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Social Benefits and Losses from FDI
Two Nontraditional Views

Assaf Razin, Efraim Sadka, and Chi-Wa Yuen

9.1 Introduction

It is commonly believed that foreign direct investment (FDI) is beneficial for growth in less developed countries. Among other things, direct investment by multinational corporations in developing countries is considered a major channel for access to advanced technologies owned by the major industrial countries. In particular, technological diffusion can take place through imports of new varieties of inputs. This is in addition to the usual role of FDI as a channel for bringing in foreign savings to augment the stock of domestic capital. Both the technology-transfer and the traditional capital-augmenting roles of FDI translate into greater income growth in the host country. Indeed, in a sample of sixty-nine developing countries over the period 1970–89, Borensztein, De Gregorio, and Lee (1998) provide evidence of (a) complementarity between FDI and human capital on income growth; (b) complementarity between FDI and non-FDI domestic investment; and (c) productivity gains from FDI exceeding those from non-FDI domestic investment.[1]

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1. The contribution of FDI to growth is evident only when the interaction between human capital and FDI is included in the regression analysis. Their interpretation is that FDI flows

FDI can improve efficiency by promoting competition. The large size of multinational enterprises and the advanced technology they possess often enable them to invest in industries in which barriers to entry (such as large capital requirements) limit the potential access of local competitors.[2]

Overall, the first view of FDI that we shall take in this paper focuses on their effects on technology transfer and promotion of competition. These effects are in addition to the traditional gains from trade afforded by FDI, i.e., the blending of foreign savings with domestic savings to finance domestic investment. We shall formalize these effects in a stylized model and provide a quantitative assessment of the welfare gains from FDI by decomposing them according to their technology transfer effect and competition promotion effect, on top of the traditional gains from intertemporal trade. In doing this, we follow Romer's (1994) argument in relation to the welfare costs of trade barriers: In assuming that the set of goods in an economy never changes, the typical economic model predicts an efficiency loss from a tariff which is second-order small (in the order of the square of the tariff rate). By relaxing this assumption and assuming instead that international trade can bring new goods to the economy, the fraction of national income lost when a tariff is imposed can be much larger (as much as two times the tariff rate).

Another important aspect of FDI is that, in situations of illiquidity associated with global financial crises, FDI provides the only direct link between the domestic capital market in the host country and the world capital market at large. For instance, FDI flows to the East Asian countries were remarkably stable during the global financial crises of 1997–98. In sharp contrast, portfolio equity and debt flows as well as bank loans dried up almost completely during the same period. This resilience of FDI to financial crisis was also evident in the Mexican crisis of 1994 and the Latin American debt crisis of the early 1980s. This may reflect a unique property of FDI, which is determined by considerations of ownership and control by multinationals of domestic activities which are more long term in nature, rather than by short-term fluctuations in the value of domestic currency and the availability of credit and liquidity.[3]

However, the resilience of FDI flows may come at a cost to the host

primarily to sectors which use technology similar to that used in the source country. Thus, the interaction of FDI with human capital is important for explaining its role on productivity. By contrast, non-FDI domestic investment may largely follow more traditional activities, and thus the interaction effects between overall domestic investment and human capital are small in their regression. Corroborative evidence found by Feenstra and Hanson (1997) shows that multinational enterprises are active in sectors that use relatively high-skilled workers.

2. In some cases, however, the presence of multinationals may drive out less efficient local firms and ultimately reduce competition.

3. During a crisis, though, foreign direct investors may contribute to capital withdrawals by accelerating profit remittances or reducing the liabilities of affiliates towards their mother companies. While these are not recorded as negative FDI flows, they result from decisions made by foreign investors.

country. Although the foreign direct investors are able to reap their profits from the host country, their investment may exacerbate distortions in the domestic capital market. The distortions originate from the lack of corporate transparency, which gives rise to asymmetric information between "insiders" and "outsiders" of firms operating in the domestic economy, including firms owned and controlled by the foreign direct investors. The domestic capital market could be trapped in a "lemons" situation described by Akerlof (1970): At the price offered by uninformed equity-buyers, which reflects the average productivity of firms whose shares are sold in the market, owners of firms (including FDI-owned firms) which have experienced a higher-than-average value will pull out of the market. This adverse selection problem in the domestic equity market could be magnified by the introduction of FDI flows, resulting in excessive investment by the foreign direct investors and at the same time worsening the misincentives for the domestic savers.[4] These social losses may significantly reduce the attractiveness of FDI to the host country. Typically also, the domestic investment undertaken by FDI establishments is heavily leveraged through the domestic credit market. As a result, the fraction of domestic investment actually financed by foreign savings through FDI flows may not be as big as it may seem, and the size of the traditional gains from FDI may thus be further limited by this domestic leverage.

The second view of FDI that we shall take in this paper focuses on such perverse interactions between FDI and the domestic capital market, which implies that FDI flows may bring losses to the host country. We model this interaction in an asymmetric information framework. Paralleling the welfare assessments of FDI based on the first view, we shall also try to quantify the possible gains and losses from trade based on this second view of FDI and disentangle these nontraditional gains/losses from the traditional gains from trade.

The rest of the paper is organized as follows. We start with an analysis of the second view in section 9.2, followed by a parallel analysis of the first view in section 9.3. Numerical simulations are used to assess the possible welfare gains/losses these two nontraditional aspects of FDI may bring to the host country relative to the traditional gains. Section 9.4 concludes.

9.2 FDI: Interactions with the Domestic Credit Market

In this section and the next, we assume a two-period model of a small, capital-importing country, referred to as the home country. It is assumed

4. There is no direct evidence on the extent of undersaving resulting from these misincentives. A somewhat related study by the World Bank (1999) shows, however, that the correlation between FDI flows and total factor productivity growth in developing countries with high saving rates is positive and significant, whereas in countries with low saving rates the correlation is negative and significant.

that capital imports are channelled solely through FDI. The economy is small enough that, in the absence of any government intervention, it faces a perfectly elastic supply of external funds at a given risk-free world rate of interest, r^*.

Let us begin with the second view of FDI. We follow Gordon and Bovenberg (1996) and Razin, Sadka, and Yuen (1998a, 1999) in modelling the risk in this economy. Suppose there is a very large number (N) of ex ante identical domestic firms. Each firm employs capital input (K) in the first period in order to produce a single composite good in the second period. We assume that capital depreciates at the rate δ. Output in the second period is equal to $F(K)(1 + \varepsilon)$, where $F(\cdot)$ is a production function exhibiting diminishing marginal productivity of capital and ε is a random productivity factor with zero mean and is independent across all firms. (ε is bounded from below by -1, so that output is always non-negative.) We assume that ε is purely idiosyncratic, so that there is no aggregate uncertainty. Through optimal portfolio decisions, consumer-savers will thus behave in a risk-neutral way.

