GLOBALIZATION AND INVESTMENT[1]: DIFFERENTIAL EFFECTS OF TRADE OPENNESS AND CAPITAL MARKET LIBERALIZATION

by

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March, 2001

1 Introduction

Economies of scale are a key contributor to the gains from trade and economic integration. For example, based on a partial equilibrium analysis, the Cecchini (1988) Report estimates that the gains from taking advantage of economies of scale will constitute about 30 percent of the total gains from the European market integration in 1992. Similarly, in a static general-equilibrium setting, Smith and Venables (1988) provide some industry simulations of the effects of the European integration, and find again a substantial role for economies of scale.

In this paper, we further look at the gains-from-trade implications of economies of scale in a dynamic (intertemporal) setting. Economies of scale are captured by a fixed set-up cost of investment, and at the center of our investigation is the effect of globalization on investment. An important aspect of trade liberalization that is addressed here is its effect on the boom-bust investment cycles.

Conventional wisdom suggests that capital market integration boosts not only the financial market, and particularly the stock market, but also the domestic investment.[4] Indeed, better access to the world capital markets may reduce the cost of funds. But such integration may have adverse effects on the terms of trade, and if investment goods are imported, it may suppress domestic investment.[5] The analyitical framework developed in this paper lends itself to a study of these issues.

[1] The authors wish to thank Elhanan Helpman, Mark Gertler and Bob Pindyck for useful comments and suggestions, and Shir Raz for research assistance.

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[4] See, Henry (2000a, 2000b) for recent empirical studies of these issues.

[5] There may be another channel linking investment to capital market integration through the real exchange rate (and investment profitability) which works in a similar way.

The organization of the paper is as follows. Sections 2 and 3 describe the analytical framework. Section 4 analyses the effects of trade openness on investment. Section 5 discusses the implications of capital markets integration for investment. We then conclude in Section 6.

2 A Setup Cost of Investment

Consider a two-good economy. One good (x) is produced domestically and can be exported abroad, but not produced elsewhere, whereas the other good (y) is not produced domestically, but can be imported from abroad. The price of the domestic good is chosen as a numeraire: $p_x = 1$. The price of the foreign good is denoted by p.

Initially, there exists a continuum of N firms which differ from each other by a productivity index ε. We denote a firm which has a productivity index of ε by an $\varepsilon-$firm. The cumulative distribution function of ε is denoted by $G(\cdot)$. With no loss of generality, we assume that the average productivity index is zero, that is $E(\varepsilon) = 0$. For the sake of simplicity, we further normalize the initial number of firms to one; $N = 1$. The number of each type of firms grows at the rate of population growth, n.

The production process lasts one period, so that if an $\varepsilon - firm$ employs a stock of capital K, it will generate a certain gross output flow (of the domestic good x) of $F(K)(1+\varepsilon)$, where F exhibits a diminishing marginal product of capital, that is, $F' > 0$, $F'' < 0$. Naturally, output cannot be negative, so that $\varepsilon = -1$, that is $G(-1) = 0$. It is also assumed that output is bounded from above, so that there exists $\overline{\varepsilon}$ such that $G(\overline{\varepsilon}) = 1$; for simplicity, assume that $\overline{\varepsilon} = 1$.

We further assume for the sake of simplicity that capital fully depreciates at the end of the production process. Thus, at the start of each period the initial stock of capital is zero.

The domestic good x serves for both consumption, domestic investment, and exports. However, there is a fixed setup cost of investment which has to be imported.[6] The fixed cost is C units of the foreign good (y).

[6] See Rothchild (1971) for one of the earliest specifications of a non-convex adjustment cost of investment.

If an $\varepsilon-$firm invests K in some period, it will have a capital stock of K and will generate in the next period a gross output of $F(K)(1+\varepsilon)$ of good x. The objective of an $\varepsilon-$firm is to maximize its value. That is, it chooses K so as to:

$$Max_{\{K\}}\left\{\frac{F(K)(1+\varepsilon)}{1+r}-K-pC\right\}, \tag{1}$$

where r is the domestic rate of interest.

