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Investment Behaviour of Financially Constrained Multinational Corporations: Consequences for the International Transmission of Business Cycle Fluctuations

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Abstract

The paper investigates the investment decision of a financially constrained multinational corporation (MNC) planning investment projects both at home and in a developing country. The collateral values of the projects diverge because of country specific transactions costs so that the willingness of banks to grant a loan depends not only on the MNC's financial wealth but also on the share of FDI in total investment. It is shown that i) variations in the MNC's financial standing affects FDI stronger than domestic investment, ii) FDI is likely to decrease following a macroeconomic shock to the MNC parent, and iii) domestic investment is likely to increase following a macroeconomic shock to the MNC affiliate.

Contents

1 Introduction

During the last three decades international financial markets have witnessed a deep and sustained structural change referred to as financial integration.[1] Recent studies focus on the determinants of the volumes of gross and net cross-border capital flows within the process of financial integration (Buch and Pierdzioch, 2001). But beside the problem of explaining the growth in volume and the volatility of international capital flows, the ongoing financial integration process has been also associated with a differentiation between structures of international capital flows to developing and industrialized countries. Hull and Tesar (2001) show that in the 1990s capital inflows to industrialized countries were dominated by bonds, then bank loans, and finally foreign direct investment (henceforth FDI), whereas the bulk of inflows to developing economies was FDI with a share in overall private inflows of more than 50 percent and bank loans played only a minor role with a share of about 10 percent.[2]

Several theorectical issues arise against the background of these trends. For example, why does FDI play such a dominant role in capital flows to developing countries, or, put differently, what specific economic functions are fulfilled by direct investments in contradistinction to other financial claims on these countries. Second, although direct investments in developing countries are means of those countries' external finance, multi-national corporations (henceforth MNCs) themselves have to refinance these investments, which is not a trivial problem if capital markets are imperfect. And last but not least, what economic consequences arise herefrom for the hosts countries' business fluctuations?

The present paper is addressed to these issues. We start out with the presumption that FDI is not only an instrument to fund investment projects in developing countries but also to diffuse technology and entrepreneurial skills (Blomström and Kokko, 1997, Lane and Milesi-Ferretti, 2001).[3] We consider a non-financial MNC, whose parent is based in

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[1] Several indicators of financial integration are (controversially) discussed in the literature, such as interest parity tests (Frankel, 1992), tests of correlations between domestic savings and investments (Feldstein and Horioka, 1980, Tesar, 1991), and tests of lacking international portfolio diversification across countries (Tesar and Werner, 1992 to name just a few (an overview is given by Obstfeld, 1995).

[2] Net FDI flows to developing countries has been risen from 35.7 billion USD in 1991 to 168.2 billion USD in 2000 and peaked out in 1999 with 184.4 billion USD (World Bank, 2002).

[3] Borensztein, De Gregorio and Lee (1998) provide evidence that foreign direct investment is a driving force for economic growth mainly due to transferring technological progress to developing countries but not by stimulating total investment.

an industrialized country and its business is referred to as the domestic project. The MNC affiliate, on the other hand, resides in a developing country and is referred to as the foreign project. External funds are needed to finance both the domestic and the foreign project if the MNC does not possess sufficient own financial wealth. But, because of the specifity and inalienability of human capital, creditors of the MNC have to be aware of the incompleteness of financial contracts, which gives rise to the wellknown holdup problem (Hart and Moore, 1994): Though banks provide funds at an early stage of the project, the MNC may later on refuse to contribute its specific entrepreneurial and technological skills unless loan obligations are renegotiated. If the bank is not willing to renegotiate, the physical assets of the projects can be liquidated in accordance with the underlying standard debt contract. But because the projects are of low value to the bank without the specific skills of the MNC, liquidation yields a comparatively low return, which in turn weakens the bank's threat point for renegotiations. In particular, it is reasonable to suppose that liquidation of the affiliate yields an even smaller return than liquidation of the MNC parent. This is because in developing countries there are particular difficulties in finding a potential buyer of the assets primarily intended to be used by a very skilled entrepreneur.

Due to these capital market imperfections, the MNC may suffer from a financial constraint on investment and, hence, faces a non-trivial decision problem. Generally, since the decision concerning how to split funds between the domestic and the foreign project is interrelated with the willingness of banks to grant a loan, the MNC may be willing to forgo investment returns abroad in favor of financial easing. The paper analyzes this investment decision using a standard incomplete contracts approach and asks how capital flows to developing countries (and hence investment in these countries) vary following a deterioration of the MNC's financial standing or country-specific macroeconomic shocks.

As regards the dependence of investments on the MNC's financial standing, total investment declines if the MNC's financial wealth decreases, but this paper also shows that FDI responds more strongly to variations in financial wealth than domestic investment does.

As regards country-specific shocks, variations in factor productivity are considered and it will be argued that the financial constraint gives rise to cross-border spillover effects on investment. But these spillover effects are asymmetric. More precisely, since the liquidation value of the MNC affiliate is less than the liquidation value of the MNC parent, FDI is likely to respond adversely to a country-specific shock to the MNC parent, whereas domestic investment is likely to increase following a shock to the MNC affiliate.

The model presented here investigates the influence of firm's financial strength on both foreign and domestic investment as well as the international spillover effects on investment, but it is not concerned with questions as why a firm is involved in FDI or where to invest.[4] Hence, the focus here is on the financial dimension of FDI only but not on industrial organization issues (on this see for example Dunning, 2000). For this purpose, the approach presented here seizes the suggestion of Lane and Milesi-Ferretti (2001) by taking into account issues regarding the enforceability of cross-border claims. But instead of enhancing a comprehensive theory of the pecking order in international capital flows (as in Hull and Tesar, 2001), we stress the observation that FDI has in recent decades been the predominant element in capital flows to developing countries. It is assumed that, on the one hand, cross-border debt contracts are more difficult to enforce because of underdeveloped legal systems, and that, on the other hand, FDI is associated with the transfer of otherwise inalienable human capital. These assumptions are drawn from Albuquerque (2001) who studies the relative variability in the components of capital flows to developing countries. But unlike Albuquerque (2001) our approach deals with the problem of how a financially constrained MNC decides how funds are shared between investments in the domestic parent and the foreign affiliate. Hence, the paper also differs from most studies concerned with international capital flows, which assume that international investors are not financially constrained but only firms in developing economies are (see for example Razin, Sadka and Yuen, 1999, and Caballero and Krishnamurthy, 2001).

Finally, the paper is also related to the literature on international business cycles. The standard real business cycle models for open economies, typically relying on perfect capital markets, fail to explain the positive international comovements in investment (see for example Baxter, 1995). Our model, albeit only a microeconomic approach, gives some reason for such comovements by stressing the role of financially constrained MNCs. It predicts that the investment cycle in developing countries depends positively on investment fluctuations in industrialized countries even beyond traditional transmission channels, such as interest rates or trade balance movements, in particular since FDI accounts for a remarkable share in total private investment in these countries.