Investment decisions are made by the firms before the state of the world (i.e., ε) is known.[5] Since all firms face the same probability distribution of ε, they all choose the same level of investment. They then seek funds to finance the investment. At this stage, the owner-managers of the firms are better informed than the outside fund-suppliers. There are many ways to specify the degree of this asymmetry in information. In order to facilitate the analysis, however, we simply assume that the owner-managers, being "close to the action," observe ε before they make their financing decisions; but the fund providers, being "far away from the action," do not.

When investment is equity financed, the original owner-managers observe ε while the new potential shareholders of the firm do not. The market will be trapped in the lemons situation described by Akerlof (1970). At the price offered by the new (uninformed) potential equity buyers, which reflects the average productivity of all firms (i.e., the average level of ε) in the market, the owner-manager of a firm experiencing a higher-than-average value of ε will not be willing to sell its shares and will pull out of the market completely. The equity market will fail to serve its investment-financing functions efficiently. Elsewhere (Razin, Sadka, and Yuen 1999), we have shown how another source of equity finance, namely, international capital flows in the form of FDI, may help mitigate this lemons problem by creating an active (albeit distorted) domestic stock market that facilitates the channelling of domestic savings to finance new domestic investment—in addition to its usual role of channelling foreign savings to the domestic capital market to help finance part of the new investment. De-

5. For a principal-agent foundation for such an economic structure under which investment is precommitted before the realization of the productivity parameter, see Sosner (1998).

spite the inefficiencies (in the form of foreign overinvestment and domestic undersaving) that may result from the information asymmetry, the gains from trade through FDI can be rather substantial.

However, when a domestic credit market is doing most of the job of channelling domestic savings into domestic investment, the role of FDI diminishes. In fact, it is often observed that FDI is highly leveraged domestically. After gaining control of the domestic firm, a foreign direct investor usually resorts to the domestic credit market to finance new investment and possibly sell (shares of) the firm in the domestic equity market later, after profits from its original investment are realized. We thus extend our analysis in the model below to include a domestic credit market and reassess the gains from trade through FDI.

9.2.1 The FDI-Equity-Credit Equilibrium

In a formal sense, foreign acquisition of shares in domestic firms is classified as FDI when the shares acquired exceed a certain fraction of ownership (say, 10–20 percent). From an economic point of view, we look at FDI not just as ownership of a sizable share in a company but, more importantly, as an actual exercise of control and management and acquisition of inside information (the value of ε in our model).

The sequencing of firm decisions is as follows. Before ε is revealed to anyone (i.e., under symmetric information), foreign investors bid up domestic firms from their original domestic owners, investment decisions are made, and full financing through domestic credit is secured. Then, ε is revealed to the owner-managers (who are all foreigners), but not to domestic equity investors. At this stage, shares are offered in the domestic equity market and the ownership in some of the firms is transferred to the domestic investors. In the initial stage (i.e., before ε is revealed to anyone), the foreign direct investors are able to outbid the domestic savers because the latter lack access to the large amounts of funds necessary to seize control of the firms, while the former, by assumption, are not liquidity constrained.[6]

Since credit is extended ex ante, before ε is revealed, firms cannot sign default-free loan contracts with the lenders. We therefore consider loan contracts which allow for the possibility of default. We adopt the "costly state verification" framework á la Townsend (1979) in assuming that lenders make firm-specific loans, charging an interest rate of r^j to firm $j(j =$

6. The existence of wealthy individuals or families in the home country may limit the scope of our analysis to the extent that they can compete with the foreign direct investors on control over these greenfield investment sites. Our analysis will carry over, however, if they form joint ventures with the foreign direct investors. On the other hand, the foreign direct investors need not be excessively resourceful. Even a small technological advantage they may enjoy over the domestic investors will enable them to bid up all these investment sites from the domestic investors and to gain control of these industries.

1,2, . . . ,N) (see also Stiglitz and Weiss 1981). The interest and principal payment commitment will be honored when the firms encounter relatively good shocks, and defaulted when they encounter relatively bad shocks. The loan contract is characterized by a loan rate (r^j), with possible default, and a threshold value ($\bar{\varepsilon}^j$) of the productivity parameter as follows:

$$(1) \quad F(K_j)(1 + \bar{\varepsilon}^j) + (1 - \delta)K^j = [K^j - (1 - \delta)K_0^j](1 + r^j).$$

When the realized value of ε^j is larger than $\bar{\varepsilon}^j$, the firm is solvent and will thus pay the lenders the promised amount, consisting of the principal $K^j - (1 - \delta)K_0^j$ plus the interest $r^j[K^j - (1 - \delta)K_0^j]$ as given by the right-hand side of equation (1). If, however, ε^j is smaller than $\bar{\varepsilon}^j$, the firm will default. In the case of default, the lenders can incur a cost in order to verify the true value of ε^j and to seize the residual value of the firm. This cost, interpretable as the cost of bankruptcy, is assumed to be proportional to the firm's realized gross return, $\mu[F(K^j)(1 + \varepsilon^j) + (1 - \delta)K^j]$, where $\mu \leq 1$ is the factor of proportionality. Net of this cost, the lenders will receive $(1 - \mu)[F(K^j)(1 + \varepsilon^j) + (1 - \delta)K^j]$.

Since there is no aggregate risk, the expected rate of return required by domestic consumer-savers, denoted by $\bar{r}$, can be secured by sufficient diversification. Therefore, the "default" rate of interest, r^j, must offer a premium over and above the default-free rate, $\bar{r}$, according to

$$(2') \quad [1 - \Phi(\bar{\varepsilon}^j)][K^j - (1 - \delta)K_0^j](1 + r^j) + \Phi(\bar{\varepsilon}^j)(1 - \mu)$$
$$\{F(K^j)[1 + e^-(\bar{\varepsilon}^j)] + (1 - \delta)K^j\} = [K^j(1 - \delta)K_0^j](1 + \bar{r}),$$

where $\Phi(\cdot)$ is the cumulative probability distribution of ε, i.e., $\Phi(\bar{\varepsilon}^j) = \text{prob}(\varepsilon \leq \bar{\varepsilon}^j)$, and $e^-(\bar{\varepsilon}^j)$ is the mean value of ε realized by the low-productivity firms, i.e., $e^-(\bar{\varepsilon}^j) \equiv E(\varepsilon|\varepsilon \leq \bar{\varepsilon}^j)$. For later use, we also denote by $e^+(\bar{\varepsilon}^j)$ the mean value of ε realized by the high-productivity firms, i.e., $e^+(\varepsilon^0) \equiv E(\varepsilon|\varepsilon \geq \bar{\varepsilon}^j)$.[7]

The first term on the left-hand side of equation (2′) is the contracted principal and interest payment, weighted by the no-default probability. The second term measures the net residual value of the firm, weighted by the default probability. The right-hand side is the no-default return required by the domestic lender. Observe that equations (1) and (2′) together imply that

$$[1 - \Phi(\bar{\varepsilon}^j)] + \frac{\Phi(\bar{\varepsilon}^j)(1 - \mu)\{F(K^j)[1 + e^-(\bar{\varepsilon}^j)] + (1 - \delta)K^j\}}{F(K^j)(1 + \bar{\varepsilon}^j) + (1 - \delta)K^j} = \frac{1 + \bar{r}}{1 + r^j}.$$

7. The weighted average of $e^-(\bar{\varepsilon}^j)$ and $e^+(\bar{\varepsilon}^j)$ must yield the average value of ε, i.e., $\Phi(\bar{\varepsilon}^j)e^-(\bar{\varepsilon}^j) + [1 - \Phi(\bar{\varepsilon}^j)]e^+(\bar{\varepsilon}^j) = E(\varepsilon) = 0$. This in turn implies that $e^-(\bar{\varepsilon}^j) < 0$ while $e^+(\bar{\varepsilon}^j) > 0$, i.e., the expected value of ε for the "bad" ("good") firm is negative (positive).

