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ABSTRACT

Conventional wisdom holds that lack of government commitment deters foreign investment in developing countries. Yet this explanation is not convincing because some econometric studies have found little support for the role of political risk and host governments can offer upfront subsidies that compensate foreign investors for their sunk cost. This paper shows that a second commitment problem upsets the argument. A multinational firm cannot credibly commit to invest in only one country. Since countries differ in production costs and government credibility, this paper explains the pattern of investment in a politically risky world.

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1. Introduction

The opening up of Eastern Europe has created new opportunities for multinational firms to take advantage of low production costs, yet being close to major markets. Despite this fact, overall foreign direct investment flows to Eastern European countries have been rather small and concentrated in certain countries.[1] The fact that foreign direct investment (FDI) is concentrated in a few countries is true also worldwide. The industrialized countries and a few fast-growing Southeast Asian countries account for a disproportionate share in the large volume of foreign direct investment.[2] At the same time many industrialized countries, in particular West European countries, fear that high domestic production costs contribute to the declining competitiveness of their economies. Though some firms respond to high cost by moving production abroad, often only a threat occurs.[3]

The above observations are puzzling in so far as one would expect multinational firms to take advantage of low production costs in developing countries or economies in transition. Lucas (1990) argues that one possible reason for the lack of FDI in some countries, and the fact that firms continue to produce in high-cost countries, is that industrialized countries are considered to be politically stable while investments in many low-cost countries are exposed to large political risk.[4] Although in recent years foreign multinationals have not been nationalized on a large scale, host country policies may still deter firms from engaging in FDI. A government can extract revenues from foreign firms by imposing high taxes and tariffs. Examples for this, often referred to as 'creeping expropriation', are abundant.[5]

One may object that lack of commitment should not be a binding constraint for two reasons. First, a host government can offer short-run fiscal incentives at the time of or shortly after the investment (like upfront subsidies or tax holidays). These fiscal incentives lower the cost of the initial sunk investment and can be effective even if the host government cannot commit to a long-run policy. Second, if a host government and foreign investors interact repeatedly, reputational concerns or the inability to attract future investment may prevent the host government from excessive taxation.

In this paper I take the first objection seriously, but I ignore the second one because many governments in transition economies have been turned over frequently, and hence a (infinitely) repeated game may not adequately represent the situation in these countries. More specifically, the contribution of the paper is to argue that upfront subsidies are not sufficient to fully overcome lack of commitment. Yet, at the same time the absence of upfront subsidies does not always lead to complete underinvestment. Both results are derived in a framework that differs from the previous literature - which I will discuss in more detail

below - in two important respects (besides the short-term horizon of governments). First, I consider the possibility that the firm invests in more than one country simultaneously. Multi-plant operations in various countries is an empirically relevant feature of multinational firms (see, for example, Horstmann and Markusen (1992), United Nations (1996) and Brainard (1997)). The second feature is that countries differ not only in terms of production costs, but governments differ also in the degree of commitment power.

A multinational firm faces a trade off between investing in a low-cost and low-credibility country on the one hand, and a high-cost and high-credibility country on the other hand. A particular objective of this paper therefore is to identify conditions in terms of differences in costs and credibility under which a low-cost country attracts very little investment or no investment at all despite offering upfront subsidies. Since I consider only a one-shot game, future gains from trade do not prevent a host government from excessive taxation when it is unable to commit. Yet the presence of a high-cost and high-credibility country matters for the interaction between a multinational firm (MNF) and a low-cost and low-credibility country because the multinational firm cannot credibly commit to invest only in one country.

This second commitment problem interacts with the government's inability to commit to a particular long run tax policy. Holding additional capacity in a high-cost country, or the threat to do so, is a rational response by the MNF even if the total unit cost in the high-cost country exceed the final goods price. Excess capacity in a high-cost country is held for strategic purposes and prevents excessive taxation by the low-cost country. The government with low credibility abstains from high taxation because it favors a low tax rate and a high tax base over a high tax rate and a low tax base. The option to hold excess capacity therefore facilitates the flow of direct investment to politically risky countries even when no upfront subsidies are paid. This logic applies when the output is sold mostly in the world market and not in the low-credibility country because otherwise the government could also restrict imports through prohibitive tariffs.

Yet, the downside of the firm's option to hold excess capacity is that upfront subsidies are much less effective. Since subsidies can be made conditional only on the capacity set up in the own country, but not on capacity in other countries or on output, there is no guarantee that the firm will utilize its capacity. Hence, the government does not offer subsidies as high as it would in the absence of an outside option (investment in a high-cost country). In particular, the typical first-best contract, under which the firm is reimbursed for investing the efficient amount in the low-cost country, is not an equilibrium in a game where the firm has the option to invest also elsewhere. For certain parameter values, the firm may choose to invest only in the low-cost location and gets a subsidy, but capacity is less than market

size.

The paper is related and differs from previous theoretical and empirical studies in a variety of ways. The importance of holding excess capacity is also stressed in Janeba (2000). There, I analyze a situation in which two countries are symmetric, both in terms of costs and their lack of commitment. A multinational firm can set up capacity in either of the two or in both countries. Governments simultaneously choose tax rates after capacities are set, but before output is determined. Unlike the present paper, the firm will never enter only one country, but it can overcome the lack of commitment in the two countries by inducing tax competition for capacity utilization if excess capacity is held. This provides a novel rationale for becoming a multinational firm. In contrast to the literature on interjurisdictional competition that paper shows also that tax competition can have positive effects. Due to the symmetry assumption, the study does not address the issue why low-cost countries have difficulties attracting investment. There are no upfront subsidies considered and hence their effectiveness cannot be evaluated. By contrast, the role of asymmetries in costs and credibility as well as the role of upfront subsidies are the focus of this paper.

Schnitzer (1999) also considers the role of production in another country as a disciplinary mechanism on host country taxation. Unlike the present paper, this outside option is exogenous. Her focus is on comparing different forms of financing foreign activities in the presence of sovereign risk. She shows that the multinational firm may choose debt financing in connection with licensing even when foreign direct investment is more efficient.

In Doyle and van Wijnbergen (1994) lack of commitment is overcome by repeated interaction. They consider a sequential bargaining game over tax rates between a host government and a multinational firm. The firm can threaten to close down its plant and move to another country. This outside option generates an equilibrium tax path which is characterized by increasing tax rates over time. Since in equilibrium the present value of tax concessions equals the sunk cost, entry of the firm always occurs. Thomas and Worrall (1994) extend the work by Doyle and van Wijnbergen by endogenizing the size of foreign direct investment (beyond the all or nothing assumption in Doyle and van Wijnbergen). They, too, consider an infinitely repeated version of the bilateral bargaining game between a host government and a multinational company. Although the host government has a short-term incentive to expropriate the firm, the government may abstain from expropriation because future gains from trade (more investment) promise higher revenues. Thomas and Worrall show that the steady state investment level is efficient when the players do not discount future gains too much.

Hansson and Stuart (1989) explain why governments simultaneously tax old capital and subsidize new investment. They show that in an infinite horizon economy such a policy implements the second-best optimum even though governments are in power for only one period. In order to avoid the lack of commitment problem, however, they impose an exogenous upper limit on the difference between the tax rates on old and new capital.

The present model has interesting welfare implications that differ from previous studies. It is well known that without repeated interaction lack of commitment may cause substantial welfare losses because of underinvestment (see, for example, Persson and Tabellini, 1990). In the present model, welfare under no commitment is also lower than under commitment. Yet the source of the welfare loss is very different. The lack of commitment may induce the firm to serve the entire market from its plant in the high cost and high credibility country. In this situation, there is no underinvestment as such, but the welfare loss is due to the fact that the MNF produces and invests in the less cost efficient location. A welfare loss arises also when the firm invests the efficient amount in the low-cost country, but also holds excess capacity in the high-cost country for strategic purposes. Finally, when subsidies are offered, the firm may invest only in the low-cost country. Yet the investment is inefficiently small.

The results of this study shed light on those econometric studies that have found little or no support for political risk as a determinant of foreign investment. This is particular true for footloose industries like electronics. Wheeler and Mody (1992) analyze the determinants of U.S. investment in manufacturing and electronics industries in 42 developing and industrialized countries. Political risk has a negative influence and is not significant in the case of investment in electronics. Raff and Srinivasan (1997) examine the determinants of tax incentives granted to U.S. multinational firms in manufacturing, drugs and pharmaceuticals, and electronic components industries. Political risk is important and significant in the case of the drugs and pharmaceutical industry which is very often an import-substituting industry (affiliates sell more than 80 percent of their output in the host country market). Again, country risk has a small negative and insignificant influence in the electronic components industry. More recently, Mody and Srinivasan (1998) find country risk to be important, in particular for Japanese firms investing abroad, but less so for U.S. firms.

The evidence on taxation as a location factor is less clear cut. While Wheeler and Mody (1992) find that the influence of corporate taxation is small and not significant, Hines (1996, and in a review article 1999) argues that taxation influences the location of FDI significantly. Hines (1996) shows that foreign investors in the U.S. are responsive to U.S. state differentials by comparing the pattern of investment from home states who operate a foreign tax credit system and those who exempt foreign source income. A one percent state tax differential

is associated with a difference of 9-11 percent in shares of manufacturing capital owned by investors from foreign tax credit countries and investors with exemption systems.

To the extent that studies find little or no influence of taxation, or no difference among states that have the same treatment of foreign source income, this could be explained by either the nature of the aggregate data on tax rates (typically corporate tax revenues over GDP) or the endogeneity of the tax rates themselves. In this paper I show that if a politically risky country attracts foreign investment, then in equilibrium its tax rate is the same as the one of a politically stable country. In other words, it may be difficult empirically to find a significant effect for the tax variable because taxes adjust endogenously. In any case, the firm produces in the politically risky country which has the lower cost. This is consistent with the empirical studies cited above which found cost differences to be significant and important.[6]

The rest of the paper is organized as follows. In the next section I introduce the basic model. The benchmark case in which the government can commit to its tax policy is presented in section 3. Section 4 contains the analysis of the no commitment case and discusses the role of excess capacity as entry strategy when no upfront subsidies are paid. Upfront subsidies are allowed for in section 5. The welfare implications are discussed in section 6. In section 7 I consider various extensions and discuss a variety of assumptions of the basic model. Concluding remarks follow in section 8.

