurs in North are richer than those in South because of the difference in wealth distribution, so their profits can be smaller in equilibrium, which allows more firms (per capita) to enter the market in North than in South. Despite this difference, what is important is the fact that profits are smaller for firms in North than those in South in both cases. When the countries are open to trade in goods in such situations, firms in North benefit from the trade liberalization more

⁹Capital would move in the opposite direction if the rental rate was higher in North than in South in autarky.

than those in South. Capital demands in North increase while those in South decrease as a result, which leads to capital reallocation from South to North; trade and capital movement are complements in the sense that trade induces capital reallocation from South to North.

To show this complementarity result more rigorously, we shall derive the equilibria under free trade with and without capital movement, and compare these equilibria with those we have derived above. In both cases, the countries engage in free trade so that all firms earn the same profits. Since the total mass of firms in the world equals $n_N + n_S = (m_N \bar{\omega}_N + m_S \bar{\omega}_S)/g$ and the worldwide population is normalized to 1, the profits for firms are

$$\pi_w = \frac{g}{\sigma(m_N \bar{\omega}_N + m_S \bar{\omega}_S)}. \quad (14)$$

Whether or not capital is internationally mobile, the borrowing constraint for country k when the countries engage in free trade can be written as

$$R_k = \frac{\theta \pi_w}{g - \omega_k(n_k)}. \quad (15)$$

As in the case where countries are in different stages of financial development, the competition effect is shut down when the countries are open to trade. What remains is the threshold wealth effect in determining the relationship between the worldwide allocation of firms and the rental rate. Similarly to the shifts of the BC curves depicted in Figure 3, the BC curves become flatter when trade is liberalized. In addition, it follows from the comparison between (11) and (15) that the two corresponding BC curves of either country intersect at the point of firm allocation such that $\pi_N = \pi_S = \pi_w$. As shown in Figure 5, these intersections are to the left of point K , since $\pi_N(n_N^K) < \pi_S(n_S^K)$ in equilibrium under perfect capital mobility without trade as we have shown above.

The trade equilibrium is illustrated in Figure 5 by T_N for North and T_S for South. As in the case of different qualities of financial institution, international allocation of firms does not change with trade liberalization when capital is immobile between the two countries. But the rental rate increases in North and decreases in South as the profits for firms in the respective countries change accordingly.

The equilibrium when both goods and capital are perfectly mobile is illustrated by TK , the intersection between the two countries' BC curves (shown in this case by dotted curves), in Figure 5. As the figure shows, this equilibrium point is located to the right of K , the equilibrium point in the case of perfect capital mobility without international trade. That is, under perfect capital mobility, more capital is allocated in North if trade in goods has been liberalized than otherwise. To show this important observation more rigorously, we note that $R_N = R_S$ implies from the borrowing constraint, expressed by (15), that $\omega_N(n_N^{TK}) = \omega_S(n_S^{TK})$ in the equilibrium allocation of firms, expressed by the masses of firms in the two countries, n_N^{TK} and n_S^{TK} . Since $\omega_N(n_N^K) > \omega_S(n_S^K)$ in the case of perfect capital mobility without trade, this means that more capital is allocated to North when the countries are open to trade than otherwise so that $n_N^{TK} > n_N^K$ and $n_S^{TK} < n_S^K$.

Proposition 2 *Suppose North is capital-abundant such that the wealth distribution in North has first order stochastic dominance over that in South. Then, trade in goods and capital movement are complements in the sense that trade induces capital to be reallocated from South to North.*

We have shown that international trade in goods induces reallocation of capital from South to North in the case where the countries are different in their wealth distributions as well as in the case where they are different in the quality of financial institution (Proposition 1 and Proposition 2). In both cases, capital movement is insufficient to equate profitability of firms between the two countries. In the case of different financial institutions, the difference in the quality attracts too much capital in North in equilibrium with a common rental rate. Whereas in the case of different wealth distributions, the threshold entrepreneurs are richer in North so the equilibrium profits, which satisfy the borrowing constraint, are lower in North than in South. Opening to trade increases profits for firms in North while decreases those in South, which relaxes the borrowing constraint in North while tightens that in South. Consequently, capital moves out of South into North.

5 Why does financial imperfection matter?

In order to deepen our understanding about the reason why the imperfection of financial institution causes complementarity between trade in goods and international capital movement, we examine the impacts of trade and capital movement in the case where the financial institution of either country is perfect or almost perfect such that the profitability constraint is binding while the borrowing constraint is slack, i.e., both θ_N and θ_S are so large that

$$R_k = \frac{\pi_k(n_k)}{g} \quad (16)$$

holds for $k = N, S$. We assume here that North is capital-abundant, i.e., $\bar{\omega}_N > \bar{\omega}_S$ to ensure asymmetry between the two countries.

