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Debt vs. Foreign Direct Investment: The Impact of Sovereign Risk on the Structure of Capital Flows to Developing Countries

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Abstract: In this paper we compare the two standard forms of international investments in developing countries, debt and foreign direct investment, from a finance perspective. It is shown that the sovereign risks associated with debt finance are generally less severe than the ones which come with FDI. FDI is chosen only if the foreign investor is more efficient in running the project, if the project is risky and if the foreign investor has a good outside option which deters creeping expropriation. We show furthermore that the host country and the foreign investor may benefit from forming a joint venture.

Journal of Economic Literature Classification Nos.: F2, F34, L14, O12.

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1 Introduction

During the communist era foreign direct investment (FDI) played virtually no role in Eastern Europe. But since the late 1980s, when the legislative framework concerning FDI was liberalized, Eastern Europe has witnessed a substantial inflow of foreign direct investments, in 1993 alone US $ 6.7 billions. Still, national experiences differ substantially. While Hungary, the Czech Republic and Poland have been quite successful in attracting foreign investors, this is less true for the states of the former Soviet Union. Similarly, annual FDI inflows into less developed countries have reached a record level of US $ 60 billions in 1993, three times the inflow of 1987. However, Latin American and East Asian countries account for almost all of this increase, while FDI to Sub-Saharan Africa stagnated.[1]

One of the advantages of FDI over international credits, so it is often argued, is that the investor (typically a multinational enterprise) brings not only capital but also technological know how and managerial expertise to the host country. However, given that there are alternative ways of transfering capital and technology to Eastern European and developing countries, for example through credits and licensing agreements, the question arises which of these alternatives is preferable. The experience of the international debt crisis of the 1980s brought up a second argument in favor of FDI, saying that the flexible payment schedules and extended property rights that come with FDI make the investor less vulnerable to high country risks. But the experience with developing countries shows that direct investments are also subject to sovereign risks. Just as a government can choose to default on its debt services, it can choose to expropriate the assets of a direct investment.[2] Thus, a priori it is not clear which of these alternatives, FDI or, say, credits plus licensing arrangements, dominates.

In this paper we analyze the pros and cons of FDI as compared to other

[1]See World Bank (1994, pp. 159-162).

[2]Estimates on the amount of non-compensated expropriation vary between 4% and 11% of total book value of all foreign direct investments in less developed countries. See, Kobrin (1980) and Williams (1975).

forms of international investments from a finance perspective. Two idealized forms of transfering foreign capital are considered: A combination of a credit and a licensing agreement ("debt finance") and foreign direct investment. The leading question of our analysis is how "safe" these different forms of investment are from the point of view of the foreign investor given the problem of sovereign risk. We will argue that debt and FDI give different rights to the foreign investor and are thus subject to different risks. In case of debt the investor has a well defined right on a fixed monetary payment. If the host country defaults on its debt repayment this may trigger international sanctions such as the exclusion from world capital markets or restrictions on its international trade. In case of FDI the investor has a property right on the physical assets of his investment in the host country, but these assets are prone to nationalization. Again, this is an unambiguous act of expropriation, and, as in case of debt repudiation, it may be punished by international sanctions. There is a second risk involved in FDI, however. Even if the assets are not nationalized, the returns from the investment may be adversely affected by sovereign acts of the host country such as changes in the tax law, specific import or export duties, or other charges the investor has to pay. In contrast to debt repudiation or outright nationalization, such forms of "creeping expropriation" that are designd to capture the return stream of a particular investment project are less visible and are not a clear cut violation of international trade and investment agreements. Hence, it is much more difficult to deter them by international sanctions. The investor can only use his control rights to protect the returns from his investment. For example he can respond to changes in taxation by transfering some of his production to other plants abroad, possibly at some cost.

In the first part of this paper (Sections 2 to 5) we discuss the risks of expropriation more thoroughly and develop a formal model which specifies the two investment alternatives, the options of the host country to expropriate the investment, and the options of the foreign investor to exercise his control rights in case of FDI. We analyze how the value of the investment to the foreign investor and to the host country depends on who is in control, what type of goods are produced and what kind of technology is used for production. It is shown that if the return streams that can be generated under the control of the host country and the foreign direct investor are the same, then there is a clear tendency towards debt finance. Debt finance is more efficient, it is more likely to be viable, and it allows to give a larger share of the surplus to the foreign investor. However, if the foreign investor is more efficient in running the project then FDI may become the preferred mode of investment. We show that these results are consistent with the empirical evidence that is so far available.

In the second part we consider two extensions of the basic model. First, in Section 6, we allow for stochastic returns of the investment. In the case of debt finance it may happen that the host country is forced into liquidity default in a bad state of the world. If the foreign investor is unable to observe the state of the world and to distinguish between liquidity default and strategic default, then there will be an inefficient punishment of the debtor country with positive probability in equilibrium. Since the return on FDI varies with the state of nature "liquidity default" is not a problem. This makes FDI comparatively more attractive.

Second, in Section 7, we consider a variant of the model in which the foreign investor may engage in a joint venture with the host country. We show that this reduces the host country's temptation to nationalize and to raise taxes, and that it may increase the overall efficiency of the project. FDI may be viable only if the project's profit stream is shared with the host country in a joint venture. Finally, Section 8 concludes and discusses some directions for further research.

There are two strands of literature which are complementary to our approach. The first one compares FDI to, say, licensing agreements, without taking into account the problem of sovereign risk. This literature, which has been called the "eclective theory of FDI" (Dunning, 1981), argues that information asymmetries and market failures in the market for technology make it difficult to transfer technological know how through licensing.[3] Thus, if the technology is very so-

[3]Horstmann and Markusen (1985) offer a game-theoretic model of this approach. They

phisticated, transaction cost considerations suggest that FDI is the optimal form of investment.

The second literature studies the effects of sovereign risk, but predominantly in the context of debt finance. The central question is how debt finance can be sustained at all. This problem is by now well understood[4]. We use a very simple model of sovereign debt, which reflects the main insights of this literature, as an ingredient to our model. There has been comparatively little theoretical work on the sovereign risks associated with FDI. An important exception is Eaton and Gersovitz (1983, 84) who analyze foreign direct investment with the threat of potential nationalization. Their first paper develops a reputation model of FDI, assuming that capital is available only through foreign direct investment and that it depreciates completely in a single period. If the host country decides to expropriate the current capital stock foreign investors will refrain from investing in the future and the country can never attract foreign capital again. Their second paper shows that the threat of nationalization may induce the foreign direct investor to choose an inefficient technology which makes nationalization less attractive to the host country. Thomas and Worrall (1994) analyze the time pattern of FDI in an infinite horizon model. They show that in order to mitigate the host country's incentives to expropriate the investor will underinvest in the beginning of the relationship and increase the inverstment level over time. None of these papers distinguishes between expropriation through nationalization on the one hand and creeping expropriation through taxation on the other hand.[5] Furthermore, they do not offer any empirical predictions on when to expect foreign direct investment instead of debt finance.

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consider a technology supplier who has a reputation for his product. He may prefer FDI to licensing because a potential licensee does not have the same incentive to maintain this reputation. Since the technology is high tech, it is impossible to fully specify all the relevant actions of the licensee.

[4]For recent surveys on the sovereign debt problem see Eaton (1993) and Eaton and Fernandez (1995).

[5]The only theoretical model we are aware off making this distinction is Raff (1992). However, in his model the government can commit to tax rates before investment costs are sunk, so there is no hold up problem. He develops an asymmetric information model in order to assess the likelihood of nationalization.

2 The Risks of Expropriation

Consider a multinational enterprise (MNE) owning a technology which can be profitably employed in a developing country. This investment project requires some initial outlay of capital. Suppose that the developing country is cash constrained, so it cannot finance the investment alone, while the multinational enterprise has sufficient liquid funds to carry out the project. Under these circumstances there are two possibilities how to finance the project. First, the MNE could offer a credit to the government of the host country (HC) and licence the technology so that HC can carry out and run the project itself. This is the case of *debt finance* in which HC owns and controls the investment project.[6] Second, MNE could carry out and run the project himself, making a *foreign direct investment (FDI)* in the host country. In this case ownership and control of the project remains with the multinational.

