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Productivity and Taxes as Drivers of FDI

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ABSTRACT

We develop a framework in which the host country productivity has a positive effect on the intensive margin (the size of FDI flows), but only an ambiguous effect on the extensive margin (the likelihood of FDI flows to occur). The source-country productivity has a negative effect on the extensive margin.
An increase in the host-country corporate tax rate reduces the actual FDI flows the likelihood of such flows to occur. An increase in the source-country corporate tax rate reduces the likelihood of FDI flows. These predictions are confronted with Data on FDI flows, drawn from the International Direct Investment dataset (Source OECD), covering the bilateral FDI flows among 18 OECD countries over the period 1987 to 2003. We find some support for the main predictions of the model.

1. Introduction

Foreign direct investment (FDI) is a form of international capital flows. It plays an important role in the general allocation of world capital across countries. It is often pictured, together with other forms of capital flows, as shifting capital from rich, capital-abundant economies to poor, capital-scarce economies, so as to close the gap between the rates of return to capital and enhance the efficiency of the worldwide stock of capital. This general portrayal of international capital flows may indeed pertain to FDI flows from developed countries to developing countries. The latter are almost all net recipients of FDI.

However, this portrayal of international capital flow is hardly reminiscent of the FDI flows among developed countries, which are much larger than those from developed to developing countries. Although net aggregate FDI flows from, or to, a developed country are typically small, the gross flows are quite large.

In this paper we indeed focus on bilateral FDI flows among OECD countries. We study the effects of two sets of driving forces that affect FDI: productivity and taxation. Specifically, we attempt to shed some light on some key mechanisms though which these sets affect FDI flows.[3]

An important feature of our FDI model (which distinguishes FDI flows from portfolio flows) is fixed setup costs of new investments. This introduces two margins of FDI decisions. There is an intensive margin of determining the magnitude of the flows of

[3] Some macroeconomic studies emphasize the effect of FDI on long-run economic growth and cyclical fluctuations. A comprehensive study by Bosworth and Collins (1999) studies a somewhat related effect: that of FDI on growth. They provide evidence on the effect of capital inflows on domestic investment for 58 developed countries during 1978-1995.

FDI, according to standard marginal productivity conditions, and also an extensive margin of determining whether at all to make a new investment. Crucially, productivity and taxes may affect these two margins in different, possibly conflicting, ways. The magnitude of the setup costs can well be industry-specific, thereby giving rise to two-way rich-rich, as well as rich-poor FDI flows.

Threshold barriers play also an important role in determining the extent of trade-based foreign direct investment; see, for instance, Zhang and Markusen (1999), Carr, Markusen and Maskus (2001), and Helpman, Melitz and Yeaple (2004). The trade-based literature typically focuses on issues such as the interdependence of FDI and trade in goods and the ensuing industrial structure. For instance, they attempt to explain how a source country can export both FDI and goods to the same host country. The explanation essentially rests on productivity heterogeneity within the source country, and differences in setup costs associated with FDI and export of goods. The trade-based literature on FDI is based on a framework of heterogeneous firms, such as in Melitz (2003). Thus, the empirical approach in this literature is geared toward *firm-level* decisions on exports and FDI in the source country. Our approach is geared toward an analysis of *aggregate* bilateral FDI. Thus, trade-based empirical applications typically use micro-dataset, whereas we utilize countrywide datasets. Note that micro-cross-country panel datasets are not available, so that micro-based empirical studies typically have to be confined to a single source or host country and to extremely short time spans. In contrast, we employ here data for 19 OECD countries over a large interval of time (1987-2003).

We first study the role of source and host productivities on the two-fold FDI decisions. Specifically, we develop a framework in which the host country productivity has a positive effect on the intensive margin (the size of FDI flows), but an ambiguous effect on the extensive margin (the likelihood of FDI flows to occur). The source-country productivity has a negative effect on the extensive margin. These predictions are confronted with the data.

We then study the effects of corporate taxation on FDI. Earlier studies (e.g. Gropp and Kostial (2000) and Benassy-Quere, Fontagae and Laahreche-Révil (2000)) suggest that FDI is sensitive to tax rate differences. Our contribution is that the host and source tax rates may have differential effects on the two margins of FDI decisions. Therefore, the sensitivity of FDI to tax rate differentials may be blurred.

The organization of the paper is as follows. Section 2 presents an analytical framework with productivity as a driving force of FDI. Section 3 extends this framework to include corporate taxation as an additional driving force. Section 4 describes our econometric approach. Section 5 describes the data. The estimations results are presented in section 6. Section 7 concludes.

2. A Stripped-Down Model of FDI

Datasets of source-host FDI flows typically include many observations with zero flows. This may be indicative of the existence of fixed setup costs of establishing new FDI, thereby generating two margins for FDI decisions - an extensive margin about whether to invest all, and an intensive margin of about how much to invest.

We present in this section a simple, stripped-down model of FDI with fixed setup costs. Consider a pair of countries, "host" and "source", in a world of free capital mobility which fixes the world rate of interest, denoted by r. We will now describe the host-country, whose economic variables will be subscripted by "H". The description of the source-country is similar with a subscript "S". Variables with neither subscript are identical for the two countries. There is a representative industry whose product serves for both consumption and investment. Firms last for two periods. In the First period there is a continuum of N_H firms which differ from each other by an idiosyncratic productivity factor ε. The number N_H of firms (or entrepreneurs) is fixed. We refer to a firm which has a productivity factor of ε as an ε-firm. The cumulative distribution function of ε is denoted by $G(\cdot)$ with a density function $g(\cdot)$. That is, the number of ε-firms is $N_H g(\varepsilon)$.

We assume for simplicity that the initial net capital stock of each firm is the same and denote it by K_H^0. If an ε-firm invests I in the first period, it augments its capital stock to $K = K_H^0 + I$, and its gross output in the second period will be $A_H F(K,L)(1+\varepsilon)$, where L is the labor input, $F(\cdot)$ is the production function, and A_H is a country (H)-specific aggregate productivity parameter. Note that ε is firm-specific, whereas A_H is country-specific.

We assume that there is a fixed setup cost of investment, C_H, which is the same for all firms (that is, independent of ε). We assume that the fixed cost has two components. One component (denoted by C_{SH}) is borne by the FDI investor in her source-country. This may involve, for instance, management time and other expenses at the home headquarter of a multinational. The second component is a standard "adjustment cost" carried out in the host country. We assume that this cost involves labor input L_H^C only. Thus,

$$C_H = C_{SH} + w_H L_H^C, \tag{1}$$

where w_H is the host-country wage rate. We assume that, due to some (suppressed) fixed factor, F is strictly concave, exhibiting diminishing returns to scale, and diminishing marginal products of labor and capital. Note that the average cost curve of the firm is U-shaped, so that perfect competition, which we assume, can prevail.[4] Consider an ε-firm that invests in the first period an amount $I = K - K_H^0$ in order to augment its stock of capital to K. Its present value becomes $V^+(A_H, K_H^0, \varepsilon, w_H) - C_H$, where

$$V^+(A_H, K_H^0, \varepsilon, w_H) = \max_{(K,L)} \left\{ \frac{A_H F(K,L)(1+\varepsilon) - wL + (1-\delta)K}{1+r} - \left(K - K_H^0\right) \right\} \tag{2}$$

where δ is the rate of physical depreciation and r is the world (fixed) rate of interest.

The demands of such a firm for K and L are denoted by $K^+(A_H, \varepsilon, w_H)$ and $L^+(A_H, \varepsilon, w_H)$. They are given by the marginal productivity conditions

$$A_H F_K(K,L)(1+\varepsilon) = r + \delta \tag{3}$$

and

$$A_H F_L(K,L)(1+\varepsilon) = w_H, \tag{4}$$

where F_K and F_L denote the partial derivatives of F with respect to K and L, respectively. Naturally, ε is the bounded from below by -1, so that output is always

[4] With constant returns to scale, the fixed cost will entail diminishing average cost curve, in which case perfect competition cannot be sustained, Were we to assume that entry is free, one could have constant returns to scale at the industry level.

nonnegative. We denote by $\bar{\varepsilon}$ the upper bound of the productivity factor, that is $G(\bar{\varepsilon}) = 1$.

Note, however, that an ε-firm may choose not to invest at all (that is, to stick to its existing stock of capital, K_H^0) and avoid the lumpy setup cost C_H. Naturally, a firm with a low ε may not find it worthwhile to incur the setup cost C_H. In this case, its present value is

$$V^-(A_H, K_H^0, \varepsilon, w_H) = \max_L \left\{ \frac{A_H F(K_H^0, L)(1+\varepsilon) - w_H L + (1-\delta)K_H^0}{1+r} \right\}. \tag{5}$$

The labor demand of such a firm, denoted by $L^-(A_H, K_H^0, \varepsilon, w_H)$, is defines by

$$A_H F_L(K_H^0, L)(1+\varepsilon) = w_H . \tag{6}$$

A firm will choose to make a new investment if its present value with the investment exceeds its present value without the investment. Naturally, a higher productivity firm (namely, a firm with a higher ε) benefits more from investment; that is, the gap between V^+ and V^- increases with ε (a formal proof is available in Razin and Sadka (2007)). Therefore, there exists a cutoff level of ε, denoted by ε_0, such that an ε-firm will make a new investment if, and only if, $\varepsilon > \varepsilon_0$. This cutoff level of ε depends on A_H, C_H, K_H^0, and w_H. We write the cutoff ε as $\varepsilon_0(A_H, C_H, K_H^0, w_H)$. It is defined implicitly by

$$V^+(A_H, K_H^0, \varepsilon_0, w_H) - C_H = V^-(A_H, K_H^0, \varepsilon_0, w_H) \ . \tag{7}$$

That is, the cutoff productivity level is the level at which the firm is just indifferent between making a new investment, incurring the setup cost, and sticking to its existing capital stock, avoiding the setup cost.