The first-order condition for the maximization of (1) yields the optimal K for an $\varepsilon-$firm as a function of r, denoted by . This $\hat{K}(\varepsilon, r)$ is thus given by:

$$F'(\hat{K}(\varepsilon, r))(1+\varepsilon)=1+r. \tag{2}$$

Note, however, that the firm always has the option not to invest and avoid the setup cost (C) of a new investment. Therefore, whether an $\varepsilon-$firm will indeed carry the new investment prescribed by equation (2) depends on whether its productivity is high enough so as to more than offset the fixed setup cost required for new investments. That is, the $\varepsilon-$firm will indeed carry on the investment prescribed by the first-order condition (2), if and only if:

$$\frac{F\left[\hat{K}(\varepsilon, r)\right](1+\varepsilon)}{1+r}-\left[\hat{K}(\varepsilon, r)+pC\right]=0.$$

Therefore, there exists a cutoff level of ε, denoted by ε_0, so that an $\varepsilon-$firm will invest, if and only if $\varepsilon=\varepsilon_0$. The cutoff level of ε is defined by:

$$F\left[\hat{K}(\varepsilon_0, r)\right](1+\varepsilon_0)=(1+r)\left[\hat{K}(\varepsilon_0, r)+pC\right]. \tag{3}$$

The lef-hand-side of equation (3) is the output generated by the new investment. The right-hand-side is the (future value of the) capital cost of this investment namely, $(1 + r)\hat{K}(\varepsilon_0, r)$, plus the (future value of the) setup cost, namely, $(1 + r)pC$.

While the marginal productivity condition (2) determines the level of investment that each firm will undertake (if it chooses to do so), condition (3) can be viewed as determining whether to invest at all. Firms with a productivity index larger than ε_0 would indeed attract new investment. But firms with a productivity index below ε_0 will attract no new investment.

Another way of describing how the decision whether or not to invest is determined is obtained by substituting equation (2) into equation (3) to get:

$$F\left[\hat{K}(\varepsilon_0, r)\right](1 + \varepsilon_0) - F'\left[\hat{K}(\varepsilon_0, r)\right](1 + \varepsilon_0)\hat{K}(\varepsilon_0, r) = (1 + r)pC. \tag{3'}$$

Equation $(3')$ thus states that the infra-marginal incremental output generated by the new investment [namely, the left-hand-side of equation $(3')$] must equal (the future value of) the setup cost; see Figure 1. Thus, an $\varepsilon-$firm will choose $\hat{K}(\varepsilon, r)$ as its optimal stock of capital if its productivity index is above ε_0; otherwise, it will not invest or produce at all. Therefore, the optimal stock of capital for an $\varepsilon-$firm, denoted by $K(\varepsilon, r)$, is given by:

$$K(\varepsilon, r) = \begin{cases} \hat{K}(\varepsilon, r) & \text{if } \varepsilon = \varepsilon_0 \\ 0 & \text{if } \varepsilon = \varepsilon_0 \end{cases}. \tag{4}$$

3 Consumption

Consider an overlapping-generations model with a standard representative consumer who lives for two periods and a population growth rate of n. The individual consumes two goods in each of the two periods, so that altogether she consumes four goods: c_{x1}, c_{y1}, c_{x2},and c_{y2}, where c_{ji} is consumption of good $j = x, y$ in the ith period of her life, $i = 1, 2$. She is endowed in the first period of her life with x_0 units of the domestic good. For the sake of simplicity, we consider a time-separable Cobb-Douglas utility function with a subjective discount factor θ :

$$u(c_{x1}, c_{y1}, c_{x2}, c_{y2}) = [\alpha \ln c_{x1} + (1-\alpha)\ln c_{y1}] \tag{5}$$
$$+\theta\,[\alpha \ln c_{x2} + (1-\alpha)\ln c_{y2}]\,.$$