The paper is organized as follows. Section 2 introduces a model of financing a single investment project using an incomplete contracts approach. Section 3 extends the analysis to the investment decision of a MNC. The main results are derived in section 4. Section 5 provides a numerical example and briefly discusses the results. The final section is a summary.

[4] On problems defining FDI appropriately see Lipsey (2001).

2 A Model with a Single Investment Project

Consider an entrepreneur endowed with some financial wealth $W \geq 0$ who has access to a project. The project requires capital investment I at date T and yields a safe return of $R(I)$ at date $T+1$, if the entrepreneur contributes specific skills at some intermediate date $T+\delta$. The strictly concave function R is twice continuously differentiable and satisfies $R'(0)=\infty$ and $R'(\infty)=0$. Capital invested at T is fully depreciated immediately at the end of the production period.[5]

Let $\gamma > 1$ denote the marginal return on an alternative investment, which is determined by the world capital market interest rate. Hence, the first best investment $I_{fb}: R'(I_{fb}) = \gamma$ decreases with that marginal return on the alternative investment γ because of the concavity of R. If the first best investment is larger than the financial wealth of the entrepreneur, he may raise a loan from a bank amounting to $I_{fb} - W$.

However, it is assumed that financial contracts are incomplete since the entrepreneur cannot commit himself at date T to contribute his specific skills to the project at date $T+\delta$. Hence, even though at date T funds are invested and repayments payable to the bank at $T+1$ are agreed upon, the entrepreneur might initiate renegotiations at $T+\delta$ to beat down repayments by the threat of withdrawing his specific skills. For the outcome of renegotiations suppose that the cooperative Nash-bargaining solution applies. If both parties reach an agreement as a result of renegotiation, the entrepreneur yields $R(I)-z$ for given invested funds I, where z denotes the outcome of the renegotiations. If renegotiations fail, the bank assumes control over the physical assets of the project (e.g. machinery and real estate) and liquidates in accordance with a standard debt contract. The proceeds of liquidation are given by an increasing and continuous function L. More precisely, we assume $L(I) = \beta I$, where $\beta \in [0,1]$, which implies that i) liquidation does not yield returns to recover more than the funds invested in the project, and ii) additional investment does not increase liquidation proceeds more than directly proportionally. These assumptions are justified by the bank's lack of specific knowledge of how to extract payments from the project's assets without employing the entrepreneur's specific skills.[6]

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[5] Any payments are measured in nominal prices, which do not vary over time; the price of capital is normalized to 1.

[6] There is a similar hold up problem between the bank and its ultimate financiers. If a bank has specific skills to collect loans, for example because only the bank knows how to bring out the best liquidation value of physical assets, the bank might itself refuse to use these specific skills on behalf of financiers.

The outcome of renegotiations z is therefore given by

$$z = \alpha R(I) + (1-\alpha)\beta I$$

where $\alpha \in (0,1)$ is a measure of the bank's exogenous bargaining power. Hence, z is a strictly increasing function of invested funds I because higher investment at date T increases the entrepreneur's opportunity costs of failing renegotiations but also the bank's liquidation value. Both effects strengthen the impact of the bank's threat point on the outcome of renegotiations but are less strong for higher investment levels, i.e. z is strictly concave in I.

However, the entrepreneur will not initiate renegotiations as long as repayments agreed upon at date T are smaller than the outcome of renegotiations at date $T+\delta$. Suppose that banks are competitively organized, hence the repayment obligation initially agreed upon at T equals the opportunity costs of external funds. Thus, the entrepreneur will not break the original contract if

$$\max[\gamma(I-W),0] \leq \alpha R(I) + (1-\alpha)\beta I, \quad (1)$$

which implies that the bank's willingness to grant a loan is restricted by some linear combination of project's expected cash flow $R(I)$ and collateral value $L(I)$. Moreover, condition (1) defines an I_{crit} as a continuously differentiable and increasing implicit function of W, where I_{crit} satisfies (1) with equality and gives an upper bound for investment: For any investment above I_{crit} the entrepreneur certainly refuses to fulfill the contract and renegotiations take place. Because the outcome of those renegotiations is smaller than the opportunity costs of invested external funds, banks are not willing to supply funds for any investment larger than I_{crit} at date T.

The next question arising is whether or not this financial constraint is binding and to what extend it actually restricts investment. According to Hart (1995), the answer is given by

Lemma 1 *Let I^* denote the actual investment chosen by the entrepreneur. If W is sufficiently large, the MNC does not suffer from the financial constraint so that $I^* = \{I_{fb} : R'(I_{fb}) = \gamma\}$. As W decreases, the financial constraint becomes binding if the bargaining power of banks fulfils*

However, as Diamnond and Rajan (2001) show, the bank is disciplined by a deposit contract which is subject to a bank run.

$$\alpha < \alpha_{crit} := \frac{(\gamma - \beta) I_{fb}}{R(I_{fb}) - \beta I_{fb}} < 1$$

implying $I^* = \{I_{sb} : \gamma(I_{sb} - W) = \alpha R(I_{sb}) + (1-\alpha)\beta I_{sb}\} < I_{fb}$ *and* $\partial I_{sb} / \partial W > 0$.

Proof *Obviously, for very large* W *the entrepreneur does not enter into renegotiations. Hence, the financial constraint (1) is not binding and the first best investment strategy* I_{fb} *will be embarked on. If wealth decreases, the LHS of (1) increases whereas the RHS is independent of* W*. Investment will not be affected by decreasing wealth as long as (1) is still fulfilled for* $I^* = I_{fb}$*. However, by the intermediate value theorem, the financial constraint becomes binding for some* $W_{crit} \in (0, I_{fb})$ *if the bargaining power of banks* α *is sufficiently weak because* $\beta \leq 1 < \gamma$*. In that case, the entrepreneur is restricted by the financial constraint and he will choose the maximum investment meeting (1) with equality. By the implicit function theorem, this second best investment* I_{sb} *decreases if financial wealth further declines (see figure 1).*

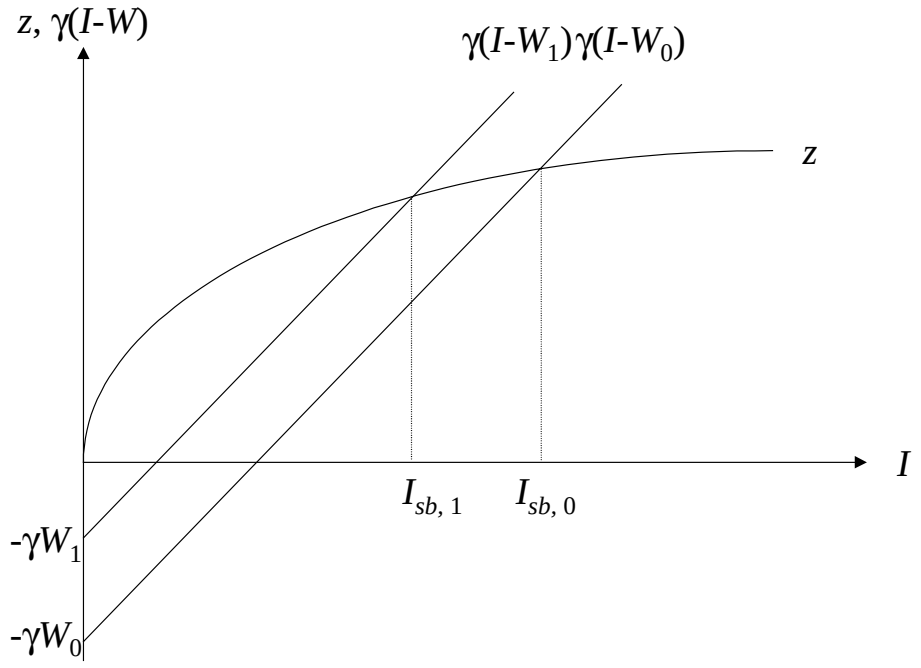

Figure 1: Financial Wealth and Investment of Financially Constrained Firms.