Figure 6 shows the two PC (profitability constraint) curves for the individual countries. Each PC curve is flatter than the corresponding country's BC curve as the threshold wealth effect is absent here. It follows from $\bar{\omega}_N > \bar{\omega}_S$ that the per-capita mass of firms is greater in North than in South in autarky, i.e., $n_N/m_N = \bar{\omega}_N/g > \bar{\omega}_S/g = n_S/m_S$. Consequently, we have $\pi_N(n_N^A) < \pi_S(n_S^A)$ and hence $R_N < R_S$ in the autarkic equilibrium as illustrated by A_N and A_S in the figure.

If capital is internationally mobile while goods remain immobile, capital moves from North to South (which accords with the traditional view) until the rental rates are equated. In Figure 6, this equilibrium is illustrated by K , the intersection between the two PC curves. Note from the profitability constraint, given by (16), that $\pi_N(n_N) = \pi_S(n_S)$ in equilibrium; the per-capita mass of firms are equated between the two countries, i.e., $n_N^T/m_N = n_S^T/m_S$, as a result of capital movement, and so are the profits for any firm between them. Indeed, the profits are equal to the free-trade equilibrium profits, given by (14), since

$$\frac{n_N^T}{m_N} = \frac{n_S^T}{m_S} = \frac{n_N^T + n_S^T}{m_N + m_S} = \frac{m_N \bar{\omega}_N + m_S \bar{\omega}_S}{g}. \quad (17)$$

If countries are open to trade while capital is internationally immobile, on the other hand, the profits for any firm become π_w , which is given by (14). In Figure 6, the equilibrium is illustrated by T ; it follows from (16) and (17) that the equilibrium rental rate is the same as the one when capital is internationally mobile while goods are not.

Now, it is immediately seen that when capital is internationally mobile, opening to trade will not induce further capital movement, in contrast to the case of financial imperfection in which it does induce further capital movement. When countries become open to trade, firms start exporting their products to each other's markets. But their profits remain the same at π_w and so does the rental rate of capital. Indeed, international trade and capital movement are substitutes in the aspects (i) that trade eliminates an incentive for international capital movement by equating the rental rates between the two countries and (ii) that international capital movement equates the profits for firms worldwide.¹⁰ Note, however, that despite the substitutability, trade is more beneficial for consumers than international capital movement since trade allows them to consume foreign varieties as well as domestic ones.

The key to understand why international trade and capital movement is complementary only when financial institutions are imperfect lies in the threshold wealth effect. What is important under financial imperfection is that the pledgeable profits determine the maximum amount of borrowing, i.e., the amount of borrowing by the threshold entrepreneurs. Indeed, the rental rate is proportional to the ratio of the pledgeable profits to the maximum amount of borrowing. When countries are different in the quality of financial institution (i.e., $\theta_N > \theta_S$), even if the profits themselves are the same between the two countries, the pledgeable profits become smaller in South. Consequently, the maximum amount that entrepreneurs can borrow becomes smaller in South, which implies that the mass of firms is smaller and hence the domestic market is less competitive in South than in North if trade in goods is restricted. Opening to trade will increase profits for firms in North and decrease those in South, which induces further capital outflow from South. When countries are different in their wealth distributions, on the other hand, the maximum amount of borrowing tends to be larger in South as there are less wealthy individuals than in North. As a result, the (pledgeable) profits must be greater in South when capital is internationally mobile (so that the rental rates are equalized) while goods are not. Opening to trade benefits firms in North and hurts

¹⁰Although trade eliminates an incentive for international capital movement by equating the rental rates between the two countries, it would not prevent capital to move from one country to another. Indeed, any capital allocation between O_N and O_S in Figure 6 can obtain in equilibrium.

those in South, and capital is reallocated toward North as a result. Note that such threshold wealth effect is absent, and so is the resulting complementarity between international trade and capital movement, if financial institutions are (almost) perfect.

6 Discussions

6.1 Impact of financial crisis in the North

We analyze here the impact of financial crisis in North on international capital reallocation. Financial crisis can be represented as a sudden fall in θ_N in this model. The analysis above indicates that a fall in θ_N shifts down the BC curve for North, inducing capital outflow from North to South. The amount of capital reallocation, however, depends on the slope of the BC curve for South. Figure 7 indicates the impact of a fall in θ_N on the equilibrium under free trade and perfect capital mobility. The figure depicts two cases with different slopes of the BC curve for South.

The BC curve for South is relatively steep in the first case. As we can see from the borrowing constraint (15), the BC curve is steep if $\omega_S(n_S)$ declines sharply with n_S . This happens when the upper-middle income class in South is thin. Individuals in the upper-middle income class forms a pool of potential entrepreneurs. If there are not many individuals in this pool, even a small increase of the mass of firms must be accompanied by a large decline in the wealth of the threshold entrepreneurs.

Now, a fall in θ_N shifts the BC curve for North from BC_N to BC'_N in Figure 7. The equilibrium point moves on the BC curve for South, indicated by BC_S^1 , from point 0 to 1. Capital moves out of North, leading to the contraction of the industry in North and expansion of that in South. The rental rate that is common between the two countries falls, reflecting the deterioration of the average quality of the financial institutions.