As usual, this utility function gives rise to the following demand functions:

$$c_{x1} = \alpha W/(1+\theta). \tag{6a}$$

$$c_{y1} = (1-\alpha)W/(1+\theta)p. \tag{6b}$$

$$c_{x2} = \alpha\theta W(1+r)/(1+\theta). \tag{6c}$$

$$c_{y2} = (1-\alpha)\theta W(1+r)/(1+\theta)p, \tag{6d}$$

where W is the present value of life-time income (wealth). Note that as we shall consider a steady state, the price (p) of the foreign good remains constant over time and the W which is applicable to both old and young is the same.

In each period there is a new generation of firms whose ε is distributed according to G. These firms are owned by the newly-born generation. Therefore, the wealth of a representative consumer is the present value of the profits of these firms. Thus, the wealth of a representative young individual is:

$$W = x_0 + \frac{1}{1+r}\int_{\varepsilon_0}^{1} F\left[K(\varepsilon, r)\right](1+\varepsilon)dG(\varepsilon) - \int_{\varepsilon_0}^{1}\left[K(\varepsilon, r) + pC\right]dG(\varepsilon),$$

which can be simplified to:

$$\begin{aligned} W = {} & x_0 + \frac{1}{1+r}\int_{\varepsilon_0}^{1} F\left[K(\varepsilon, r)\right](1+\varepsilon)dG(\varepsilon) \\ & - \int_{\varepsilon_0}^{1} K(\varepsilon, r)dG(\varepsilon) - pC[1 - G(\varepsilon_0)]. \end{aligned} \tag{6}$$

[Recall that only the firms with a productivity index above ε_0 carry out new investment, and the number of such firms per young individual is $1 - G(\varepsilon_0)$.]

4 Trade-Open Economy

Assume that the economy is open to trade in goods, but does not have an access to the world capital markets. However, there are domestic financial intermediaries that lend or take deposits at a fixed rate.[7] As x is produced domestically only, the country enjoys some market power in the world markets. Denote the foreign demand function for good x per young individual by $D(p)$. As p is the relative price of y, it follows that as p rises, the demand for x rises too, so that $D'(p) > 0$. However, being small consumption-wise, the demand of our economy for good y has no effect on p.

In order to complete the description of the steady-state of this economy, it remains to state the equilibrium conditions in the markets for the two goods (x and y). Market clearing in the domestic good (x) requires that domestic consumption of both the young (namely, c_{x1}) and the old [namely, $c_{x2}(1+n)^{-1}$, per young individual], plus the domestic component of investment [namely,$\int_{\varepsilon_0}^{1} K(\varepsilon, r)dG(\varepsilon)$], plus exports [namely, $D(p)$] must equal domestic output [namely, $(1+n)^{-1}\int_{\varepsilon_0}^{1} F[K(\varepsilon, r)]dG(\varepsilon)$, per young individual], plus the initial endowment (namely, x_0). That is:

[7] These intermediaries play the role of "the social contrivance of money" in Samuelson's (1958) formulation.

$$\frac{\alpha W}{1+\theta} + \frac{\alpha\theta W(1+r)}{(1+\theta)(1+n)} + \int_{\varepsilon_0}^{1} K(\varepsilon, r)dG(\varepsilon) + D(p) = \frac{1}{1+n}\int_{\varepsilon_0}^{1} F[K(\varepsilon, r)]dG(\varepsilon) + x_0. \tag{7}$$