3 Investment Behavior of MNCs

Next consider an internationally operating entrepreneur with investment opportunities both at home and in a developing country. It is assumed that the projects' returns, denoted in domestic currency, are mutually independent. Furthermore, the foreign and the domestic projects are identical, which can be justified by recognising that FDI in developing countries mainly involves a transfer of technology and entrepreneurial skills from developed countries. To emphasize this point we assume that, beyond its liquidation value, the foreign project is worthless without the skills of the domestic entrepreneur but has the same value as the domestic project otherwise. As a result of standard neoclassical optimisation, the associated first order conditions in case of comprehensive contracting require that the marginal returns on investment at home and abroad have to be balanced and equal the marginal opportunity costs of investment. Hence, it follows $I_{fb} = FDI_{fb}$.

What happens to investment following a country-specific shock when contracts are complete? For the sake of simplicity, we assume that this shock induces a marginal percental shift in the factor productivity measured by some ε, and the project's return is then given by $(1+\varepsilon)R(\cdot)$.

Lemma 2 *If contracts are complete, the optimum decision concerning the foreign (domestic) project is unaffected by a shock to the domestic (foreign) factor productivity* $\bar{\varepsilon}$ *(*$\underline{\varepsilon}$*) whereas investment at home (abroad) varies by* $\partial I_{fb} / \partial \bar{\varepsilon} = -R'(I_{fb}) / R''(I_{fb})$ *(or* $\partial FDI_{fb} / \partial \underline{\varepsilon} = -R'(FDI_{fb}) / R''(FDI_{fb})$ *respectively).*

Proof *Omitted.*

Thus, in the neoclassical setting, domestic investment is independent of country-specific foreign shocks and vice versa. The only way foreign shocks may influence investment at home is through the traditional interest rate channel by affecting the user costs of capital, i.e. only if the alternative return on investment changes, both domestic investment and FDI vary but in the same direction.

For the case of incomplete contracting, suppose that i) loanable funds in developing economies are scarce due to underdeveloped financial markets, and that ii) the enforceability of debt claims in these economies is even more difficult because of underdeveloped legal systems, in particular because of underdeveloped or even non-

existing bankruptcy law.[7] These assumptions imply that, although the funds needed in the developing country have to be borrowed in the developed country, it is even more difficult to finance the project by a cross-border debt contract (or, alternatively, requires a low leverage and hence a low investment).

However, when the MNC borrows at home and uses funds (partly) for investment in the developing country, the hold up-problem abroad vanishes because the MNC assumes managerial control over foreign assets and will not renegotiate with itself.[8] Nevertheless, the MNC might initiate renegotiations with the domestic bank in order to beat down total loan repayments. For these renegotiations we suppose that domestic banks have even fewer skills to liquidate foreign assets, an issue justified in the presence of transactions costs. One may think of these costs as those the banker has to bear in order to find a potential buyer of the assets. This is a bold venture particularly in developing countries because in these countries the value of the physical assets to local firms as potential buyers is much lower since they do not possess any of the specific skills needed to use the specific physical assets appropriately. Precisely, we assume that liquidization of the foreign project yields only a fraction $\mu \leq 1$ of the liquidation value of a domestic project of same size.

Finally, it is presumed that the MNC's financial wealth can be arbitrarily transferred from either country into the other before investments are placed so that the distribution of wealth does not affect the allocation of investment across countries. To reason this, suppose that wealth of entrepreneurs is invested in internationally tradable safe financial assets, e.g. US-treasury bills, which can be liquidated easily on an open market.[9]

By applying the same structure of renegotiations as above, investments of MNCs are hence restricted by

$$\max\{\gamma(I + FDI - W), 0\} \leq \alpha[R(I) + R(FDI)] + (1-\alpha)\beta(I + \mu FDI). \tag{2}$$

[7] The shortcoming in developing countries' legal systems can be captured formally by an even weaker bargaining power of banks vis-à-vis borrowers in developing economies.

[8] This proceeding is generally consistent with observations that foreign direct investment plays a predominant role in international capital flows to developing economies. However, our motivation for the dominance of foreign direct investment does not rely on the assumption that domestic lenders have fewer information on foreign entrepreneurs' probability of success than foreign lenders (as for example in Razin, Sadka and Yuen, 1998), which might even be true among developed countries. Instead, the reason here is given by the underdeveloped legal system in developing economies, which makes it more difficult to enforce debt or loan repayments in those countries.

[9] An alternative but equivalent assumption would be to suppose that only the MNC parent possesses financial wealth.

Having set up the basic model, the following section draws the conclusions concerning the combined investment decision of the MNC.

4 Results

In a first place, the analysis of an unconstrained MNC serves as a benchmark for the interrelated domestic and foreign investment decisions and yields

Proposition 1 *For unconstrained MNCs it follows:*

1. *The first best investment strategy is executed in both countries.*
2. *Investment does not vary in either country following an intra-marginal change of wealth.*
3. *A country-specific shock to the factor productivity at home does not affect FDI and vice versa.*

Proof *See appendix.*

The proposition states that, if the financial constraint is not binding because of sufficiently large financial wealth or because of a strong bargaining power of the bank, the balance of marginal returns on investments in both countries and the marginal opportunity costs of investment determine the investment strategy. As long as lower wealth does not imply a financial constraint, this strategy is independent of the precise amount of financial wealth and of the occurrence of shocks. The latter implies that investment responds solely in that country where the shock arises.

Proposition 2 *For constrained MNCs, for which* $\mu = 1$ *holds, it follows:*

1. *Underinvestment in both countries occurs symmetrically.*
2. *Investment at home and abroad will be reduced symmetrically following a decrease of financial wealth.*
3. *An adverse country-specific shock to the factor productivity lowers investment in that country where the shock occurs, but may also affect investment in the other country, but the sign of the latter effect is not univocal.*

Proof *See appendix.*

The first and the second results are straightforward because there are no fundamental differences between the projects if liquidation skills are symmetric. Hence, the firm invests such that marginal returns of both projects are balanced. If the financial constraint is further tightened due to decreasing financial wealth, investment in both countries will be reduced by the same amount.