The wage rate w_H is determined in equilibrium by a clearance in the labor market. We assume that labor is confined within national borders. Denoting the country's endowment of labor by $\overline{L}_H^0$, we have the following labor market-clearing equation:

$$N_H \int_{-1}^{\varepsilon_0(A_H, C_H, K_H^0, w_H)} L^-(A_H, K_H^0, \varepsilon, w_H) g(\varepsilon) d\varepsilon$$
$$+ N_H \left\{1 - G\left[\varepsilon_0(A_H, C_H, K_H^0, w_H)\right]\right\} L_H^C$$
$$+ N_H \int_{\varepsilon_0(A_H, C_H, K_H^0, w_H)}^{\bar{\varepsilon}} L^+(A_H, \varepsilon, w_H) g(\varepsilon) d\varepsilon = \overline{L}_H^0 \ .$$

Dividing the latter equation through by N_H yields

$$\int_{-1}^{\varepsilon_0(A_H, C_H, K_H^0, w_H)} L^-(A_H, K_H^0, \varepsilon, w_H) g(\varepsilon) d\varepsilon$$
$$+ \left\{1 - G\left[\varepsilon_0(A_H, C_H, K_H^0, w_H)\right]\right\} L_H^C$$
$$+ \int_{\varepsilon_0(A_H, C_H, K_H^0, w_H)}^{\bar{\varepsilon}} L^+(A_H, \varepsilon, w_H) g(\varepsilon) d\varepsilon = \overline{L}_H^0 \qquad (9)$$

where $L_H^0 \equiv \overline{L}_H^0 / N_H$ is the amount of labor per firm. (Note that there are $N_H \left[1 - G(\varepsilon_0)\right]$ firms that make new investments, employing an extra fixed input of L_H^C.)

Note that no similar marker-clearing equation is specified for capital, because we assume that capital is freely mobile internationally and its rate of return (n) is equalized internationally. The same description with the subscript S replacing H holds for the source-country.

Note that differences in labor abundance between the two countries are manifested in the wage differences. To see this, suppose that the two countries are identical, except that effective labor per firm is more abundant in the host-country than in the source-country, that is $L_H^0 > L_S^0$. Note also that the number of firms in the economy is also a measure of the abundance of entrepreneurship. Thus, the abundance (respectively, scarcity) of labor is also relative to the scarcity (respectively, abundance) of entrepreneurship. If wages were equal in the two countries, then labor demand per firm would be equal and the market-clearing condition (equation (8)) could not hold for both countries. Because of the diminishing marginal product of labor, it follows that the wage in the relatively labor-abundant country is lower than in the relatively labor-scarce country, that is $w_H < w_S$.[5] Thus, equal returns to capital (through capital mobility) coexist with unequal wages.[6]

2.1 M&A FDI

One may think of FDI as the investment of source-country entrepreneurs in the acquisition of host-country existing firms (whose number is fixed - N_H). We indeed deal initially with this kind of FDI through mergers and acquisitions (M&A). Suppose that the

[5] The equilibrium wage gap implies that the host-country employs more workers per firm than the source-country. Thus, even though the productivity distribution across firms is assumed equal, the source-country is effectively more productive in equilibrium.

[6] See also Amiti (2005) who studies the effect of agglomeration on cross-regional wage differences. See also Melitz (2003) for the role of fixed costs in intra-industry reallocations in reaction to industry-specific productivity shocks.

source-country entrepreneurs are endowed with some "intangible" capital, or know-how, stemming from their specialization or expertise in the industry at hand. We model this comparative advantage by assuming that the setup cost of investment in the host-country, when investment is done by source- country entrepreneurs (FDI investors) is only $C_H^* = C_{SH}^* + w_H L_H^{C^*}$, which is below C_H (the setup cost of investment when carried out by the host-country direct investors). This cost advantage implies that the foreign investors can bid up the direct investors of the host-country in the purchase of the investing firms in the host-country. Each such firm (that is, each firm whose ε is above $\varepsilon_0(A_H, C_H^*, K_H^0, w_H)$) is purchased at its market value, which is $V^+(A_H, K_H^0, \varepsilon, w_H) - C_H^*$. This essentially assumes that competition among the foreign direct investors shifts all the gains from their lower setup cost to the host-country original owners of the firm. The new owners also invest an amount $K^+(A_H, \varepsilon, w_H) - K_H^0$ in the firm.

Thus, the amount of foreign direct investment made in an ε-firm (where $\varepsilon > \varepsilon_0$) is

$$FDI(A_H, C_{SH}^*, K_H^0, \varepsilon, w_H) = V^+(A_H, K_H^0, \varepsilon, w_H) - C_{SH}^* + K^+(A_H, \varepsilon, w_H) - K_H^0 . \qquad (10)$$

Note that the acquisition price is $V^+ - C_{SH}^* - w_H L_H^{C^*}$, but $w_H L_H^{C^*}$ constitutes part of FDI; therefore only C_{SH}^* is subtracted in equation (10).

Aggregate notional FDI is given by

$$FDI_N(A_H, C_H^*, C_{SH}^*, K_H^0, w_H) = N_H \int_{\varepsilon_0(A_H, C_H^*, K_H^0, w_H)}^{\bar{\varepsilon}} FDI(A_H, C_{SH}^*, K_H^0, w_H, \bar{\varepsilon}) g(\varepsilon) d\varepsilon . \qquad (11)$$

Note that FDI_N, as defined in equation (11), would be the actual flow of FDI, when $\varepsilon_0(A_H, C_H^*, K_H^0, w_H)$ is below $\bar{\varepsilon}$. That is, FDI_N is the actual FDI only if

$$\varepsilon_0(A_H, C_H^*, K_H^0, w_H) \le \bar{\varepsilon}. \qquad (12)$$

Otherwise, the actual FDI would be zero. For this reason we refer to FDI_N as the <u>notional</u> FDI. The <u>actual</u> FDI, denoted by FDI_A, is therefore defined by:

$$FDI_A(A_H, C_H^*, C_{SH}^*, K_H^0, w_H) = \begin{cases} FDI_N(A_H, C_H^*, C_{SH}^*, K_H^0, w_H) & \text{if } (12) \text{ holds} \\ 0 & \text{otherwise} \end{cases} \qquad (13)$$

We refer to (12) as the selection-condition equation. It specifies when there will by any FDI flow to the host-country. Equation (11) is referred to as the flow equation which describes the actual FDI flow only if the selection-condition equation is satisfied.

2.2 Aggregate Productivity Shock: Flow and Selection

Note that the parameter A_H is a host-country specific productivity factor that applies to all firms in this country. We examine how a shock to this factor affects the aggregate level of FDI flowing to the host-country. Suppose first that the domestic wage rate (w_H) is fixed. A positive productivity shock has three positive effects on the notional FDI (namely, FDI_N), as specified in equation (11). First, it raises the marginal productivity of capital, thereby increasing the amount of investment that is made by each investing firm (which is acquired by FDI investors). Second, it raises the value of such firms and, consequently, their acquisition price which constitutes a part of the notional

FDI flows. Third, it increases the number of firms purchased by FDI investors (by lowering the threshold productivity level ε_0).[7,8]

Turning to the selection-condition equation (13), note that a positive aggregate productivity shock (while still maintaining the wage rate w_H constant) increases the profitability of investments and, consequently, reduces the likelihood that no firm will make any investment. Formally, a rise in A_H reduces the likelihood that the threshold idiosyncratic productivity ε_0 exceeds the upper bound on the idiosyncratic productivity $\bar{\varepsilon}$. That is, a positive aggregate productivity shock raises the likelihood of satisfying the selection condition, so that the notional FDI turns to be realized.

Thus, a positive aggregate productivity shock, keeping w_H fixed, raises the actual FDI (both through the flow and selection-condition equation).

Now, we drop the supposition that the wage rate w_H is fixed. When wages are not fixed (but are rather determined by the labor-market clearing equation (9)), then the increase in the demand for labor raises the wage rate (w_H) in the host-country (and the fixed setup cost $w_H L_H^C$), thereby countering the above three effects on the notional FDI. With a unique equilibrium, the initial effects of the increase in A_H are likely to dominate the subsequent counter-effects of the rise in w_H, so that the notional FDI still rises. Thus, an increase in the host-country's aggregate productivity factor (A_H) raises the volume of

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[7] For a formal derivation of the results see Razin and Sadka (2007).

[8] We assume plausibly that the third effect which represents the marginal investing firm is rather small relative to the margin of investment of all investing firms (the first effect). We ignore the third effect in the empirical investigation.

the notional FDI flows from country S to country H that is governed by the flow equation.

Next, consider the effect of an aggregate productivity shock on the selection condition equation. A rise in A_H increases the value of the domestic component of the setup cost, $w_H L_H^C$. This effect by itself weakens the advantage of carrying out positive FDI flows from country S to country H at all. In other words, as w_H rises, ε_0 rises, thereby reducing the likelihood of satisfying the selection-condition equation. The follow-up effect that is triggered by a positive aggregate productivity shock works in the opposite direction of the initial effect (holding w_H constant), and may dominate it.

To sum up, a positive aggregate productivity shock in the host-country raises the observed notional FDI flows in the flow equation and, at the same time, may lower the likelihood of observing positive FDI flows at all. Indeed, this possibility is demonstrated in Razin and Sadka (2007).

Note also that the source-country aggregate productivity factor (A_S) does not affect the flows of M&A FDI from country S to country H. This is because we assumed free international mobility of portfolio capital which set a common rate of interest (r) worldwide.

2.3 Greenfield FDI

So far, FDI has taken the form of mergers or acquisitions of the N_H existing firms. Consider now the possibility of establishing a new firm (that is, a greenfield FDI, where $K_H^0 = 0$). Suppose that the newcomer entrepreneur does not know in advance the productivity factor (ε) of the potential firm. The entrepreneur therefore takes $G(\cdot)$ as the cumulative probability distribution of the idiosyncratic productivity factor of the new firm. However, we assume that ε is revealed to the entrepreneur, before she decides whether or not to make new investment. The expected value of the new firm is therefore:

$$V(A, C_{nH}^{*}, w) = \int_{-1}^{\bar{\varepsilon}} \max\{V^{+}(A_H, 0, \varepsilon, w_H) - C_{nH}, 0\} g(\varepsilon) d\varepsilon, \tag{14}$$

where C_{nH} is the setup cost of greenfield investment. Note that when K_H^0 is equal to zero, only the firms with ε high enough to justify a greenfield investment have a positive value. This explains the max operator in equation (14).