2. The Model

A world economy consists of two countries. Country 1 is the home of a large number of firms, most of which are immobile. A few firms are mobile and may produce in the second country, country 2, which has very few or no domestic firms. Country 1 (2) is referred to as the large (small) country. It is also possible to think of the large country as an industrialized country whereas the small country may represent a developing country or an economy in transition. The difference between the two countries determines how and when each government sets its tax policy in order to compete for the mobile firms. This will be discussed in more detail below.

Consider now the decision problem of a typical mobile firm. The firm maximizes profits by selling a homogeneous good. World demand is one unit and the consumers' reservation price equals one.[7] The good is produced in either of the two or in both countries. Before production can take place the firm has to set up capacity $\bar{q}_i$ in country i. Output from country $i's$ plant is denoted $q_i \leq \bar{q}_i$. Investment in capacity is costly whereas production itself is assumed to be costless. Per unit capacity costs in country i are constant and denoted

c_i. I allow for the possibility that country 2 is the more efficient location in the sense that capacity costs in country 2 are not more than in country 1, i.e.,

$$0 < c_2 \leq c_1 \leq 1.$$

The last inequality reflects the assumption that investment cost in either country are not higher than the consumers' reservation price.[8]

Each government imposes a proportional tax t_i on the output produced in its country q_i. Country 1 taxes all firms uniformly and does not provide specific tax incentives for mobile firms. I assume that the tax rate of government 1 is determined by considerations concerning the large number of immobile firms. The tax rate is therefore exogenously given in the following and set at $0 < t_1 < 1$. The assumption that the tax rate is exogenous can be relaxed as long as government 1 is able to commit. I will discuss this issue and other assumptions in section 7. The government of country 2, by contrast, offers a firm-specific tax rate t_2.

The firm maximizes profits net of taxes. The firm chooses a price of one in order to extract total consumer surplus. The profit function can be written

$$\pi = (1 - t_1)q_1 + (1 - t_2)q_2 - c_1\bar{q}_1 - c_2\bar{q}_2, \tag{1}$$

where $q_1 + q_2 \leq 1$ represents the firm's total output. This constraint must hold because world demand is one.

Government 2 is assumed to maximize its tax revenues which are given by

$$R_2 = t_2 q_2. \tag{2}$$

Government 1 is passive and obtains revenues equal to $R_1 = t_1 q_1$.

In the following the role of commitment for the amount of investment in country 2 is analyzed. As a benchmark case, I consider a game in which government 2 can commit to a tax rate before the firm takes any action. The sequencing is therefore (1) government 2 chooses t_2, (2) the firm chooses capacities $\bar{q}_1, \bar{q}_2$, and (3) the firm chooses outputs q_1, q_2. Then I consider a game in which government 2 cannot commit to its tax policy before the firm has made its capacity decision. The sequencing of events is as follows: (1) The firm chooses capacities $\bar{q}_1$ and $\bar{q}_2$, then (2) government 2 chooses its tax rate t_2, and finally (3)

the firm chooses outputs q_1 and q_2. Both the government and the firm are forward looking. I therefore solve for the subgame-perfect equilibrium of each game which is characterized in terms of the three exogenous variables (t_1, c_1, c_2). The role of upfront subsidies is considered in section 5.

It might be useful to point out here again the difference to Janeba (2000). In that paper I consider a situation in which the two countries have the same lack of commitment and the cost of capacity are always the same (i.e., $c_1 = c_2$). Hence the tax rates of both countries are fully endogenous and set simultaneously after capacities are chosen. The paper does not consider upfront subsidies.

3. The benchmark case: No lack of commitment

When government 2 has commitment power, there is no reason for the firm to hold excess capacity ($\bar{q}_1 + \bar{q}_2 \leq 1$), and thus output will always equal capacity. To see this, consider the last stage of the game.The firm charges a price of one in order to extract all consumer surplus. At the final stage capacity costs are sunk and tax rates are given. The firm maximizes

$$\pi(q_1, q_2) = (1 - t_1)q_1 + (1 - t_2)q_2 \tag{3}$$

over q_1 and q_2 subject to $0 \leq q_i \leq \bar{q}_i \leq 1, i = 1, 2$, and $q_1 + q_2 \leq 1$.[9] As tie-breaking rules, I assume that the firm produces in country 2 when tax rates are the same, and satisfies demand when it is indifferent between all output levels. The firm wishes to produce in the country with the lower tax rate. Capacity constraints may result in production in the high tax country. More formally, when $\bar{q}_i \leq 1, i = 1, 2$, the solution to maximizing (3) is

$$(q_1^*, q_2^*) = \begin{cases} (min\{1 - \bar{q}_2, \bar{q}_1\}, \bar{q}_2) & \text{if} \quad t_2 \leq t_1 < 1 \\ (\bar{q}_1, min\{1 - \bar{q}_1, \bar{q}_2\}) & \text{if} \quad t_1 < t_2 \leq 1 \\ (\bar{q}_1, 0) & \text{if} \quad 1 < t_2 \end{cases} \tag{4}$$

The firm always utilizes capacity in the country with the lower tax. The capacity in the high tax country may or may not be fully utilized. Output in the high tax country is equal to the minimum of residual demand and capacity in the high tax country. Capacity in the high tax country is underutilized if residual demand is the smaller of the two. This is the situation of excess capacity (since $1 - \bar{q}_i < \bar{q}_j$ implies $\bar{q}_i + \bar{q}_j > 1$).

The optimal output decision rule (4) is now used to solve for optimal capacities. Note first that the firm never installs capacity in country 2 when $t_2 > 1$. When tax rates are below one, and assuming w.l.o.g. $t_2 \leq t_1$, the firm's profit is $(1-t_1)\cdot min\{1-\bar{q}_2, \bar{q}_1\} - c_1\bar{q}_1 + (1-t_2-c_2)\bar{q}_2$. There is no reason to hold excess capacity because profit is decreasing in $\bar{q}_1$ when $1-\bar{q}_2 < \bar{q}_1$. Thus the firm invests and produces in the country with the lower total costs, as given by c_i+t_i, provided these are less than one. The optimal capacity and output choices in countries i, j (indexed by o), are

$$\bar{q}_i^o = q_i^o = 1 \quad \text{and} \quad \bar{q}_j^o = q_j^o = 0 \quad \text{if} \quad c_i + t_i \leq \min\{c_j + t_j, 1\}. \tag{5}$$

Recall that the firm produces in only one country when the firm is indifferent between locations.

In the first stage government 2 chooses its tax rate in order to maximize tax revenues subject to the firm's optimal behavior given in (5). The tax rate is set just low enough in order to attract investment because otherwise revenues are zero. The optimal tax rate is

$$t_2^o = \begin{cases} c_1 + t_1 - c_2 & \text{if} \quad t_1 + c_1 \leq 1 \\ 1 - c_2 & \text{if} \quad t_1 + c_1 > 1. \end{cases} \tag{6}$$

The two branches in (6) reflect whether production in country 1 is profitable or not. When the inequality in the first branch of (6) holds, the firm could serve the market from country 1. Therefore t_2 is chosen such that the firm is just willing to produce in country 2. In the second case investment and production in country 1 are not profitable and hence t_2 is set in order to extract the total rent.

Using (5) and (6), the firm's equilibrium profit is then found to be

$$\pi^o = \begin{cases} 1 - c_1 - t_1 & \text{if} \quad t_1 + c_1 \leq 1 \\ 0 & \text{if} \quad t_1 + c_1 > 1 \end{cases} \tag{7}$$

Government 2's tax revenues can be derived similarly

$$R_2^o = \begin{cases} c_1 + t_1 - c_2 & \text{if} \quad t_1 + c_1 \leq 1 \\ 1 - c_2 & \text{if} \quad t_1 + c_1 > 1 \end{cases} \tag{8}$$

Government 1 does not obtain any revenues since the firm never produces in country 1. The pattern of investment (5) would be realized also in the absence of any taxation. This indicates that the equilibrium is first-best optimal since transfers between the firm and the governments leave world welfare unaffected. Define world welfare as $W = \pi + R_1 + R_2 + CS$ where CS is consumer surplus. Since R_1 and CS are zero, world welfare in the benchmark case is

$$W^o = 1 - c_2. \tag{9}$$

The above findings are summarized in

Proposition 1 *When government 2 can commit to its tax rate before the firm chooses capacities, the investment decision is first-best efficient. The firm invests one unit in country 2 and world welfare equals* $1 - c_2$.

4. Lack of commitment: No upfront subsidies

In the rest of the paper it is assumed that government 2 cannot commit to a particular tax rate before the firm enters country 2. The government sets its tax rate before the firm chooses output however. The lack of commitment potentially deters investment since a high tax rate may be imposed once the firm has set up its capacity in country 2. This disadvantage is may be compensated by the cost advantage. Hence there is a trade-off between commitment and the cost of capacity. In this section I show that the firm may produce in country 2 even if no upfront subsidies are paid.