An important problem with both types of finance is the political risk of expropriation associated with international investments. Since HC is a sovereign country it cannot be forced by the courts to honour the terms of a contract it has agreed upon with the foreign investor. Consider the case of debt finance first. If the HC defaults on its debt it is impossible for the investor to seize any financial or physical assets of the investment project in the host country or to force it to repay. The debt crisis in the early 1980s and the recent developments in Mexico demonstrated again that default is a very serious problem for international lending.[7] There is a large literature on this "soveign debt problem" which argues that the host country will repay its debt only if the costs of default outweigh the benefits from repudiation. For example, if HC defaults on its debt it may lose access to international capital markets and may not be able to borrow and lend in the future. Furthermore, trade sanctions may be imposed by the rest of the world which reduce HC's gains from international trade. Finally, the multinational may

[6]Without loss of generality we restrict attention to the case where any credit is directly given by the MNE rather than by a third party like a bank.

[7]See Eichengreen and Portes (1986) for a historical survey on foreign lending and default since the 1920s.

succeed in seizing assets held by the host country abroad. We will not model these different costs of default explicitly but simply assume that HC is punished and has to suffer an exogenously given utility loss $\pi > 0$ if it repudiates its debt.[8]

The political risks of foreign direct investment have received less attention in the theoretical literature. After the MNE has sunk the investment cost in the host country there are two possibilities for expropriation. First, HC may nationalize the project without paying adequate compensation to MNE. In this case MNE loses the investment's return stream and *in addition* all control rights over the project. Second, HC could change the rules of the game and try to capture the quasi-rents of the project by increasing taxes, import or export duties and other charges MNE has to pay. While these policies shift returns from MNE to HC, they typically do not affect the control rights over the investment project.

Empirically, both types of expropriation are of significant importance. Concerning outright expropriation, Kobrin (1980) reports that from 1960 to 1976 there have been at least 1535 cases in 76 less developed countries in which foreign firms were forced to divest. Nationalization was the dominant form of expropriation (50 % of all cases) followed by forced sale (32 %), forced contract renegotiation (8 %, in particular in the mining sector) and various other forms government intervention. The book value of these firms represented 4.4% of the total stock of foreign direct investments in the expropriating countries at the end of 1976.[9] These data include some instances of mass expropriation due to a shift in political-economic ideology (e.g. Algeria 1967-72 or Chile 1971-72). However, "in the vast majority of countries expropriation was more 'selective' rather than mass" (Kobrin, 1980, p. 75).

The threat of changes in taxation, specific import or export duties, or other charges the multinational has to pay is also well recognized in the literature

[8]For explicit models of the costs of default see e.g. Eaton and Gersovitz (1981) and Bulow and Rogoff (1989a).

[9]Williams (1975) collected similar data for the period 1956-72. He reports that 11.1% of all foreign direct investments in less developed countries were expropriated without compensation.

and has been called the "obsolescing bargain"[10]. This is, in fact, the classical hold-up problem: After investment costs are sunk the bargaining position of the multinatinational does not reflect its investment effort, and it cannot prevent the host country from capturing some of quasi-rents of the projects by increasing taxation. There are several empirical studies confirming this effect.[11]

Note that there are two important differences between outright nationalization and increases in taxation. First, nationalization without adequate compensation is an unambiguous act of expropriation and a violation of international trade and investment agreements. Thus, as in the case of debt repudiation, nationalization may be punished by the same sort of international sanctions as described above. This is not the case for increases in taxes or tariffs, however. Every country is free to choose its tax system at will. Furthermore, in contrast to outright nationalization, small changes in the tax system which are specifically designed to expropriate the return stream of a praticular investment are much less visible and cannot be verified unambiguously to outside observers on the international capital markets. Every country taxes foreign direct investments, and it is difficult to draw the line between fair taxation and expropriation. Thus, increases of taxation cannot be deterred by international sanctions.

The second difference between these two modes of expropriation is the allocation of control rights over the investment project. In case of nationalization HC takes over control of the project and the multinational is excluded from any decisions to be made on the project in the future. In contrast, a mere increase in taxation, even if it expropriates the entire return stream, leaves MNE in control. In this case the multinational can respond to changes in taxation by taking several kinds of actions which affect the profitability of the project. In particular, MNEs typically own many investment projects which are geographically diversified over several foreign contries so that they can, at some cost, shift some or all production from one country to another.[12] It is the threat of taking these actions

[10]See Vernon (1971)

[11]For a survey see Kobrin (1987).

[12]Many studies of multinational enterprises emphasize the observation that these firms are

which disciplines taxation in the host country.

In the following we develop a very simple model which can be used to analyze and compare debt finance and foreign direct investment in less developed countries. This model focusses on the possibility that the multinational may withdraw from the host country and shift production abroad in response to changes in taxation. This basic model already yields several important empirical predictions about the efficiency and viability of debt finance versus FDI. Furthermore, it can easily be extended in several directions. In particular, it can be used to discuss the merits of joint ventures which are a frequently observed phenomenon in foreign direct investment.

3 The Model

Consider two risk-neutral parties, A (she) and B (he), who want to finance a joint investment project. A is a multinational enterprise registered in a developed country who owns a technology which may be profitably employed in a developing country. The government of the host country is called B. The investment project requires an initial outlay of capital $I > 0$. We are interested in the case where B is cash constrained and has no liquid funds available while A has sufficient cash to pay for I. Without loss of generality the riskless world interest rate is assumed to be zero, so there is no discounting. If the project is not carried out both parties get their outside option utilities which are normalized to 0. As described in Section 2, there are two possibilities how to finance and run the project, *debt finance* and *foreign direct investment*.

3.1 Debt Finance

Under debt finance A licenses the technology to B and gives a credit in order to finance the deal. In this case a debt contract has to specify an amount $C \geq I$, to

"footloose". See e.g. Caves (1982, p. 255) and the examples given there.

be payed by A to B in period 0 in order to finance the investment project, and an amount $D \geq C$ to be paid by B to A in period 1 after the investment payed off. Let us assume that A can make sure that the credit is spent by B on the investment project.[13] The repayment (D) will be chosen to compensate A for his initial capital outlay (C) and for granting the license to B. In addition, D can be used to split the surplus which may be generated in the relationship.

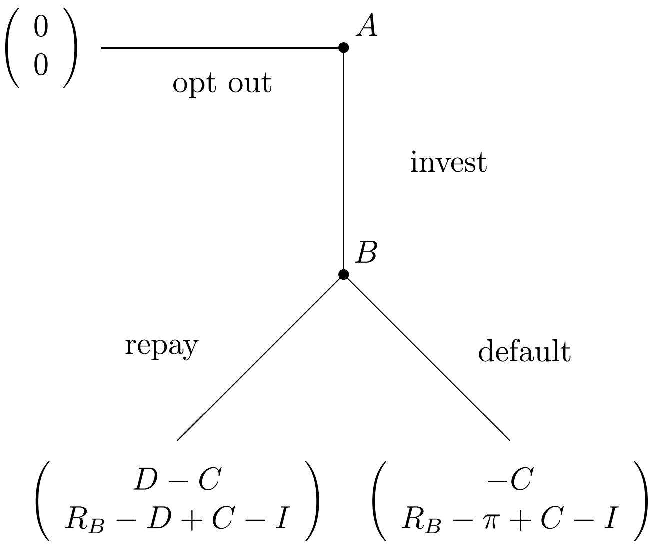

Figure 1: Debt Finance

If B receives the credit and invests I, the project generates a deterministic return $R_B > I$, where the subscript B stands for return under B-control.[14] After B received R_B he has to decide whether or not to repay D. If he repudiates his debt an exogenously given punishment is triggered, e.g. trade sanctions and a temporary exclusion from international capital markets, which yields a utility loss $\pi > 0$ to B. Note that A does not benefit from B's punishment, and that the punishment cannot be renegotiated.[15] Thus, if the investment is financed by

[13]The typical case is that the capital outlay I is used to buy machinery and other equipment on the world market which can be organized or financed directly by A.

[14]The case of stochastic returns will be analyzed in Section 6.

[15]The assumption that there is no renegotiation is made for simplicity only. There is an emerging literature on sovereign debt renegotiation, e.g. Bulow and Rogoff (1989b) and Fernandez and Rosenthal (1990). It would be desirable to allow for renegotiation in this model as well, but this would considerably complicate the analysis. However, if the renegotiation process does not

debt, final payoffs are given by

$$U_A \;=\; \begin{cases} D - C & \text{if } B \text{ honors his debt} \\ -C & \text{if } B \text{ repudiates} \end{cases}$$

and

$$U_B \;=\; \begin{cases} R_B - D + C - I & \text{if } B \text{ honors his debt} \\ R_B - \pi + C - I & \text{if } B \text{ repudiates} \end{cases}$$

The time structure of debt finance is summarized in Figure 1.