With no access to foreign capital markets, the import of the foreign good is determined by the value of exports of the domestic good, as trade in goods must be balanced period-by-period. The imports of the foreign good in each period are equal to domestic consumption of the young (namely, c_{y1}), and the old [namely, $c_{y2}(1+n)^{-1}$, per young individual], plus the setup cost which is exclusively imported (namely, $[1-G(\varepsilon_0)]C$). Note that only firms with productivity index ε above ε_0 make new investment and incur the setup cost C; the number of such firms per young individual is $1-G(\varepsilon_0)$. Exports of $D(p)$ units of the domestic good can finance imports of $D(p)/p$ units of the foreign good. Therefore:

$$\frac{(1-\alpha)W}{(1+\theta)p} + \frac{(1-\alpha)\theta W(1+r)}{(1+\theta)p(1+n)} + [1-G(\varepsilon_0)]C = \frac{D(p)}{p}. \tag{8}$$

This completes the description of the market equilibrium in the trade-open economy. There are four endogenous variables - W, p, r, and ε_0 - and four equations - (3), (7), (8) and (9). Note that $K(\varepsilon, r)$ is defined implicitly by the F.O.C. (2) and equation (4).

Naturally, for an economy with financial intermediaries, we shall focus our attention on the golden-rule (efficient) steady-state equilibrium in which the rate of interest (namely, r) will be equal to the rate of population growth (namely, n), which is known as the "biological" rate of interest. To see that this is indeed an equilibrium note that by employing equation (7) we can rewrite equation (8) as:

$$\frac{\alpha W}{1+\theta} + \frac{\alpha\theta W(1+r)}{(1+\theta)(1+n)} - W - \frac{r-n}{(1+r)(1+n)}\int_{\varepsilon_0}^{1} F[K(\varepsilon, r)]dG(\varepsilon) - [1-G(\varepsilon_0)]pC + D(p) = 0. \tag{9}$$

Now, by adding up equations (8′) and (9) we get:

$$\frac{\theta W(r-n)(1+r)}{1+\theta} = (r-n)\int_{\varepsilon_0}^{1} F[K(\varepsilon, r)]dG(\varepsilon). \tag{10}$$

Thus, the golden rule (namely, $r = n$) is indeed an equilibrium steady state.[8]

4.1 Trade Openness and Investment

Because of the setup cost of a new investment, low-productivity firms may not find it worthwhile to carry out a new investment. On the other hand, very high-productivity firms are likely to invest, that is: as long as $G(\varepsilon_0) < 1$, there will be a positive mass of firms (namely, the firms with $\varepsilon \geq \varepsilon_0$) that will carry out new investment. The endogenously determined cutoff -$\varepsilon, \varepsilon_0$, depends crucially on the setup cost C. If C is high enough, then no firm will carry out a new investment, that is the endogenously-determined ε_0 is equal to (or exceeds) 1.[9]

This possibility is demonstrated below. Suppose, tentatively, that $\varepsilon_0 = 1$, and drop out the $\varepsilon-$cutoff equation (3). Then we can find from the remaining three equations of the model - (7), (8) and (9) - the price (p), the wealth level (W), and the domestic rate of interest (r which is equal to n) that support such an equilibrium. (Note that when $\varepsilon_0 = 1$, then $1 - G(\varepsilon_0) = 0$, so that C washes out from the above three equations, and p, W, and r may indeed be solved from these three equations, independently of C. Denote these solution values by p^0, W^0, and $r^0 = n$. Now, go back to equation (3), which determines the cutoff level of ε. Set $\varepsilon_0 = 1$ (and the solution values $r^0 = n$ and p^0 for r and p, respectively) in this equation and solve for a critical value of C. Denote this level of C by C_0^T. For this level of C, the cutoff level of ε is indeed equal to 1, and there will be no firm which will carry

[8] But as Gale (1973) pointed out, there is another steady state equilibrium in which $r \neq n$. In this case the term $r - n$ cancels out on both sides of equation (10), and it follows that the value of second-period consumption of each individual (namely, $\theta W(1 + r)/(1 + \theta)]$ is equal to the output that accrues to that individual in the second period (namely, $\int_{\varepsilon_0}^{1} F[K(\varepsilon, r)]d\varepsilon(\varepsilon)]$. This situation is termed by Gale an autarky vis-a-vis the young and the old.