Since $e^{-}(\bar{\varepsilon}^j) < \bar{\varepsilon}^j$ and $0 \leq \mu \leq 1$, it follows that $r^j > \bar{r}$, the difference being a risk premium (which depends, among other things, on K^j, $\bar{\varepsilon}^j$, and μ).

The firm in this setup is competitive (i.e., a price taker) only with respect to $\bar{r}$, the market default-free rate of return. This $\bar{r}$ cannot be influenced by the firm's actions. However, r^j, K^j, and $\bar{\varepsilon}^j$ are firm specific and must satisfy equations (1) and (2′). In making its investment (i.e., choosing $K^j - [1 - \delta]K_0^j$) and its financing (loan contract) decisions, the firm takes these constraints into account. Since these decisions are made before ε is known, i.e., when all firms are (ex ante) identical, they all make the same decision. We henceforth drop the superscript j.

In the equity market which opens after ε is revealed to the (foreign) owner-managers, there is a cutoff level of ε, denoted by ε^0, such that all firms experiencing a value of ε above ε^0 will be retained by the foreign direct investors and all other firms (with ε below ε^0) will be sold to domestic savers. This cutoff level of ε is given by

$$(3') \quad \frac{[F(K)(1+\varepsilon^0)+(1-\delta)K]-[K-(1-\delta)K_0](1+r)}{1+r^*}$$
$$= \left[\frac{\Phi(\bar{\varepsilon})}{\Phi(\varepsilon^0)}\right]\cdot 0 + \left[\frac{\Phi(\varepsilon^0)-\Phi(\bar{\varepsilon})}{\Phi(\varepsilon^0)}\right]$$
$$\cdot\left[\frac{\{F(K)[1+\hat{e}(\bar{\varepsilon},\varepsilon^0)]+(1-\delta)K\}-[K-(1-\delta)K_0])1+r)}{1+\bar{r}}\right].$$

where $\hat{e}(\bar{\varepsilon}, \varepsilon^0) \equiv E(\varepsilon|\bar{\varepsilon} \leq \varepsilon \leq \varepsilon^0)$ is the conditional expectation of ε given ε lies between $\bar{\varepsilon}$ and ε^0.

Notice that firms that experience a value of ε below $\bar{\varepsilon}$ default and have zero value. These firms are not retained by the foreign direct investors; hence $\varepsilon^0 \geq \bar{\varepsilon}$. All other firms generate in the second period a *net* cash flow of $[F(K)(1+\varepsilon)+(1-\delta)K]-[K-(1-\delta)K_0](1+r)$. The left-hand side of equation (3′) represents the marginal (from the bottom of the distribution) firm retained by foreign investors. The right-hand side of equation (3′) is the expected value of the firms that are purchased by domestic savers. With a conditional probability of $[\Phi(\varepsilon^0)-\Phi(\bar{\varepsilon})]/\Phi(\varepsilon^0)$, they generate a net expected cash flow of $\{F(K)[1+\hat{e}(\bar{\varepsilon},\varepsilon^0)]+(1-\delta)K\}-[K-(1-\delta)K_0](1+r)$; and with a probability of $\Phi(\bar{\varepsilon})/\Phi(\varepsilon^0)$, they generate a zero net cash flow. This explains equation (3′).

We can substitute equation (1) into equations (2′) and (3′) in order to eliminate r and then rearrange terms to obtain

$$(2) \quad [1-\Phi(\bar{\varepsilon})]F(K)(1+\bar{\varepsilon})+\Phi(\bar{\varepsilon})(1-\mu)F(K)[1+e^{-}(\bar{\varepsilon})]$$
$$+[1-\Phi(\bar{\varepsilon})\mu](1-\delta)K = [K-(1-\delta)K_0](1+\bar{r}),$$

and

$$\frac{\varepsilon^0 - \bar{\varepsilon}}{1 + r^*} = \left[\frac{\Phi(\varepsilon^0) - \Phi(\bar{\varepsilon})}{\Phi(\varepsilon^0)}\right] \cdot \left[\frac{\hat{e}(\bar{\varepsilon}, \varepsilon^0) - \bar{\varepsilon}}{1 + \bar{r}}\right]. \tag{3}$$

Consider now the capital investment decision of the firm that is made before ε becomes known, while it is still owned by foreign direct investors. With a probability of $\Phi(\varepsilon^0) - \Phi(\bar{\varepsilon})$, it will be sold to domestic savers who pay a positive price equalling

$$\frac{\{F(K)[1 + \hat{e}(\bar{\varepsilon}, \varepsilon^0)] + (1 - \delta)K - [K - (1 - \delta)K_0](1 + r)\}}{(1 + \bar{r})} = \frac{F(K)[\hat{e}(\bar{\varepsilon}, \varepsilon^0) - \bar{\varepsilon}]}{(1 + \bar{r})},$$

by using equation (1). With a probability of $1 - \Phi(\varepsilon^0)$, it will be retained by the foreign investors, for whom it is worth

$$\frac{\{F(K)[1 + e^+(\varepsilon^0)] + (1 - \delta)K - [K - (1 - \delta)K_0](1 + r)\}}{(1 + r^*)} = \frac{F(K)[e^+(\varepsilon^0) - \bar{\varepsilon}]}{(1 + r^*)},$$

by using equation (1). Hence, the firm seeks to maximize

$$V = [1 - \Phi(\varepsilon^0)] \cdot \left\{\frac{F(K)[e^+(\varepsilon^0) - \bar{\varepsilon}]}{1 + r^*}\right\} + \Phi(\bar{\varepsilon}) \cdot 0 + [\Phi(\varepsilon^0) - \Phi(\bar{\varepsilon})] \cdot \left\{\frac{F(K)[\hat{e}(\bar{\varepsilon}, \varepsilon^0) - \bar{\varepsilon}]}{1 + \bar{r}}\right\} \tag{4}$$

subject to constraint (equation [2]), by choice of K and $\bar{\varepsilon}$, given ε^0.[8] The first-order conditions are spelled out in the appendix.