Suppose that greenfield entrepreneurship is in limited capacity. Thus, an entrepreneur in a source country (and there are a limited number of them) may have to decide whether to establish a new firm at home (the source country) or abroad (the host country), but not in both. Her decision is naturally determined by where $V(\cdot)$, as defined in equation (14), is higher. She will invest in the host-country rather than in the source-country if, and only if,

$$V(A_H, C_{nH}^{*}, w_H) > V(A_S, C_{nS}^{*}, w_S) . \tag{15}$$

(We continue to maintain the assumption that the source-country entrepreneurs have a cutting-edge advantage over their counterparts in the host-country in establishing greenfield investments.)

This is a selection-condition equation for greenfield FDI. In contrast to the M&A case, there is a role played here by the aggregate productivity factor in the source-country (A_S). A positive shock to A_S increases the likelihood of the source-country entrepreneurs of staying at home, thereby reducing the likelihood of greenfield FDI flows from country S to H.

Note that in a many-country world, an entrepreneur from source country S chooses to invest in host country H, if the latter offers the most profitable investment. Also, she may need to outbid competitors from other source countries (for instance, in the case of acquiring a concession from the host-country government to operate something). In this case, $V(A_H, C^*_{nH}, w_H)$ in the selection-condition equation (15) must be the maximum over all $V(A_H', C^*_{nH}', w_H')$ for potential other host countries:

$$V(A_H, C^*_{nH}, w_H) = \arg\max_{H' \in D} V(A_H', C^*_{nH}', w_H') > V(A_S, C^*_S, w_S), \qquad (15')$$

where D is the set of potential host countries in which the entrepreneurs of source-country S can outbid all competing entrepreneurs from other potential source countries.[9]

Each entrepreneur in the source country, who decides to actually make a greenfield FDI in host-country H, invests according to the marginal productivity conditions. Aggregation over these entrepreneurs from source-country S provides a flow equation of greenfield FDI from S to H.

As we have seen, the host-country aggregate productivity factor (A_H) affects positively the notional FDI flows from source countries in the case of M&A flows;

[9] Eaton and Kortum (2002) applied the probability theory of extremes to provide a tractable form for a selection-condition equation in a similar context.

whereas the source-country aggregate productivity factor (A_S) has no effect on these flows. At the same time, a positive shock to A_H may reduce the likelihood of having M&A FDI flows to the host-country H (because of general equilibrium effects on wages in the host-country); again, A_S has no effects on these flows. In the case of greenfield FDI, a positive shock to A_H has positive effects both on the notional FDI flows to host-country H and on the likelihood of these flows to actually materialize. A positive shock to A_S does not affect the notional flows to host-country H, but it reduces the likelihood of such flows to occur at all. Note also that the likelihood of having greenfield FDI flows from country S to country H is negatively affected by positive productivity shocks in all other potential host countries (A_H').[10]

3. Source and Host Corporate Taxation

The economic literature has dealt extensively with the effects of taxation on investment, going back to the well-known works of Harbeger (1962) and Hall and Jorgenson (1967). Of particular interest are the effects of international differences in tax rates on foreign direct investment; see, for instance, Auerbach and Hassett (1993), Hines (1999), Desai and Hines (2001), De Mooij and Ederveen (2001), and Devereux and Hubbard (2003).

In this section we attempt to provide a new look at the mechanisms through which corporate tax rates influence aggregate FDI flows in the setup adopted here of twofold

[10] A comprehensive study of the latter effects (A_H') is not available. We ignore these effects in the empirical investigation.

investment decisions in the presence of threshold barriers. In this context, the source and host tax rates may have different effects on these two decisions (the flow and selection-condition equations).

Consider for concreteness the case of a parent firm that weighs the development of a new product line. We can think of the fixed setup cost as the outlays of developing this product line. The firm may choose to make the development at home and then carry the production at a subsidiary abroad. This choice may be determined by some "genuine" economic considerations such as source and host aggregate productivity factors, as discussed in the preceding section, and by tax considerations.

In this context there arises the issue of double taxation. The income of a foreign affiliate is typically taxed by the host country. If the source country taxes this income too, then the combined (double) tax rate may be very high, and even exceeds 100%.[11] This double taxation is typically relieved at the source country by either exempting foreign-source income altogether or granting tax credits.[12] In the former case, foreign-source income is subject to the tax levied by the host country only. When the source country taxes its residents on their world-wide income and grants full credit for foreign taxes (residence taxation), then in principle the foreign-source income is taxed at the source-country tax rate, so that the host-country tax rate becomes irrelevant for investment decisions the source-country residents. But, in practice, foreign-source income is far from being taxed at the source-country rate. First, there are various reduced tax rates for foreign-source income. Second, foreign-source income is usually taxed only upon

[11] For a succinct review of this issue see, for example, Hines (2001).

[12] This is also the recommendation of the OECD model tax treaty (OECD, 1997). A similar recommendation is made also by the United Nations model tax treaty (UN 1980).

repatriation, thereby effectively reducing the present value of the tax. Thus, in practice, the host country tax rate is much relevant for investment decisions of the parent firm at the source country. The relevance of the host-country tax rate intensifies through transfer pricing.[13]

Note that one of the major elements through which corporate taxation affects investment decision is the treatment of depreciation.[14] Denote the true rate of depreciation in host country H by δ_H, and the rate allowed for tax purposes by $\delta_H^{'}$. Concentrating, for simplicity, on M&A FDI, equation (2) becomes in this case

$$V^{+}(A_H, K_H^0, \tau_H, \varepsilon, w_H) = \max_{(K,\, L)} \left\{ \frac{[A_H F(K,L)(1+\varepsilon) - w_H L](1-\tau_H) + \tau_H \delta_H^{'} K + (1-\delta_H)K}{1+(1-\tau_H)r} - \left(K - K_H^0\right) \right\}, \tag{16}$$

where τ_H is the host-country corporate tax rate. Note that in the presence of taxation, the discount rate is the after-tax rate $-(1-\tau_H)r$. (This specification assumes that the subsidiary uses debt in the host country to finance the new investment.) Employing the envelope theorem, it follows from equation (16) that $\partial V^{+} / \partial \tau_H < 0$. That is, the present value of the cash flow falls when the corporate-tax rate in the host country rises, as is indeed expected. Furthermore, the amount of new investment depends negatively on τ_H. The first-order condition for the stock of capital (equation (3)) now becomes

$$A_H F_K(K,L)(1+\varepsilon) = r + \frac{\delta_H - \delta_H^{'} \tau_H}{1-\tau_H}. \tag{17}$$

[13] The 2005 Jobs Creation Act in the U.S. allows U.S. companies to pay merely a tax of 5.25% on their foreign-source income.

[14] See, for instance, Auerbach (1983).

This latter equation defines (implicitly) an equation for the flow of FDI. As $\delta_H^{'}$ is typically smaller than δ_H, it follows that the flow of FDI declines in τ_H.

The source-country parent firm will indulge into the project if, and only if,

$$w_H L_H^{C^*}(1-\tau_H) + C_{HS}^*(1-\tau_S) < V^+(A_H, K_H^0, \tau_H, \varepsilon, w_H) \,, \tag{18}$$

where τ_S is the corporate tax rate in the source country. Recall that $w_H L_H^{C^*}$ and C_{HS}^* are, respectively, the host-country and source-country components of the fixed cost C_H^*.

To sum up: as is evident from condition (18), the tax rate in the source country, τ_S, affects positively the decision by a parent firm in country S whether to carry out a foreign direct investment in country H; the tax rate in the host country, τ_H, has a negative effect on this decision. The tax rate in the source country, τ_S, is irrelevant for the determination of the magnitude of FDI flows; the latter are negatively affected by τ_H.

As before, there is a cutoff productivity level, denoted by $\varepsilon_0(A_H, C_H, L_H^{C^*}, C_{HS}^*, K_H^0, \tau_H, \tau_S, w_H)$, such that all firms with a firm-specific productivity level above ε_0 will make new investment and be acquired by FDI investors. All other firms will make no new investments and remain under domestic ownership. The cutoff level of ε_0 is defined implicitly by (18) with the inequality sign is replaced by an equality sign. It follows from equation (18) that an increase in the source-country corporate tax rate (τ_S) reduces ε_0, so that more firms are purchased by FDI investors. The reason for this is that a rise in τ_S reduces the after-tax source-country component of the fixed cost. Note that V^+ declines in τ_H. But a rise in τ_H reduces also the after-tax, host-country component of the fixed cost (namely, $w_H L_H^{C^*}(1-\tau_H)$). However, if the first effect dominates the second, which is plausible, then an increase in τ_H raises ε_0; that is, an increase in the host-country corporate-tax rate reduces the number of investing firms (which are also purchased by FDI investors).

As before, aggregate notional FDI is given by

$$FDI_N(A_H, w_H L_H^{C^*}, C_{SH}^*, K_H^0, \tau_H, \tau_S, w_H) = \int_{\varepsilon_0(A_H, w_H L_H^{C^*}, C_{SH}^*, K_H^0, \tau_H, \tau_S, w_H)}^{\bar{\varepsilon}} FDI(A_H, C_{SH}^*, w_H L_H^{C^*}, K_H^0, \tau_H, \tau_S, \varepsilon, w_H) g(\varepsilon) d\varepsilon \quad , \tag{19}$$

where, as before,

$$FDI(A_H, C_{SH}^*, w_H L_H^{C^*}, K_H^0, \tau_H, \tau_S, \varepsilon, w_H) = V^+(A_H, K_H^0, \tau_H, \varepsilon, w_H) - C_{SH}^*(1-\tau_S) + K^+(A_H, \tau_H, \varepsilon, w_H) - K_H^0 \quad , \tag{20}$$

and where K^+ is implicitly defined by equation (17).