The second stage: The trade-off between tax rate and tax base

The optimal output decision rule (4) can be used to analyze the second stage of the game in which the government of country 2 chooses its tax rate. Inserting (4) into (2) gives

$$R_2 = t_2 q_2^* = \begin{cases} t_2 \bar{q}_2 & \text{if} \quad t_2 \leq t_1 < 1 \\ t_2 \cdot min\{1 - \bar{q}_1, \bar{q}_2\} & \text{if} \quad t_1 < t_2 \leq 1 \\ 0 & \text{if} \quad 1 < t_2. \end{cases} \tag{10}$$

Provided that $\bar{q}_2 > 0$, in each of the first two branches in (10) revenue is continuous and monotonically increasing in t_2. The revenue function, however, is not necessarily continuous at $t_2 = t_1$ and $t_2 = 1$. This implies that government 2 chooses either a tax rate equal to t_1 or one.[10] Assuming that the lower tax rate is chosen when the government is indifferent, revenue maximization requires

$$t_2^* = \begin{cases} t_1 & \text{if} \quad t_1\bar{q}_2 \geq min\{1-\bar{q}_1, \bar{q}_2\} \\ 1 & \text{if} \quad t_1\bar{q}_2 < min\{1-\bar{q}_1, \bar{q}_2\}. \end{cases} \tag{11}$$

The inequality in (11) describes the trade-off between the tax rate and the tax base. The left hand side of the inequality represents the revenue when the government chooses $t_2 = t_1$, which is the maximum tax rate in the first branch of (10). The right hand side, on the other hand, represents the revenue under the maximum tax rate in the second branch. Since the maximum tax rate is one, tax revenues are equal to output produced in country 2 which is given by (4).

Equation (11) is at the heart of the analysis. It shows that the government may choose a low tax rate in order to attract a large tax base. A necessary condition for $t_2^* = t_1$ to be optimal is $1 - \bar{q}_1 < \bar{q}_2$ or $1 < \bar{q}_1 + \bar{q}_2$. The latter inequality indicates that the firm must hold excess capacity when it wishes to avoid a tax rate of one. The intuition for this result is straightforward. Suppose the firm does not hold excess capacity ($\bar{q}_1 + \bar{q}_2 \leq 1$). According to (4), the firm always utilizes its capacity in country 2 when $t_2 \leq 1$. Government 2 faces no trade off between the tax rate and its tax base and the optimal tax rate must be one. By holding excess capacity, however, the firm introduces a trade-off for government 2 because it can threaten to serve the market from its plant in country 1 without utilizing all capacity in country 2.

[Insert Figure 1 about here]

Figure 1 illustrates the government revenue function (10) for various capacity levels. The tax rate in country 1 is fixed at $t_1 = \frac{1}{3}$ and the capacity in country 2 is $\bar{q}_2 = \frac{2}{3}$. In panel (a) the firm holds total capacity less or equal to one ($\bar{q}_1 \leq \frac{1}{3}$). In this case government revenue is monotonically increasing until a tax rate of one. Panels (b) and (c), by contrast, show cases when the firm holds excess capacity ($1 < \bar{q}_1 + \bar{q}_2$). The revenue function is discontinuous at $t_2 = t_1$. For any given level of $\bar{q}_2$, the drop in revenue at $t_2 = t_1$ is larger, the higher is the capacity in country 1. Panel (b) is a situation in which $\bar{q}_1$ is relatively small ($\bar{q}_1 = \frac{3}{5}$) and

therefore the government is still better off by imposing a tax rate of one. This is not the case in panel (c), where $\bar{q}_1$ is relatively large ($\bar{q}_1 = \frac{17}{20}$). Thus the optimal tax rate is $t_2^* = t_1$.

The first stage: Excess capacity as an endogenous threat point

I now turn to the firm's optimal capacity choice. The main question in this section is whether the firm finds it advantageous to hold a sufficient amount of excess capacity in order to induce the low tax rate. In the first stage the firm maximizes its profit, given in (1), by choosing $\bar{q}_1, \bar{q}_2$. When choosing capacities the firm is forward looking and knows that outputs (q_1^*, q_2^*) and country 2's tax rate t_2^* are determined by (4) and (11). The previous analysis allows me to focus on three possible strategies as equilibrium candidates. The firm may not invest in any country (the default option), or may invest only in country 1, or may invest in both countries. The analysis of the last option is the most complex one and will be discussed after the first two options are reviewed. Investment in country 2 only is never optimal since $t_2^* = 1$ and the firm cannot recover its cost of capacity.

The payoffs in the first two cases are straightforward. Investment in country 1 alone is profitable when $c_1 + t_1 \leq 1$. The firm chooses $q_1 = \bar{q}_1 = 1$ and its profit is[11]

$$\pi(1,0) \;=\; 1 - c_1 - t_1. \tag{12}$$

The second option is to make no investment at all which gives zero profits.

$$\pi(0,0) \;=\; 0. \tag{13}$$

In both cases government 2 obtains zero revenues.

In the remainder of this section the possible benefits of building plants in both countries are evaluated. I show that for certain parameter values the firm finds it optimal to enter both countries and to hold excess capacity. The following result is a first step and characterizes the optimal capacity mix if the firm sets up plants in both countries.

Proposition 2 *Suppose the firm enters country 2 with capacity $\bar{q}_2 > 0$.*

a) *The profit function has a local maximum at*

$$\bar{q}_1 \;=\; 1 - t_1\bar{q}_2 \;>\; 0. \tag{14}$$

The capacity level $\bar{q}_1$ is the minimum capacity in country 1 that is necessary to induce a low tax rate $t_2^* = t_1$. The firm holds excess capacity.

b) *When the firm chooses capacities according to (14), outputs in country 1 and 2 are $q_1 = 1 - \bar{q}_2$ and $q_2 = \bar{q}_2$.*

Proof: a) Suppose that the firm can induce $t_2^* = t_1$ by choosing $\overline{q}_1 < 1 - t_1\overline{q}_2$ which is equivalent to $t_1\overline{q}_2 < 1 - \overline{q}_1$. Equation (11) states that in this case country 2 will choose $t_2^* = 1$ in the third stage. This is obvious when $1 - \overline{q}_1 < \overline{q}_2$. It is also true when $1 - \overline{q}_1 \geq \overline{q}_2$ because $t_1\overline{q}_2 < \min\{1 - \overline{q}_1, \overline{q}_2\}$. Hence $\overline{q}_1 < 1 - t_1\overline{q}_2$ does not induce the low tax rate.

When choosing capacities $\overline{q}_1 = 1 - t_1\overline{q}_2$ and $\overline{q}_2$, government 2 is just indifferent between $t_2 = t_1$ and $t_2 = 1$ since $R_2(t_2 = t_1) = t_1\overline{q}_2 = \min\{1 - \overline{q}_1, \overline{q}_2\} = R_2(t_2 = 1)$.

Suppose that $\overline{q}_1 > 1 - t_1\overline{q}_2$ gives a higher profit. In this case country 2 chooses a low tax rate because $\overline{q}_2 > t_1\overline{q}_2 > 1 - \overline{q}_1$ implies $t_1\overline{q}_2 > \min\{1 - \overline{q}_1, \overline{q}_2\}$. At the same time the firm holds idle capacity which is costly. Reducing capacity in country 1 to $1 - t_1\overline{q}_2$ is therefore optimal. Notice that the firm holds excess capacity because $\overline{q}_1 + \overline{q}_2 = 1 + \overline{q}_2(1 - t_1) > 1$.

b) The output choice follows from (4). Q.E.D.

Proposition 2 can be illustrated in terms of panels (b) and (c) in *figure 1*. For any capacity level in country 2, the locally optimal capacity in country 1 is the level at which the government revenue function's two local optima give the same tax revenue.

It remains to be shown whether this capacity mix is a global profit maximum. Using the results from Proposition 2, the firm's profit can be written

$$\begin{aligned} \pi(1 - t_1\bar{q}_2, \bar{q}_2) &= (1 - t_1)q_1^* + (1 - t_2^*)q_2^* - c_1\bar{q}_1 - c_2\bar{q}_2 \\ &= 1 - t_1 - c_1(1 - t_1\bar{q}_2) - c_2\bar{q}_2. \end{aligned} \tag{15}$$

Equation (15) is easily understood. The firm holds excess capacity and satisfies demand at a price of one. In both countries the cost of producing one unit of output is equal to country 1's tax t_1 since the firm holds excess capacity. The profit gross of capacity costs therefore is $1 - t_1$. The net profit is found by subtracting capacity costs and may be positive or negative. The firm will enter both countries if the maximum value of (15) is greater than the maximum

of (12) and (13). For certain parameter values that is indeed the case, as the following result shows.

Proposition 3 *When the government of country 2 cannot commit before the firm makes its capacity decision, the optimal capacity choices are*

$$(\bar{q}_1^*, \bar{q}_2^*) = \begin{cases} (1-t_1, 1) & \text{if } c_1 t_1 \geq c_2 \quad \text{and} \quad (1-t_1)(1-c_1) \geq c_2 \\ (1,0) & \text{if } c_1 t_1 < c_2 \quad \text{and} \quad 1 \geq c_1 + t_1 \\ (0,0) & \text{if } (1-t_1)(1-c_1) < c_2 \quad \text{and} \quad 1 < c_1 + t_1. \end{cases} \tag{16}$$

For certain parameter values the firm finds it optimal to invest in country 2 even when no upfront subsidies are paid. This occurs only when the firm holds excess capacity in country 1, which in equilibrium is not utilized.

Proof: As a first step, I derive the maximum of (15). Taking the derivative with respect to $\bar{q}_2$ (which changes $\bar{q}_1$ according to Proposition 2) gives

$$\frac{d\pi}{d\bar{q}_2} = c_1 t_1 - c_2.$$

When $c_1 t_1 - c_2 < 0$, investment in country 2 is not profitable even when the firm holds excess capacity in country 1. Whenever the firm enters both countries it must hold excess capacity. A marginal increase in capacity in country 2 leaves sales unchanged, but it affects the firm's cost in two ways. First, it increases the cost by c_2. Second, it allows the firm to lower excess capacity in country 1 by t_1 units. This saves costs equal to $c_1 t_1$. If the latter term is less than c_2, then reducing $\bar{q}_2$ is optimal for the firm. Investment in both countries cannot be optimal.