The (maximized) value of V in equation (4) is the price paid by the foreign direct investors at the greenfield stage of investment. Since the value of ε is not known at this point, the same price is paid for all firms. The low-ε firms are then (after ε is revealed to the foreign direct investors) resold to domestic savers, all at the same price, because ε is not observed by these savers. Net capital inflows through FDI are given by

8. The ε^0-condition, as given by equation (3), is determined by equilibrium in the equity market. As such, it will not be taken into account by the price-taking firms when choosing their investment levels.

$$\text{FDI} = \frac{N[1 - \Phi(\varepsilon^0)]F(K)[e^+(\varepsilon^0) - \bar{\varepsilon}}{(1 + r^*)} \tag{5}$$

(see equation [4]). Unlike the case with no domestic credit (in which the foreign direct investors have to bring in their own capital to finance the domestic investment projects), all capital outlays are financed domestically and FDI consists only of the price paid for the ownership and control of the high-ε firms.

The remainder of the equilibrium conditions is standard. The first-period resource constraint is given by

$$\text{FDI} = N[K - (1 - \delta)K_0] - [NF(K_0) - c_1]. \tag{6}$$

The second-period resource constraint is

$$c_2 = N[F(K) + (1 - \delta)K] - \text{FDI}(1 + r^*) \tag{7}$$
$$- N\mu\Phi(\bar{\varepsilon})\{F(K)[1 + e^-(\bar{\varepsilon})] + (1 - \delta)K\}.$$

Note that the last term on the left-hand side of equation (7) reflects the existence of real default costs. Finally, the consumer-savers do not have access to the world capital market and can only borrow/lend from the domestic market. As a result, in maximizing utility, they will equate their intertemporal marginal rate of substitution to the domestic risk-free rate of return as follows:

$$\frac{u_1(c_1, c_2)}{u_2(c_1, c_2)} = 1 + \bar{r}. \tag{8}$$

In this model, the eight equations (i.e., [2], [3], [5]–[8] together with the two first-order conditions associated with the choice of K and $\bar{\varepsilon}$) determine the eight endogenous variables, i.e., K, r, $\bar{r}$, $\bar{\varepsilon}$, ε^0, c_1, c_2, FDI, and the LaGrange multiplier λ associated with the constraint (equation [2]).

9.2.2 Gains from Trade

To flesh out in a simplified manner the kind of gains or losses brought about by FDI, we compare the laissez-faire allocation in the presence of FDI with the closed economy laissez-faire allocation.

In the autarky case, the lemons problem will drive the equity market out of existence. Firms will have to rely solely on the provision of domestic credit in financing its investment projects. The firm-specific debt contract for any firm j continues to be characterized by a default-risky interest rate (r^j) and a threshold productivity level ($\bar{\varepsilon}^j$) that satisfy the cutoff condition (equation [1]). The default-free interest rate ($\bar{r}$) is still defined implicitly by equation (2′). Again, since all firms are ex ante identical, we can drop the superscript j. The firm's investment decision is to choose K, r, and $\bar{\varepsilon}$ to solve the following problem:

$$(4') \quad \max_{(K,r,\bar{\varepsilon})} F(K) - \Phi(\bar{\varepsilon})\{F(K)[1 + e^{-}(\bar{\varepsilon})] + (1 - \delta)K\} - [1 - \Phi(\bar{\varepsilon})][K - (1 - \delta)K_0](1 + r)$$

subject to equations (1) and (2′). We can use equation (1) to substitute out the risky interest rate (r) in equation (2′) as well as in the objective function above. The first order conditions with respect to K and $\bar{\varepsilon}$ for this reduced problem are laid out in the appendix. Utility maximization by the consumer-savers continues to yield the same intertemporal condition (equation [8]). In the absence of capital flows, FDI ≡ 0 in the two resource constraints (equations [6] and [7]). Together, these five conditions determine the five endogenous variables, i.e., K, $\bar{r}$, $\bar{\varepsilon}$, c_1, and c_2.

In the open economy case with domestic credit, FDI has conflicting effects on welfare. Its first role (discussed in detail in Razin, Sadka, and Yuen 1999) is to facilitate the channelling of domestic saving into domestic investment by getting around a lemons problem and sustaining a domestic equity market. This, by itself, is welfare enhancing; but, as we have already indicated, FDI is driven also by distorted incentives, and its traditional role of directing foreign savings into domestic investment may generate an excessive stock of domestic capital (either when capital inflows are not needed at all or, when they are needed to start with, too much of them take place). This foreign overinvestment (coupled with possible domestic over- or undersaving)—i.e., $F'(K) - \delta < r^*$ (and $\gtrless \bar{r}$)—tends to reduce welfare.

We use numerical examples to illustrate the total effect of FDI on welfare. In these examples, we employ a logarithmic utility function ($u[c_1, c_2] = \ln[c_1] + \gamma \ln[c_2]$), with a subjective discount factor γ, a Cobb-Douglas production function ($F[K] = AK^{\alpha}$), and a uniform distribution of ε defined over the interval $(-a, a)$. The welfare gain (loss) is measured by the uniform percentage change (in c_1 and c_2) which is needed in order to lift the autarkic utility level to the FDI utility level. We set the parameter values as $\gamma = 0.295$, $\alpha = 0.333$, $\delta = 0.723$, $N = 1$, $A = 1$, $K_0 = 1$, $a = 0.99$, and $\mu = 0.05$. This set of values yields a normalized output level of unity in the initial period. Since we think of each period as constituting half the lifetime of a generation (i.e., about twenty-five years), the values of γ and δ are chosen in such a way as to reflect an annual time preference rate of 5 percent and an annual depreciation rate of 5 percent.

Unlike the case where domestic credit is not available (as analyzed in Razin, Sadka, and Yuen 1999), an autarkic economy with a domestic credit market can utilize domestic savings to debt-finance domestic investment. The crucial role of FDI as a vehicle for sustaining a domestic equity