The <u>actual</u> FDI will be equal to the notional FDI only when ε_0 is below $\bar{\varepsilon}$:

$$\varepsilon_0(A_H, w_H L_H^{C^*}, C_{HS}^*, K_H^0, \tau_H, \tau_S, w_H) \leq \bar{\varepsilon} \ . \tag{21}$$

The latter in the selection-condition equation. The actual flow of FDI (FDI_H) is thus

$$FDI_A(A_H, w_H L_H^{C^*}, C_{SH}^*, K_H^0, \tau_H, \tau_S, w_H) = \begin{cases} FDI_N(A_H, w_H L_H^{C^*}, C_{SH}^*, K_H^0, \tau_H, \tau_S, w_H) & \text{if condition (21) holds} \\ 0 & \text{otherwise} \end{cases} \tag{22}$$

Note that an increase in the host-country corporate tax rate (τ_H) reduces the actual FDI flows from S to H and the likelihood of such flows to occur. An increase in the source-country corporate tax rate (τ_S) reduces the likelihood of FDI flows from S to H to occur.[15]

4. Econometric Approach

The twofold nature of FDI decision gives rise to many cases of zero actual FDI flows. With *n* countries in a sample, there are potentially *n(n-1)* pairs of source-host (s,h) countries. In fact, the actual number of (s,h) pairs with observed flows is typically much smaller. Therefore, the selection of the actual number of (s,h) pairs, which is naturally endogenous, cannot be ignored; that is, this selection cannot be taken as *exogenous*. This feature of FDI decisions lends itself naturally to the application of the Heckman selection model (1974, 1979). This selection bias method is adopted to jointly estimate the likelihood of surpassing a certain threshold (the selection-condition equation) and the magnitude of the FDI flow (the flow equation), provided that the threshold is indeed surpassed.

Failing to take into account the selection-condition equation, by either dropping out observations with zero flows or by treating such observations as literally indicating zero flows, results in biased estimates of the coefficients of the flow equation. In addition, the selection-condition equation per se provides meaningful economic information about

[15] As before, we ignore the extensive margin effect of τ_S in the flow equation.

the determinants of FDI flows through the likelihood of having such flows at all. For a more detailed analysis – see Razin and Sadka (2007, chapter 7).

Figure 1 explains the intuition for the cause of the bias. Suppose, for instance, that x_{ijt} is an explanatory variable which measures the productivity differential between the *i*-th source country and the potential *j*-th host country in period t, holding all other explanatory variables constant. Our theory predicts that the parameter β_x is positive. This is shown by the upward sloping line *AB*. Note that the slope is an estimate of the "true" marginal effect of x_{ijt} on Y^*_{ijt}, the latent variable denoting the flow of notional FDI from the source country *i* to host country *j* in period *t*. But recall that flows could also be equal to zero, if the setup costs are sufficiently high. A threshold, which is derived from the setup costs, is shown as the curve TT' in Figure 1. However, if we discard observations with zero actual FDI flows, the remaining sub-sample is no longer random.

To illustrate, suppose that for high values of x_{ijt} (say, x^H in Figure 1), (*i, j*) pair-wise FDI flows are all positive. That is, for all pairs of countries in the sub-sample the threshold is surpassed and the *observed* average of notional FDI flows for $x_{ijt} = x^H$ is also equal to the conditional population average for FDI flows, point R on line *AB*. However, suppose that this does not hold for low values of x_{ijt} (say, x^L). For these (*i, j*)-pairs, we observe positive values of $Y_{i,j,t}$, the observed actual flow of FDI, only for a subset of country pairs in the population.[16] Point S is, for instance, excluded from the sub-sample of positive FDI flows. Consequently, for low x_{ijt}'s, we observe only flows between

[16] This will be indeed the case when the residuals in the flow and selection equations are positively correlated. An opposite bias occurs in the case of a negative correlation.

country pairs with low setup costs. As a result, the observed average of the FDI flows is at point M', whereas the "true" average is at point *M*. As seen in Figure 1, the OLS regression line for the sub-sample is therefore the A'B' line, which underestimates the effect of productivity differentials on bilateral FDI flows.

If we do not discard the zero FDI flow observations, the OLS estimates of β are still biased, because they are based on observations on *Y,* the actual FDI, rather than on Y^*, the notional FDI.

5. Data and Descriptive Statistics

We consider several potential explanatory variables of the twofold decisions on FDI flows. As in Razin and Sadka (2007), these variables include standard "mass" variables (the source and host population sizes); "distance" variables (physical distance between the source and the host countries and whether or not the two countries share a common language); and "economic" variables (source and host real GDP per capita, source-host differences in average years of schooling, and source and host financial risk rating). We also control for country and time fixed effects. The dependent variable in the flow equation is the log of the FDI flows. (The flow equation is also known as the "gravity" equation.)

The main variables are grouped as follows: (1) standard country characteristics such as real GDP per-capita, population size, educational attainment (as measured by average years of schooling), and financial sound rating (the inverse of financial risk rating); (2) (s,h) source-host characteristics, such as (s,h) FDI flows, geographical distance, common language (zero-one variable); (3) productivity; and (4) corporate tax rates. Productivity is approximated by labor productivity, that is, output per worker, as measured by PPP-adjusted real GDP per worker. This variable is at times instrumented by the capital/labor ratio and years of schooling. Corporate taxes are measured by the statutory rates or by the "effective" average rates, as compiled y Devereux, Griffith and Klemm (2002). The effective rates are at times instrumented by the statutory corporate tax rates and GDP per capita.

Table 1 summarizes the data sources. Table 1A in the appendix describes the list of the countries in the sample and indicates for each host-source pair the (time) average of FDI flows as percentages of the host and source GDP. Some source countries do not interact with more than with few host countries. We do not smooth the data by taking multi-year averages, but rather employ unfiltered annual data. This enables us to investigate the effects of the explanatory variables over the business cycle. In the text we present in Table 2 some aggregate statistics of the detailed country-pair data of Table 2A. Specifically, we consider all the EU countries, except the U.K. and Ireland, as one block of countries. We then present (time) average flows among this block, the U.K., the U.S., Ireland, and Japan as percentages of the host and source country/block GDP. This underscores the prominence of the U.S. as a source of FDI and the U.K., Ireland and Japan as recipients of FDI. Note that the EU (excluding the U.K. and Ireland) plays a relatively small role either as a source or host of FDI.

Data on FDI flows are drawn from the International Direct Investment dataset (Source OECD), covering the bilateral FDI flows among 18 OECD countries over the period 1987 to 2003.[17] The source OECD dataset reports FDI flows from OECD countries to OECD and non-OECD countries, as well as FDI flows from non-OECD countries to OECD countries. However, it does not report FDI flows from non-OECD to non-OECD countries. This is why we employ in our sample OECD countries only. The Source OECD provides data on FDI flows in U.S. dollars, and we deflate them by the U.S. CPI for urban consumers.

6. Empirical Evidence

As was mentioned before, productivity is taken as one of the drivers of FDI. Note that productivity is measured here by labor productivity. However, because both the latter and FDI flows are affected by other variables which are not controlled in the regression, such as business-cycle variables (e.g. interest rates, unemployment rate), we present in our results alternatives. In the first we simply employ labor productivity. In the second we instrument the labor productivity variable by the capital-labor ratio, years of schooling and country fixed effects.

As for the tax variables we employ first the statutory tax rates. Another alternative is the effective tax rates as compiled by Devereux, Griffith and Klemm (2002). These rates measure the gap between the cost of capital in the corporate sector (that is, the required rate of return on an investment) and the tax-free interest rate. For the same reasons as in the case of productivity, we also use the statutory corporate tax rates, GDP

[17] Razin and Sadka (2007) use also samples containing both OECD and non-OECD countries.

per capita and country-fixed effects as instruments to generate fitted values for the effective tax rates.

Table 2A in the appendix presents the instrumented productivity and tax equations. As expected, the coefficients of the capital-labor ratio and years of schooling are positive and significant in the instrumented productivity equation. Similarly, the statutory tax rate and GDP per capita are positive and significant in the instrumented tax equation. R^2 is very high, close to one, in both equations.

Consider first productivity as a driver of FDI flows. The estimation results are described in Table 3. Panel (1) refers to the uninstrumented productivities, whereas panel (2) considers fitted productivities. The coefficients of the variables other than the productivity and tax variables are presented "below the line" in this table. Source GDP per capita has a positive and significant effect on the flows of FDI in both panels. Host GDP per capita has a positive and significant effect on the flow of FDI in panel (2) only. Neither host nor source GDP per capita is significant in the selection equation. In contrast, the host population size has a negative and significant effect in the selection equation only. The source population follows a similar pattern but only in panel (2). As expected, the physical distance variable has a negative and significant effect in both equations and in both panels. Common language has a positive and significant effect in both panels, but only in the flow equation. Turning to the financial sound rating variable – it is only the source variable which has a negative (as expected) and significant effect, and the flow equation of panel (1) only. The source-host schooling gap is not significant throughout. The existence of previous FDI (a dummy variable) may be indicative of low setup costs. We therefore employ it as an exclusion restriction variable in the selection equation. Indeed, its coefficient is found to be significant and positive.

We turn now to the variables "above the line" which are at the focus of the investigation: the host and source productivity factors, as approximated by outputs per worker. In Panel (1) of Table 3 the host output per worker has a positive effect in both the flow and selection equations, but it is significant only in the flow equation. Source-country output per worker has a negative and significant effect on the selection mechanism. This result is consistent with the analytical framework developed earlier. Noteworthy, the source-country output per worker has also a negative and significant effect on the flow of FDI. In Panel (2) of Table 3, with the productivity variables instrumented by capital per worker and education attainment, the host productivity is positive and significant in both equations. The source productivity has a negative and significant affect both in the flow and selection equations.

All in all, the estimation results are consistent with the prediction of our theory that the source productivity has a negative effect on the likelihood of the occurrence of FDI, but that the host productivity has an ambiguous effect on this likelihood.

The effect of productivity on the flow and selection of FDI are depicted in Figures 2 and 3. Figure 2 depicts the effect of productivity in five host countries (the U.K., Ireland, France, Germany and Japan) on the flow of FDI from the U.S.. Throughout, all the explanatory variables, except the productivities in these host countries, are held constant, at their sample averages. The estimated coefficient of the host productivity (which is positive) is used to draw the graphs. The shaded boxes describe the frequencies of the productivities in all of these five host countries in the sample. The U.K. exhibits a high sensitivity of the FDI flows from the U.S. to its productivity, relative to the other EU countries and Japan in the "relevant" range (where the sample observations are concentrated).

In figure 3 we depict the effect of U.S. productivity on the likelihood of generating FDI from U.S. to each one of the aforementioned five host countries. This effect is negative, but relatively weak in the relevant range.