The response of both foreign and domestic investment to variations in firms' financial wealth is the first result from our analysis worth mentioning: Any reduction of firms' financial wealth induces a decrease of both foreign and domestic investment irrespectively whether the MNC parent or its affiliate suffers from the declining financial wealth. This implies that international capital flows to developing countries also depend on the financial standing of the MNC parent based in the industrialized country.

An adverse technological shock to the domestic project influences the optimum investment decision twofold. First, since marginal returns on investments have to be balanced, the MNC substitutes domestic investment in favor of FDI following the shock. Second, the financial constraint is tightened by the shock because maximum pledgable repayments fall due to a decreasing domestic cash flow. Thus the bank is less willing to supply funds if a shock hits the MNC. This effect is referred to as the lending effect of shocks by which the firm is forced to reduce domestic as well as foreign investment. Even though both the substitution and the lending effect operate in the same direction concerning domestic investment, the net effect on FDI is not clear-cut.

As regards the dominance of either effect on FDI, somewhat more detailed arguments have to be developed for alternative parameter settings. First, if the bargaining power of the bank α is too strong, the financial constraint is not binding at all even following the shock. Hence, there is no critical financial wealth and first best investments in both countries are feasible irrespectively of the occurence of shocks (see proposition 1).

Second, if the bargaining power of the bank α is too weak, the projects' cash flows scarcely influence the maximum pledgeable repayments. Hence, the lending effect can be neglected with the following consequences: i) A MNC just endowed with critical financial wealth decreases domestic investment while FDI maintains at its first best level. The fall in domestic investment then eases the financial restriction so that critical financial wealth decreases. Hence, MNCs endowed with somewhat less financial wealth are now able to maintain the first best investment abroad. ii) MNCs continuing to be constrained after the shock deviate from first best investment abroad but (because of the effective substitution effect and the negligible lending effect) the second best investment abroad is higher than before the shock. Moreover, total investments of these MNCs are

nearly unaffected by the shock since investment in that country where the shock occurs is just substituted in favor of the other country's investment.

Third, for some intermediate values of the bargaining power, the financial constraint is binding, i.e. there exists a $W_{crit} < I_{fb} + FDI_{fb}$, and a shock at home may have an adverse total effect on FDI. As shown in the appendix, the lending effect dominates the substitution effect if

$$\frac{\alpha R(I)}{(\gamma-\beta)-\alpha[R'(I)-\beta]} > -\frac{R'(I)}{R''(I)}.$$

In general, this condition is likely to hold if the shock does affect the pledgeable repayments noticeably through its influence on the project's cash flow (α is not too small), and if any fall in domestic investment does not ease the financial constraint by too much ($\gamma-\beta$ is small). Both imply that the adjustment of the investment allocation due to the substitution effect is, on it's own, not sufficient to restore the creditworthiness of the MNC. The MNC therefore has to curtail investment abroad in order to meet its tightened financial constraint. However, since these requirements also imply that the level of critical financial wealth is low, only a few MNCs may be concerned with the need to restrict investment abroad. Note that if this condition holds for $I^* = I_{fb}$, then holding FDI at its first best level requires more financial wealth.

In contrast to the previuos case with α very low, total investment decreases following the shock irrespectively of the response of FDI if α takes some intermediate value. This is because the operative lending effect compels the MNC to take back total investment since substituting domestic and foreign investment is insufficient to meet the financial constraint. Finally, note that country-specific shocks abroad have laterally reversed effects because of the strict symmetry of the projects.

As mentioned above, developing countries are rather characterized by even more difficulties in liquidating physical assets than in industrialized countries. For that, the associated results are summarized as follows

Proposition 3 *For constrained MNCs, for which $\mu < 1$ holds, it follows:*

1. *Underinvestment in both countries occurs but is more severe abroad than at home.*

2. *Investment at home as well as abroad will be reduced following a decrease in wealth, whereby the share of FDI in total investment is likely to decrease if both μ and $\gamma-\beta$ are small.*

3. *If the second part of this proposition holds, domestic investment is likely to increase following a shock to the MNC affiliate but FDI is likely to decrease following a shock to the MNC parent.*

Proof *See appendix.*

The proposition argues that it is always optimal for a constrained MNC to invest fewer funds into the foreign project if banks have fewer skills to liquidate foreign assets. This result is driven by the need to trade off not only the marginal returns on investments in the countries but also to take into account the different effects of these investments on the strength of the financial constraint. Since foreign assets are less valuable for banks than domestic assets, their willingness to grant loans is even more restricted if the firm uses funds for FDI. Hence, a firm is willing to forgo investment returns abroad in favor of financial easing.

Moreover, the share of FDI in total investment is likely to decrease following declining wealth if the skills of lenders to liquidate foreign assets are not only smaller but actually poor (μ is small) and if the liquidation value of domestic assets is large compared to the opportunity costs of funds ($\gamma - \beta$ is small). Both conditions imply that the banks' marginal costs of failing renegotiations are much higher if the MNC invests into the foreign project. Under these circumstances, any shift of funds away from the domestic to the foreign project has a sharp impact on the financial constraint.

Whenever the financial constraint is tightened due to a fall in financial wealth, the MNC seeks to loosen this constraint in a most efficient way by both a reduction of total investment and by a reallocation of funds. But if the financial constraint is only slightly affected by variations in domestic investment because $\gamma - \beta$ is small, the MNC will reduce FDI in the first place. This strategy is even more profitable if μ is very small and, in a way, irrespectively of its opportunity costs, which may come from the resulting differences in the marginal products of investment. However, a sufficient condition for proposition 3, item 2, to be generally true for any $\mu < 1$ and irrespectively of further restrictions on β and γ is to require $\frac{\partial}{\partial I}\left(-R''(I)/R'(I)\right) > 0$, which means that, beyond decreasing marginal returns, the relative change of marginal returns is even larger for higher investments (see appendix). But, as the numerical example presented below shows for somewhat arbitrarily chosen parameters, this is not a necessary condition at all.

Proposition 3, item 3, summarizes the results of country-specific shocks for $\mu < 1$. Again, a substitution and a lending effect have to be taken into account, but their relative magnitudes are different and, hence, the investment responses differ depending

on where the shock arises. As in case of symmetric liquidation skills, we examine the effects of shocks more detailed for different parameter settings. First, let us suppose that the bargaining power of the bank is very strong, then liquidation skills of the bank are again irrelevant for the outcome of renegotiations and there is no critical financial wealth at all. First best investments in both countries are accomplishable and there are no cross-border spillover effects (see proposition 1).

Second, if the bargaining power of the bank is too weak then the lending effect of the shock is weak as well. Hence, the substitution effect dominates by which investment declines in that country where the shock occurs but investment in the other country rises. However, in case of both μ and $\gamma - \beta$ being small, FDI will increase only slightly if the shock arises at home whereas domestic investment will increase sharply if the shock arises in the developing country. This is because any variation in FDI influences the financial constraint significantly but variations in domestic investment have only little effects on the financial scope.