If the upper-middle income class in South is thick, on the other hand, capital reallocation as a result of the financial crisis in North is large in scale. In such cases, the BC curve for South is relatively flat as curve BC_S^2 in Figure 7 indicates. The equilibrium point moves from 0 to 2, indicating that the amount of capital reallocation from North to South is greater than

that in the first case. The rental rate does not decrease much because the new entrepreneurs in South are relatively rich in this case so that they can afford a relatively high rental rate.

It has been documented that in recent years, the middle income class has become thicker in emerging market economies. The capacity to absorb capital in these economies has been increasing and the scale of potential capital outflow from North in case of financial turmoil is greater than ever.

6.2 Alternative use of capital

We have assumed that capital is used only in one industry to simplify the analysis. Here, we relax this assumption by allowing capital to be invested elsewhere. Specifically, we introduce an alternative investment opportunity that yields a fixed return of \bar{R}_N . The alternative opportunity may be investment to another (unmodeled) industry or purchasing a government bond (which is also unmodeled). We also assume that this investment opportunity only exists in North for simplicity.

Let us consider the case in which countries are different only in the quality of financial institutions and international trade in goods has already been liberalized. The relevant borrowing constraint, therefore, is given by (9).

Figure 8 describes the impact of capital account liberalization in this case. The equilibrium under free trade without capital movement is illustrated by two points, T_N and T_S (as those described in Figure 3 as the equilibrium points in the basic model). We examine the case in which an alternative investment opportunity yields the return that is greater than the rental rate in South but is smaller than that in North before capital is allowed to move internationally. Capital is not invested in the alternative opportunity in the free-trade equilibrium without capital movement because the alternative opportunity only exists in North and the equilibrium rental rate in North is greater than its return \bar{R}_N . We also focus on the case where \bar{R}_N is greater than the rental rate given by the intersection between the two BC curves as indicated in Figure 8.

Now, we allow capital to be perfectly mobile between the two countries. If there is

no alternative investment opportunity, the equilibrium would be the one described by the intersection between the two BC curves as seen in the previous analysis. But that would not be equilibrium because the rental rate at the intersection is smaller than \bar{R}_N so that part of capital would instead be invested in the alternative opportunity. Indeed, although capital that is to create firms of the mass $O_N B$ is allocated in North, only the mass $O_N A$ of firms will operate in North.¹¹ The remaining $g \times AB$ units of capital will be invested in the alternative investment opportunity. Capital account liberalization induces large capital flight from South. The amount of capital inflow into North is so large that the investment return from the differentiated-good industry would fall short of the return from the alternative investment opportunity unless some amount of capital is indeed invested outside of the differentiated-good industry.

The investment return from the differentiated-good industry is suppressed due to the reduced effective demands for capital caused by the financial imperfection. So the actual investment return from the differentiated-good industry may well be higher than that from the alternative investment opportunity, i.e., $\pi_w/g > \bar{R}_N$. Indeed, it is easy to see that if θ_N or θ_S is sufficiently small, the BC curve for North lies below the point KT as depicted in Figure 8 even though π_w/g is greater than \bar{R}_N . In such a situation, investment in the alternative opportunity is inefficient, and capital account liberalization causes excess capital flight from South such that part of capital ends up being invested in this less-profitable investment opportunity in North.

7 Conclusion

We have shown the complementarity between trade in goods and international capital movement under financial imperfection. We have constructed a simple model that enables us to capture the effects of international capital flow within the financially-dependent industry and to graphically illustrate the formal analysis. We have considered two cases (i) that countries

¹¹Recall that the horizontal axis of all the figures in the paper measures the mass of firms in the differentiated-good industry rather than the amount of capital allocated in each country. They are closely related to each other, however, such that if K units of capital is allocated to the industry, the mass of operating firms is equal to K/g .

are different only in the quality of financial institutions and (ii) that they are different in wealth distributions such that there are more rich individuals in North than in South. We have found that in both cases, trade in goods facilitates capital flight from South, suggesting that this complementarity prevails even in more-general cases where the countries are different in both aspects.

In recent years, many developing countries and emerging market economies liberalize capital account as well as trade in goods. It is of their central interest whether such liberalization helps develop manufacturing industries. This analysis offers a caution that in the world of financial imperfection, capital account liberalization when countries are open to trade in goods will entail capital flight and hence shrink the manufacturing industries in such countries. Capital account liberalization that is not accompanied by financial development can cause unintended and unwelcome consequences for those countries.

Financial institution is far from perfect in most (if not all) countries. Given that conventional wisdom may fail to be valid under imperfect financial institution as this analysis suggests, there are still many research agendas left to be explored in this direction.

Appendix

A A Cause of Financial Imperfection

Here, we present a simple model to yield financial imperfection of the type that we have studied in the paper. This model setting is a simplified version of Tirole's (2006).

Let us consider a situation in which an agent tries to borrow g from a lender to finance a profitable project. This project potentially generates profits of $\pi (> Rg)$ where R is an exogenous (gross) rental rate. In order to complete the project successfully with a high probability, however, the agent must exert effort, which is unobservable to the lender. If the agent exerts effort, the project generates π with the probability 1. If the agent shirks, on the other hand, the project generates π with the probability $p^L (< 1)$ and 0 with the probability $1 - p^L$. By shirking, however, the agent can get non-pecuniary benefits $b\pi$, where $0 < b < 1$.