Consider next the tax variables. The estimation results are presented in the first three panels of Table 4. The first panel refers to the statutory tax rate; the second – to the effective tax rates; and the third – to the fitted effective tax rates. As expected, and as predicted also by our theory, the host tax rate has a negative and significant effect on the flow of FDI in the flow equation in all of these panels. This negative effect rises in magnitude when moving from the statutory, to the effective and to the fitted effective tax rate. Noteworthy, the source tax rate follows exactly the same pattern: it has a negative and significant effect in the flow equation, with the magnitude of the effect rising when moving from the statutory, to the effective, and to the fitted effective rate. This result may allude to the existence of source residence taxation in the source countries: as the source country taxes its residents on their income in the host country, the source country tax has a depressing effect on their investment abroad. The source tax rate has a positive and significant effect on the selection mechanism, as predicted by our theory, only in Panel (1). However, this effect intensifies and becomes even more significant, when we consider in Panel (4) a larger set of countries (for which we had data on the statutory rates only).

The effect of the statutory tax rates on the flow and selection of FDI are depicted in Figures 4 and 5. Figure 4 depicts the effect of corporate taxes in aforementioned five host countries on the flow of FDI from the U.S.. Throughout, all the explanatory variables, except the tax rates in these host countries, are held constant, at their sample averages. The estimated coefficient of the host tax (which is negative) is used to draw the graphs. As before, the shaded boxes describe the frequencies of the productivities in all of these five host countries in the sample. The U.K. exhibits a high sensitivity of the FDI flows from the U.S. to its tax rate, relative to the other EU countries and Japan, in the "relevant" range (where the sample observations are concentrated.

In figure 5 we depict the effect of the U.S. tax rate on the likelihood of generating FDI from U.S. to each one of the aforementioned host countries. This effect is positive and relatively strong for Ireland and Japan.

Apparently, when we look at the two sets of drivers (productivity and taxation) together, there arise some multicolinearity problems. As a result, the estimated results do not change much in sign but their statistical significance weakens. We present these results in Table 3A in the appendix.

7. Concluding Remarks

We study the role of productivity and corporate taxation as driving forces of FDI among OECD countries in the presence of threshold barriers, which generate two margins for FDI decisions.

Some simulations, based on the estimation results, suggest that there are marked differences in the sensitivity of FDI flows from the U.S. to productivity and taxes in OECD countries. The sensitivity of these flows to productivity in the U.K. is positive and high, relative to other EU countries and Japan. Similarly, the sensitivity of these flows to taxes in the U.K is negative and high, relative to other EU countries and Japan.

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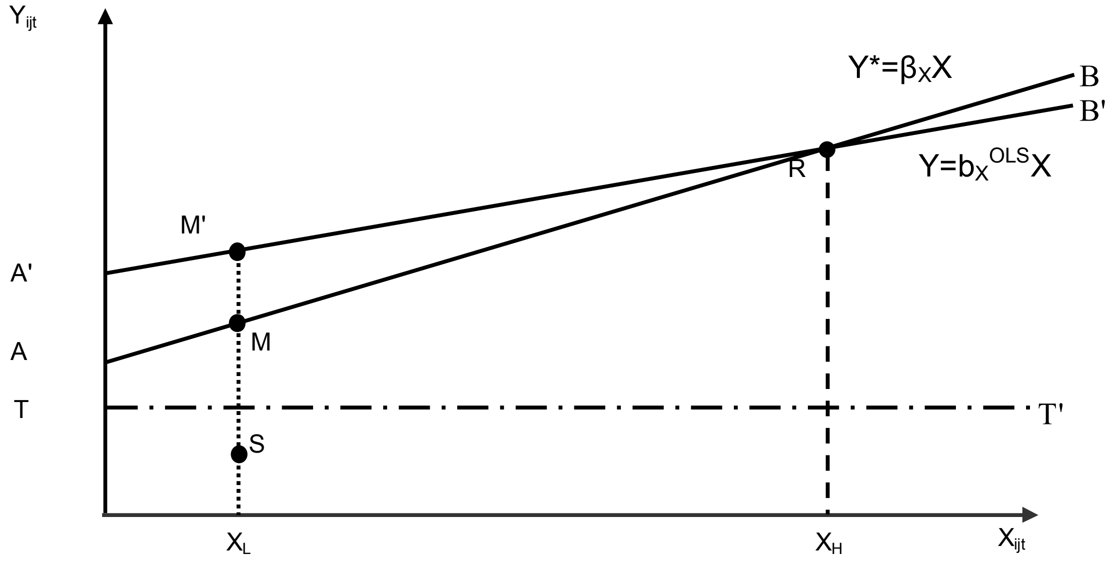

Figure 1: Biased OLS Estimates of the Flow Equation

Figure 2 - The Flow Equation: The Effect of Host-Country Productivity
Source Country: U.S.
Host Countries: France, Germany, Ireland, Japan, U.K

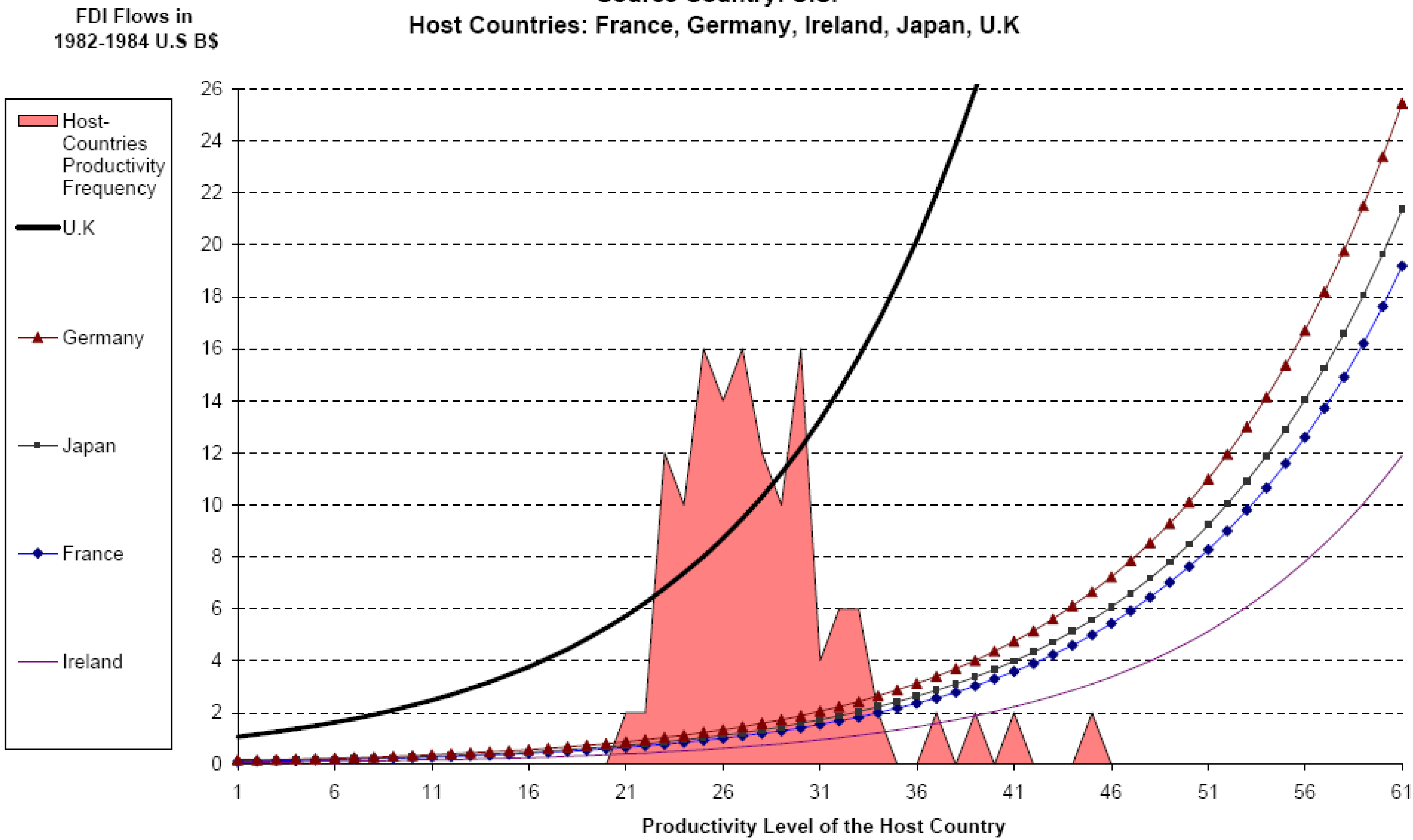

Figure 3 - The Selection Equation: The Effect of Source-Country Productivity
Source Country: U.S.
Host Countries: France, Germany, Ireland, Japan, U.K