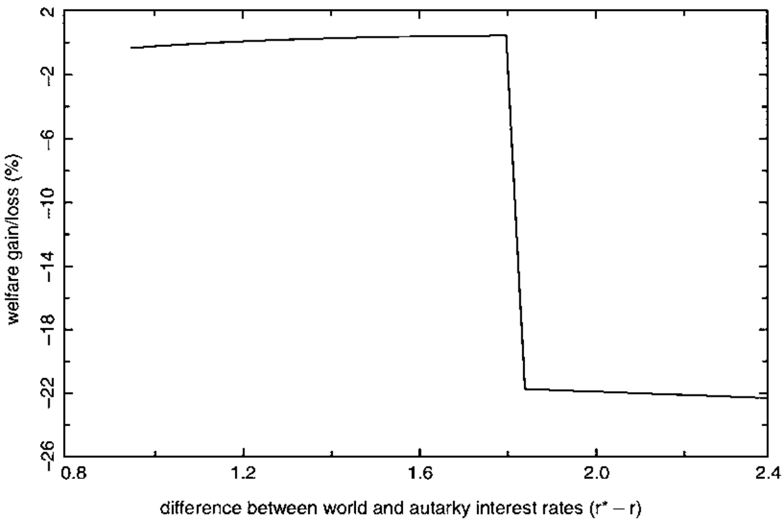

Fig. 9.1 Welfare gain/loss from FDI with domestic credit and equity

market through which domestic savings are channelled into domestic investment is thus substantially diminished. Consequently, the negative effect of FDI associated with the distorted incentives emanating from the domestic equity market dominates, and altogether there may exist a net welfare loss from trade.[9] Figure 9.1 illustrates the welfare gains and losses occurring at various levels of the world rate of interest, r^*, relative to the autarky risk-free rate $\bar{r}$. Among other things, three points are worth noting from this figure. First, except for levels of $r^* - \bar{r}$ ranging from 1.2 to 1.8 (equivalent to an annual real rate differential of 3.2 percent to 4.2 percent) where some minimal welfare gains of 0.04 percent to 0.55 percent are recorded, welfare losses are prominent (about −2 percent at lower levels of $r^* - \bar{r}$ and increasing to more than −20 percent when $r^* - \bar{r}$ exceeds 1.8). Second, observe that there is a discrete jump in the welfare levels around $r^* - \bar{r} = 1.8$. Below that level, we have a low investment, low FDI equilibrium, with an investment rate of about 17 percent and a FDI/GDP ratio of 6–8 percent. Above that, the investment rate surges to 25–26 percent and the FDI/GDP ratio to 11–13 percent. The saving rate is relatively stable, though—only slightly higher in the latter case (around 13 percent) than in the former (around 10 percent). This suggests the possibility of multiple equilibria driven by self-fulfilling expectations. Although the role of FDI in financing domestic investment is much less important relative

9. This possibility of losses from trade in an originally distorted economy can be viewed as a corroboration of the earlier findings of Brecher and Diaz-Alejandro (1977) and Helpman and Razin (1983).

to the scenario with no domestic credit (not shown here; see Razin, Sadka, and Yuen 1999), foreign overinvestment (i.e., $F'[K] - \delta < r^*$) prevails in all these cases. So also does domestic oversaving (i.e., $F'[K] - \delta > \bar{r}$). Third, note that the autarkic default-free interest rate $\bar{r}$ (= 2.9) falls short of all the values of r^* considered here. So here we have the possibility that although the FDI flows are not fundamentally needed, they do nevertheless flow in.

9.3 FDI: Technology Transfer and Promotion of Competition

We now return to discuss in detail the second view of FDI. We start with an autarkic situation in the host country where only traditional inputs are used for domestic production and the domestic input markets are plagued by perils of imperfect competition. In this section, we assume that FDI can bring new inputs to an economy and can promote competition in the domestic input market. We view technology transfer as the introduction of new inputs brought in by the foreign direct investors in the sense that productivity can be raised by the addition of more varieties of inputs. Alternatively, we can view these new inputs as tradable goods and the traditional inputs as nontradable goods. To illustrate the possible gains from FDI in a partial equilibrium setting, we show in figures 9.2 and 9.3 the gains from the increase in the use of traditional inputs brought about by increased competition (area B in figure 9.2)[10] and from the introduction of new inputs (area C in figure 9.3).

As in the previous section, the economy is producing a single, all-purpose (consumption and capital) good with a composite capital input through a Cobb-Douglas technology:

$$(9) \qquad Y = AK^{\alpha}, \text{ where } K = \left(\sum_{j=1}^{M} k_j^{\theta}\right)^{1/\theta}, \qquad 0 < \theta < 1.$$

That is, capital is a composite of a number of varieties of individual inputs (k_j, $j = 1,2, \ldots, M$). The elasticity of substitution among these inputs is given by $(1/(1 - \theta)$. In the absence of uncertainty, we can interpret the production technology specified in section 9.2.2 as a special case of equation (9), with $M = 1$.

It is easy to show that, holding the cost of production constant, a mere increase in the number of inputs can generate more output. In particular, suppose that either $\hat{k}$ units each of M kinds of inputs or $\tilde{k}$ units each of $M + m$ kinds of inputs can be used to compose the same aggregate level of

10. Area A of figure 9.2 does not constitute any welfare gain or loss from increased competition because the gain in consumer surplus due to the fall in the input price from w (its imperfectly competitive level) to 1 (its competitive level) is exactly offset by the loss in producer surplus.

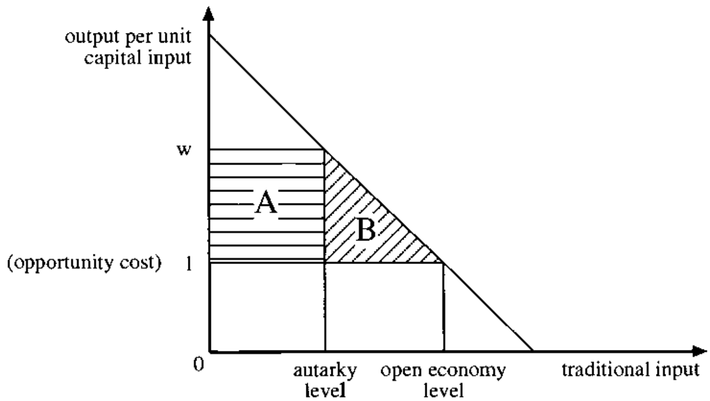

Fig. 9.2 Gains from increase in competition in the use of traditional inputs

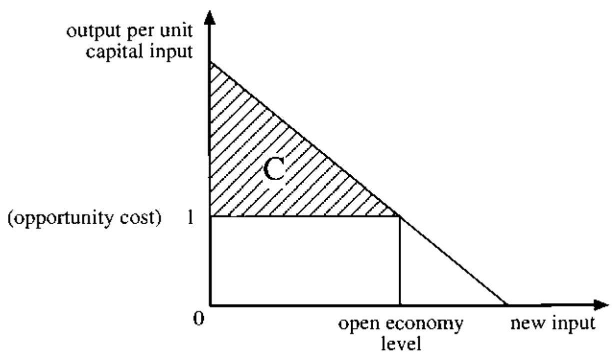

Fig. 9.3 Gains from the introduction of new inputs

capital stock ($\overline{K}$), i.e., $M\hat{k} = (M + m)\tilde{k} = \overline{K}$, and hence incur the same input costs. Then

$$Y(M, \hat{k}) = A\left(\sum_{j=1}^{M} \hat{k}^{\theta}\right)^{\alpha/\theta} = A\left[M\left(\frac{\overline{K}}{M}\right)^{\theta}\right]^{\alpha/\theta} = AM^{\alpha(1-\theta)/\theta}\overline{K}^{\alpha},$$

and

$$Y(M + m, \tilde{k}) = A\left(\sum_{j=1}^{M+m} \tilde{k}^{\theta}\right)^{\alpha/\theta} = A\left[(M + m)\left(\frac{\overline{K}}{M + m}\right)^{\theta}\right]^{\alpha/\theta}$$

$$= A(M + m)^{\alpha(1-\theta)/\theta}\overline{K}^{\alpha}.$$

Obviously, $Y(M + m, \tilde{k}) > Y(M, \hat{k})$ for $m > 0$; i.e., there exist productivity gains from an increase in the variety of inputs. From the growth accounting perspective, a 1 percent growth in the variety of inputs will translate into a $\alpha(1 - \theta)/\theta$ percent growth in total output.