[9] More realistically there may be other sectors of the economy with different investment technologies that carry out new investment and generate capital accumulation and growth.

out a new investment. Evidently, for all $C = C_0^T$ there will be the same zero-investment equilibrium.

The proportion of investing firms, that is $1 - G(\varepsilon_0)$, is plotted in Figure 2 for various levels of C. When there is no setup cost of investment (that is, $C = 0$), then all firms (except the -1-firm) make positive investments. As C rises, fewer and fewer firms invest and when C reaches C_0^T, the number of investing firms drops to zero.

It is useful to compare this trade-open economy to its autarkic counterpart. We can envisage a closed (autarkic) economy which can produce both x and y, according to linear technologies, yielding a Ricardian linear production possibility frontier; see Figure 3. In this autarky, the price of y (denoted by $\overline{p}$) is uniquely determined by the inverse of the slope of the production possibility frontier. However, the domestic technology of producing y is old relative to the modern world technology, that is $\overline{p}$ is "very much" higher than p. Hence, opening up the economy to trade in goods induces it to specialize à-la-Ricardo in producing x and benefit from the modern world technology of producing y by importing y.

Given the much higher price of y under autarky, the cost $\overline{p}C$ of the setup cost C is higher. Thus, the level of C above which no firm makes positive investment is lower. Denote this critical level of C by C_0^A. Similarly, at each level of C below this critical C_0^A, the proportion of the investing firm is lower under autarky than under trade-openness. This is depicted in Figure 2. One can see that the liberalization of trade made a discrete "increase" in investment as the proportion (and the number) of investing firms "jumps" up.

4.2 Boom-Bust Investment Cycles

As was already explained in the preceding subsection, when the setup cost of investment is below C_0^T, there will be an equilibrium with a positive mass of firms carrying out new investments. That is, the endogenously determined cutoff level of ε (namely, ε_0) will be below 1, and a positive mass of $1 - G(\varepsilon_0)$ firms, per young individual will make new investments.

However, as explained in the preceding subsection, when $C \geq C_0^T$, there is an equilibrium with no new investment. An interesting question is whether there may still be in this case another equilibrium (or equilibria) with a positive number of firms making new investments.

In order to gain some insight into the possibility of such a multiplicity of equilibria, consider the cutoff-ε equation (3) and the trade-balance equation (9). For $C > C_0^T$, we have already seen that there is an equilibrium with $\varepsilon_0 = 1$, $p = p^0$, $W = W^0$ and $r = n$, and no new investments [that is, $1 - G(\varepsilon_0) = 0$]. Now, consider a lower foreign good price (p). This reduces the domestic value (pC) of the setup cost (C), and, as can be seen from equation (3), it may induce a positive number of (high-productivity) firms to make new investments. That is, a lower p may reduce the cutoff level ε_0 below 1, so that the proportion $1 - G(\varepsilon_0)$ of investing firms may become positive. For such a change to occur, the economy must also have higher export revenues [namely, $D(p)/p$)] in order to finance the new imports of the foreign good (namely, $[1 - G(\varepsilon_0)]C$) required for the setup cost and the increased domestic consumption demand for the foreign good.

To seethat this demand indeed increases, substitute for W [from equation (7)) in the trade-balance equation (9), to get:

$$\begin{aligned} &\frac{(1-\alpha)[1+\theta(1+r)(1+n)^{-1}]W^*(\varepsilon_0, r)}{(1+\theta)p} \\ &+ \left\{1 - \frac{(1-\alpha)[1+\theta(1+r)(1+n)^{-1}]}{1+\theta}\right\}[1-G(\varepsilon_0)]C = \frac{D(p)}{p}, \end{aligned} \tag{11}$$

where:

$$W^*(\varepsilon_0, r) = x_0 + \frac{1}{1+r}\int_{\varepsilon_0}^{1} F[K(\varepsilon, r)](1+\varepsilon)dG(\varepsilon) - \int_{\varepsilon_0}^{1} K(\varepsilon, r)dG(\varepsilon).$$