The agent unambiguously shirks if the entire π goes to the lender. In order to induce the agent to exert effort, therefore, the lender must abandon some of π , giving a contingent reward w to the agent; the reward is given to the agent if and only if the project has successfully generated π . The reward w should satisfy the incentive condition, $w \geq p^L w + b\pi$, where the left-hand side is the agent's payoff when she exerts effort, while the right-hand side is her expected payoff when she shirks. We assume that negative rewards (i.e., penalties) are not allowed perhaps because the asset held by the agent is limited. This incentive condition can be written as

$$w \geq \frac{b}{1 - p^L} \pi.$$

The lender expects to obtain at most $\{1 - [b/(1 - p^L)]\}\pi$ if he induces the agent to exert effort. Alternatively, he may set $w = 0$ so that he obtains the expected payoff of $p^L \pi$. Consequently, the lender obtains the returns at most $\theta \pi$, where

$$\theta \equiv \max \left\{ 1 - \frac{b}{1 - p^L}, p^L \right\}.$$

Obviously, the lender will not lend g if Rg exceeds $\theta \pi$. Note that if p^L is small enough, θ is

equal to $1 - [b/(1 - p^L)]$. Under a developed financial institution with a solid legal system, non-pecuniary benefits tend to be small. The parameter θ can be considered to represent the quality of a financial institution because θ increases as b diminishes.

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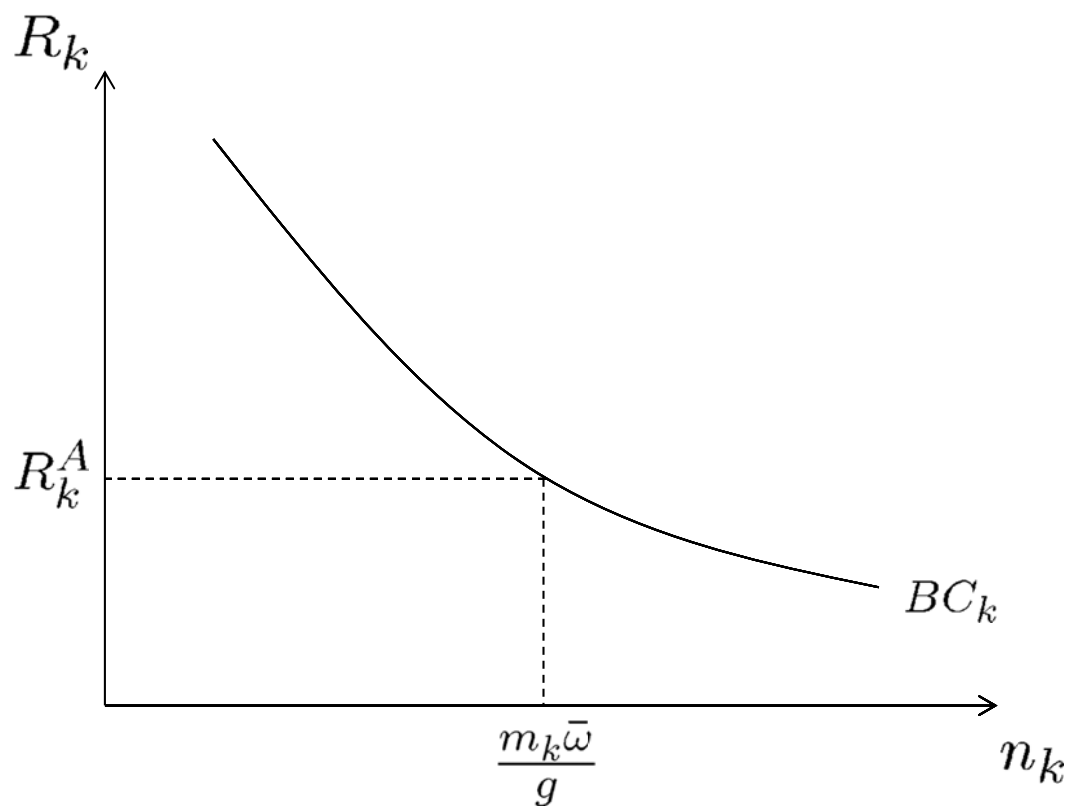