If, on the other hand, $c_1 t_1 - c_2 \geq 0$, then investment in both countries might be profitable. Since $\frac{d\pi}{d\bar{q}_2}$ is independent of the capacity in country 2, the firm considers the maximum capacity in country 2, $\bar{q}_2 = 1$, and hence $\bar{q}_1 = 1 - t_1$. Note that for these capacity levels Proposition 2 implies that capacity in country 1 is not utilized. The firm's profit (15) is then further simplified to

$$\pi(1-t_1, 1) = (1-t_1)(1-c_1) - c_2. \tag{17}$$

This level of profit may or may not be higher than the ones from the other two options. The optimal capacity choices follow now by comparing the profit levels given in (12), (13), (17), and by noting that $\pi(1-t_1,1) > \pi(1,0)$ if $c_1 t_1 > c_2$. The parameter restrictions in (17) are a complete partition of the set of exogenous variables. Q.E.D.

The presence of a high-cost and high credibility country changes the standard rent extraction problem in two ways. Even when production in the high-cost country alone is not profitable ($c_1 + t_1 > 1$), investment in both countries is optimal under the conditions provided in the first line of (16). In equilibrium the firm does not utilize its capacity in country 1 because the market is served from its plant in country 2. Yet, the capacity in country 1 is held for strategic purposes and allows the firm to take advantage of the lower cost in country 2. Excess capacity is a threat point that arises endogenously.

Secondly, when production in the high-cost country alone is profitable ($c_1 + t_1 < 1$), the firm may still find it optimal to invest in both countries. Producing only in country 2, however, can never be optimal when no upfront subsidies are paid. Note that investment in both countries is not optimal when c_2 is too high. Also, if capacity cost are identical across countries the firm always produces in country 1.

[Insert Figure 2 about here]

Figure 2 illustrates in (c_1, t_1)-space the optimal capacity choice for a specific value of the capacity cost in country 2, $c_2 = 0.2$. The lens in the middle is the set of parameter values for which the firm invests in both countries. The area which is below the lens and the diagonal, describes the regime in which the firm invests only in country 1. The area above is characterized by no investment.

5. Can upfront subsidies compensate for the lack of commitment?

For a large subset of the parameter space country 2 attracts no investment at all despite its cost advantage. One may conjecture that this result does not continue to hold when upfront subsidies are paid before investment decisions are made. This section demonstrates that upfront subsidies facilitate foreign investment to country 2. Yet, it is also shown that in many cases the firm still does not invest at all or too little in country 2. The partial ineffectiveness of upfront subsidies is due to an important but realistic constraint upon the set of feasible contracts between the host government and the multinational firm. The subsidy can be made conditional on activities (variables) in country 2, but not on those in

country 1. The firm is always free to invest in country 1. I will discuss the possibility to condition the subsidies on output in section 7.

I assume that government 2 offers a nonlinear contract of the form

$$s_2(\bar{q}_2') = \begin{cases} s & \text{if} \quad \bar{q}_2 \geq \bar{q}_2' \\ 0 & \text{else} \end{cases} \tag{18}$$

where $s \geq 0$ is the subsidy paid to the firm when capacity is at least $\bar{q}_2'$. To simplify notation, I use $s_2(\bar{q}_2') = s$ as shorthand for the contract specified in (18). When not referring to a specific value of the subsidy, I also use the notation $s_2(\bar{q}_2')$ for a contract that pays a subsidy when the capacity is at least $\bar{q}_2'$. The subsidy scheme in (18) gives the government a powerful instrument, perhaps stronger than what governments actually control. This allows me to show that even with this instrument country 2 may not attract investment.

I now consider an extended version of the game considered in the previous section. Before the firm makes its capacity decision government 2 offers a contract specifying the amount of the subsidy s and the critical level of capacity $\bar{q}_2'$. The continuation of the game is identical to the one considered in section 4.

Government 2 maximizes tax revenues net of subsidies paid to the firm

$$R_2 = t_2 q_2 - s_2(\bar{q}_2').$$

When offering the contract, the government anticipates that the subsidy affects the firm's capacity choice, its own tax rate t_2^*, and outputs according to (4) and (11). A first step towards the solution is to consider the firm's possible responses to a contract that offers a subsidy $s > 0$ for any capacity level $\bar{q}_2 \geq \bar{q}_2'$. The firm has four qualitatively different options. There are the three options that the firm considered already without subsidies. The fourth option is to enter only country 2. This might be profitable now when upfront subsidies are sufficiently large. The profit when the firm does not invest or when it invests only in country 1 is identical to (12) and (13). This leaves the other two options which I consider now in more detail.

I. Enter only country 2 with a capacity that is high enough to receive the subsidy, i.e., $\bar{q}_1 = 0, \quad \bar{q}_2 \geq \bar{q}_2'$.[12] In this case government 2 always chooses $t_2^* = 1$ since there is no

threat to serve the market from the plant in country 1. It is optimal for the firm then to set up capacity just equal to the threshold level ($\bar{q}_2 = \bar{q}_2'$) in order to receive the subsidy. The firm's profit is

$$\pi(0, \bar{q}_2') \;=\; -c_2\bar{q}_2' + s. \tag{19}$$

Government 2 imposes $t_2 = 1$ and receives revenues equal to

$$R_2(0, \bar{q}_2') \;=\; \bar{q}_2' - s. \tag{20}$$

II. Investment in both countries combined with 'optimal' excess capacity, i.e., $\bar{q}_2 \geq \bar{q}_2'$ and $\bar{q}_1 = 1 - t_1\bar{q}_2$. This induces government 2 to choose $t_2^* = t_1$. The firm's profit equals

$$\pi(1 - t_1\bar{q}_2, \bar{q}_2) \;=\; (1 - t_1) - c_1(1 - t_1\bar{q}_2) - c_2\bar{q}_2 + s. \tag{21}$$

Government 2 obtains

$$R_2(1 - t_1\bar{q}_2, \bar{q}_2) \;=\; t_1\bar{q}_2 - s. \tag{22}$$

Note that when the firm invests in both countries it can never be optimal to choose capacity in country 1 either strictly less or strictly more than $1 - t_1\bar{q}_2$. This follows from Proposition 2.[13]

R_2 is positive only when the firm sets up capacity in country 2. Since all bargaining power is assumed to rest with government 2, an optimal contract that induces investment in country 2 must make the firm as well off as the maximum of (12) and (13).

Deriving the optimal contract is not trivial. Consider, for example, the particular contract that would be optimal for government 2 in the absence of country 1. The government offers a subsidy just equal to the capacity cost when the firm builds a capacity of one unit, i.e., $s_2(1) = c_2$. In the absence of outside opportunities, the firm accepts, invests and produces one unit in country 2, and breaks even. The contract implements the first best. When investment in country 1 is possible, however, the contract is not optimal in general. This is shown in

Proposition 4 *In the absence of country 1, government 2 offers an upfront subsidy just equal to the firm's unit capacity cost for one unit of capacity. This leads to the first-best outcome. When the firm has the option to invest in country 1, the subsidy scheme would generate negative tax revenues for government 2 when* $t_1 < c_2$.

Proof: Suppose the government offers $s_2(1) = c_2$. The firm optimally responds by choosing $\bar{q}_1^* = 1 - t_1$ and $\bar{q}_2^* = 1$ rather than capacities $\bar{q}_1 = 0, \bar{q}_2 = 1$. For it is true under the subsidy scheme that

$$\pi(1 - t_1, 1) - \pi(0, 1) = (1 - t_1)(1 - c_1) \geq 0,$$

where the strict inequality holds when $c_1 < 1$. The firm invests in both countries rather than in country 2 only because the profit difference is positive and $\pi(1 - t_1, 1) > 0$.

Using (22), government revenue is equal to $t_1 - c_2$ which is negative by assumption. Q.E.D.

The optimal contract must take into account the possibility that the firm opts for holding excess capacity. Proposition 4 does not rule out the possibility that the subsidy scheme is optimal when $t_1 > c_2$. The following Proposition characterizes the investment decision under the optimal contract and shows that the above subsidy scheme is not part of an equilibrium. While it is possible that the firm invests only in country 2, the capacity will be less than one. The proof is lengthy and relegated to the appendix.

Proposition 5 *Suppose government 2 cannot commit to a tax rate before the firm makes its investment decision, but offers upfront subsidies conditional on the firms's capacity to be set up in country 2.*

a) *The firm's total capacity is always strictly positive. The optimal capacity mix is*

$$(\bar{q}_1^*, \bar{q}_2^*) = \begin{cases} (1, 0) & \text{if} \quad t_1 \leq \alpha \\ \left(0, \frac{c_1 + t_1 - 1}{c_1 t_1}\right) & \text{if} \quad \beta \leq t_1 < \gamma \\ \left(0, 1 - \frac{(1 - t_1)(1 - c_1)}{c_2}\right) & \text{if} \quad \delta \leq t_1 \text{ and } 1 - c_2 \leq c_1 \\ (1 - t_1, 1) & \text{else} \end{cases}$$

where the parameters $\alpha, \beta, \gamma, \delta$ *are defined in the appendix.*

b) *For certain parameter combinations the firm invests only in country 2 and receives an upfront subsidy. Investment is inefficiently low* ($\overline{q}_2^* < 1$). *A necessary condition for this case is that the firm cannot invest and produce in country 1 alone.*

c) *The firm may invest only in country 1 even if the cost advantage of country 2 is large. This happens only when* t_1 *is small relative to* c_1.

d) *When neither country has a cost advantage, the firm never invests only in country 2. Investment in both countries may be optimal.*

A comparison of Propositions 3 and 5 reveals that upfront subsidies change the outcome considerably. Subsidies induce foreign direct investment to country 2 when no investment was made in the absence of subsidies. The region with no investment has disappeared. Outcomes also differ when previously the firm invested only in country 1. Compared to Proposition 3, for a larger set of parameter values the firm now chooses to invest in both countries. *Figure 3* illustrates in (c_1, t_1)-space the pattern of investment for $c_2 = 0.2$. The figure shows that the area in which the firm chooses capacities $(1, 0)$ has decreased while the area of the excess capacity regime $(1 - t_1, 1)$ has increased. The boundary line between these two regimes is given by the equation $t_1 = c_2/(1 + c_1)$, or equivalently

$$c_1 t_1 - c_2 + t_1 = 0. \tag{23}$$

The firm chooses capacities $(1, 0)$ when the sum of the terms on the left-hand side is negative, and the second regime $(1 - t_1, 1)$ when the sum is positive. Condition (23) can be explained as follows. The term $c_1 t_1 - c_2$ has already appeared in the previous section and describes the net change in cost along the incentive constraint that must hold when the firm enters country 2. In contrast to Proposition 3, the firm may enter now even if $c_1 t_1 - c_2 < 0$, provided that the subsidy compensates for the net loss along the optimal capacity mix. In fact, the maximum subsidy is t_1, the third term in (23). The maximum upfront subsidy can be derived from the government revenue function by setting (22) equal to zero. Hence, the firm enters country 2 if the change in net costs plus the maximum feasible upfront subsidy (t_1) is non-negative.