Indeed, one can see from (11) that a lower p boosts domestic consumption demand for the foreign good.[10]

Now, if the export revenues $D(p)/p$ indeed increase when p falls, then there may

[10]Recall that $r = n$, so that the term multiplying $[1 - G(\varepsilon_0)]C$ on the left-hand-side of (11) reduces to $\alpha > 0$.

exist another equilibrium with a lower p (below p^0) and a lower ε_0 (below 1) with a positive proportion of firms making new investments. Thus, the possibility of a multiple equilibria seems to rest on the price elasticity of the foreign demand for the country's exports. If this demand is inelastic, then indeed a decline in p will generate higher export revenues.[11] (Note that the price of the domestic good is $1/p$, so that a decline in p means an increase in the price of the domestic good; and if the foreign demand for the domestic good is inelastic, then indeed an increase in its price raises export revenues.)

We establish the possibility of multiple equilibria by numerical simulations. We specify a uniform distribution of ε over the interval $[-1,1]$, so that $G(\varepsilon) = (1+\varepsilon)/2$ for $\varepsilon \in [-1,1]$. The production function is of the Cobb-Douglas form $F(K) = K^{\beta}$, where β is the capital share in GNP. The foreign demand for the domestic good is of the constant elasticity form $D(p) = (p)^{\sigma}$, $\sigma > 0$.

With these specifications we find for setup costs below C_T^0 just one equilibrium with a positive investment. For some range of values of the setup cost above C_T^0, there are indeed two equilibria. In one equilibrium (the "bad" equilibrium), there is zero investment, that is $\varepsilon_0 = 1$. In the other equilibrium (the "good" equilibrium), there is a lower price (p) of the foreign good and there is a positive aggregate investment (that is, there is a positive number [namely, $1 - G(\varepsilon_0)$] of firms per young individual which make positive new investments). Evidently, for very high values of C, there is only one (zero-investment) equilibrium. Figure 4 depicts the two equilibrium proportions of investing firms [namely, $1 - G(\varepsilon_0)$] that arise when the foreign demand for the domestic good is inelastic. This multiplicity of equilibria occurs for values of C above C_0^T but below some bound, $\bar{C}$. We specify a value of σ below one $(\sigma = 0.5)$, so that the price elasticity of the foreign demand for the domestic good is below one.

It should be emphasized that the multiplicity of equilibria is an intrinsic feature of opening up the economy. To see this, reconsider the closed (autarkic) economy whose linear Ricardian possibility frontier is described in Figure 3. In this autarky the price of y (namely, $\bar{p}$) is uniquely determined by the inverse of the slope of the production possibility frontier

[11] Note that even though the aggregate foreign demand for the country's export may be inelastic, still each domestic firm is atomistically small and faces a perfectly elastic demand.

and the possibility of multiple equilibria vanishes.

Thus, the trade-open economy is plagued by an endogenously determined "boom" and "bust" investment cycles. Optimistic expectations regarding the terms-of-trade (namely, p) are self-validated by low, setup costs (namely pC), high investment, high exports, high export revenues (because of inelastic demand), and low p. On the other hand, pessimistic expectations regarding the terms of trade are also self-validated by high setup costs, low investment, low exports, low export revenues, and high p.

In general, the demand facing exports of small developed countries is fairly low (unlike the textbook paradigm of a small country), but still above one. For example, a widely cited survey by Goldstein and Khan (1985) put this elasticity in the range of 1.0-1.6 for Austria, Belgium and Denmark. However, this elasticity refers to aggregate measures of exports, but for a specific exports good things may be different. An inelastic demand for a country's certain export good can arise only when the country is a major supplier of this good in the world market. One can think of at least three categories of such goods: energy, commodities, and high-tech products. Indeed, Robert Pindyck (1979) estimated the demand elasticity of various energy products to be significantly below one in the short run,[12] but about one or even a bit higher in the long-run. Similarly, Pindyck (1978) estimated the demand elasticity for a commodity such as bauxite (used to produce aluminium) to be extremely small, about 0.05-0.10. However, estimates of elasticity of demand for high-tech products, such as semiconductors [Irwin and Klenow (1994)] and computers [Gordon (2000)] are higher than one, between 1.5 and 2.0.