This game is straightforward to analyze: B will repay his debt if and only if $D \leq \pi$. Of course, A will never grant a credit if this condition is violated. Furthermore, the credit C has to be sufficient to cover the investment cost I. Hence, debt finance is feasible only if numbers D and C can be found such that $\pi \geq D \geq C \geq I$ which is the case if and only if

$$\pi \;\geq\; I\;. \tag{1}$$

Note that this condition is independent of R_B, the return generated by the investment under B-ownership. But, of course, the parties will agree to debt finance only if the joint surplus, W, that can be generated is positive, i.e., if

$$W^{debt} \;=\; U_A + U_B \;=\; R_B - I \;\geq\; 0\;. \tag{2}$$

If (1) and (2) are both satisfied, debt finance is viable. Note that, since B is cash constrained at the time of the investment, it is not possible to share the surplus arbitrarily between the two parties because no ex ante side payments from B to A are feasible. The most A can get out of this deal is $\pi - I$.

3.2 Foreign Direct Investment

In the case of FDI A carries out the investment project herself and is supposed to run it thereafter. However, after investment costs are sunk, B has the option

always yield the ex-post efficient outcome (e.g. because there is bargaining under asymmetric information, see Section 6 below), then the payoffs assumed here could be interpreted as the reduced form payoffs of the renegotiation game. Modelling the renegotiation process explicitly has to be left to future research.

to nationalize the project. Note that B is cash constrained, so he cannot compensate A for the expropriation.[16] After nationalization B owns and controls the project and realizes the return R_B. However, as discussed in Section 2, outright nationalization is very similar to debt repudiation in that it is a highly visible and unambiguous act which violates international agreements. Hence, it will be punished similarly. For simplicity, let us assume that nationalization triggers the same penalty π as in case of debt repudiation.[17] Thus, if A invests and B nationalizes payoffs are given by $-I$ for A and $R_B - \pi$ for B.

If B does not nationalize, he still has the option to capture at least some of the returns of the investment by altering taxation to which A is liable. In principle the optimal tax structure may be quite complicated. However, in the very simple model considered here, we can, without loss of generality, restrict attention to the case where B chooses the total amount of taxes, T, to be paid by A. Of course, A cannot be forced to pay taxes in excess of the returns of the investment project. Hence, if T exceeds the returns, A has to pay all of the returns but not more.

As long as A is the owner of the project she may decide to shift production from B's country to other plants abroad in response to a tax increase and to (partially) withdraw from the host country. If A does not withdraw the project will generate a pre-tax return R_A. If A shifts production (partially) abroad the return generated in the host country is reduced to $\underline{R}_A$, $0 \leq \underline{R}_A < R_A$, while an additional profit r will be received abroad. The amount of this additional pro-

[16]If B nationalizes now and defers compensation until after the returns of the project are realized we are back to the case of debt finance considered above.

[17]Eaton and Gersovitz (1983, p. 89-90) argue that the punishment in case of nationalization is typically less severe as compared to the punishment after debt repudiation, in particular if the host country does not nationalize foreign direct investments on a large scale but rather selectively. In this case potential future investors may not refrain from investing in the host country because they consider the past nationalization record not to be relevant for their own investment projects. On the other hand, nationalization without paying adequate compensation clearly is a hostile act of the host country, while the host country may have been forced to repudiate its debt due to liquidity constraints. This argument suggests that there is less scope to renegotiate the punishment in case of nationalization. See also the discussion in Section 6. An extension of the model in which the two penalties differ is straightforward and left to the reader.

fit depends on many factors, in particular on possible excess capacities in other plants, on market conditions for the output good, on the internal flexibility of A, and so on. It seems realistic to assume that A is better informed about these circumstances than B. We model this by assuming that after B has chosen T, nature determines the outside option profit $r \in [\underline{r}, \overline{r}]$ according to some cumulative distribution function $F(r)$. A learns the realization of r and then decides whether to fully engage herself in B's country or whether to withdraw and shift some production abroad.

Note that B can guarantee himself a tax of at least $\underline{R}_A$, so he will never choose $T < \underline{R}_A$. Furthermore, he will never choose $T \geq R_A$, since this would induce A to withdraw for sure. Using this fact payoffs are given by

$$U_A \;=\; \begin{cases} R_A - T - I & \text{if } A \text{ does not withdraw} \\ r - I & \text{if } A \text{ withdraws} \end{cases}$$

and

$$U_B \;=\; \begin{cases} T & \text{if } A \text{ does not withdraw} \\ \underline{R}_A & \text{if } A \text{ withdraws} \end{cases}$$

The time structure of foreign direct investment is summarized in Figure 2.

Again, the game is easily solved by backwards induction. Consider the subgame in which B did not nationalize the investment project. A will not withdraw from B's country if and only if $r < R_A - T$ which happens with probability $F(R_A - T)$. Hence, B chooses the optimal tax T^* such that

$$T^* \;\in\; \arg\max_{T} \{T \cdot F(R_A - T) + \underline{R}_A \cdot (1 - F(R_A - T))\} \tag{3}$$

where $\underline{R}_A \leq T^* < R_A$. Thus, B's expected payoff in this subgame is given by

$$U_B \;=\; T^* \cdot F(R_A - T^*) + \underline{R}_A\,(1 - F(R_A - T^*)) \;\equiv\; T^e\;, \tag{4}$$

where T^e denotes the expected amount of taxes extracted from A. On the other hand, A's expected profit can be written as

$$\begin{aligned} U_A \;&=\; R_A \cdot F(R_A - T^*) - T^* \cdot F(R_A - T^*) - \underline{R}_A\,(1 - F(R_A - T^*) \\ &\qquad + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r)dF(r) - I \\ &=\; R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r)dF(r) - T^e \;\, - I\;. \end{aligned} \tag{5}$$

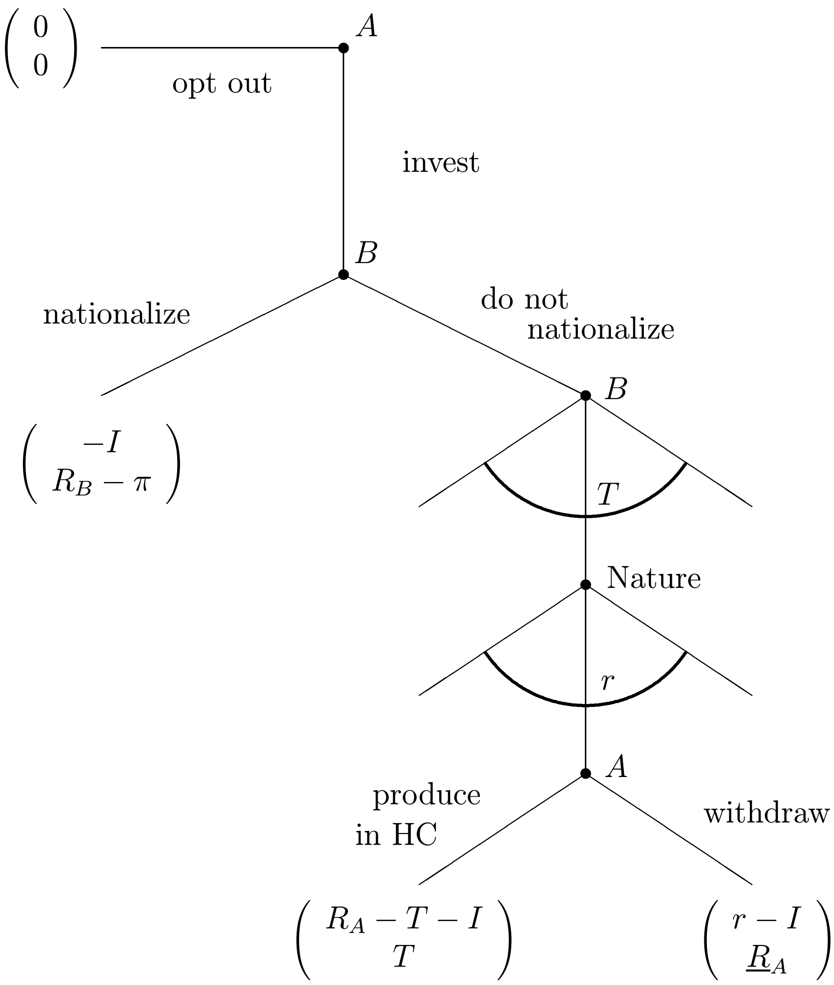

Figure 2: Foreign Direct Investment

Comparing (4) to B's payoff after nationalization, we see that B refrains from nationalizing the project if and only if

$$R_B - \pi \ < \ T^e \ . \tag{6}$$

If this condition is violated, A will never make a foreign direct investment. So suppose (6) holds. Then FDI is profitable for A if and only if

$$R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - T^e \ \geq \ I \ . \tag{7}$$

Inequalities (6) and (7) are the Scylla and Charybdis of foreign direct investment. On the one hand there is the threat of expropriation through nationalization. If the expected amount of taxes, T^e, is too small, for example because A has a strong outside option to witdraw ($\underline{R}_A$ small, expected value of r high), then B cannot be prevented from nationalizing the investment. On the other hand there is the threat of expropriation through taxation. If T^e is too large, for example because A's outside option is weak, then B would restrain from nationalization. But in this case the project may no longer be profitable for A.