Finally, consider the case of an intermediate bargaining power of banks. If the shock hits the MNC parent, the line of arguments is similar to the case of symmetric liquidation skills with one important exception: Although the impact of the shock on domestic investment is undoubtedly adverse, FDI is now likely to be affected adversely too. This is because the MNC is not inclined to substitute domestic investment in favor of FDI to a great extend since, despite the devaluation of the domestic project due to the shock, any shift away from domestic investment tightens the financial constraint sharply as foreign collaterals are of low value to the bank.

If the shock emerges in the developing country, domestic investment is likely to increase following the shock. The willingness of the MNC to substitute the less profitable FDI in favor of domestic investment is much greater because the bank honors smaller investment abroad by a vigorously increasing willingness to lend. The resulting ample financial scope is used by the MNC primarily to facilitate domestic investment. Moreover, since the shock worsens the productivity of that project with an anyway comparatively low investment and low return, its influence on the MNC's total cash flow is weak so that the lending effect is not as strong as if the shock affects the domestic project.

In the following section let us exemplify and discuss the main results of the model.

5 Discussion

The main results stated in proposition 3 shall be illustrated by a numerical example. Suppose the following Cobb/Douglas-type production function $R(I) = 240I^{1/2}$ and set parameters as follows: $\alpha = 0.3$, $\beta = 1$, $\gamma = 1.2$ and $\mu = 0.1$. In that case, MNCs endowed with $W \geq 1583.3$ perform the first best investment at home as well as abroad given by $I_{fb} = FDI_{fb} = 10000$. MNCs not able to finance nearly 8 percent of total first best investment by own wealth have to underinvest in both countries. But underinvestment is even more severe abroad than at home as shown in figure 2.

For $W = 0$, the second best investment abroad amounts to 7544.3, but at home it is 9471.7. The share of FDI to total investment declines continuously from 50 to 44.3 percent if wealth decreases from 1583.3 to 0.

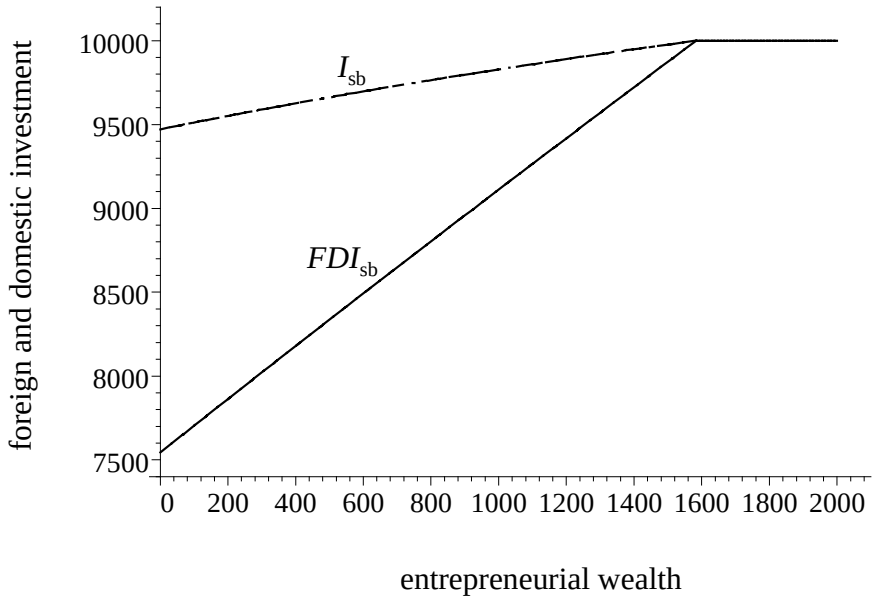

Figure 2: Domestic Investment (dashed line) and Foreign Investment (solid line) as Functions of Entrepreneurial Wealth.

Next introduce an adverse shock to the factor productivity of the domestic project. Let the shock reduce the factor productivity by 5 percent. Following the shock, the first best

investment strategy is then given by $I_{fb} = 9025$ and $FDI = 10000$ but feasible only if $W \geq 1762.1$, for which the share of FDI in total investment is somewhat more than 52.5 percent. Figure 3 shows that both domestic and foreign investments are lower if there is a shock at home, i.e. as regards foreign investment, the lending effect dominates the substitution effect.

The responses of investments are different if a shock of same magnitude occurs abroad. Figure 4 depicts the responses of domestic and foreign investment to a 5 percentage techological shock abroad. In our example, a shock abroad (slightly) increases domestic investment whereas foreign investment falls. The critical financial wealth decreases to 1250.

This example points out that international spillover effects may be asymmetric depending on whether the industrialized country or the developing country suffers from a macroeconomic shock. Although these shocks are viewed throughout the paper as disturbances to the factor productivity, other interpretations such as terms-of-trade shocks are also conceivable. The key point is: When the MNC parent experiences unfavorable business conditions then the foreign affiliate in the developing country is very likely affected adversely because the MNC is barely intended to maintain foreign investment. On the other hand, when the foreign affiliate has to deal with macroeconomic disturbances the MNC parent will redistribute capital away from the affiliate to the parent.

The results of this paper come from shortcomings in developing countries' legal systems and from the low collateral value of the affilliate's plant. Since FDI flows to developing countries amount to 15 percent of domestic investment (World Bank, 2002) the price of attracting international capital flows through FDI payed by developing countries is their dependency on business fluctuations in industrialized economies. This comovement in business fluctuations is consistent with the stylized facts for these countries. For example, Agénor, McDermott and Prasad (2000) show that business cycles in developing countries are indeed positively correlated with business cycles in industrialized countries.