[Insert Figure 3 about here]

Proposition 5 shows also that investment in country 2 alone is a possible outcome. The perhaps surprising feature is that investment is less than market size. To understand the logic

behind the optimal contract that induces this investment behavior, note that the situation arises only when the firm is in a weak position. The firm can neither invest only in the high-cost country nor in the absence of subsidies insure against confiscatory taxation by holding excess capacity. Government 2 must take into account, however, that the firm may hold excess capacity when subsidies are offered.

I now derive for one case the equilibrium contract under which the firm indeed does not want to hold excess capacity. Consider a subsidy being offered for some capacity level in country 2. The firm either invests exactly $\bar{q}_2'$, takes the subsidy, and forgoes the option to have excess capacity in country 1. This yields $\pi = -c_2\bar{q}_2' + s$. Or, alternatively, the firm can invest $\bar{q}_2 \geq \bar{q}_2'$, $\bar{q}_1 = 1 - t_1\bar{q}_2$, and get the subsidy as well, without facing the confiscatory tax. Which capacity level is chosen under the second option, depends on parameters. For example, when $c_1t_1 - c_2 < 0$, the firm will choose exactly $\bar{q}_2'$ in country 2 and its profit becomes $\pi = 1 - t_1 - c_1(1 - t_1\bar{q}_2') - c_2\bar{q}_2' + s$.

Government 2 can now induce the firm to choose the first option. The firm prefers the first option for any given subsidy when $\bar{q}_2' \leq \frac{c_1+t_1-1}{c_1t_1}$ (which is positive for $c_1 + t_1 > 1$). In addition, the subsidy can be chosen such that the firm makes zero profits ($s = c_2\bar{q}_2'$). Under this subsidy, government revenues are increasing in $\bar{q}_2'$ and hence under the optimal threshold capacity level

$$R_2\left(0, \frac{c_1 + t_1 - 1}{c_1t_1}\right) = \frac{(1 - c_2)(c_1 + t_1 - 1)}{c_1t_1}.$$

This is higher than if the firm had opted for the second option at $\bar{q}_2'$.

The remaining question is whether there is any other contract that could make the government better off? The only candidate is a contract in which the firm does hold excess capacity and the subsidy induces the firm to make zero profit. To find this contract, set the firms profit (21) equal to zero, solve for the subsidy, and insert the subsidy in the government revenue function (22) which gives $R_2 = t_1\bar{q}_2 + 1 - t_1 - c_1(1 - t_1\bar{q}_2) - c_2\bar{q}_2$. The term is increasing in $\bar{q}_2'$ and the maximum revenue under the contract is found when the firm holds unit capacity in country 2, i.e.

$$R_2(1 - t_1, 1) = 1 - c_1(1 - t_1) - c_2.$$

Comparison of $R_2(1-t_1, 1)$ and $R_2(0, \frac{c_1+t_1-1}{c_1t_1})$ shows that there exist parameter values under which the government finds it preferable that the firm invests only in country 2, but less than 1.

Intuitively, by offering the subsidy for a capacity level less than one, the government makes it costlier for the firm to hold excess capacity. For the low tax rate to be optimal, $\overline{q}_1$ must increase when $\overline{q}_2$ falls (Proposition 2). Any capacity above the critical level is a waste from the firm's point of view if it enters only country 2. The gains from not holding excess capacity are split between the two players. This trick does not work when the cost of capacity in country 1 are relatively small.

6. The welfare cost of excess capacity

The results from Proposition 3 and 5 can be compared in terms of world welfare to the benchmark result where government 2 is able to commit. Note that world welfare is determined by the capacity choices and not by subsidies since the latter are simply transfers between the firm and the government. The comparison is trivial when the firm does not invest at all. The comparison is more interesting when the firm does undertake some investment. If the firm invests only in country 1 under no commitment ($1 - c_1 - t_1 \geq 0$ necessary), then it is easily seen that

$$W^* = 1 - c_1 \leq 1 - c_2 = W^o. \tag{24}$$

World welfare in the no commitment case W^* is in general strictly smaller than with commitment, unless capacity cost are identical. It is well known that lack of commitment leads to welfare losses. The conventional reason for this result is underinvestment. Here, however, this is not the case. The firm invests the efficient amount, but at the less efficient location. The welfare loss, measured by $\frac{W^*}{W^0}$, can be quite substantial and is driven by the difference in capacity cost. Note that the magnitude of the cost difference is constrained only by the condition $c_1 + t_1 \leq 1$. For example, when the parameter values are $c_1 = \frac{3}{5}, c_2 = \frac{1}{5}$ and $t_1 \leq \frac{2}{5}$, the welfare loss is 50 percent since $\frac{W^*}{W^0} = \frac{1}{2}$.

Another source of welfare loss arises in an excess capacity situation. Consider the case where the firm invests in both countries and holds excess capacity even without upfront subsidies.[14] Equation (16) shows that a necessary condition for this is $c_1 t_1 - c_2 \geq 0$, which in turn holds only if $c_1 > c_2$. It follows that for the case $c_1 + t_1 \leq 1$ profit is given by (17), tax revenues equal t_1, and world welfare is

$$W^* = 1 - c_2 - c_1(1 - t_1) < 1 - c_2 = W^o. \tag{25}$$

In contrast to the previous case welfare is now directly dependent on t_1, and not only on c_1 and c_2. Although it is not so surprising that welfare is lower without commitment, it is

interesting to note that the welfare loss can be substantial even if the firm invests in country 2. Consider, for example, the parameter values $c_1 = \frac{3}{5}$, $c_2 = \frac{1}{5}$, $t_1 = \frac{1}{3}$. For these values, the firm invests in both countries and the relative welfare level $\frac{W^*}{W^0}$ is $\frac{1}{2}$.

A different way of looking at welfare effects is to compare the situations with and without country 1. In the absence of subsidies, there is a classic underinvestment result when investment can be made only in country 2. Allowing for investment in country 1 leads often to a welfare increase. The outcome is not first-best because the firm either invests in the wrong location or invests too much. By contrast, when subsidies are available, but investment is restricted to country 2, the outcome is first-best efficient. Yet, allowing for investment in country 1 leads under certain parameter values to partial underinvestment in country 2. This is another source of inefficiency.

Finally, one may ask whether upfront subsidies are welfare improving. This is clearly the case when no investment takes place in the absence of subsidies, but the firm invests under subsidies. In some other situations upfront subsidies are ineffective, for instance, when the firm always invests only in country 1, or always in both countries (with excess capacity). Interestingly, upfront subsidies are welfare decreasing when upfront subsidies induce the firm to switch from investing only in country 1 to investing in both with excess capacity. To see this, note that according to (16) a necessary condition for the former is $c_1 t_1 - c_2 < 0$. In that situation welfare equals $1 - c_1$. The discussion following Proposition 5 shows that with upfront subsidies the firm may invest in both countries, and holds excess capacity even when $c_1 t_1 - c_2 < 0$. World welfare equals then $1 - c_2 - c_1(1 - t_1)$ which is less than under no subsidies. The above results are summarized in

Proposition 6 *The welfare effects of the option to hold excess capacity in the presence of upfront subsidies are:*

a) Without commitment world welfare is strictly smaller than under commitment unless country 2 has no cost advantage. Lack of commitment in country 2 causes substantial welfare losses because either the firm invests the efficient amount in the more expensive location, or the firm invests more than the size of the market, or the firm invests in the low-cost location less than the size of the market.

b) Upfront subsidies are welfare improving if investment was zero in the absence of subsidies. They are welfare decreasing, however, if upfront subsidies induce the firm from investing only in country 1 to investing in both countries while holding excess capacity.

7. Discussion and Extensions

In this section I discuss various assumptions and address possible extensions of the basic model.

Endogenous tax policy in country 1

So far it has been assumed that government 1 is passive. It might be argued that this is not realistic, in particular if country 1 does not attract any investment at all. The question is whether the main conclusions from the previous sections continue to hold when government 1's tax policy is endogenous. Consider the case where government 1 sets a firm-specific tax rate before capacities are chosen.[15] In this sense there is *ex ante* competition because government 1 by choosing its tax rate and government 2 by choosing its upfront subsidy compete before capacities are set. This setting is different from Janeba (2000) because in that paper there are no upfront subsidies, both countries are symmetric and choose their tax rates after capacities are set (i.e., *ex post* competition).

I assume that government 1 must choose from the set of nonnegative tax rates which is consistent with maximization of tax revenues or any other objective (like output) subject to a nonnegative budget constraint. Government 1 can always attract investment when it offers a zero tax rate. This can be easily seen from *figures 2* and *3*, and follows directly from (16) when $t_1 = 0$. The pattern of investment changes compared to the base model, but the welfare consequences partly stay the same.