FDI is viable if (6) and (7) are both satisfied. If this is the case, the joint surplus that can be generated by financing the project through FDI is given by

$$W^{FDI} \;=\; U_A + U_B \;=\; R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - I \; . \qquad (8)$$

In the model described so far there will be neither default nor nationalization in equilibrium. This is due to the assumption that all payoffs are deterministic functions of the actions taken by both players. Therefore, the foreign investor perfectly anticipates the behaviour of the host country and will refrain from his investment if he expects to be expropriated. It is straightforward to introduce some noise into the model which leads to default or nationalization with positive probability in equilibrium. Suppose, for example, that the punishment π is a random variable. Recall that π is the net present value of foregone opportunities if the country loses access to international capital markets, if trade sanctions are imposed, or if future investors refrain from foreign direct investments. Hence, variations in the country's discount rate or in the expected flow of future benefits from international trade and foreign investments affect the amount of punishment that can be inflicted on the host country. Foreign investors form expectations about π. They will invest if the expected return from the project is sufficiently high to cover their investment costs, even if they anticipate that with some positive probability the realization of π will be so low that the country will default on its debt or nationalize the investment. Since the introduction of uncertainty on π complicates the exposition of the model without affecting our qualitative results, we stick to the deterministic model for the comparative static analysis.[18]

[18]However, in Section 6 we consider the case of stochastic returns to the investment which affects debt finance and FDI differently.

4 Efficiency and Viability of Debt Finance and FDI

There are two reasons why the allocation under FDI may be more efficient than under debt finance. First, the return stream generated by the multinational (R_A) may exceed the return stream that can be obtained by the host country itself (R_B). This is, for example, the case if A can employ specific skills or synergies from other activities to reduce production costs, to raise product quality or to improve marketing, and if the employment of these factors cannot be transfered from A to B through a contract. Thus, if high technology goods or components are produced and if they are marketed abroad, then the multinational is presumably more efficient in organizing production as compared to the host country. On the other hand, if a standardized and rather low tech good is produced and marketed domestically, then R_A and R_B are likely to be roughly the same. R_B may exceed R_A if B has better information about the local production and market conditions.

There is a second reason why FDI may be more efficient than debt finance. If the project is owned and controled by the multinational, she can partially shift production and profits to other countries. This may be efficiency enhancing if the additional profits that can be obtained by producing abroad turn out to be very high ($r > R_A - \underline{R}_A$). In this case A-control offers additional flexibility which increases efficiency. However, A may choose to withdraw from B's country even if $r < R_A - \underline{R}_A$ because she wants to escape B's taxation. In this case the additional flexibility yields an ex post efficiency loss. This discussion is summarized in the following proposition.

Proposition 1 *Suppose that FDI and debt finance are both viable, i.e. (1), (2), (6) and (7) hold. FDI is more efficient than debt finance if R_A is sufficiently greater than R_B and/or if the option of withdrawing from B's country gives rise to a sufficiently strong efficiency gain.*

However, if $R_A = R_B$ and if $r \leq R_A - \underline{R}_A$ with probability 1, then debt finance is always at least as efficient as FDI.

Note that if debt finance is viable, if $R_A = R_B$, and if withdrawing from B's country is never profitable, then debt finance achieves the first best. On the other hand, there is an efficiency loss under FDI, because A withdraws with positive probability in order to avoid taxation in B's country. This inefficiency is due to the fact that B cannot credibly commit himself not to expropriate A's returns by increasing taxation.

Supppose that one form of financing and running the project is more efficient than the other. Of course, it is always possible that the project cannot be realized at all because neither debt finance nor FDI is viable. The more interesting question is whether it may happen that the more efficient form of finance is not viable, while the less efficient form is. The following proposition shows that this is impossible if debt finance is more efficient.

Proposition 2 *Suppose debt finance is more efficient than FDI, and FDI is viable. Then debt finance is also viable.*

Proof: Debt is more efficient than FDI if and only if

$$R_B - I \ > \ R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - I \ . \tag{9}$$

Suppose that FDI is viable, i.e. (6) and (7) hold. We want to show that debt must also be viable, i.e. (1) and (2) hold. Note first that, since $T^e \geq 0$, (7) implies that

$$R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) \ \geq \ I \ . \tag{10}$$

Hence, (9) implies (2). Second,

$$\begin{aligned} \pi \ &> \ R_B - T^e \ \geq \ R_B - \left[R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - I \right] \\ &= \ R_B - \left[R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) \right] + I \ > \ I \ . \end{aligned} \tag{11}$$

The first inequality follows from (6), the second from (7), and the third from (9). But (11) implies (1). *Q.E.D.*

On the other hand, the next proposition shows that if FDI is the more efficient form to finance the investment it may happen that debt is viable but FDI is not. The reason is that even if FDI is very efficient (for example, because R_A is much higher than R_B) it may be the case that most of these returns will be taxed away by B, so that A cannot cover her investment costs. Or it may be the case that A's outside option is very good, in which case B get's too little taxes out of the project and is induced to nationalize it.

Proposition 3 *Suppose FDI is more efficient than debt finance, and debt finance is viable. Then there are cases where FDI is not viable, i.e. the project can only be realized if the less efficient debt finance is chosen.*

Proof: The proof is by example. Suppose that r is uniformly distributed on $[0, \overline{r}]$, $\underline{R}_A = 0$, and $\overline{r} > \frac{R_A}{2}$. Consider the subgame after B decided not to nationalize. It is a simple exercise to compute the optimal tax $T^* = \frac{R_A}{2}$, the expected tax $T^e = \frac{R_A^2}{4\overline{r}} = U_B$, A's expected payoff $U_A = \frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} - I$ and the joint surplus $W^{FDI} = \frac{3R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} - I$. FDI is more efficient than debt finance if and only if

$$\frac{3R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} - I \ > \ R_B - I \ . \tag{12}$$

Debt is viable if (1) and (2) hold. We want to show that there are parameter constellations such that either

$$R_B - \pi \ > \ \frac{R_A^2}{4\overline{r}} \tag{13}$$

which corresponds to a violation of (6), or

$$\frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \ < \ I \ , \tag{14}$$

i.e. (7) does not hold.

To see that (13) is possible set $\pi = I$ and

$$R_B \;=\; \frac{R_A^2}{4\overline{r}} + I + \epsilon \;, \tag{15}$$

where $\epsilon > 0$ is small. Then $\pi \geq I$ and $R_B \geq I$, so debt finance is viable. Furthermore, (13) holds, so FDI is not viable. Finally, (12) is satisfied, too, if

$$\frac{3R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \;>\; \frac{R_A^2}{4\overline{r}} + I + \epsilon \tag{16}$$

which is equivalent to

$$\frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \;>\; I + \epsilon \;, \tag{17}$$

which is the case if I is sufficiently small.

To show that (14) is possible set $\pi = R_B = I$. Thus (1) and (2) hold. (12) and (14) hold if and only if

$$\frac{3R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \;>\; I \;>\; \frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \tag{18}$$

Since $\frac{3R_A^2}{8\overline{r}} > \frac{R_A^2}{8\overline{r}}$, such values for I exist. *Q.E.D.*

Propositions 2 and 3 show that there is a tendency towards debt finance even if a multinational is more efficient in carrying out the project because the risks of expropriation may make foreign direct investment unsustainable. We are now going to show that even if FDI is viable and more efficient than debt finance there may be a tendency to choose debt.