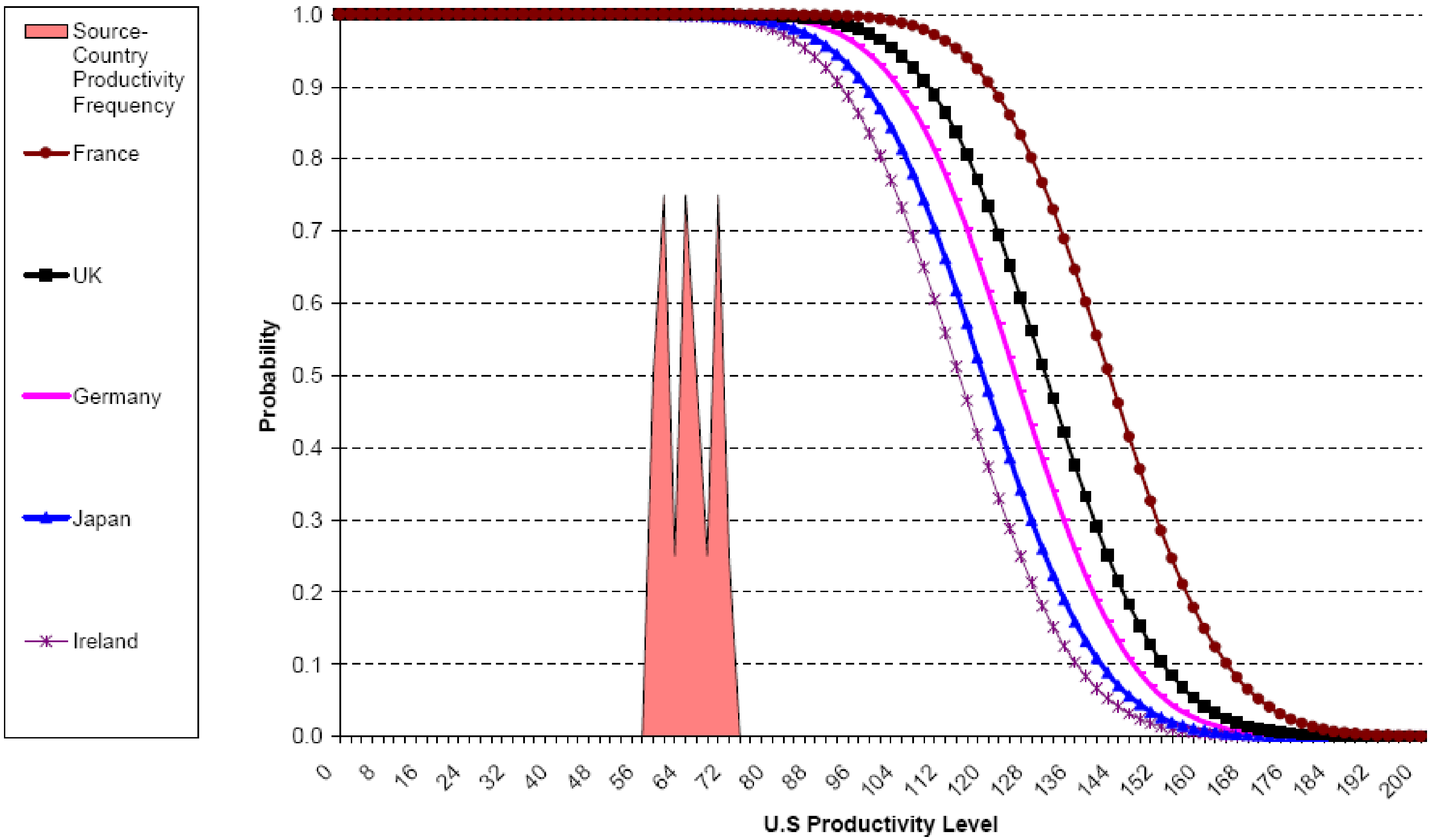

Figure 4 - The Flow Equation: The Effect of Host-Country Tax Rate
Source Country: U.S.
Host Countries: France, Germany, Ireland, Japan, U.K

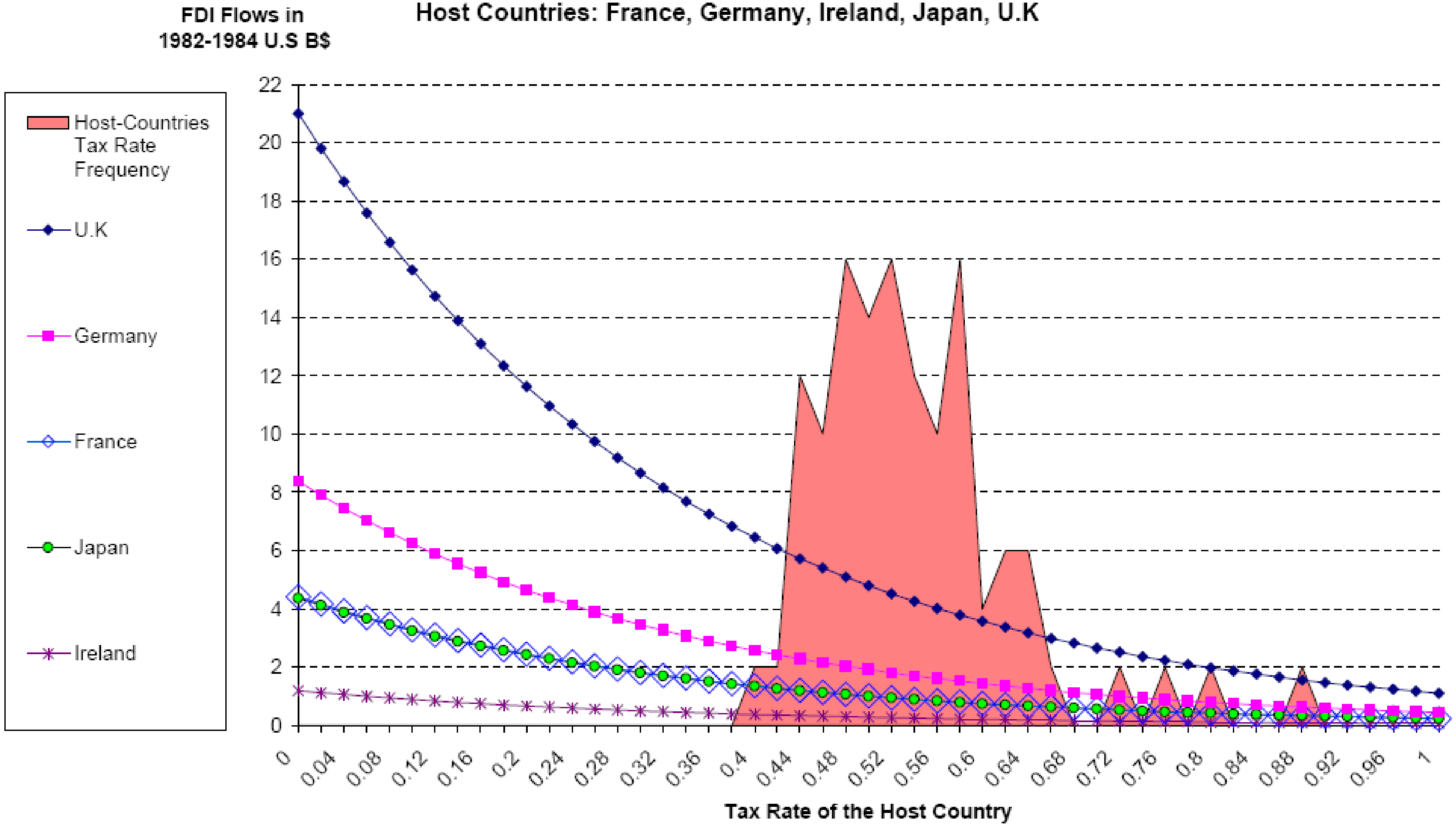

Figure 5 - The Selection Equation: The Effect of Source-Country Tax Rate
Source Country: U.S.
Host Countries: France, Germany, Ireland, Japan, U.K

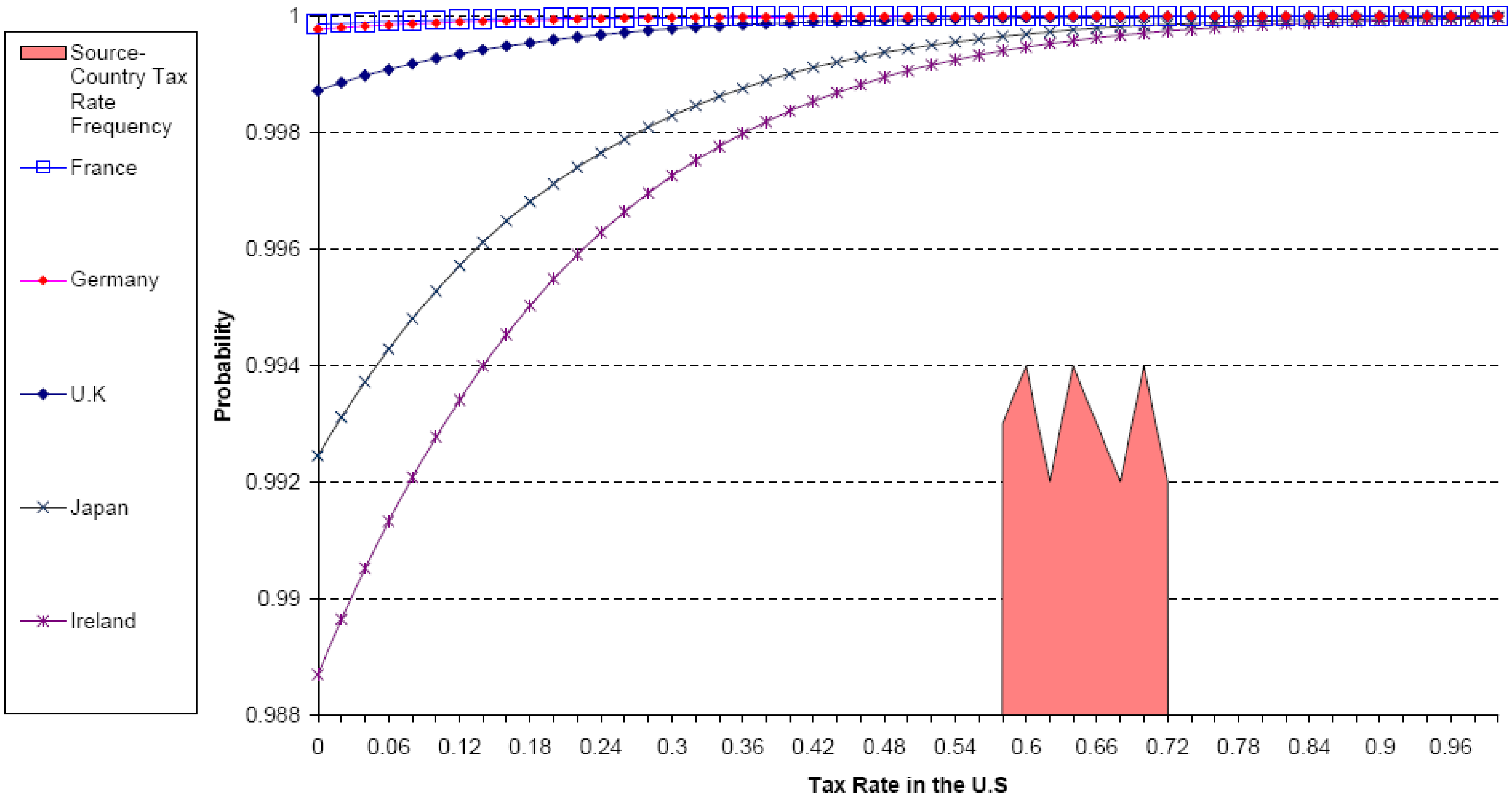

Table 1
Data Sources

Variables	*Source*
FDI Flows	International Direct Investment Database (OECD)
GDP	World Economic Indicators
Population	World Economic Indicators
Number of Workers	World Economic Indicators
Distance	Andrew Rose website: www.haas.berkeley.edu/~arose
Common Language	Andrew Rose website: www.haas.berkeley.edu/~arose
Education Attainment	Barro-Le Dataset, www.nber.org/pub/barro.lee/
ICRG Index of Financial Sound Rating (the inverse of Financial Risk Rating)	PRS Group
Capital Stock	Francesco Caselli website: http://personal.lse.ac.uk/casellif
Effective Tax Rates	Devereux, Giffith and Klemm (2002)