The above argument suggests that government 1 can change outcomes considerably. This may not be the case in a slightly more general model however. Consider the situation in which not only capacity cost differ across countries, but cost of production as well. In particular, suppose that production cost in country 2 are zero, while strictly positive in country 1. Now country 1 cannot always attract investment even when it offers a zero tax rate. In fact, the modified model can be analyzed using the base model by reinterpreting the tax rate t_1 as the tax rate of government 1 *and* the cost of production in country 1. Thus the firm may choose to hold excess capacity, as before, because the lowest possible bid by government 1 ($t_1 = 0$) does not reduce the cost of production in country 1 to zero.

Other tax instruments

Instead of a proportional output tax one may consider a proportional profits tax. All results go through under such a modification. To see this, suppose that under the profits tax capacity costs are tax deductible. The firm's profit is then $\pi = (1-t_1)(q_1-c_1\overline{q}_1)+(1-t_2)(q_2-c_2\overline{q}_2)$. In

the last stage the firm's optimal output choice is the same as under the output tax. Working backwards, government 2's revenue in the second stage becomes $R_2 = t_2(q_2^* - c_2\overline{q}_2)$ instead of $R_2 = t_2 q_2^*$. Since the firm's optimal output choice is unaffected, the government's optimal tax rate choice remains the same, too, because a constant is substracted if capacity costs are tax deductible. This logic extends then also to the first stage. Suppose, for example, that the firm holds optimal excess capacity in country 1, $\overline{q}_1 = 1 - t_1\overline{q}_2$, which induces $t_2^* = t_1$. The firm's profit becomes $\pi = (1 - t_1)(1 - c_1(1 - t_1\overline{q}_2) - c_2\overline{q}_2)$ instead of (15). The optimal capacity choice, however, remains unaffected.

The model can also be extended to a linear (instead of proportional) output tax. The firm's profit reads $\pi = \sum_i (1 - t_i)q_i - a_i - c_i\overline{q}_i$ and government revenues are $R_i = a_i + t_i q_i$. Two variants are conceivable that differ in their implications. In the first variant a_i must be paid by the firm whenever it is present in country i even if output q_i is zero. In this case a_i is a lump sum tax on the firm. The firm follows the same output decision rule (4), which is independent of a_i. Because of this, the government of country 2 has an incentive to raise a_2 in the second stage in order to expropriate the rent from the firm. The firm anticipates the government's incentive and does not invest in country 2.

The outcome is different if we assume that taxes are due only if the firm's output in country i is strictly positive. In this variant a_i is not a lump sum tax. The firm's optimal output choice in stage three depends now not only on tax rates but also on the a_i terms. As long as the firm has capacity in country 1, output in country 2 is nonincreasing (and decreasing at certain points) in the tax parameters a_2 and t_2. The trade off between tax rates and tax bases remains in place, although now in a more complicated way. Holding excess allows the firm to lower taxation in country 2.

The role of the contract structure

The main result in section 5 was derived under the assumption that the upfront subsidy is conditional on capacity and not output. Consider instead a contract that offers a proportional subsidy conditional on output in country 2 - but not conditional on output in country 1. This is reasonable because q_1 may not be observable and/or verifiable in country 2. Assume also that the subsidy is enforceable in the last stage of the game when the firm chooses output, whereas t_2 cannot be fixed in advance. The reason could be that not all elements of a tax system (or all mechanism to extract revenues) are contractible in the same way. In such an environment the main conclusion from the base model goes through. In the last stage the firm maximizes $\pi = (1 - t_1)q_1 + (1 - t_2 + s)q_2$, where s is the proportional subsidy rate. The optimal output decision rule (4) is modified because the firm's critical switching point

depends on whether t_2 is less or greater than $t_1 + s$ (as opposed to simply t_1). Intuitively, with a guaranteed subsidy s government 2 can raise its tax rate further. This feeds into the government revenue function (11) which now becomes $R_2 = (t_2 - s)q_2^*$. It is easy to see that the optimal tax rates for government 2 are either $t_1 + s$ or $1 + s$ (instead of t_1 or 1). Yet government 2's decision depends on capacities in the same way as in (11). The firm therefore keeps its threatpoint by holding excess capacity.

Yet another contract specification is to assume that the government pays a subsidy when capacity is above the critical level $\bar{q}_2'$, but does not allow any investment otherwise. The outcome to this modified contract structure is the same as in section 5 because the proof of Proposition 5 reveals that the firm will never choose $0 < \bar{q}_2 < \bar{q}_2'$.

A particular feature of the model is that the output tax is proportional while the subsidy is a step function. The reason for choosing a step function for the subsidy rather than a proportional subsidy scheme is intentional and strengthens the result. To show that upfront subsidies cannot completely compensate for the lack of commitment, the government has not only all bargaining power but also a powerful instrument. The step function is *a priori* more powerful than a proportional scheme because the government can offer a payment for a sufficiently large capacity without being afraid that the firm invests less and still receives some payment.

Note that in the present context a proportional subsidy scheme would generate the same results. Consider, for example, Proposition 4 which shows that the typical first-best contract does not work in the present framework. With the step function, the government offers a payment equal to c_2 if the firm invests one unit and nothing else. Proposition 4 demonstrates that the firm would still hold excess capacity. The same is true if the government had offered a proportional subsidy $s_2 = c_2\bar{q}_2$, which gives the firm the same payment as under the original scheme if capacity is one.

The government's inability to run the firm

An important assumption is that government 2 cannot expropriate the firm and run it itself. This may be explained by the fact that only the multinational firm has the technological know how, the management skills, and access to financial resources. Many developing countries or transition economies do not have access to advanced human and financial capital. Expropriations are less attractive and not optimal from the host government's point of view, an idea that is formalized in Raff (1992).

Plant-specific fixed cost

In the basic model production at plant-level is characterized by constant returns to scale. The relevance of excess capacity as a form of insurance becomes even clearer if plant-specific fixed cost are introduced. Production at plant level is characterized by increasing returns to scale and this by itself makes it less likely that the firm produces in both locations. The basic model can be easily generalized to incorporate fixed cost. Let $f_1 \geq f_2 > 0$ be the fixed cost that the firm must pay when it sets up a plant in country 1 and 2 respectively. The weak inequality ensures that country 1's cost disadvantage is maintained also in the presence of fixed costs. The qualitative structure of all results is preserved. Changes materialize in the form of modified boundary constraints for each type of market structure. For example, when no upfront subsidies are paid (Proposition 3), the firm invests in both countries when $c_1 t_1 \geq c_2 + f_2$ and $(1-t_1)(1-c_1) \geq c_2 + f_1 + f_2$. The first inequality reflects the net change in costs when investing in both countries rather than in country 1 only. Since the firm must pay the fixed cost for the plant in country 1 in both cases, the decision depends only on the fixed cost in country 2. The plant-specific fixed cost in country 1 do matter when assessing the overall profit level. For this to be positive, the second condition must be fulfilled.[16]

Economies of scale arise not only from plant-specific, but also from firm-specific fixed cost, as shown, for example, by Markusen (1984). When fixed costs are firm-specific, there is an incentive for a multinational firm to emerge, rather than having two independent firms operating in two countries. The present model is more relevant in this case and, at the same time, the cost of holding excess capacity become less important *ceteris paribus.*

Pre-existing capacity

In contrast to the basic model, in some cases the firm may consider expanding its existing capacity because of an increase in demand. This may change the initial situation because the firm has already sunk some investment. The opening up of Eastern Europe is a good example. New investment opportunities have arisen that did not exist previously and, at the same time, demand for many goods has increased. It is conceivable that the firm produced from a plant in a high-cost country (country 1) and now has the opportunity to relocate its plant to country 2 or to expand its operation in country 1. Does the presence of pre-existing capacity affect the previous conclusions?

Consider the set of parameter values that are consistent with the condition $1-t_1-c_1 \geq 0$, i.e., production in the high-cost country gives non-negative profits. Denote by $\bar{q}_1^p$ the pre-existing capacity in country 1. In the absence of upfront subsidies pre-existing capacity does not change Proposition 3. The reason for this is that pre-existing capacity reduces the firm's cost by the same amount regardless of whether it increases capacity in country 1 or

opens a plant in country 2. For example, when $\bar{q}_1^p < 1 - t_1$, profits for the two options are $\pi(1,0) = 1 - t_1 - c_1(1 - \bar{q}_1^p)$ and $\pi(1 - t_1\bar{q}_2, \bar{q}_2) = 1 - t_1 - c_1(1 - t_1\bar{q}_2 - \bar{q}_1^p) - c_2\bar{q}_2$. The comparison shows that the firm's decision depends only on the sign of $c_1t_1 - c_2$, not on $\bar{q}_1^p$. A similar argument can be made when $\bar{q}_1^p \geq 1 - t_1$. Results are also unaffected when upfront subsidies are considered.

8. Conclusions

This paper provides an explanation for the lack of foreign investment in many developing countries and economies in transition despite their low cost of production and the presence of upfront subsidies. Low levels of FDI can be explained in a framework in which countries differ not only in terms of costs but also governments differ in credibility. Countries compete for investment along two dimension rather than costs alone. The trade off between costs and credibility is not trivial and may lead to a variety of outcomes depending on cost differentials. The multinational firm may invest only in the politically stable, but high-cost location, or invest the efficient amount in the unstable, low-cost location, but holds simultaneously excess capacity elsewhere, or the firm invests only, but too little, in the less costly and unstable location. The last case arises only when upfront subsidies are available. In general, however, upfront subsidies do not lead to efficient investment.

World welfare is often considerably less than what it would be in the absence of lack of commitment. This holds regardless of the investment pattern. The sources of the welfare loss are different from other models in which lack of government commitment leads to underinvestment. Here, total investment is not always too small, but rather the firm invests either in the more costly location or invests too much.