Suppose that A has a strong bargaining position, for example because she has a monopoly on the technology required for the project which could also be carried out in some other less developed country and because the output of the project is designed for the world market. In particular A may decide which form of finance to use. The problem is that no side-payments from B to A are feasible before the investment is carried out because B is cash constrained. Therefore, A may prefer the less efficient form of finance if this allows her to capture a higher payoff. B cannot bribe A to choose the more efficient alternative because he has no cash. The following proposition shows that this problem cannot arise if debt finance is more efficient, but it may prevail under FDI.

Proposition 4 *Suppose that FDI and debt finance are both viable. If debt finance is more efficient, then A's maximimum payoff under debt finance exceeds her payoff under FDI. However, if FDI is more efficient, there are cases where A's maximum payoff under debt finance exceeds her payoff under FDI.*

<u>Proof:</u> A's maximum payoff under debt finance is

$$U_A^{max}(debt) = \min\{R_B, \pi\} - I \ , \tag{19}$$

while her payoff under FDI is given by

$$U_A(FDI) \ = \ R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - T^e - I \ . \tag{20}$$

Suppose debt finance is more efficient, i.e.,

$$R_B - I \ > \ R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - I \ , \tag{21}$$

and suppose that FDI is viable, i.e.,

$$R_B - \pi \ < \ T^e \ . \tag{22}$$

Then we have

$$\begin{aligned} U_A^{max}(debt) &= \min\{R_B, \pi\} - I \ > \ R_B - T^e - I \\ &> \ R_A \cdot F(R_A - T^*) + \int_{R_A - T^*}^{\overline{r}} (\underline{R}_A + r) dF(r) - T^e - I \ = \ U_A(FDI) \ , \end{aligned} \tag{23}$$

where the first inequality follows from (22) and the second from (21).

Suppose now that FDI is more efficient. Again we give an example to show that it may happen that $U_A^{max}(debt) > U_A(FDI)$. Consider the example given in the proof of Proposition 3. FDI is more efficient than debt finance iff

$$\frac{3R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} - I \ > \ R_B - I \ . \tag{24}$$

Consider parameters such that $\pi = R_B > I$ and $U_A(FDI) = \frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} - I > 0$. This makes sure that FDI and debt are both viable. We want to show that it is possible that

$$U_A(FDI) \ = \ \frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} - I \ < \ R_B - I \ = \ U_A^{max}(debt) \ . \tag{25}$$

Inequalities (24) and (25) can both be satisfied if

$$\frac{3R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \; > \; R_B \; > \; \frac{R_A^2}{8\overline{r}} + \frac{\overline{r}}{2} \tag{26}$$

Given that the RHS of this inequality is greater than I, it is not difficult to find parameter values for R_B, such that $R_B > I$ and (26) both hold. *Q.E.D.*

5 Empirical Implications

Our model predicts that, from a pure financing point of view, there is a tendency towards debt finance. Debt finance is more efficient because it avoids an inefficient withdrawal from the host country by footloose multinationals for tax reasons. It is also more likely to be viable and it allows to shift a larger share of total surplus to the foreign investor. Indeed, the World Bank reports that less developed countries have relied more on debt than on FDI as a source of external financing:

> "For 58 countries, debt stocks at the end of 1991 were more than five times as large as FDI stocks, measured as the accumulated net FDI inflows from 1960 or the earliest date for which data were available. In these countries, debt was 68 % of GDP, while FDI stock was only 13 %." (World Bank, 1993, p. 28)

FDI will be prefered to debt finance only if the returns that can be generated under the control of the multinational are sufficiently high as compared to the returns that could be achieved under the control of the host country. Furthermore, the better the outside option of the multinational, the higher is the expected payoff from FDI and the more likely it is that FDI generates sufficient returns to finance the investment.

The relative value of the investment project under different ownership regimes is affected by the type and destination of the goods to be produced. The more sophisticated the goods and the more advanced the production technologies the more difficult it is for the host country to run production itself and to match the efficiency of a multinational. Furthermore, while it is possible to transfer the technology required to produce less sophisticated and mature goods to a less developed country through a licensing agreement, this seems to be much more difficult if high tech products are concerned. This observation has been made in many empirical studies on FDI.[19]

Similarly, a multinational seems to be at an advantage if production is oriented towards export markets rather than towards the domestic market of the host country. Most multinationals have world wide marketing operations already in place, they benefit from an established brand name, and they face lower barriers to entry as compared to an LDC exporter who typically has no reputation for quality nor an international marketing network. On the other hand, the host country may be at an advantage if production is oriented towards the domestic market. A local producer may have superior information about local market conditions and he may face lower bureaucratic barriers to entry.

The destination of goods also has a strong impact on the multinationals outside option to withdraw from the host country. If production is for the domestic market withdrawal is not much of an option. It would be very difficult to shift production abroad and then reimport the goods to the host country without facing governmental interference (high import tariffs, etc.). In this case withdrawal can only be used to shift scarce managerial and technological resources to a more profitable use abroad. On the other hand, the threat of withdrawal may be very powerful if production is destined for export markets. An extreme case is a multinational (like a car manufacturer) who globally spreads the production of the components of his final products and who has several geographically diversified plants for each component.

Hence, Propositions 1 to 4 suggest the following empirical hypotheses:

- If production is low tech and oriented towards domestic markets ($R_A \leq R_B$, $E(r)$ small), the multinational does not have an efficiency advantage and

[19]For a detailed discussion of this point see Caves (1982, p. 200ff).

FDI is unlikely to be viable. Hence, we should expect debt finance.

- If production is high tech but still oriented towards domestic markets ($R_A > R_B$, $E(r)$ small), the multinational may have a significant efficiency advantage. However, his outside options are poor and FDI is exposed to the threat of excessive expropriation through taxation. Hence, FDI is unlikely to be viable. If the investment project does go ahead at all, it is more likely to be financed by debt and to be run by the host country itself.

- If production is low tech and destined for export markets ($R_A \gtreqless R_B$, $E(r)$ high), the multinational may have a significant efficiency advantage if marketing and a reputation for quality is very important. In this case there may be FDI which is also viable because of the multinational's strong outside option. If marketing is less important, debt finance is likely to be more efficient.

- If production is high tech and for export markets ($R_A \gg R_B$, $E(r)$ high), there is a strong case for FDI. The multinational is likely to be more efficient in running the investment himself, and he has good outside options. Hence, FDI is more likely to be observed in this case.

These hypotheses seem to be consistent with the empirical evidence available on FDI. Oman (1984, p. 47, 61), who surveys empirical studies on the financing of foreign investments, finds a clear tendency that FDI is much more important in export oriented and high technology industries in the manufacturing sector, while debt finance (and joint ventures, see also Section 7 below) tends to dominate in industries which are either low tech or oriented towards the domestic market. He also reports (p. 56, 59) that market orientation tends to weigh more heavily than the degree of technological sophistication. This observation suggests that the threat to withdraw from the host country in reaction to excessive taxation is indeed very important to make FDI viable.

Propositions 1 to 4 also suggest that the threat of expropriation through nationalization is less severe in high tech and export oriented industries. If the multinational has a strong efficiency advantage in running the project and if his marketing network is required to export the goods ($R_A \gg R_B$), then nationalization is not a very attractive option for the host country. This is confirmed by a cross country study on forced divestment in 76 countries from 1960 to 1976 by Kobrin (1980). He reports that five industries account for almost half of all forced divestments in manufacturing: food products, beverages, textile and apparel, leather and footwear, and basic metals.

> "The manufacturing industries most vulnerable to forced divestment differ from the remaining among two dimensions. First, and perhaps most importantly, they are all quite obviously industries in which technology is mature and R&D expenditures are relatively low or even unimportant. ... Second, ... none of these five industries are very tightly integrated internationally. ...
>
> The three manufacturing industries that tend to be least vulnerable to forced divestment have quite the opposite characteristics. Drugs, chemicals and plastics are all relatively research intensive and globally integrated. Thus, it would appear that manufacturing firms are more vulnerable to the extend that they are in industries in which technology is mature and thus *both* the perceived value of inputs to the host country and the perceived costs in terms of difficulties likely to be encountered in running the enterprise are lower. They also appear more vulnerable if the industries are not integrated globally and the local subsidiary is thus more valuable as an entity-in-itself." (Kobrin, 1980, p. 80f)

However, the choice between debt finance and FDI is not only affected by industry characteristics, but also by the characteristics of the host country.[20] The World Bank reports that the FDI/debt ratio tends to increase with national income as measured by GDP per capita.[21] This may simply reflect the fact that countries with a higher income per capita tend to have a better educated workforce and a more reliable infrastructure, which are important requirements for the production of high technology goods destined for export markets. However,

[20] Oman (1984, p. 48) claims that "industry specific factors tend to be outweighed by others, particularly those which are host country specific." Unfortunately, however, he does not offer any systematic evaluation of these additional factors.