9.3.1 Autarky with Traditional Inputs and Imperfect Competition

We view the market structure for capital inputs as monopolistically competitive. There are M symmetric input-coordinating firms. Each firm will buy each specific input (k_i) from the households at the competitive price of unity and sell the aggregate stock to the final producers at a monopolistically competitive price of w_i.

Taking these input prices w_i and the interest rate r as given, the final good producer chooses its quantities demanded for the capital inputs (k_i) to solve the following investment problem

$$\max_{(k_i)} \frac{Y + (1 - \delta)\sum_{j=1}^{M} k_j}{1 + r} - \sum_{j=1}^{M} w_j k_j \tag{10}$$

subject to equation (9). Solution to the problem yields the following inverse demand function

$$w_i(k_i) = \frac{mpk_i + (1 - \delta)}{1 + r}, \tag{11}$$

where mpk_i is the marginal product of the ith capital input, defined as

$$mpk_i \equiv \alpha A K^{\alpha - \theta} k_i^{\theta - 1}. \tag{11a}$$

As a monopoly supplier of capital inputs to the final producers, the ith input-coordinating firm will take the inverse demand functions $w_i(k_i)$ (and the competitive return of unity to be paid to the households) as given and choose the quantities supplied of capital inputs k_i to maximize its profit

$$\max_{(k_i)} \pi_i(k_i) \equiv [w_i(k_i) - 1]k_i.$$

Solution to this problem yields the markup condition

$$w_i(k_i)[1 - \eta_i(k_i)] = 1, \tag{12}$$

where $\eta_i(k_i)$ is the reciprocal of the elasticity of the inverse demand function, defined as

$$\eta_i(k_i) \equiv -\frac{w_i'(k_i)k_i}{w_i(k_i)} \tag{12a}$$

$$= -\left[\frac{mpk_i}{mpk_i + (1 - \delta)}\right]\left[(\theta - 1) + (\alpha - \theta)\left(\frac{k_i^{\theta}}{\sum_{j=1}^{M} k_j^{\theta}}\right)\right].$$

Note that with full depreciation ($\delta = 1$) and when the number of capital inputs is infinitely large ($M \to \infty$), $\eta_i(k_i) = \theta - 1$ so that the markup, $1/[1 - \eta_i(k_i)]$, becomes a constant equal to $1/\theta$ (> 1).

The problem of the consumer-saver (competitive supplier of domestic savings) is the same as the one spelled out in section 9.2 above—except that, instead of K_0, he or she now takes $\Sigma_{j=1}^{M} k_{j0}$ as the initial endowment. Solution to his or her utility maximization problem yields the standard intertemporal condition (equation [8]), where (in the absence of default risk here) $\bar{r}$ is simply the autarky interest rate.

Assuming symmetry in the capital inputs across firms, the economy-wide resource constraints are given by

$$(6') \qquad c_1 = N\{AM^{\alpha/\theta}k_0^{\alpha} - M[k - (1 - \delta)k_0]\},$$

and

$$(7') \qquad c_2 = N[AM^{\alpha/\theta}k^{\alpha} + (1 - \delta)Mk].$$

In this model, the five equations (i.e., [11], [12], [6′], [7′], [8]) determine the five endogenous variables (c_1, c_2, k, w, $\bar{r}$).

9.3.2 FDI with New Inputs and Increased Competition

The opening-up of the economy involves three features. First, because of the difference between the world rate of interest r^* and the autarky interest rate $\bar{r}$, capital will flow in. Second, bundled with FDI, m new types of capital inputs will be imported.[11] Third, the increase in competition (given the perfectly elastic supply of inputs from abroad) will drive w_i to its competitive level of unity.

In the presence of imported capital inputs and under a competitive input market structure, the maximization problem facing the producer-investors becomes the following:

$$(10') \qquad \max_{(k_i)} \frac{Y + (1 + \delta)\sum_{j=1}^{M+m} k_j}{1 + r^*} - \sum_{j=1}^{M+m} k_j,$$

subject to

$$(9') \qquad Y = AK^{\alpha}, \qquad \text{where } K = \left(\sum_{j=1}^{M+m} k_j^{\theta}\right)^{1/\theta}.$$

Solution to the problem yields the standard marginal productivity condition

$$mpk_i = r^* + \delta,$$

11. See also a similar setup in Borensztein, De Gregorio, and Lee (1998).

where, as in equation (11a), $mpk_i \equiv \alpha A K^{\alpha-\theta} k_i^{\theta-1}$ except that K now includes both traditional and new inputs.

The consumer-saver's problem remains unchanged, except that the autarky interest rate $\bar{r}$ is now replaced by the world rate of interest r^*. As a result, the intertemporal condition becomes

$$(8') \qquad \frac{u_1(c_1, c_2)}{u_2(c_1, c_2)} = 1 + r^*.$$

The two economy-wide resource constraints are modified as follows:

$$(6'') \quad \text{FDI} = N[(M + m)k - (1 - \delta)Mk_0] - (NAM^{\alpha/\theta}k_0^{\alpha} - c_1),$$

and

$$(7'') \quad c_2 = N[A(M + m)^{\alpha/\theta}k^{\alpha} + (1 - \delta)(M + m)k] - \text{FDI}(1 + r^*).$$

In this model, the four equations (i.e., [11′], [8′], [6″], and [7″]) determine the four endogenous variables (c_1, c_2, k, FDI).

9.3.3 Gains from Trade

As is clear from the discussion above, there are three possible sources of gains from FDI flows: (a) traditional gains (from the use of foreign savings to augment the domestic capital stock), (b) gains from technology transfer, and (c) gains from the promotion of competition in the input market. The two nontraditional types (b) and (c) both result from the importation of increased variety of capital inputs.

In the simulations reported below, we choose the same set of parameter values as in section 9.2.2 above, i.e., $\gamma = 0.295$, $\alpha = 0.333$, $\delta = 0.723$, $N = 1$, and $K_0 = 1$. In the benchmark model with both the technology-transfer and competition-promotion features, we set $\theta = 0.314$, $M = 0.05$, and $m/M = 0.1$. The value of the production coefficient A is reset from 1 to 24 so as to generate a normalized output level of unity in the initial period in the presence of input variety M. The values of θ and M are chosen in such a way as to produce a markup of input price over its marginal cost of 1.4 as in Rotemberg and Woodford (1995). Our values of α and θ also imply a contribution of input variety to output growth (i.e., $\partial \ln[Y]/\partial \ln[M] = \alpha[1 - \theta]/\theta$) of 0.728. In the alternative traditional model with perfectly competitive input markets and without technology transfer, we set $\theta = 0.298$ and $m/M = 0$ so as to yield a unit markup.