Figure 1. The binding borrowing constraint

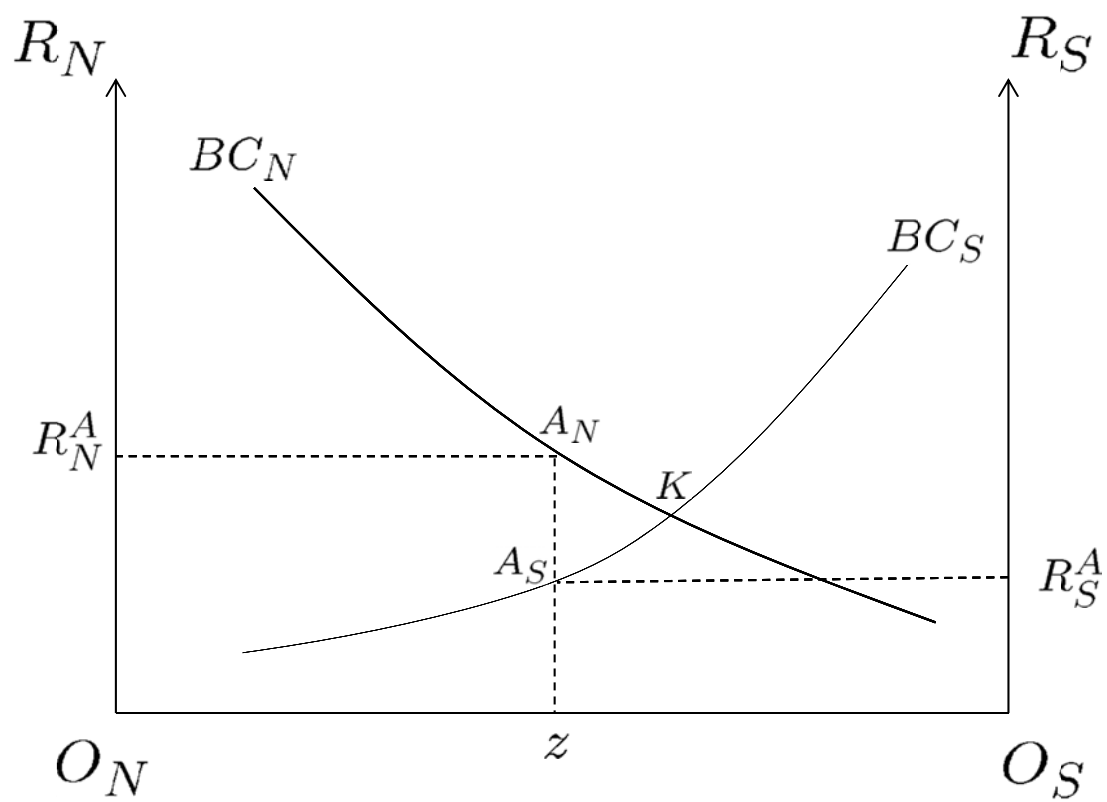


Figure 2. The equilibria without trade ($\theta_N > \theta_S$)

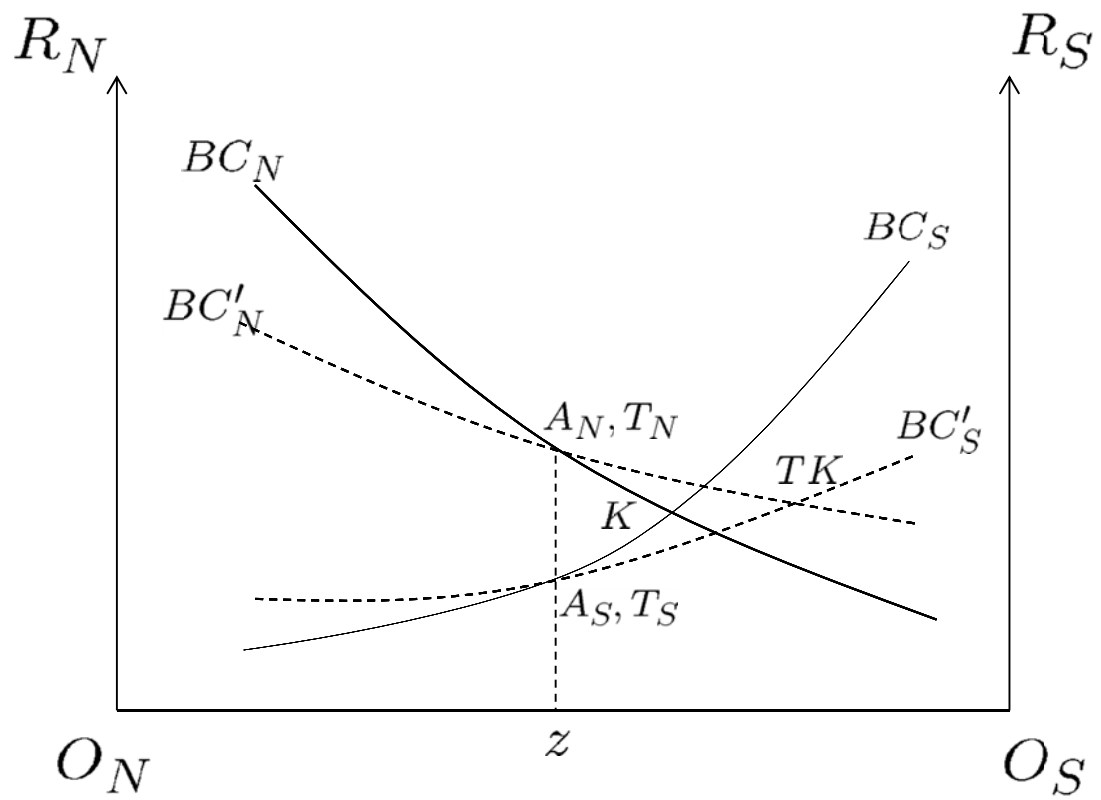


Figure 3. The equilibria with and without trade ($\theta_N > \theta_S$)