[21] See World Bank (1993, p. 28).

our analysis suggests an additional explanation for this phenomenon. Countries with a higher income tend to suffer more from the punishments in case of debt repudiation or forced divestment, so the threat of outright expropriation is less severe. Hence, the scenario described in Proposition 3, where debt finance is viable while FDI is not viable even though it is the more efficient form of investment, is less likely to occur. Thus, one would expect to observe more FDI as compared to debt finance if the host country is less credit constrained.

6 Strategic versus Liquidity Default

The previous sections have shown that there is a clear tendency towards debt finance. In this section we consider a variant of the model in which returns are stochastic. Most of our previous results carry over if the realizations of these returns are observable by international capital markets. However, if these returns are not observable, the punishment in case of debt repudiation cannot distinguish between strategic default (the debtor country could repay the debt but is unwilling to do so) and liquidity default (the debtor would like to repay but is unable to do so because the return is too small and he is liquidity constrained). This yields an additional inefficiency in the case of debt finance which is the more severe the more risky the investment project.

To illustrate this problem consider the following modification of our basic model: The return generated by the investment if it is controlled by A (B) is stochastic and given by $\overline{R}_A$ ($\overline{R}_B$) with probability q and 0 with probability $1-q$. Assume that the expected returns are just the same as in the deterministic model, i.e.,

$$
\begin{aligned}
q\overline{R}_A &= R_A \ , \\
q\overline{R}_B &= R_B \ .
\end{aligned}
$$

Keeping expected returns constant, the investment project is more risky the smaller q (and the higher $\overline{R}_A$, $\overline{R}_B$ respectively).

The realization of the return stream is drawn by nature when production is carried out in the host country, i.e., after A decided on whether to withdraw from the host country, but before B has to decide whether to repay his debt. For simplicity we assume that if A decides to withdraw, her return in the host country is still deterministic and given by $\underline{R}_A$.

The analysis of foreign direct investment is basically unchanged. Nature determines the realization of the return after all relevant decisions have been taken. Since all parties are risk-neutral, only expected returns matter. The actual amount of taxes to be paid by A if her investment succeeded will be higher, but she cannot be forced to pay taxes if returns are 0. The expected tax rate is just the same as in the deterministic model.[22]

The analysis of debt finance depends on whether or not B's return from running the project is observable by international capital markets. The time structure of debt finance with stochastic returns is depicted in Figure 3, where we used the fact that the optimal credit offers $C = I$.

Suppose first that R_B is publicly observable. In this case B should be punished after strategic default but not after liquidity default. If the project failed, a liquidity default cannot be deterred anyway, so the deadweight loss π should be avoided. B will choose to default strategically if $D > \pi$, so his repayment is bounded above by π. Furthermore, he can repay only if the project was successful. Thus, A will finance the project by offering a credit to B only if

$$q\pi \;\geq\; I\ . \tag{27}$$

Comparing (27) to (1) in the deterministic case, it is more difficult to employ debt finance the more risky the project (the lower q).

Suppose now that R_B is private information of B. In this case international

[22]What happens if A knows the realization of the return stream before she decides on withdrawal? In this case A benefits from the riskiness of the project because she can shift production abroad if she expects returns in the host country to be low and stay if returns are expected to be high. This effect reinforces the main conclusion of this section that risky returns make FDI more attractive.

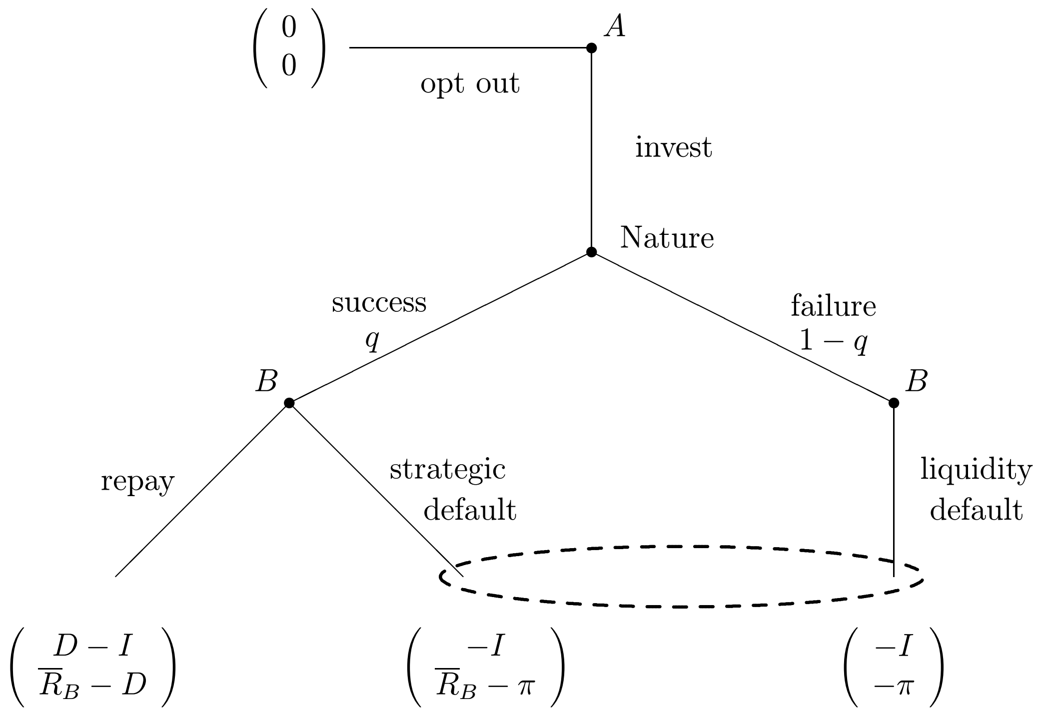

Figure 3: Debt Finance with Strategic and Liquidity Default

capital markets cannot distinguish strategic default from liquidity default and the same punishment has to be applied in both cases. Suppose that $D \leq \pi$ and $qD \geq C = I$ (otherwise A would not offer a credit to finance the investment). Then B's expected payoff from debt finance is given by

$$U_B \;=\; q\left[\overline{R}_B - D\right] - (1-q)\pi \;. \tag{28}$$

This expression has to be positive, otherwise B is not going to participate. This condition puts an upper bound on the level of D:

$$D \;\leq\; \overline{R}_B - \frac{1-q}{q}\pi \tag{29}$$

Hence, the maximum payoff A can obtain with debt finance is given by

$$U_A^{max}(debt) \;=\; \min\left\{\pi, \overline{R}_B - \frac{1-q}{q}\pi\right\} \tag{30}$$

which is decreasing with the riskiness of the project (increasing with q).

Finally, the project will only be undertaken if

$$W^{debt} \;=\; U_A + U_B \;=\; q\overline{R}_B - I - (1-q)\pi \;=\; R_B - I - (1-q)\pi \;\geq\; 0\;. \quad (31)$$

Comparing this with (2) in Section 3.1, the expected net surplus, $R_B - I$, has to be sufficient to cover the deadweight loss of the inefficient punishment in case of liquidity default. Hence, the riskier the project, the less profitable is debt finance. The analysis is summarized in the following proposition.

Proposition 5 *An increase in the riskiness of the investment project does not affect foreign direct investment but reduces the prospects of debt finance:*

(a) *A decrease in q, keeping the expected return $R_B = q\overline{R}_B$ constant, reduces $q\pi$ which is the maximum amount A is prepared to lend. Hence, an increase in the riskiness may render debt finance unviable.*

(b) *If international capital markets cannot distinguish strategic default from liquidity default, an inefficient punishment has to be incurred by B with probability $1-q$ which reduces A's maximum payoff and the total surplus from debt finance. An increase in riskiness increases the expected amount of this deadweight loss and may render debt finance unprofitable.*

Note that the inefficiencies of debt finance caused by the riskiness of the investment project arise even though both parties are risk neutral. They are due to B's liquidity constraint and the inability of international capital markets to distinguish strategic default from liquidity default. Typically the production of high technology goods destined for export markets is more risky than the production of mature goods or goods produced for the domestic market. Hence, the effect described in this section confirms our empirical hypothesis that FDI has a comparative advantage in the former industries.