The welfare gains from FDI between the benchmark and traditional cases are compared in figure 9.4. In the latter case (solid line), the welfare gains are positive as long as the interest differential between the world rate and the autarky rate ($r^* - r$) is nonzero. However, the relevant range for our purpose (i.e., positive rather than negative capital inflows) is the downward-sloping segment, when $r^* < r$ (= 3.051, or an annual rate of

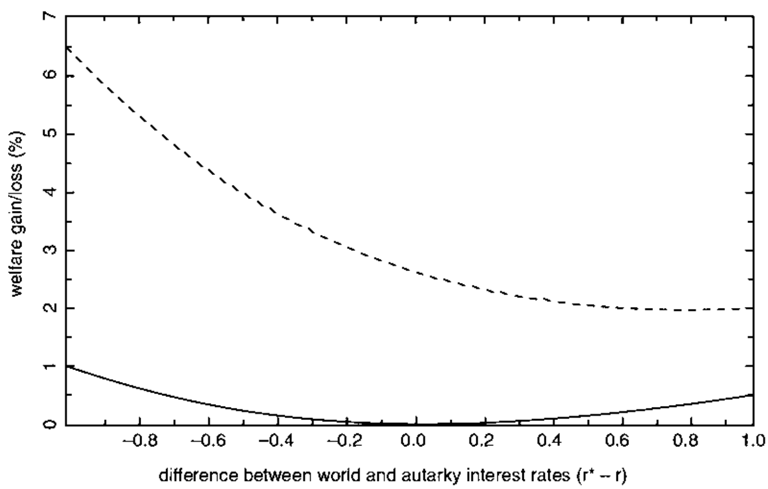

Fig. 9.4 Welfare gains from FDI with technology transfer and promotion of competition vs. traditional gains from FDI

5.76 percent). In comparison, the former case (dashed line) generates much bigger welfare gains—as big as a 6 percent or greater difference in lifetime consumption with a FDI/GDP ratio of 27 percent when $r^* - r = -1$ (or an annual rate differential of 2.81 percent)—because of the technology transfer and competition promotion effects. At $r^* = r$ (when the traditional gains are absent), we still have a positive FDI/GDP ratio of 9 percent, producing a gain of 2.6 percent that represents a measure of these nontraditional effects.

In order to disentangle the two nontraditional effects (b) and (c), we use in figures 9.5 and 9.6 the traditional case as a frame of reference (solid line) and consider variations in the technology transfer effect and competition promotion effect. The former effect is examined in figure 9.5 by varying the m/M ratio from 0 percent (solid line) to 10 percent (dashed line) to 20 percent (dotted line). The latter effect is studied in figure 9.6 by varying the markup from unity (solid line) to 1.4 (dashed line; the Rotemberg-Woodford 1995 number) to 2.0 (dotted line; Hall's 1988 estimate). These two figures are not easily comparable, but one message is clear: Both effects can generate large welfare gains through FDI inflows even in the absence of traditional gains from FDI. In addition, when $r^* = r$, the technology transfer effect delivers a welfare gain of 1.9 percent when the m/M ratio equals the benchmark value of 0.1 while the competition promotion effect induces a gain of 0.7 percent when the markup equals the benchmark value of 1.4. These two welfare numbers together make up the overall nontraditional gains of 2.6 percent found in the mixed case depicted by figure 9.4.

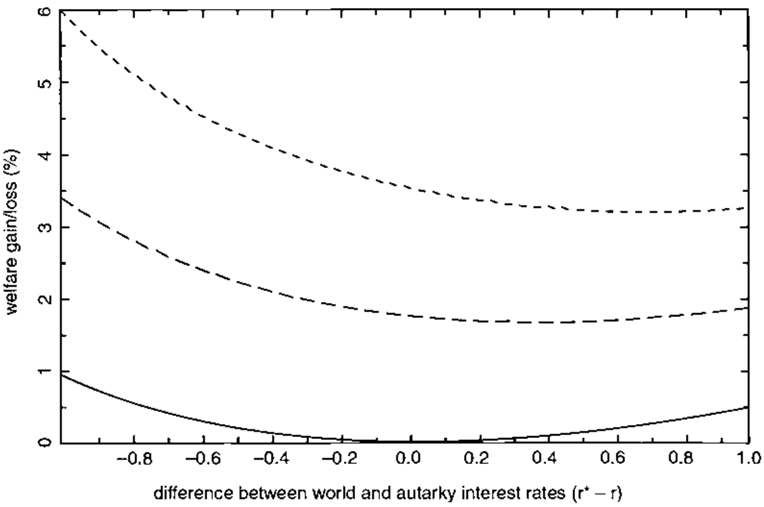

Fig. 9.5 Welfare gains from FDI with technology transfer

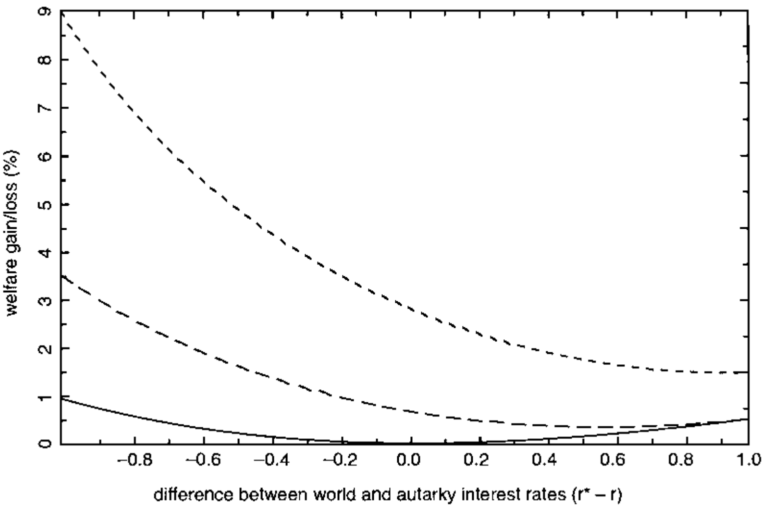

Fig. 9.6 Welfare gains from FDI with promotion of competition

9.4 Conclusion

International capital flows typically fall into three major categories—i.e., portfolio flows, loans, and FDI—and perform a variety of functions in the world economy. Their common traditional role lies in the blending of foreign savings with domestic savings to finance domestic investment.

FDI, distinct from other types of capital flows, performs two important additional functions. First, FDI can be viewed not only as an exchange of the ownership of domestic investment sites from domestic residents to foreign residents, but also as a corporate governance mechanism in which the foreign investor exercises management and control over the host-country firm. In so doing, the foreign direct investors gain crucial inside information about the productivity of the firm under their control—an obvious advantage over the uninformed domestic savers, who are offering to buy shares in the firm. Taking advantage of their superior information, the foreign direct investors will tend to retain the high-productivity firms under their ownership and control and sell the low-productivity firms to these uninformed savers. This adverse selection problem, which plagues the domestic stock market, leads to overinvestment by the foreign direct investors and, at the same time, to undersaving by the domestic residents.

A second view focuses on the effects of FDI in facilitating technology transfer through the importation of new varieties of factor inputs and in promoting competition in the input market. We nest the two theories into a calibrated model and use numerical simulations to reassess the welfare gains/losses FDI may generate for the host country and compare them to the more traditional gains. We also provide a quantitative assessment of the magnitudes of the potential gains/losses arising separately from the two views of the role of FDI.