5 Capital-Open Economy

Conventional wisdom suggests that capital market integration boosts domestic investment and growth.[13] Suppose that as a final step of the liberalization of the economy, it is now opened to the world capital market (in addition to the goods trade). Naturally, this means that the trade account needs no longer be balanced period-by-period, but rather only in

[12] For instance, the elasticity of the short-run residential demand for oil was estimated to be 0.15 and that of the industrial demand to be 0.3.

[13] See, for example, Henry (2000a, 2000b).

present value over the infinite horizon. In a steady state, however, the current account has to be balanced period-by-period. There could be a fixed amount of external debt (possibly negative), peryoung individual. Denote this amount by B in units of the foreign good. Each generation borrows an amount of $B(1+n)^t$ (in units of the foreign good) when young, and repays $B(1+n)^t\ (1+r^*)$ in the next period, when old, where r^* is the world rate of interest. Thus, at each period the young borrow $B(1+n)^t$ and the old repay $B(1+n)^{t-1}(1+r^*)$. Therefore, there is a net payment of $B(1+n)^{t-1}(1+r^*)-B(1+n)^t$ in each period, which is equal to $B(r^*-n)/(1+n)$, per young individual.

Because in the steady state the foreign good price is constant over time, it follows that the domestic rate of interest r is equated in the steady state to r^* through interest parity. Thus, we have to replace r by r^* in the four equations describing the equilibrium in our economy, namely: (3), (7), (8), and (9). Also, the trade balance equation (9) is now replaced by the current account balance equation:

$$\frac{(1-\alpha)W}{(1+\theta)p}+\frac{(1-\alpha)\theta W(1+r^*)}{(1+\theta)p(1+n)}+[1-G(\varepsilon_0)]C+\frac{B(r^*-n)}{1+n}=\frac{D(p)}{p}. \tag{9'}$$

Evidently, when $r^*<n$, or when $r^*>n$, then as B grows to infinity or declines to minus infinity, respectively, the trade-balance equation (9') becomes unbounded if the rate of interest faced by our economy (namely, r^*) is constant. We henceforth assume that our economy faces an upward supply of external funds[14]:

$$r^*=S(B), \tag{12}$$

where $S'(B)>0$. We assume that $S(0)$ is less than the autarkic rate of interest (namely, $S(0)<r=n$). Thus, when we open up the economy to foreign supply of funds, B rises to a uniquely determined B^*, determined by $r^*=S(B^*)=n$. In this case the term $B^*(r^*-n)/(1+n)$ vanishes from the left-hand-side of equation (9′), which then becomes identical to

[14] See also Bernanke and Gertler(1989).

equation (9). Thus, the economy goes back to the financial-autarky steady state. The welfare of the generations living in the new capital-open steady state is the same as the welfare of the generation living in the financial-autarky steady state, because both face the same rate of interest $r = n = r^*$. Put differently, the steady-state gain from external borrowing, namely, $-B(r^* - n)$, vanishes because $r^* = n$. However, the young generation born when the economy is opened up to external funds faces immediately a lower interest rate $(r^* < n)$ and scores a welfare gain. So do the succeeding generations, until r^* is pushed back to n.

An interesting question is whether the financial liberalization that enables an immediate access to a relatively low-interest borrowing (at $r^* < n$) would initially and throughout part of the transition period boost domestic investment before we reach the steady state (where the economy goes back to an allocation which is identical to the financial-autarky, steady-state allocation.) Naturally, every investing firm will invest now more; see the marginal productivity of capital equation (2). But, recall that there is also a setup cost of investment in the form of the imported good. If the price of the imported good (p) rises as a result of the capital market liberalization, this acts to reduce the proportion of the investing firms; see the cutoff-ε equation (3).