7 Joint Ventures

If a multinational enterprise engages in foreign direct investment in a less developed or eastern European country, it is often observed that this is done by forming a joint venture with a local firm, often a state-owned company of the host country. Sometimes the multinational is forced to give away some share of the project without adequate compensation in which case this arrangement is nothing but a disguised form of expropriation. In the model of Section 3, expropriating a share of the return stream by forcing the multinational into a joint venture is equivalent to imposing a tax.

However, there are circumstances where a joint venture can be efficiency improving and where the multinational voluntarily agrees to it. In order to show this we have to consider a variant of our basic model of foreign direct investment.

The basic version of the model focused on the case of footloose multinationals: If taxation in the host country becomes too high, the MNE has the option to (partially) withdraw and to shift production to other plants abroad. This threat is credible if the MNE has several production facilities which are geographically diversified, and if production is primarily for export markets, not for the domestic market of the host country. If this is not the case the MNE cannot rely on the threat of withdrawal to secure at least some of the quasi-rents of the project.

There is, however, a complementary mechanism which restricts taxation of the host country and which works even if there is no possibility to shift production abroad. Suppose that during the production stage, i.e. after the initial investment has been made, the owner of the project has to engage in additional actions which affect the profitability of the project. For example, the owner may have to decide on the level of complementary investments in training for local workers and managers, in upgrading the existing technology, in infrastructure, or in marketing of the goods to be produced.

The host country has the option to expropriate the entire return stream through expropriation. However, high taxes reduce the incentives of the multinational to further invest into the project and thus reduce the expected value of the return stream. Therefore, the host country will limit its taxes and leave a rent to the multinational in order to induce a higher investment in the second stage. We will show that if the multinational and the host country engage in a joint venture then this further reduces HC's incentives to tax, which in turn leads to an efficiency improvement.

To be more precise, consider the subgame after the initial investment has been made and after B did not nationalize the project. B may now decide on the tax to be imposed on the project. Thereafter A has to decide on the level of further investments or effort to put in. The return of the project is stochastic and may be either $\overline{R}_A$ or 0. A's effort affects the probability of success. Without loss of generality we assume that A chooses the probability of success, $q \in [0, 1]$, directly at cost $K(q)$. $K(q)$ is increasing and strictly convex with $K'(0) = 0$ and $\lim_{q \to 1} K(q) = \infty$. The last assumption implies that for q sufficiently close to 1, $K'''(q) > 0$. In order to guarantee a unique solution of the following maximization problems we assume that $K'''(q) > 0$ for all $q \in (0, 1)$.

Suppose now that A and B engage in a joint venture after the initial investment has been sunk. B receives some share $1 - \alpha$ of the project's net profits. A gets the remainder of profits and is left with the control rights on the project, so she can choose the level of investment at her discretion. Note that we assume that B does not only share the revenues but also the costs from the subsequent investment. A significant part of these costs will be in local currency, for example the costs for complementary investments in infrastructure or the costs for training local workers. Thus, B could share these costs even if he has no access to international capital markets and hard currency. In a first step we take α to be exogenously given. The time structure of this game is summarized in Figure 4.

Consider A's decision on how much to invest in the second stage of the

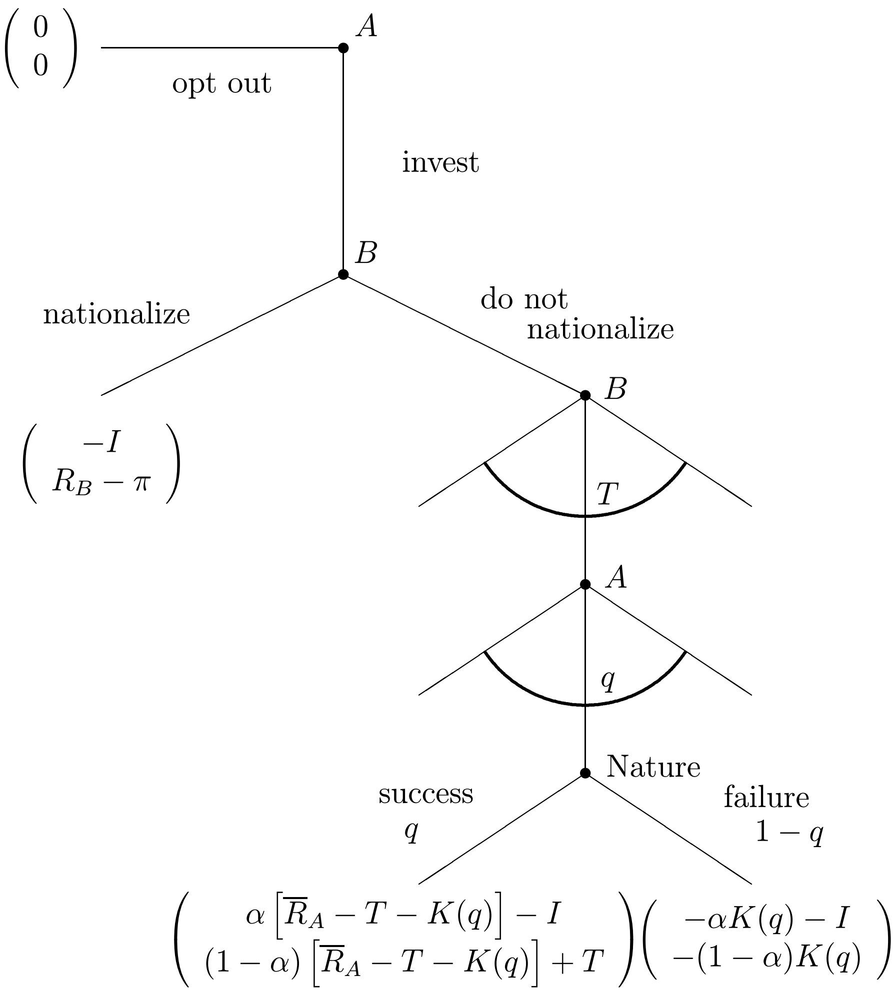

Figure 4: FDI with Joint Venture

project. A maximizes

$$U_A \;=\; q\alpha\left[\overline{R}_A - T - K(q)\right] - (1-q)\alpha K(q) - I \; . \tag{32}$$

Given the assumptions on $K(q)$ the optimal level of q is uniquely characterized by the following first order condition:

$$K'(q^*) \;=\; \overline{R}_A - T \; . \tag{33}$$

Note that $q^*(T)$ is a continuous and strictly decreasing function of T for all $T \in (0, \overline{R}_A)$. Note further, that it does not dependent directly on α, A's share of net profits.

When B decides on the level of taxes to be imposed on the project, he takes the effect of T on q^* and thus on his own share of net profits into account. B maximizes

$$U_B \;=\; q^*(T)\left[(1-\alpha)\left[\overline{R}_A - T - K(q^*(T))\right] + T\right] - (1-q^*(T))(1-\alpha)K(q^*(T)) \;. \tag{34}$$

Lemma 1 *For any $\alpha \in (0,1)$, B's maximization problem has a unique interior solution $T^*(\alpha) \in (0, \overline{R}_A)$.*

<u>Proof:</u> We first show that B's payoff function is strictly concave in T. By the implicit function theorem, $\frac{dq^*(T)}{dT} = -\frac{1}{K''(q^*)} < 0$. Differentiating U_B with respect to T we get

$$\begin{aligned} \frac{dU_B}{dT} &= \frac{dq^*(T)}{dT}\left[(1-\alpha)\underbrace{\left[\overline{R}_A - T - K'(q^*(T))\right]}_{=0 \text{ by env. theorem}} + T\right] + \alpha q^*(T) \\ &= -\frac{T}{K''(q^*(T))} + \alpha q^*(T) \end{aligned} \tag{35}$$

and

$$\begin{aligned} \frac{d^2U_B}{dT^2} &= -\frac{K''(q^*(T)) - TK'''(q^*(T))\frac{dq^*(T)}{dT}}{\left[K''(q^*(T))\right]^2} + \alpha\frac{dq^*(T)}{dT} \\ &= \underbrace{-\frac{1}{K''(q^*(T))}}_{<0} + \underbrace{\frac{TK'''(q^*(T))\frac{dq^*(T)}{dT}}{\left[K''(q^*(T))\right]^2}}_{\leq 0} + \underbrace{\alpha\frac{dq^*(T)}{dT}}_{<0} \;<\; 0 \;. \end{aligned} \tag{36}$$