The present paper suggests an explanation as to why some empirical studies have found little support for the role of taxation and political risk as determinants of foreign investment in some countries. Footloose industries, like electronics, are a good example for simultaneous investment and production in various locations. The power to shift production quickly may explain why less tax incentives are given and political risk seems to play less of a role, as has been shown by Wheeler and Mody (1992) and Raff and Srinivasan (1997). The assumptions and the main results of the paper are also in line with anecdotal evidence. Currently, many automobile companies expand the number of locations of their plants. In their effort to become global players, car makers invest and produce in politically risky countries. The cost advantage of these countries has led to capacity underutilization in some Western European countries. Yet plants are still held in politically stable countries in order to be not completely

dependent on a single government.

The idea of this paper should be extended and tested in future research. Building on the anecdotal evidence, one should test the role of excess capacity directly. One problem could be the availability of firm-specific data on capacity and output across production units in various countries. Future work should also address the issue why certain countries have commitment power and others have not. The trade-off between credibility and costs could be revisited when commitment is endogenous.

Appendix

Proof of Proposition 5

The Proposition is proved indirectly by analyzing the optimal contract for various subsets of the parameter space.

A) $1 < t_1 + c_1$: This is the case where the firm can never invest profitably at home only.

AA) $(1 - t_1)(1 - c_1) - c_2 < 0$: The firm cannot profitably insure against excessive taxation without subsidies. Since the firm's profit (21) is linear and continuous in $\bar{q}_2$ except at the critical point $\bar{q}_2'$, the government considers only two types of contracts (beside the default option $s_2 = 0$ for all capacity levels).

a) $s_2(1) = c_2 - (1 - t_1)(1 - c_1)$. This subsidy will give the highest output and hence the greatest revenue in country 2 under the low tax rate t_1. Even with the subsidy the firm cannot enter only country 2, but it breaks even when it accepts the contract and chooses capacities $(1 - t_1, 1)$. Excess capacity induces $t_2^* = t_1$ and $q_2^* = \bar{q}_2^* = 1$. Government revenues are

$$R_2(1 - t_1, 1) = t_1 - s_2(1) = 1 - c_1(1 - t_1) - c_2. \tag{26}$$

b) Alternatively, the government can offer a contract which makes the firm at least as well off as in the case with excess capacity. This can be achieved by offering a subsidy for a sufficiently low capacity level, i.e.,

$$\begin{aligned} \pi(0, \bar{q}_2') &= -c_2\bar{q}_2' + s_2(\bar{q}_2') \\ &= max\{\pi(1 - t_1\bar{q}_2', \bar{q}_2'), \pi(1 - t_1, 1)\}. \end{aligned} \tag{27}$$

The right-hand side represents the profit (including the subsidy) when the firm invests in both countries and holds excess capacity. The first entry on the RHS ($\bar{q}_2 = \bar{q}_2'$) is higher than the second term ($\bar{q}_2 = 1$) if and only if $c_1 t_1 - c_2 < 0$.

Let me consider first the case $c_1 t_1 - c_2 < 0$. Then (27) can be solved for the threshold capacity level

$$\bar{q}_2' = \frac{c_1 + t_1 - 1}{c_1 t_1},$$

which makes the firm indifferent between holding and not holding excess capacity. For $\bar{q}_2 < \bar{q}_2'$, the firm prefers investing only in country 2. $\bar{q}_2'$ is

positive by assumption A). Government 2's revenue equals (recall $t_2^* = 1$)

$$\begin{aligned} R_2(0, \vec{q}_2') &= \vec{q}_2' - s_2(\vec{q}_2') = \vec{q}_2'(1 - c_2) \\ &= \frac{(1 - c_2)(c_1 + t_1 - 1)}{c_1 t_1}. \end{aligned} \tag{28}$$

Now, it is easily checked that (26) is higher than (28) if and only if

$$t_1 < \frac{(1 - c_1)(1 - c_2)}{c_1^2}. \tag{29}$$

On the other hand, when $c_1 t_1 - c_2 \geq 0$ the second term in (23) is higher than the first one. The firm accepts the government offer if the subsidy makes the firm indifferent to holding capacity in country 1. Solving (27) for the threshold capacity level gives

$$\vec{q}_2' = 1 - \frac{(1 - t_1)(1 - c_1)}{c_2},$$

which is positive by assumption AA). Government revenue equals

$$\begin{aligned} R_2(0, \vec{q}_2') &= \vec{q}_2' - s_2(\vec{q}_2') = \vec{q}_2'(1 - c_2) \\ &= (1 - c_2)\left(1 - \frac{(1 - t_1)(1 - c_1)}{c_2}\right). \end{aligned} \tag{30}$$

Comparison of (26) and (30) reveals that the government prefers the former if and only if

$$c_1 < 1 - c_2. \tag{31}$$

AB) $(1 - t_1)(1 - c_1) - c_2 \geq 0$: This is the opposite case of AA).
Conditions AB) and A) imply $c_1 t_1 - c_2 > 0$. The firm has a nonnegative profit when it chooses capacities $(1 - t_1, 1)$, even in the absence of subsidies. This means that a contract of type a) offers no subsidies. A contract of type b) is not feasible because

$$-c_2 \vec{q}_2' \geq (1 - t_1)(1 - c_1) - c_2, \tag{32}$$

which has no solution for $\vec{q}_2' > 0$. In summary, the firm always invests in both countries and no subsidies are paid.

B) $1 \geq t_1 + c_1$: The firm makes nonnegative profits when it invests only in country 1.
The firm prefers capacities $(1 - t_1, 1)$ over $(1, 0)$ even in the absence of subsidies when

$c_1 t_1 - c_2 \geq 0$. If this condition holds, the government faces the same problem as in case AB) and therefore offers no upfront subsidies.

If $c_1 t_1 - c_2 < 0$, then government 2 can offer a contract that makes the firm just indifferent between capacities $(1,0)$ and $(1 - t_1 \vec{q}_2', \vec{q}_2')$. This contract must satisfy

$$1 - t_1 - c_1 = 1 - t_1 - c_1(1 - \vec{q}_2') - c_2 \vec{q}_2' + s_2(\vec{q}_2')$$

which can be solved for the subsidy

$$s_2(\vec{q}_2') = (c_2 - c_1 t_1)\vec{q}_2'.$$

Inserting the subsidy into the government revenue function gives

$$R_2(1 - t_1 \vec{q}_2', \vec{q}_2') = t_1 \vec{q}_2' - s_2(\vec{q}_2') = \vec{q}_2'\,(t_1(1 + c_1) - c_2). \tag{33}$$

Revenue is increasing in $\vec{q}_2'$ and hence the best contract is $s_2(1) = c_2 - c_1 t_1$.

The optimal capacity choices for each of the above cases can now be summarized as follows.

$$(\vec{q}_1^*, \vec{q}_2^*) = \begin{cases} (1,0) & \text{if} \quad t_1 \leq \alpha \\ \left(0, \frac{c_1 + t_1 - 1}{c_1 t_1}\right) & \text{if} \quad \beta \leq t_1 < \gamma \\ \left(0, 1 - \frac{(1-t_1)(1-c_1)}{c_2}\right) & \text{if} \quad \delta \leq t_1 \text{ and } 1 - c_2 \leq c_1 \\ (1 - t_1, 1) & \text{else} \end{cases} \tag{34}$$

where

$$\begin{aligned} \alpha &= min\left\{1 - c_1, \frac{c_2}{1 + c_1}\right\} \\ \beta &= max\left\{1 - c_1, 1 - \frac{c_2}{1 - c_1}, \frac{(1 - c_1)(1 - c_2)}{c_1^2}\right\} \\ \gamma &= \frac{c_2}{c_1} \\ \delta &= max\left\{1 - c_1, \frac{c_2}{c_1}\right\} \end{aligned}$$

The expressions α, β, γ, and δ represent the restrictions in terms of t_1 which must hold in the various subcases. Proposition 5 follows now from (34). □

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Endnotes

1. See, for example, Calvo, Sahay, and Vegh (1995). The United Nations (1996) report that in 1995 the flows to and the stocks of FDI in the Czech Republic, Hungary and Poland together were about 2/3 of the total foreign investment in Central and Eastern Europe, which comprises 25 countries including Russia.

2. According to the United Nations (1996), the 10 largest recipient countries of FDI in the developing world received about 80 percent of the total direct investment flowing to developing countries in 1995.

3. A good example is the recent threat by the automobile firm Volkswagen to close down its plant in eastern Germany, where costs are close to western Germany's standards, and move to neighboring countries. See The Economist (1996).

4. Lucas discusses also other explanations like the lack of skilled labor and good infrastructure. Although these factors may contribute to an explanation (see Mody and Srinivasan (1998) for an empirical analysis), the present paper explores only the role of political risk. A typical list of political risk comprises expropriation, currency inconvertibility, and restrictions on profit repatriation. In this paper I interpret political risk as lack of commitment in government tax policy. There is no uncertainty and governments exploit multinationals whenever optimal. Uncertainty could be built in however.

5. In 1995, China announced the scrapping of various benefits for foreign firms which came in the form of exemptions from custom duties or tax rebates for the usage of local materials; see The Economist (1995). During recent years Russia has frequently considered the introduction of a 'super profits tax' for foreign oil companies investing in Russia. This tax is considered to deter U.S. companies from making investments in Russia (see Streng 1993). Note, however, that political risk is occasionally present also in industrialized countries. After Mercedes built a new automobile plant in Alabama, USA, in 1993, a newly elected governor in 1994 renegotiated the tax package for Mercedes on the basis that too much was given to the car maker and the state was in deep financial trouble. See The New York Times (1996).

6. There is also anecdotal evidence that excess capacity plays a role in the decision making of multinationals. For example, excess capacity plays a role in the European light-vehicle market. Many automobile companies produce both in Western Europe and in some of the economies in transition in Eastern Europe. Current and predicted total capacity levels exceed production by about 4 million units or about 25 to 30 percent. At the same time, European car companies have cashed a large amount of subsidies from regional governments even after factories have been built. See The Wall Street Journal (1997). This is particularly true for Western European countries where many automobile factories are underutilized and workers are laid off. Aware of the relatively high cost of production, the German government emphasizes in advertisements the 'low-risk feature' when firms invest in Germany rather than in Eastern Europe. There is a perceived trade-off between costs and credibility.