Table 2: Time Average of FDI Flows
(as percentage of the source and host countries' GDP)

		Source											
		11 EU members^		United States		United Kingdom		Japan		Ireland		Australia	
		source	host	source	host	source	host	source	host	source	host	source	host
Host	11 EU members^			0.312869	0.17889	2.376682	0.212644	0.144592	0.043268	3.054325	0.016687	0.13403	0.00359
	United States	0.256095	0.447895			2.113071	0.330653	0.436291	0.228337	2.287701	0.021859	0.627204	0.02938
	United Kingdom	0.158893	1.775918	0.22806	1.457443			0.135544	0.453339	0.801327	0.048932	0.428621	0.128307
	Japan	0.015865	0.053016	0.045511	0.086959	0.060505	0.01809			0.189286	0.003456	0.016369	0.001465
	Ireland	0.03258	5.963265	0.042012	4.396814	0.12974	2.124668	0.007071	0.387289			0.018591	0.091136
	Australia	0.012581	0.469737	0.033767	0.720863	0.134444	0.449123	0.044343	0.495434	0.065708	0.013404		

Note:
^ The countries are: Austria, Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Spain, Sweden and Portugal.

Table 3 - Bilateral FDI Flows and Selection Equations: Productivity Effect

	1		2	
	Flow	Selection	Flow	Selection
Productivity-source	**-0.066**	**-0.059**		
	(0.018)**	**(0.024)***		
Productivity-host	**0.042**	0.014		
	(0.018)*	(0.028)		
Instrumented productivity-source			**-0.080**	**-0.136**
			(0.033)*	**(0.052)****
Instrumented productivity-host			-0.012	0.047
			(0.036)	(0.046)
GDP per capita - source^	**5.812**	2.150	**3.515**	0.996
	(0.837)**	(1.124)	**(0.621)****	(0.667)
GDP per capita - host^	1.437	-1.532	**3.955**	-1.452
	(0.853)	(1.204)	**(0.607)****	(0.797)
Schooling difference	0.093	-0.053	0.002	0.022
	(0.063)	(0.069)	(0.070)	(0.081)
Common language	**0.516**	-0.179	**0.497**	-0.089
	(0.090)**	(0.118)	**(0.106)****	(0.148)
Distance^	**-1.013**	**-0.305**	**-1.081**	**-0.388**
	(0.044)**	**(0.074)****	**(0.048)****	**(0.088)****
Population-source^	0.754	-3.889	-1.363	**-7.880**
	(1.739)	(2.554)	(2.081)	**(2.972)****
Population-host^	-2.764	**-5.529**	-0.217	**-9.043**
	(1.463)	**(2.597)***	(1.683)	**(3.040)****
Financial risk-source	**-0.030**	0.023	-0.017	0.009
	(0.012)*	(0.019)	(0.014)	(0.025)
Financial risk-host	-0.015	-0.029	-0.019	-0.016
	(0.011)	(0.017)	(0.013)	(0.020)
Previous FDI dummy (1 if yes)		**1.538**		**1.500**
		(0.085)**		**(0.093)****
Observations	4702	4702	3833	3833

Note:
^ In logs;
Country and time fixed effects are accounted for; Robust standard errors in parentheses;
* significant at 5%; ** significant at 1%

Table 4 - Bilateral FDI Flows and Selection Equations: Tax Effect

	Panel A						Panel B^^	
	Flow	Selection	Flow	Selection	Flow	Selection	Flow	Selection
Tax rate-s	**1.795**	**1.656**					-0.131	**2.418**
	(0.579)**	**(0.759)***					(0.652)	**(0.904)****
Tax rate-h	**-2.955**	-0.504					**-1.963**	-1.063
	(0.621)**	(0.694)					**(0.734)****	(0.900)
Effective tax rate-s			**2.383**	1.331				
			(0.790)**	(1.051)				
Effective tax rate-h			**-3.096**	0.124				
			(0.841)**	(1.031)				
Instrumented effective tax rate-s					**2.400**	2.047		
					(0.912)**	(1.193)		
Instrumented effective tax rate-h					**-4.536**	-0.778		
					(0.974)**	(1.093)		
GDP per capita-s^	**2.961**	-0.498	**2.928**	-0.443	**2.841**	-0.581	**1.867**	-0.053
	(0.490)**	(0.505)	**(0.494)****	(0.511)	**(0.507)****	(0.524)	**(0.519)****	(0.543)
GDP per capita-h^	**3.235**	-0.798	**3.186**	-0.860	**3.493**	-0.747	**1.814**	-0.701
	(0.460)**	(0.580)	**(0.460)****	(0.588)	**(0.470)****	(0.595)	**(0.495)****	(0.603)
Schooling difference	**0.197**	-0.045	**0.174**	-0.075	**0.185**	-0.054	-0.068	-0.151
	(0.065)**	(0.070)	**(0.065)****	(0.069)	**(0.065)****	(0.069)	(0.070)	(0.078)
Common language	**0.516**	-0.192	**0.518**	-0.189	**0.517**	-0.192	**0.609**	0.088
	(0.087)**	(0.114)	**(0.087)****	(0.114)	**(0.087)****	(0.114)	**(0.103)****	(0.130)
Distance^	**-1.005**	**-0.248**	**-1.003**	**-0.246**	**-1.004**	**-0.248**	**-0.970**	**-0.457**
	(0.043)**	**(0.070)****	**(0.043)****	**(0.070)****	**(0.043)****	**(0.070)****	**(0.046)****	**(0.071)****
Population-s^	-0.114	**-4.395**	-0.563	**-5.064**	-0.060	**-4.433**	-1.364	-1.312
	(1.588)	**(2.220)***	(1.604)	**(2.276)***	(1.594)	**(2.223)***	(1.599)	(1.813)
Population-h^	-2.032	-2.845	-1.662	-2.922	-1.906	-2.822	-1.940	-0.466
	(1.315)	(2.323)	(1.348)	(2.366)	(1.320)	(2.324)	(1.232)	(1.721)
Financial risk-s	**-0.022**	0.023	**-0.023**	0.025	**-0.023**	0.023	0.002	0.019
	(0.011)*	(0.018)	**(0.011)***	(0.018)	**(0.011)***	(0.018)	(0.013)	(0.014)
Financial risk-h	-0.015	-0.031	-0.017	**-0.032**	-0.015	**-0.032**	-0.008	-0.021
	(0.011)	(0.016)	(0.011)	**(0.016)***	(0.011)	**(0.016)***	(0.011)	(0.015)
Previous FDI dummy (1 if yes)		**1.622**		**1.626**		**1.624**		**0.860**
		(0.083)**		**(0.083)****		**(0.083)****		**(0.108)****
Observations	4974	4974	4974	4974	4974	4974	3210	3210

Note:
^ In logs;
^^This panel relates to corporate tax rate (without local taxes) for additional 5 OECD countries: Denmark, Korea, Mexico, New Zealand and Turkey. Observations are smoothed over 2-3 years period;
Country and time fixed effects are accounted for; Robust standard errors in parentheses;
* significant at 5%; ** significant at 1%

Table A.1: Time Average of FDI Flows (as percentage of the source and host countries' GDP)

	Source	United States		United Kingdom		Austria		Belgium		
		source	host	source	host	source	host	source	host	
Host	United States			2.1131	0.3307	0.0503	0.0013	0.1445	0.0043	111
	United Kingdom	0.2281	1.4574			0.0927	0.0147			112
	Austria	0.0055	0.2196	0.0220	0.1385					122
	Belgium	0.0239	0.8078							124
	France	0.0338	0.1940	0.2495	0.2242	0.0268	0.0038			132
	Germany	0.0520	0.2055	1.0118	0.6259	0.1957	0.0192			134
	Italy	0.0257	0.1779	0.0494	0.0535	0.0415	0.0071			136
	Netherlands	0.1082	11.3238	0.5877	9.6242	0.0610	0.1589			138
	Norway	0.0089	0.4769	0.0504	0.4230	0.0023	0.0030	0.3661	0.5807	142
	Sweden	0.0361	0.0361	0.2852	0.0446	0.0286	0.0007			144
	Switzerland	0.0615	1.8512	0.2500	1.1770	0.0554	0.0415	0.2872	0.2558	146
	Canada	0.1084	1.3516	0.1219	0.2378	0.0122	0.0038	0.1877	0.0693	156
	Japan	0.0455	0.0870	0.0605	0.0181	0.0018	0.0001	0.1545	0.0087	158
	Finland	0.0020	0.1291	0.0158	0.1573	0.0032	0.0050			172
	Greece	0.0008	0.0571	0.0252	0.2841	0.0023	0.0040			174
	Ireland	0.0420	4.3968	0.1297	2.1247	0.0237	0.0616			178
	Portugal	0.0032	0.2551	0.0281	0.3522	0.0084	0.0167			182
	Spain	0.0217	0.3015	0.1019	0.2216	0.0192	0.0067			184
	Australia	0.0338	0.7209	0.1344	0.4491	0.0266	0.0141	0.0737	0.0466	193