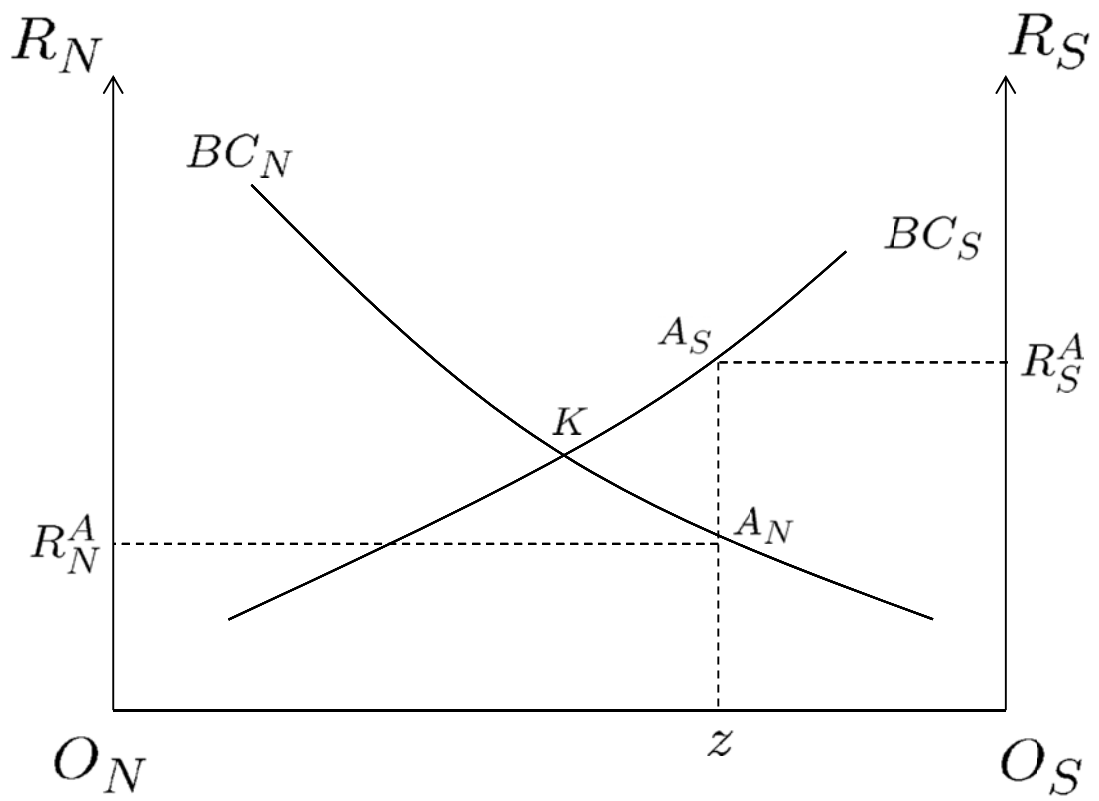


Figure 4. The equilibria without trade ($F_N < F_S$)