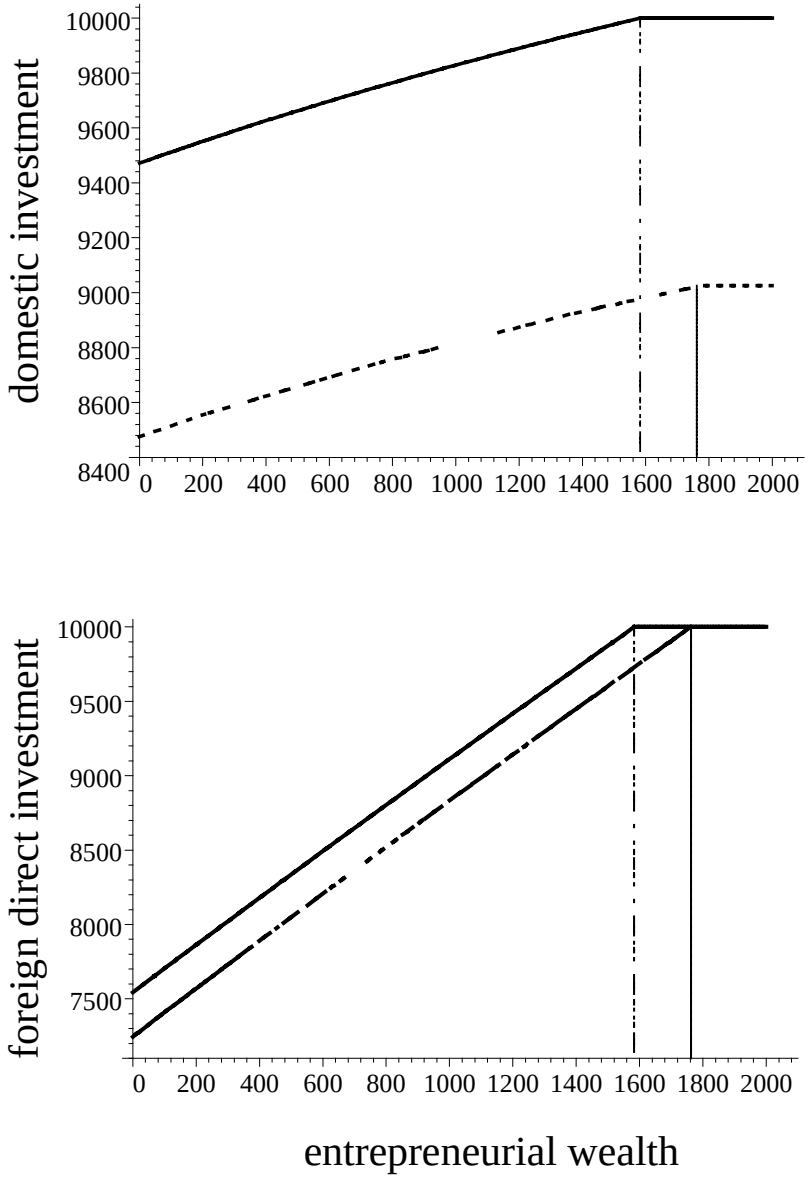

Figure 3: Domestic and Foreign Direct Investment Before (solid line) and After (dotted line) a Country-specific Shock at Home.

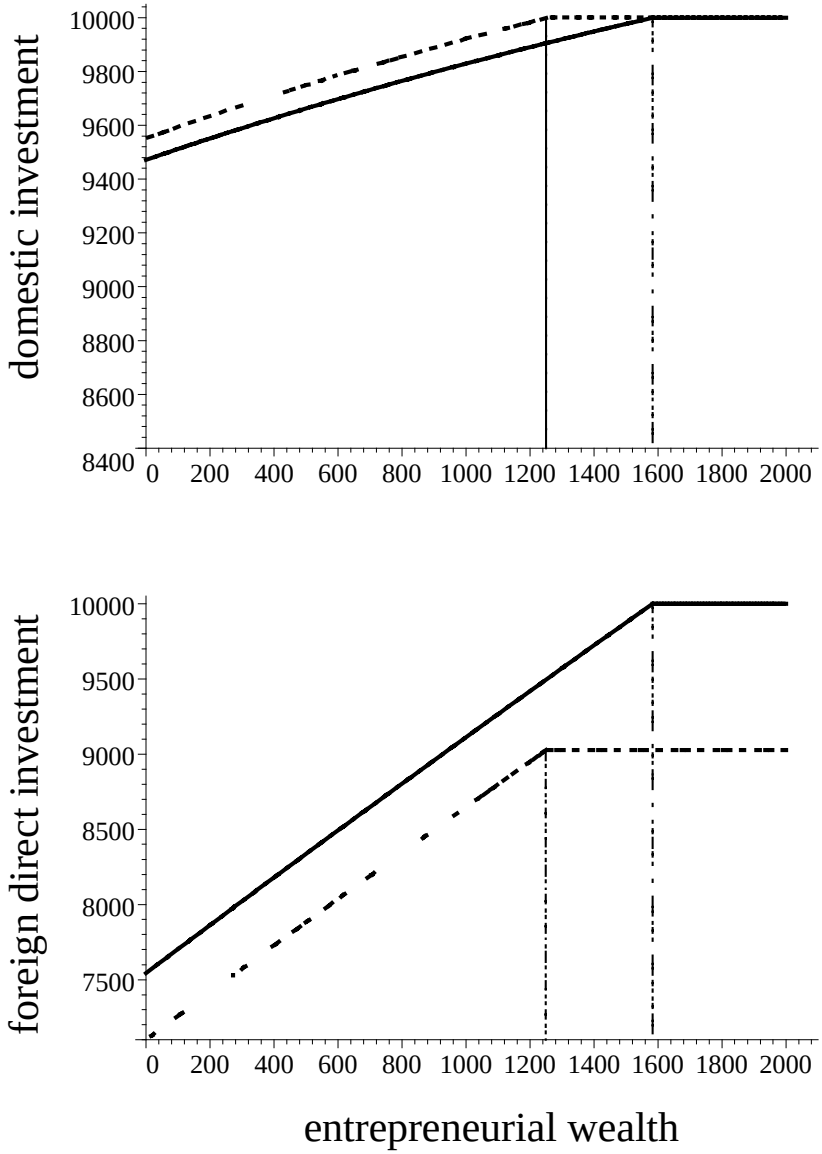

Figure 4: Domestic and Foreign Direct Investment Before (solid line) and After (dotted line) a Country-specific Shock Abroad.

6 Summary

The paper gives reason that FDI makes developing countries vulnerable to business fluctuations in industrialized countries. A standard incomplete contracts approach is used to investigate the combined investment decision of a multinationally operating corporation based in an industrialized country that plans investment projects at home and in a developing country. Since investment in the foreign affilate is associated with a transfer of inalienable specific technological and managerial human capital it can hardly be financed by a cross-border debt contract if contracts are not enforcable due to underdeveloped legal systems. Hence, the MNC parent has to raise a bank loan at home secured by its tangible assets. These assets are, however, of low value to the bank if they are confined to the foreign affiliate. Hence the MNC's decision concerning the internal allocation of external funds influences the willingness of the bank to grant a loan. The main results are twofold. First, a deterioration of the MNC's financial standing, measured by the amount of financial wealth, leads to an excessive outflow of FDI. Second, a macroeconomic disturbance to the industrialized country is likely to induce a comparatively strong comovement in domestic and foreign investment, whereas a shock of same type and magnitude affecting the developing country is likely to force the MNC to reallocate investment in favor of its parent.