	Source	France		Germany		Italy		Netherlands	
		source	host	source	host	source	host	source	host
Host	United States	0.6661	0.1160	0.6503	0.1645	0.0721	0.0104	10.5764	0.1011
	United Kingdom	0.5726	0.6370	0.3348	0.5412	0.0892	0.0824	4.3388	0.2649
	Austria	0.0133	0.0931	0.0830	0.8442	0.0069	0.0400	0.4940	0.1898
	Belgium								
	France			0.1645	0.2390	0.0850	0.0706	2.3512	0.1291
	Germany	0.3326	0.2289			0.0397	0.0227	2.8226	0.1066
	Italy	0.1155	0.1391	0.0617	0.1081			0.8949	0.0592
	Netherlands	0.2632	4.7957	0.1077	2.8523	0.1717	2.5967		
	Norway	0.0196	0.1824	0.0056	0.0757	0.0007	0.0055	0.1956	0.1001
	Sweden	0.0378	0.0066	0.0581	0.0147	0.0046	0.0007	0.7326	0.0070
	Switzerland	0.1070	0.5603	0.0572	0.4354	0.0231	0.1004	1.7004	0.4889
	Canada	0.1582	0.3433	0.0236	0.0743	0.0041	0.0073	0.6300	0.0751
	Japan	0.0537	0.0179	0.0288	0.0139	0.0084	0.0023	0.2918	0.0053
	Finland	0.0041	0.0455	0.0091	0.1457	0.0012	0.0112	0.2061	0.1250
	Greece	0.0058	0.0722	0.0077	0.1395	0.0036	0.0373	0.3343	0.2297
	Ireland	0.0588	1.0710	0.0669	1.7706	0.0266	0.4026	1.3414	1.3414
	Portugal	0.0174	0.2429	0.0143	0.2889	0.0082	0.0943	0.2017	0.1542
	Spain	0.1129	0.2731	0.0563	0.1978	0.0339	0.0681	1.3620	0.1809
	Australia	0.0225	0.0836	0.0196	0.1056	0.0046	0.0142	0.7249	0.1479

	Source	Norway		Sweden		Switzerland		Canada	
		source	host	source	host	source	host	source	host
Host	United States	0.2470	0.0046	0.0226	0.0226	1.8723	0.0622	1.2120	0.0972
	United Kingdom	0.3060	0.0365	0.0184	0.1177	0.8926	0.1896	0.2792	0.1431
	Austria	0.0304	0.0228	0.0004	0.0162	0.0988	0.1320	0.0034	0.0108
	Belgium	0.4630	0.2918			0.3193	0.3584		
	France	0.0928	0.0100	0.0089	0.0512	0.2122	0.0405	0.0837	0.0386
	Germany	0.3041	0.0224	0.0137	0.0543	0.5071	0.0666	0.0289	0.0092
	Italy	0.0237	0.0031	0.0052	0.0359	0.3404	0.0783	0.0083	0.0046
	Netherlands	0.1770	0.3457	0.0158	1.6565	0.3684	1.2814	0.2184	1.8333
	Norway			0.0128	0.6853	0.0980	0.1746	0.0016	0.0070
	Sweden	0.4273	0.0080			0.1303	0.0043	0.0287	0.0023
	Switzerland	0.0111	0.0062	0.0035	0.1050			0.0867	0.2093
	Canada	0.0939	0.0218	0.0012	0.0153	0.1250	0.0518		
	Japan	0.0019	0.0001	0.0004	0.0007	0.0876	0.0056	0.1048	0.0161
	Finland	0.0725	0.0859	0.0308	1.9554	0.0305	0.0644	0.0024	0.0122
	Greece	0.0027	0.0036	0.0000	0.0022	0.0439	0.1050	0.0024	0.0138
	Ireland	0.1090	0.2128	0.0086	0.8952	0.1486	0.5169	0.0086	0.0723
	Portugal	0.0058	0.0087	0.0005	0.0366	0.0654	0.1738	0.0218	0.1401
	Spain	0.0594	0.0154	0.0017	0.0237	0.1786	0.0825	0.0239	0.0266
	Australia	0.0102	0.0040	0.0005	0.0108	0.1026	0.0728	0.0783	0.1341

	Source	Japan		Finland		Greece		Ireland	
		source	host	source	host	source	host	source	host
Host	United States	0.4363	0.2283	0.7384	0.0116	0.0517	0.0007	2.2877	0.0219
	United Kingdom	0.1355	0.4533	0.2971	0.0299	0.0912	0.0081	0.8013	0.0489
	Austria	0.0009	0.0197	0.0273	0.0173	0.0009	0.0005	0.0022	0.0008
	Belgium	0.0115	0.2039						
	France	0.0246	0.0739	0.2059	0.0186	0.0063	0.0005	0.4087	0.0224
	Germany	0.0168	0.0348	0.6342	0.0395	0.0153	0.0008	0.5556	0.0210
	Italy	0.0038	0.0136	0.0683	0.0074	0.0023	0.0002	0.1225	0.0081
	Netherlands	0.0775	4.2425	0.8166	1.3470	0.0071	0.0104	1.3921	1.3921
	Norway	0.0024	0.0663	0.4541	0.3836	0.0004	0.0003	0.0083	0.0042
	Sweden	0.0018	0.0010	1.6341	0.0258	0.0015	0.0000	0.0285	0.0003
	Switzerland	0.0049	0.0765	0.5742	0.2723	0.0040	0.0017		
	Canada	0.0180	0.1174	0.0888	0.0175	0.0048	0.0008		
	Japan			0.0384	0.0012	0.0006	0.0000	0.1893	0.0035
	Finland	0.0013	0.0424			0.0004	0.0004	0.0570	0.0346
	Greece	0.0000	0.0012	0.0045	0.0051			0.0035	0.0024
	Ireland	0.0071	0.3873	0.0765	0.1262	0.0100	0.0145		
	Portugal	0.0006	0.0242	0.0190	0.0239	0.0043	0.0048	0.0906	0.0693
	Spain	0.0058	0.0422	0.0457	0.0100	0.0044	0.0009	0.3936	0.0523
	Australia	0.0443	0.4954	0.0376	0.0127	0.0008	0.0002	0.0657	0.0134

	Source	Portugal		Spain		Australia	
		source	host	source	host	source	host
Host	United States	0.0387	0.0005	0.2079	0.0150	0.6272	0.0294
	United Kingdom	0.0714	0.0057	0.1613	0.0742	0.4286	0.1283
	Austria	0.0210	0.0106	0.0133	0.0385	0.0003	0.0006
	Belgium					0.0144	0.0228
	France	0.0497	0.0036	0.0977	0.0404	0.0100	0.0027
	Germany	0.0150	0.0007	0.2154	0.0613	0.0168	0.0031
	Italy	0.0321	0.0028	0.0896	0.0446	0.0128	0.0041
	Netherlands	0.5102	0.6675	0.1753	1.3203	0.0747	0.3660
	Norway	0.0001	0.0001	0.0035	0.0135	0.0004	0.0010
	Sweden	0.0003	0.0000	0.0101	0.0007	0.0023	0.0001
	Switzerland	0.0092	0.0035	0.1071	0.2319	0.0048	0.0067
	Canada	0.0038	0.0006	0.0135	0.0121	0.0524	0.0306
	Japan	0.0000	0.0000	0.0208	0.0029	0.0164	0.0015
	Finland	0.0000	0.0000	0.0046	0.0211	0.0003	0.0008
	Greece	0.0059	0.0053	0.0087	0.0448	0.0000	0.0000
	Ireland	0.0653	0.0854	0.0259	0.1947	0.0186	0.0911
	Portugal			0.1373	0.7905	0.0001	0.0002
	Spain	0.6530	0.1135			0.0025	0.0016
	Australia	0.0007	0.0002	0.0220	0.0339		

Table A.2: The Instrumented Equations For Productivity and Effective Tax Rates

	1	2
	productivity	**Effective tax rate**
Capital-Labor ratio	**1.808E-04**	
	(6.09e-06)**	
Years of schooling	**1.262**	
	(0.092)**	
Tax rate		**0.642**
		(0.005)**
GDP per capita		**3.19e-06**
		(1.5e-07)**
Observations	4279	5414
R-squared	0.958	0.962

Note:
Standard errors in parentheses;
* significant at 5%; ** significant at 1%;

Table A.3: Bilateral FDI Flows and Selection Equations: Productivity and Tax Effects

	1		2	
	Flow	**Selection**	**Flow**	**Selection**
Productivity - source	**-0.060**	-0.051		
	(0.020)**	(0.026)		
Productivity - host	0.018	0.006		
	(0.018)	(0.031)		
Instrumented productivity - source			**-0.089**	**-0.135**
			(0.033)**	**(0.054)***
Instrumented productivity - host			-0.039	0.040
			(0.036)	(0.046)
Tax rate - source	1.036	1.212		
	(0.652)	(0.826)		
Tax rate - host	**-2.747**	-0.612		
	(0.655)**	(0.787)		
Instrumented effective tax rate - source			1.473	0.924
			(1.036)	(1.375)
Instrumented effective tax rate - host			**-5.388**	-1.489
			(1.115)**	(1.244)
GDP per capita - source^	**5.419**	1.666	**3.383**	0.895
	(0.949)**	(1.222)	**(0.657)****	(0.725)
GDP per capita - host^	**2.766**	-1.152	**4.890**	-1.192
	(0.878)**	(1.342)	**(0.624)****	(0.834)
Schooling difference	**0.174**	-0.019	**0.104**	0.053
	(0.066)**	(0.073)	**(0.074)**	(0.083)
Common language	**0.513**	-0.182	**0.495**	-0.094
	(0.090)**	(0.118)	**(0.106)****	(0.148)
Distance^	**-1.015**	**-0.306**	**-1.082**	**-0.393**
	(0.044)**	**(0.074)****	**(0.048)****	**(0.089)****
Population - source^	0.712	-3.860	-1.006	**-7.596**
	(1.788)	(2.556)	(2.058)	**(2.986)***
Population - host^	-1.738	**-5.398**	-0.081	**-8.931**
	(1.493)	**(2.633)***	(1.689)	**(3.023)****
Financial risk - source	**-0.026**	0.023	-0.012	0.011
	(0.012)*	(0.019)	(0.014)	(0.025)
Financial risk - host	-0.020	-0.027	**-0.029**	-0.015
	(0.011)	(0.017)	**(0.013)***	(0.020)
Previous FDI dummy (1 if yes)		**1.534**		**1.501**
		(0.085)**		**(0.093)****
Observations	4702	4702	3833	3833

Note:

^ In logs;

Country and time fixed effects are accounted for; Robust standard errors in parentheses;

* significant at 5%; ** significant at 1%