The second term is nonpositive because $K'''(q) \geq 0$. Hence, the optimal $T^*(\alpha)$ must be unique. Furthermore, it is never optimal to choose $T \geq \overline{R}_A$, because this would imply $q^*(T) = 0$ and $U_B = 0$, while a strictly positive payoff can be obtained by choosing $T < \overline{R}_A$. Finally, it cannot be optimal to choose $T = 0$. To see this note that at $T = 0$ $q^*(T) > 0$. Therefore

$$\left.\frac{dU_B}{dT}\right|_{T=0} \;=\; -\frac{T}{K''(q^*(T))} + \alpha q^*(T) \;=\; \alpha q^*(0) \;>\; 0 \;. \tag{37}$$

Hence, if $\alpha > 0$, a strictly higher payoff can be obtained by choosing $T > 0$. *Q.E.D.*

Since $T^*(\alpha) \in (0, \overline{R}_A)$ it must satisfy the following first order condition:

$$\frac{dq^*(T)}{dT} T + \alpha q^*(T) \;=\; 0 \; . \tag{38}$$

Using the implicit function theorem again, it is straightforward to show that

$$\frac{dT^*}{d\alpha} \;=\; -\frac{q^*(T)}{-\frac{K'''T}{[K''(q^*(T))]^3} + (1+\alpha)\frac{dq^*(T)}{dT}} \;>\; 0 \; . \tag{39}$$

The denominator is negative, so $T^*(\alpha)$ is strictly increasing with α. This result is very intuitive. The lower α, the higher is the share of profits that goes directly to B. Hence, B will restrict the amount of taxes to be imposed on the project in order to increase the expected profits earned in the joint venture. Note that even if $\alpha = 1$ (A gets all of the net profits) B will choose $T^*(1) < \overline{R}_A$, i.e., he will leave some rent to A in order to induce a positive q.

The following proposition summarizes the effect of α on total surplus and on the payoffs of both players:

Proposition 6 *A decrease of A's share, α, of net profits reduces the optimal tax rate $T^*(\alpha)$ and increases the efficiency of the project. B's payoff is strictly increasing as α decreases. The effect of a reduction of α on A's payoff is ambiguous. For large values of α, A may benefit from giving up some share of the project to B.*

Proof: We have shown already that $\frac{dT^*(\alpha)}{d\alpha} > 0$. Differentiating U_B and U_A with respect to α we get:

$$\begin{aligned}
\frac{dU_B}{d\alpha} &= \frac{dq^*}{dT}\frac{dT^*}{d\alpha}\left[(1-\alpha)\underbrace{\left[\overline{R}_A - T^* - K'(q^*)\right]}_{=0 \text{ by env. theorem}} + T^*\right] \\
&\quad + q^*\left[-\overline{R}_A + T^* + \alpha\frac{dT^*}{d\alpha}\right] + K(q^*) \\
&= K(q^*) - q^*\left[\overline{R}_A - T\right] + \frac{dT^*}{d\alpha}\underbrace{\left[\alpha q^* + \frac{dq^*}{dT}T^*\right]}_{=0 \text{ by env. theorem}} \\
&= K(q^*) - q^*\left[\overline{R}_A - T^*\right] \;<\; 0 \; .
\end{aligned} \tag{40}$$

The last inequality follows from the fact that $q^* \left[\overline{R}_A - T^*\right] - K(q^*)$ is the net profit of the project which must be positive at the optimum. Otherwise A should have choosen $q = 0$.

$$\begin{aligned}
\frac{dU_A}{d\alpha} &= \frac{dq^*}{dT}\frac{dT^*}{d\alpha}\left[\alpha \underbrace{\left[\overline{R}_A - T^* - K'(q^*)\right]}_{=0 \text{ by env. theorem}}\right] + q^*\left[\overline{R}_A - T^* - \alpha\frac{dT^*}{d\alpha}\right] - K(q^*) \\
&= \underbrace{q^*\left[\overline{R}_A - T^*\right] - K(q^*)}_{>0} - \underbrace{\alpha q^*\frac{dT^*}{d\alpha}}_{>0} \ . \qquad (41)
\end{aligned}$$

Thus, the impact of α on A's payoff may be ambiguous. A marginal increase of α increases A's share of the total net payoff, $q^* \left[\overline{R}_A - T^*\right] - K(q^*)$. On the other hand, a marginal increase of α induces B to increase total taxes by $\frac{dT^*}{d\alpha}$, of which A has to pay her share α. The increase in taxation is relevant only if the project was successful (which happens with probability q^*). If α is close enough to 0, the second effect vanishes and A always prefers to increase α. However, if α is sufficiently large, the second effect may dominate. The effect of a change of α on total surplus is given by

$$\frac{d(U_A + U_B)}{d\alpha} = -\alpha q^* \frac{dT^*}{d\alpha} < 0 \ . \qquad (42)$$

Q.E.D.

Proposition 6 indicates two rationales for joint ventures. First, A may benefit directly from giving some share of net profits to B. This induces B to impose lower taxes on the project which increases overall efficiency and may increase A's payoff directly.

However, there is a second rationale for joint ventures. Foreign direct investment is viable only if there is no temptation for B to nationalize the project. That is, B's payoff from nationalization must not exceed his payoff from leaving A in control of the project and taxing it:

$$R_B - \pi \le q^*\left[(1-\alpha)\left[\overline{R}_A - T^* - K(q^*)\right] + T^*\right] - (1-q^*)(1-\alpha)K(q^*) \ . \qquad (43)$$

Giving B a share in the project increases the right hand side of this inequality and makes it less likely that B will nationalize the project. But, of course, the project has to be sufficiently profitable that A can still recover his initial investment costs I.

The empirical evidence suggests that the risk of forced divestment is indeed much lower if the multinational engages in a joint venture with a local partner in the host country.[23] Furthermore, Caves (1982) and Reuber (1973, pp. 82-7) report that export-oriented investment projects are more likely to be wholly owned by a multinational than domestic market-oriented firms which are frequently run as joint ventures with local partners. This observation is consistent with our model which suggests that if production is destined for the domestic market the risk of nationalization is particularly high and hence B should be given shares in the firm as a safeguard against forced divestment. Furthermore, the threat of withdrawal from the host country is not sufficient to deter the host country from excessive taxation. Thus, a joint venture may be used to mitigate the problem of creeping expropriation through taxation.

8 Conclusions

The paper has shown that the sovereign risks associated with debt finance are generally less severe than the ones which come with FDI. If the return streams that can be generated under the control of the host country and the foreign direct investor are the same and not too risky, then debt finance tends to be more efficient, it is more likely to be viable, and it allows to give a larger share of the surplus to the foreign investor. However, FDI will be the preferred mode of capital transfer if the foreign investor is more efficient in running the project, if the project is risky, and if the foreign investor has a good outside option which deters creeping expropriation. Furthermore, we have shown that the host country and the foreign investor may benefit from forming a joint venture.

[23] See Kobrin (1980, p. 82).

There are several theoretical questions raised in this paper which deserve further attention. In particular, we used a rather crude static model of foreign direct investment. In a companion paper (Schnitzer, 1995) we set up a dynamic model of FDI which gives room for implicit contracts between the host country and the foreign investor. This paper confirms several of the results obtained in the static framework and offers many new insights. In particular, it gives much richer picture on how cooperation may be sustained, it shows that sovereign risk may induce over- as well as underinvestment, and it offers a framework to discuss frequently observed phenomena such as tax holidays for FDI.

The theory developed in both of these papers seems to be consistent with the empirical evidence which is available so far. However, it would be very desirable to have less aggregated data on FDI, in particular on the types of goods produced, on the market orientation of these goods, on the outside options of the foreign investors, but also on host country characteristics (such as indebtedness, creditworthiness and expropriation record) and on the types of contracts employed (joint ventures, and other new forms of international investments). This is why in a current project with Dalia Marin we intend to collect such a data set on the foreign direct investment behaviour of German and Austrian firms. We are particularly interested in their foreign direct investments in Eastern Europe for which hardly any recent data exist. On the basis of this data we hope to be able to put the hypothesis developed in this paper to a rigorous econometric test in the near future.

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