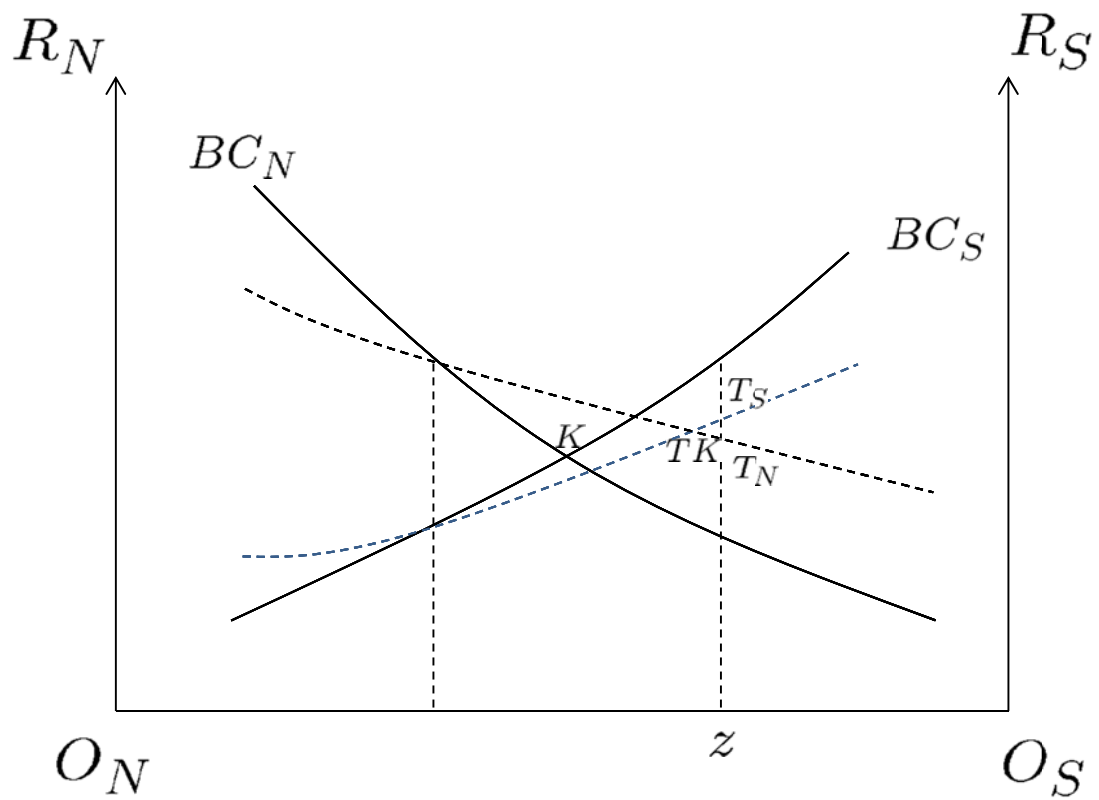


Figure 5. The equilibria with and without trade ($F_N < F_S$)

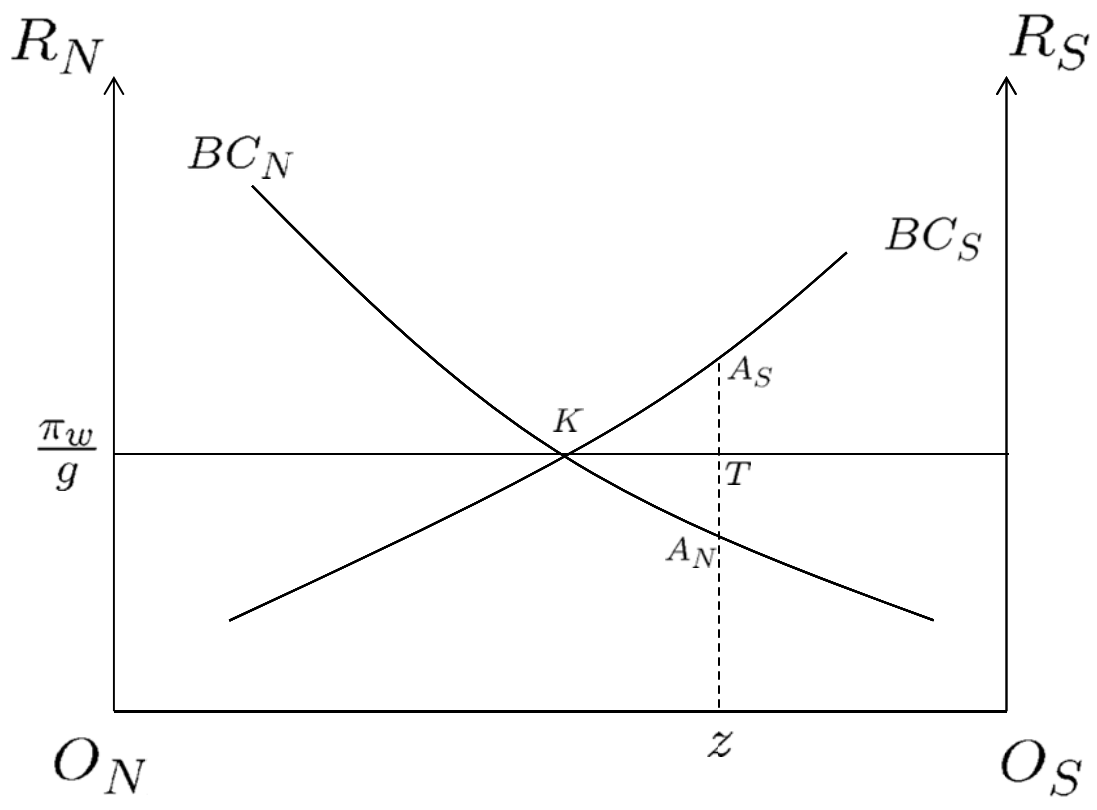


Figure 6. The equilibria when the financial institutions are sufficiently developed