In accordance with the first view, our simulation results show that substantial welfare losses can indeed be brought about by FDI in the presence of adverse selection in the domestic equity market. These losses can nonetheless be dominated by the gains induced by the technology transfer and competition promotion effects of FDI, i.e., the second view (cf. figures 9.1 and 9.2 at a common level of interest rate differential of, say, 1, where the net gain is 1.8 percent of permanent consumption). A more rigorous assessment of the net gains/losses from these two views taken together requires blending the two models into a unified framework and redoing the simulation exercise in that context. This more difficult task is left for future research.

Drawing on the efficiency implications of the two nontraditional roles, corrective government policies are called for. Enforcement of better disclosure rules for corporations and fiscal measures that will subsidize domestic saving and that will tax excessive FDI may serve to counteract the adverse selection problem triggered by FDI in the domestic stock market. Removing policy and institutional barriers, which may hinder other types of international capital flows, can potentially mitigate the adverse selection problems in the domestic stock market as well.

Evidently, allowing the host country to use nontraditional new inputs—as specified in this paper as a form of technology transfer or as a side benefit from FDI—is not affected by the magnitude of FDI, whether big or small. Thus, there is no reason to subsidize FDI on this ground.[12]

Appendix

Derivation of First-Order Conditions for the Firm's Investment Problem in the FDI-Equity-Credit Equilibrium and the Autarky Equilibrium

In the open economy case, the maximization of firm value V as specified in equation (4) with respect to K and $\bar{\varepsilon}$ yields the following first-order conditions:

$$\text{(A1)}\quad 0 = \left\{\frac{[1-\Phi(\varepsilon^0)][e^+(\varepsilon^0)-\bar{\varepsilon}]}{1+r^*} + \frac{[\Phi(\varepsilon^0)-\Phi(\bar{\varepsilon})][\hat{e}(\bar{\varepsilon},\varepsilon^0)-\bar{\varepsilon}]}{1+\bar{r}}\right\}F'(K)$$
$$+\ \lambda\{[1-\Phi(\bar{\varepsilon})](1+\bar{\varepsilon})+\Phi(\bar{\varepsilon})(1-\mu)[1+e^-(\bar{\varepsilon})]\}F'(K)$$
$$-\ \lambda(\bar{r}+\delta)-\lambda\Phi(\bar{\varepsilon})\mu(1-\delta),$$

and

$$\text{(A2)}\quad 0 = -\frac{1-\Phi(\varepsilon^0)}{1+r^*} - \frac{\Phi'(\bar{\varepsilon})[\hat{e}(\bar{\varepsilon},\varepsilon^0)-\bar{\varepsilon}]}{1+\bar{r}}$$
$$+\ \frac{[\Phi(\varepsilon^0)-\Phi(\bar{\varepsilon})]\left[\dfrac{\partial\hat{e}}{\partial *}(\bar{\varepsilon},\varepsilon^0)-1\right]}{1+\bar{r}} - \lambda\Phi'(\bar{\varepsilon})(1+\bar{\varepsilon})$$
$$+\ \lambda[1-\Phi(\bar{\varepsilon})]+\lambda\Phi'(\bar{\varepsilon})(1-\mu)[1+e^-(\bar{\varepsilon})]$$
$$+\ \lambda\Phi(\bar{\varepsilon})(1-\mu)\frac{de^-(\bar{\varepsilon})}{d\bar{\varepsilon}}F(K)-\lambda\mu\Phi'(\bar{\varepsilon})(1-\delta)K,$$

where λ is a Lagrange multiplier. Our numerical simulations suggest that, in this case as well as in the case without domestic credit, there will be domestic undersaving and foreign overinvestment, i.e., $\bar{r} < F'(K) - \delta < r^*$.

In the autarky case, the first-order conditions for the maximization problem as stated in equation (4′) with respect to K and $\bar{\varepsilon}$ are

12. Naturally, policy intervention may be called for if the set of goods available in the economy as well as the degree of competition in the domestic input market are positively related to the amount of FDI flows. The latter involves, however, an antitrust issue that should more appropriately be tackled through regulations rather than Pigouvian taxes/subsidies.

$$\begin{aligned} 0 = {} & F'(K) - \Phi(\bar{\varepsilon})\{F'(K)[1 + e^{-}(\bar{\varepsilon})] + (1 - \delta)\} \\ & - [1 - \Phi(\bar{\varepsilon})][F'(K)(1 + \bar{\varepsilon}) + (1 - \delta)] \\ & + \lambda[1 - \Phi(\bar{\varepsilon})][F'(K)(1 + \bar{\varepsilon}) + (1 - \delta)] \\ & + \lambda\Phi(\bar{\varepsilon})(1 - \mu)\{F'(K)[1 + e^{-}(\bar{\varepsilon})] + (1 - \delta)\} \\ & - \lambda(1 + \bar{r}), \end{aligned}$$

and

$$\begin{aligned} 0 = {} & -\Phi'(\bar{\varepsilon})\{F(K)[1 + e^{-}(\bar{\varepsilon})] + (1 - \delta)K\} \\ & - \Phi(\bar{\varepsilon})F(K)[de^{-}(\bar{\varepsilon})/d\bar{\varepsilon}] - [1 - \Phi(\bar{\varepsilon})]F(K) \\ & + \Phi'(\bar{\varepsilon})[F(K)(1 + \bar{\varepsilon}) + (1 - \delta)K] + \lambda[1 - \Phi(\bar{\varepsilon})]F(K) \\ & - \lambda\Phi'(\bar{\varepsilon})[F(K)(1 + \bar{\varepsilon}) + (1 - \delta)K] \\ & + \lambda\Phi'(\bar{\varepsilon})(1 - \mu)\{F(K)[1 + e^{-}(\bar{\varepsilon})] + (1 - \delta)K\} \\ & + \lambda\Phi(\bar{\varepsilon})(1 - \mu)\{F(K)[de^{-}(\bar{\varepsilon})/d\bar{\varepsilon}]\}. \end{aligned}$$

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Comment Anne O. Krueger

This paper is a well-done and interesting exercise in which the authors develop an asymmetric information model of foreign direct investment (FDI). The driving factor in the model is the assumption that foreigners have inside information about the prospects of the domestic firms into which they buy. They then retain equity shares in firms with good prospects, but sell shares in firms with less satisfactory prospects. Domestic investors do not have this information, and buy shares on the domestic capital market.

Because foreigners have selectively retained shares, the average return on the domestic share market is less than it would have been had there been less (or no) FDI. There is overinvestment by foreigners (who get above-average rates of return because of their superior knowledge) and undersavings by domestic residents (who are receiving below-average rates of return), with a consequent welfare loss (which could be offset by increased competition, technology transfer, and other benefits of FDI in their model). Razin, Sadka, and Yuen (RSY) then simulate their model, and conclude that welfare losses may well result from FDI based on plausible estimates for the parameters.

The model is ingenious and well developed. It has long been known that capital inflows in the presence of distortions could be immiserizing (see

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