To see whether aggregate investment can indeed fall in the movement from the trade-open economy to the capital-open economy, it is useful to consider as a benchmark case a setup cost of investment that is equal to C_0^T at which the financial autarky investment is zero. At every C below this C_0^T, the financial autarky aggregate investment is positive. Now, consider the initial period when the capital market is opened up. We can calculate a critical value of the setup cost C (denoted by C_0^K) at which there is an equilibrium with zero investment. If C_0^K for the capital-open economy is below the financial-autarky C_0^T, then for all values of C between C_0^K and C_0^T, the aggregate investment in the financial-autarky economy is positive, but zero in the capital-open economy (in the first period when it was just opened up). We now turn to investigate the question whether C_0^K can be below C_0^T. At the benchmark of zero-investment financial-autarky case, equation (8) becomes:

$$\frac{\alpha\theta x_0(1+r)}{(1+\theta)(1+n)} + \frac{\alpha x_0}{1+\theta} + D(p) = x_0.$$

Now, when the interest rate falls as a result of the capital market liberalization, then the domestic consumption demand for the domestic good (by the old) declines; see the first-term on the left-hand side of the above equation. Hence, the foreign demand for the domestic good must go up in order to clear the market for the domestic good. This can happen only when the relative price of the domestic good (namely, $1/p$) falls, so that p rises. Thus, a decline in the interest rate triggers two conflicting effects on the critical value of C: on the one hand, a lower interest directly boosts investment; but, on the other hand, a lower interest rate may deteriorate the terms of trade and increase the setup cost pC.

If the budget share of the domestic good (namely, α) is small and/or the subjective discount rate is high (namely, θ is small), so that the domestic good consumption demand by the old is also small, the effect of the decline in the interest rate on the consumption demand for the domestic good is small, and the rise in the price of the foreign good is limited. In this case, the first of two aforementioned conflicting effects dominates: A decline in the interest rate moves the critical value of C upward. Thus, the conventional response of domestic investment to a capital market liberalization prevails: Aggregate domestic investment rises in the capital-open economy. But when α and/or θ are high and the foreign demand for the domestic good is relatively inelastic, then the liberalization of the capital market (which brings about a decline in the interest rate) may shift the critical value of C downward, and aggregate investment may decline in the capital-open economy.

Calculations based on the simulations carried out in the preceding section confirm indeed that $C_0^K \leq C_0^T$, when α and θ are relatively large. In this case, capital market integration may indeed suppress aggregate investment in the initial stages before the economy converges to the steady state.

6 Concluding Remarks

In the presence of economies-of-scale in the investment technology, globalization may have non-conventional effects on the level of investment and its cyclical behavior. We envisage a sequential globalization: First, domestic production is exposed to international trade, and second the capital account is liberalized.

Trade openness leads to a discrete “jump” in the level of investment as it triggers a shift from a domestic production of capital goods with an old investment technology to importation of these goods which are produced abroad with modern technology. In the presence of economies-of-scale, such a shift creates a sizable boost in aggregate investment. But when the world demand for the country’s export is inelastic, trade openness may also lead to boom-bust cycles of investment supported by self-fulfilling expectation. (Investment cycles may be driven also by other mechanisms, such as balance-sheet effects; see Krugman (2000).) Pursuing further the process of liberalization with the opening up of the capital account may adverssely affect the country’s terms of trade and actually discourage, rather than encourage, domestic investment, when the latter has a large import component. Capital account liberalization will not necessarilyeliminate the cyclical behavior of investment.

Note, however, that there may be other factors associated with globalization that may boost investment. For example, globalization may lead to a ”race to the bottom” among national tax authorities, thereby enhancing domestic investment.

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