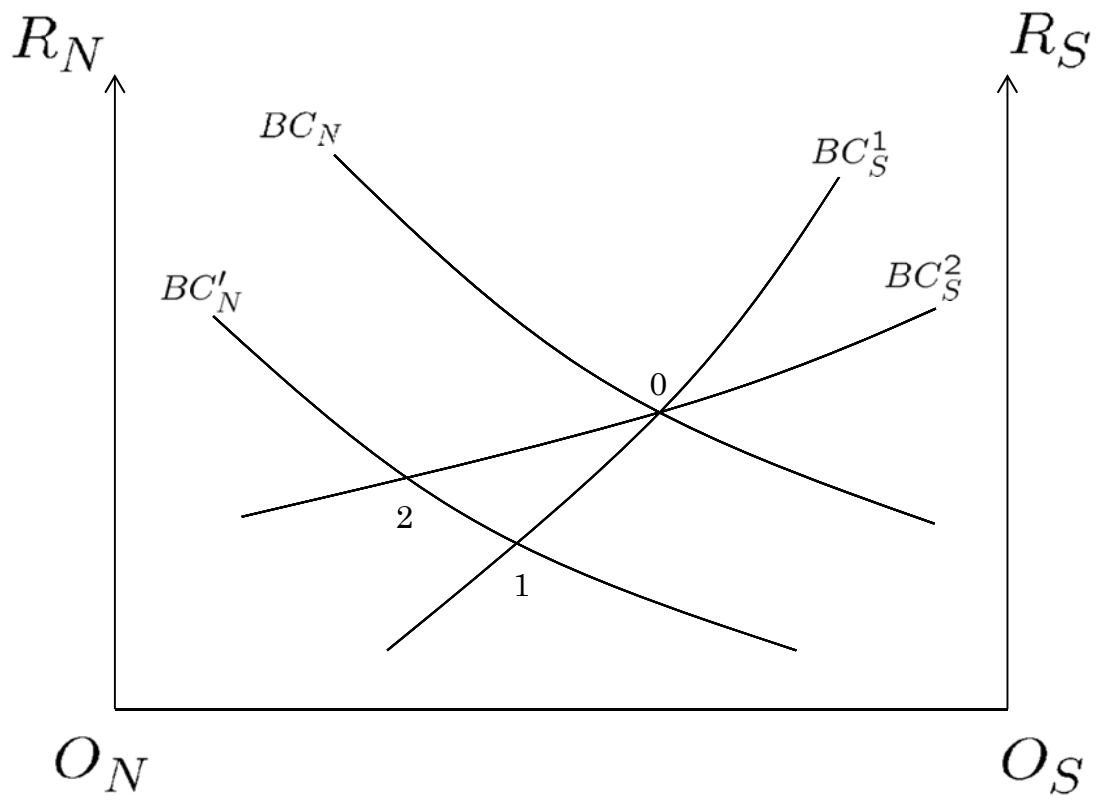


Figure 7. Impact of financial crisis in North

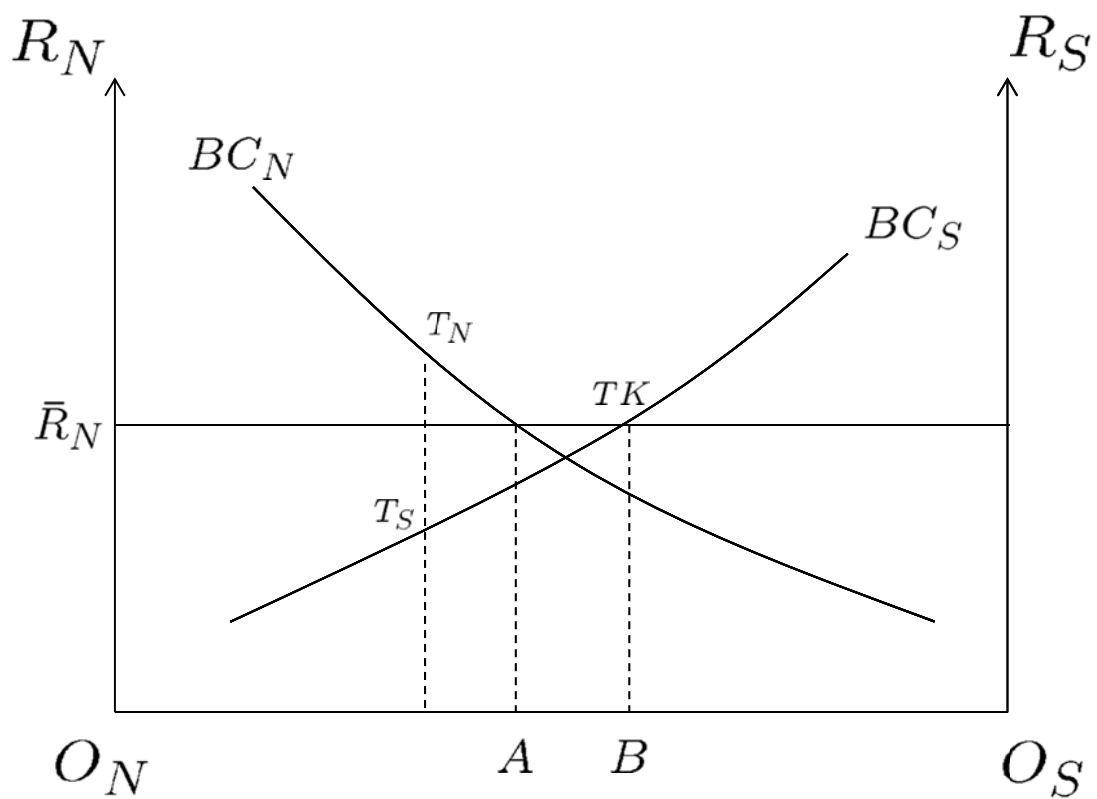


Figure 8. Impact of capital account liberalization in the presence of an alternative use of capital