7. The simplifying assumption allows me to isolate the conflict over the rent between the firm and country 2 and makes the analytical treatment much simpler. Note that the consumers' residency does not matter for the firm's decision because it always extract total consumer surplus. It is assumed, however, that consumption is outside of country 2.

8. Differences in capacity cost are quite typical. Capacity cost should be broadly interpreted and may include land prices, the cost of regulation and the compliance cost with environmental standards. These are quite high in many industrialized countries.

9. Although capacities could take arbitrary values at this point, it is clear that the firm never chooses $\bar{q}_i > 1$ since capacity is costly and demand is fixed at one. It is therefore assumed that capacity in any single country does not exceed one.

10. It is obvious that the foreign government is indifferent between all tax rates when $\bar{q}_2 = 0$.

11. In the following the arguments of π represent the capacities in country 1 and 2 respectively.

12. Choosing $\bar{q}_2 < \bar{q}_2'$ is clearly never optimal since the firm forgoes the subsidy and will face a tax of $t_2 = 1$.

13. Choosing $0 < \bar{q}_2 < \bar{q}_2'$ and $\bar{q}_1 = 1 - t_1\bar{q}_2$ does not make sense. When the profit (which has the same structure as (21) without the subsidy) is decreasing in $\bar{q}_2$, the firm should either not invest at all in country 2 or invest sufficiently to receive the subsidy. If the profit is increasing in $\bar{q}_2$, the firm should at least invest the threshold level and get the subsidy.

14. In this case upfront subsidies are ineffective and welfare is the same regardless of whether upfront subsidies are paid or not.

15. This is a very strong assumption. It can be argued that lack of commitment is tied to choosing a firm-specific tax rate. If this is true, government 1 could not have both advantages, commitment and the choice of firm-specific tax policies. I explore this possibility nevertheless because it is interesting to find out what happens when this strong assumption is made. Note also that some politically stable countries like the EU prohibit governments from firm-specfic subsidies because they distort competition.

16. A similar argument can be established for the case in which upfront subsidies are made (Proposition 5). The boundary condition for the regimes $(1, 0)$ and $(1 - t_1, 1)$ is augmented by the fixed cost in country 2 and now reads $c_1 t_1 - c_2 + t_1 - f_2 = 0$.

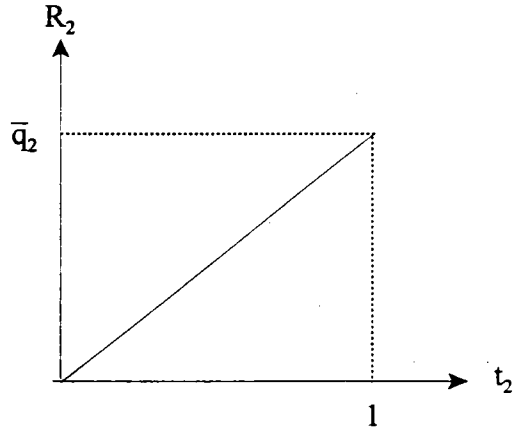

Figure 1 (a) - Government revenues without excess capacity

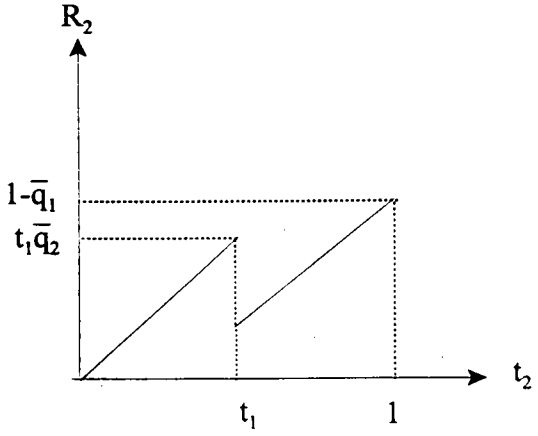

Figure 1 (b) - Government revenues when excess capacity in country 1 is "small"

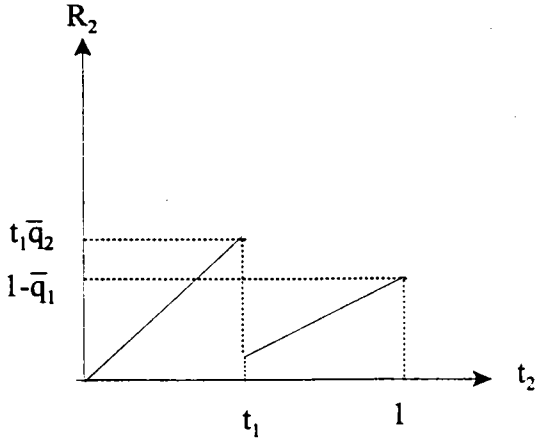

Figure 1 (c) - Government revenues when excess capacity in country 1 is "large"

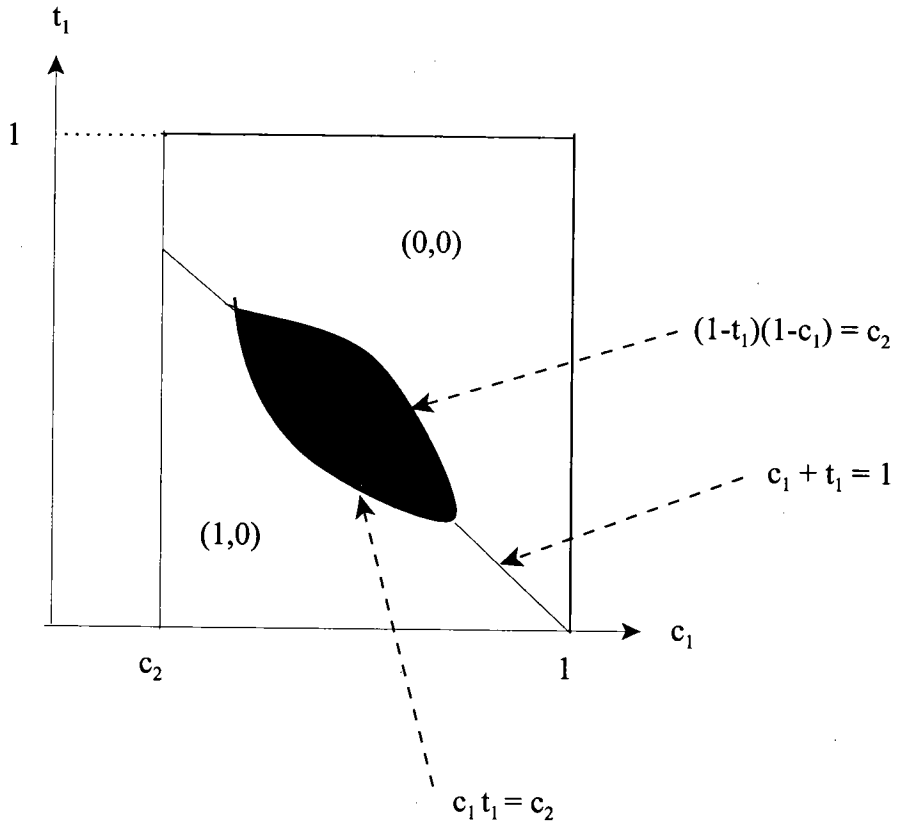

Figure 2: Investment Pattern without Subsidies

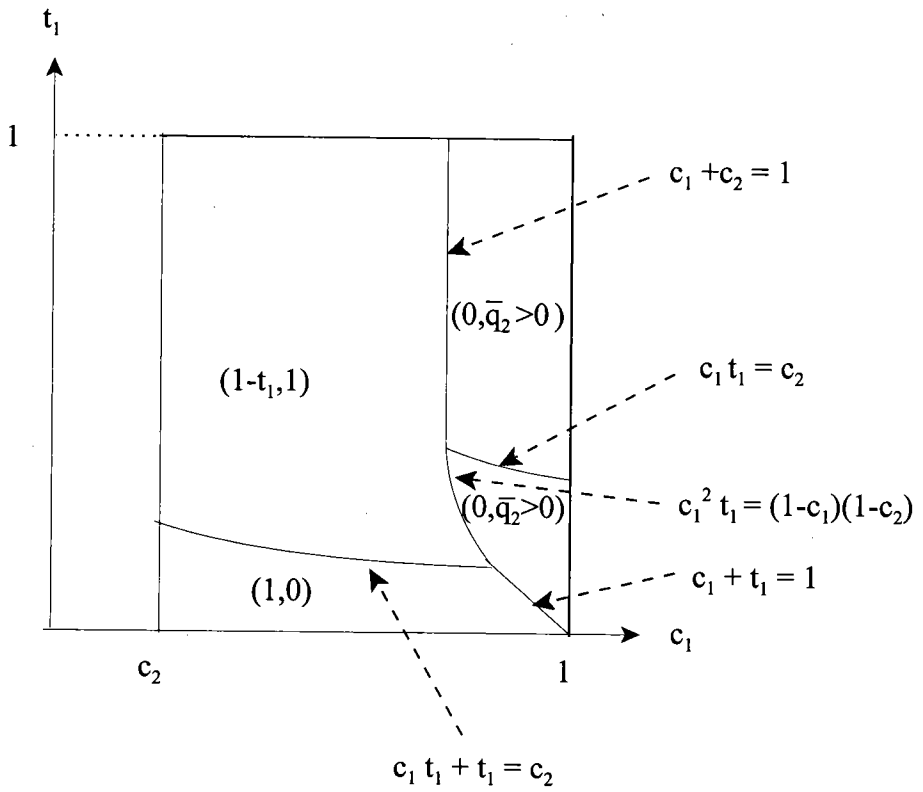

Figure 3: Investment Pattern with Subsidies