Appendix: A Formal Model

The MNC faces the following optimisation problem

$$\max_{I,FDI} R(I) - \gamma I + R(FDI) - \gamma FDI$$

(A) $$s.t.$$

$$\alpha\left[R(I) + R(FDI)\right] + (1-\alpha)\beta\left[I + \mu FDI\right] \geq \max\left\{\gamma\left(I + FDI - W\right), 0\right\}$$

The interior solution (I^*, FDI^*) satisfies

(B) $$R'(I^*) - \gamma + \lambda\left[\alpha R'(I^*) + (1-\alpha)\beta - \gamma\right] = 0$$

(C) $$R'(FDI^*) - \gamma + \lambda\left[\alpha R'(FDI^*) + (1-\alpha)\mu\beta - \gamma\right] = 0$$

(D) $$\alpha\left[R(I^*) + R(FDI^*)\right] + (1-\alpha)\beta\left(I^* + \mu FDI^*\right) - \gamma(I^* + FDI^* - W) \geq 0$$

(E) $$\lambda \geq 0$$

where λ denotes the Langrangian multiplier associated with the financial constraint. Consolidating (B) and (C) gives

(F) $$R'(FDI^*) = \frac{\gamma - \mu\beta}{\gamma - \beta} R'(I^*) - \frac{\gamma\beta(1-\mu)}{\gamma - \beta}$$

It follows from (F) that investing the first best investment in the home country, i.e. $I^* = \{I_{fb} : R'(I_{fb}) = \gamma\}$, implies that first best investment abroad is optimal too, i.e. $FDI^* = \{FDI_{fb} : R'(FDI_{fb}) = \gamma\}$ and vice versa. Hence, if (D) is not binding due to sufficiently large W the first best investments are feasible and a country-specific productivity shock either at home ($\bar{\varepsilon}$) or abroad ($\underline{\varepsilon}$) then implies

$$\frac{\partial FDI_{fb}}{\partial \bar{\varepsilon}} = \frac{\partial I_{fb}}{\partial \underline{\varepsilon}} = 0$$
$$\frac{\partial FDI_{fb}}{\partial \underline{\varepsilon}} = \frac{\partial I_{fb}}{\partial \bar{\varepsilon}} > 0$$

To simplify notation, define

$$\Omega(I) := (\gamma - \beta) - \alpha\left(R'(I) - \beta\right)$$
$$\Psi(FDI) := (\gamma - \mu\beta) - \alpha\left(R'(FDI) - \mu\beta\right)$$

Case 1: $\mu = 1$

If (D) is not met for $\left(I_{fb}, FDI_{fb}\right)$ and $\mu = 1$ because of too little wealth, then (F) implies $I_{sb} = FDI_{sb}$ irrespectively of the level of total investment and, hence, of the MNC's financial wealth. For the latter it follows by applying the general implicit function theorem to (D) and (F)

$$\frac{\partial FDI_{sb}}{\partial W} = \frac{\partial I_{sb}}{\partial W} = \frac{\gamma}{2\Omega(I_{sb})} > 0$$

1. Occurence of a country-specific shock at home $\bar{\varepsilon}$:

   At any point $\left(I_{sb} FDI_{sb}\right)$ where $FDI_{sb} = I_{sb}$, the comparative statics for $W < W_{crit}$ result in

   (G) $$\frac{\partial I_{sb}}{\partial \bar{\varepsilon}} = \frac{1}{2}\left(\frac{\alpha R(I_{sb})}{\Omega(I_{sb})} - \frac{R'(I_{sb})}{R''(I_{sb})}\right) > 0$$

(H) $$\frac{\partial FDI_{sb}}{\partial \bar{\varepsilon}} = \frac{1}{2}\left(\frac{\alpha R(I_{sb})}{\Omega(I_{sb})} + \frac{R'(I_{sb})}{R''(I_{sb})} \right)$$

where the first fractions in brackets indicate the common responses of the investment in either country to the financial tightening caused by the shock (lending effect) and where the second fractions denote the substitution effect between domestic and foreign investment. If the substitution effect is not too strong, it follows $\partial FDI_{sb} / \partial \bar{\varepsilon} \geq 0$ and from (D) we obtain

$$\frac{\partial W_{crit}}{\partial \bar{\varepsilon}} = -\frac{\alpha R(I_{fb}) + \Omega(I_{fb}) \frac{R'(I_{fb})}{R''(I_{fb})}}{\gamma} \geq 0$$

A necessary condition for $\partial FDI_{sb} / \partial \bar{\varepsilon} \geq 0$ is to require

$$\alpha R(I_{sb}) \geq -\Omega(I_{sb}) \frac{R'(I_{sb})}{R''(I_{sb})}$$

which is likely to hold if $\gamma - \beta$ is small and if α is not too small. For $\alpha \to 0$ the sign of $\partial FDI_{sb} / \partial \bar{\varepsilon} \geq 0$ is unquestionably negative.

Finally, comparing (G) and (H) yields

$$\frac{\partial I_{sb}}{\partial \bar{\varepsilon}} > \frac{\partial FDI_{sb}}{\partial \bar{\varepsilon}}$$

2. Occurence of a country-specific shock abroad $\underline{\varepsilon}$:

Because of the symmetry of the projects it follows

$$\frac{\partial I_{sb}}{\partial \bar{\varepsilon}} = \frac{\partial FDI_{sb}}{\partial \underline{\varepsilon}}$$
$$\frac{\partial FDI_{sb}}{\partial \bar{\varepsilon}} = \frac{\partial I_{sb}}{\partial \underline{\varepsilon}}$$
$$\frac{\partial W_{crit}}{\partial \bar{\varepsilon}} = \frac{\partial W_{crit}}{\partial \underline{\varepsilon}}$$

Case 2: $\mu < 1$

If (D) is not met for $\left(I_{fb}, FDI_{fb}\right)$ and $\mu < 1$ because of too little wealth, then (F) implies $FDI_{sb} < I_{sb}$ and it follows for $W < W_{crit}$

$$\frac{\partial I_{sb}}{\partial W} = \gamma \frac{R''(FDI_{sb})}{\Omega(I_{sb})R''(FDI_{sb}) + \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R''(I_{sb})} > 0$$

$$\frac{\partial FDI_{sb}}{\partial W} = \gamma \frac{R''(I_{sb})}{\Omega(I_{sb})R''(FDI_{sb}) + \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R''(I_{sb})} \frac{\gamma-\mu\beta}{\gamma-\beta} > 0$$

where

(I) $$\frac{\partial FDI_{sb}}{\partial W} > \frac{\partial I_{sb}}{\partial W} \Leftrightarrow \frac{\gamma-\mu\beta}{\gamma-\beta}\frac{R''(I_{sb})}{R''(FDI_{sb})} > 1$$

which is likely to hold true for any $W < W_{crit}$ if both μ and $\gamma-\beta$ are small. In consideration of (F), this condition can be reformulated to

$$\frac{R''(I_{sb})/R'(I_{sb})}{R''(FDI_{sb})/R'(FDI_{sb})} + \frac{\gamma\beta(1-\mu)}{R''(FDI_{sb})(\gamma-\beta)}\frac{R''(I_{sb})}{R'(I_{sb})} > 1$$

which holds true irrespectively of further restrictions on μ and $\gamma-\beta$ at least if $-\frac{R''(I_{sb})}{R'(I_{sb})} \geq \frac{R''(FDI_{sb})}{R'(FDI_{sb})}$ for which it is sufficient to require $\frac{\partial}{\partial x}\left(-R''(x)/R'(x)\right) \geq 0$ for all $x \geq 0$.

1. Occurence of a country-specific shock at home $\bar{\varepsilon}$:

   From the general implicit function theorem it follows for $W < W_{crit}$

   (K) $$\frac{\partial I_{sb}}{\partial \bar{\varepsilon}} = \frac{\alpha R(I_{sb})R''(FDI_{sb}) - \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R'(I_{sb})}{\Omega(I_{sb})R''(FDI_{sb}) + \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R''(I_{sb})} > 0$$

   (L) $$\frac{\partial FDI_{sb}}{\partial \bar{\varepsilon}} = \frac{\gamma-\mu\beta}{\gamma-\beta}\frac{\alpha R(I_{sb})R''(I_{sb}) + \Omega(I_{sb})R'(I_{sb})}{\Omega(I_{sb})R''(FDI_{sb}) + \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R''(I_{sb})}$$

   As in case of $\mu = 1$, a necessary condition for $\partial FDI_{sb}/\partial\bar{\varepsilon} > 0$ is again to require

   $$\alpha R(I_{sb}) \geq -\Omega(I_{sb})\frac{R'(I_{sb})}{R''(I_{sb})}$$

   which is likely to hold if $\gamma-\beta$ is small but α is not too small. For $\alpha \to 0$ the sign of $\partial FDI_{sb}/\partial\bar{\varepsilon}$ is unquestionably negative.

2. Occurence of a country-specific shock abroad $\underline{\varepsilon}$:

From the general implicit function theorem it follows for $W < W_{crit}$

$$\text{(M)} \qquad \frac{\partial I_{sb}}{\partial \underline{\varepsilon}} = \frac{\alpha R(FDI_{sb})R''(FDI_{sb}) + \Psi(FDI_{sb})R'(FDI_{sb})}{\Omega(I_{sb})R''(FDI_{sb}) + \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R''(I_{sb})}$$

$$\text{(N)} \qquad \frac{\partial FDI_{sb}}{\partial \underline{\varepsilon}} = \frac{\alpha R(I_{sb})\frac{\gamma-\mu\beta}{\gamma-\beta}R''(I_{sb}) - \Omega(I_{sb})R'(FDI_{sb})}{\Omega(I_{sb})R''(FDI_{sb}) + \frac{\gamma-\mu\beta}{\gamma-\beta}\Psi(FDI_{sb})R''(I_{sb})} > 0$$

A necessary condition for $\partial I_{sb} / \partial \underline{\varepsilon} > 0$ is to require

$$\alpha R(FDI_{sb}) \geq -\Psi(FDI_{sb})\frac{R'(FDI_{sb})}{R''(FDI_{sb})}$$

which is less likely to hold ceteris paribus if μ is small since $\Psi(FDI)$ is decreasing in μ.

For any $W < W_{crit}$ we obtain

$$\text{(O)} \qquad \frac{\partial I_{sb}}{\partial \underline{\varepsilon}} < \frac{\partial FDI_{sb}}{\partial \bar{\varepsilon}}$$

at least if $\partial FDI_{sb} / \partial W > \partial I_{sb} / \partial W$. The proof can be given as follows. Rearranging (L) and (M) yields

$$\text{(P)} \qquad \begin{aligned} \frac{\partial FDI_{sb}}{\partial \bar{\varepsilon}} = &\left(\frac{\gamma-\beta}{\gamma-\mu\beta}\frac{R''(FDI_{sb})}{R''(I_{sb})}\frac{\Omega(I_{sb})}{\alpha R(I_{sb})} + \frac{\Psi(FDI_{sb})}{\alpha R(I_{sb})} \right)^{-1} \\ &+ \left(\frac{\gamma-\beta}{\gamma-\mu\beta}\frac{R''(FDI_{sb})}{R''(I_{sb})} + \frac{\Psi(FDI_{sb})}{\Omega(I_{sb})}\frac{R''(I_{sb})}{R'(I_{sb})} \right)^{-1} \end{aligned}$$

$$\text{(Q)} \qquad \begin{aligned} \frac{\partial I_{sb}}{\partial \underline{\varepsilon}} = &\left(\frac{\Omega(I_{sb})}{\alpha R(FDI_{sb})} + \frac{\gamma-\mu\beta}{\gamma-\beta}\frac{R''(I_{sb})}{R''(FDI_{sb})}\frac{\Psi(FDI_{sb})}{\alpha R(FDI_{sb})} \right)^{-1} \\ &+ \left(\frac{\Omega(I_{sb})}{\Psi(FDI_{sb})}\frac{R''(FDI_{sb})}{R'(FDI_{sb})} + \frac{\gamma-\mu\beta}{\gamma-\beta}\frac{R''(I_{sb})}{R'(FDI_{sb})} \right)^{-1} \end{aligned}$$

Since for $W < W_{crit}$ we have $FDI_{sb} < I_{sb}$ so that

$$R(FDI_{sb}) < R(I_{sb})$$
$$R'(FDI_{sb}) > R'(I_{sb})$$

Furthermore, from (B) and (C) we have in consideration of the definitions of Ω and Ψ

$$\frac{\Psi(FDI_{sb})}{\Omega(I_{sb})} = \frac{R'(FDI_{sb}) - \gamma}{R'(I_{sb}) - \gamma} > 1$$

As shown above, $\partial FDI_{sb} / \partial W > \partial I_{sb} / \partial W$ holds if

$$\frac{\gamma - \mu\beta}{\gamma - \beta} \frac{R''(I_{sb})}{R''(FDI_{sb})} > 1$$

Moreover, from (F) we have

$$R'(FDI_{sb}) > \frac{\gamma - \mu\beta}{\gamma - \beta} R'(I_{sb})$$

Hence, for the first fractions in (P) and (Q) we obtain

(R)
$$\left(\frac{\gamma - \beta}{\gamma - \mu\beta} \frac{R''(FDI_{sb})}{R''(I_{sb})} \frac{\Omega(I_{sb})}{\alpha R(I_{sb})} + \frac{\Psi(FDI_{sb})}{\alpha R(I_{sb})} \right)^{-1} > \left(\frac{\Omega(I_{sb})}{\alpha R(FDI_{sb})} + \frac{\gamma - \mu\beta}{\gamma - \beta} \frac{R''(I_{sb})}{R''(FDI_{sb})} \frac{\Psi(FDI_{sb})}{\alpha R(FDI_{sb})} \right)^{-1}$$

and for the second fractions, respectively,

(S)
$$\left(\frac{\gamma - \beta}{\gamma - \mu\beta} \frac{R''(FDI_{sb})}{R''(I_{sb})} + \frac{\Psi(FDI_{sb})}{\Omega(I_{sb})} \frac{R''(I_{sb})}{R'(I_{sb})} \right)^{-1} > \left(\frac{\Omega(I_{sb})}{\Psi(FDI_{sb})} \frac{R''(FDI_{sb})}{R'(FDI_{sb})} + \frac{\gamma - \mu\beta}{\gamma - \beta} \frac{R''(I_{sb})}{R'(FDI_{sb})} \right)^{-1}$$

Inequality (R) means that the lending effect is stronger if the shock arises in the industrialized contry and inequality (S) means that the substitution effect is stronger if the shock arises in the developing country.

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