Corruption and Multinational Investment:
Micro-foundations and Empirical evidence

Josef C. Brada
Arizona State University

Zdenek Drabek
World Trade Organization

Jose Mendez
Arizona State University

M. Fabricio Perez
Wilfrid Laurier University

Abstract

How multinational corporations' (MNCs) investment decisions are affected by countries' corruption levels? In this paper, we develop a model to study the interaction between multinational corporations (MNCs) and the level of corruption in their home and host countries. The model predicts that host country corruption tend to reduce the likelihood and size of multinational investments. Moreover, our model also shows that, ceteris paribus, MNCs have incentives to invest in countries with similar levels of corruption as their home country. MNCs develop skills for dealing with corruption, and these skills become a valuable competitive advantage as they can be used in other nations with similar corruption levels. We empirically test the model's predictions using data on foreign direct investment from 49 home countries to 167 host countries for the period 2005-2009.

I. Introduction

This paper has two objectives. The first is to contribute to the understanding of the role of corruption, which we view as a proxy for institutional quality, in determining bilateral FD flows among a large sample of home and host countries. In our model, we retain the widely accepted finding that home- and host-country levels of corruption influence the direction and volume of FDI by creating economic environments that are either favorable or unfavorable to rational economic activity and thus to FDI. We call this effect the corruption environment effect since it captures the effect of the economic environment in the home and host countries on economic activity. The second objective is to suggest an alternative way in which institutions influence economic outcomes. Rather than viewing institutions only as environmental factors that either promote or hinder efficient economic activity, we argue that a home country's institutions have an important impact on the skills and capabilities of home-country firms, and these skills, in turn, influences their choices of host countries in which to invest as well as the amount that they may wish to invest, We show that this effect, which we call the skill-matching effect is, in the case of foreign direct invest flows, is an important one.

We construct a model of FDI that shows how the two effects of corruption interact to shape the pattern of bilateral FDI so that home- and host-country corruption reduce FDI while FDI flows between countries with similar levels of corruption will be ceteris paribus, greater than between countries with different levels of ~~We~~corruption. We test our model using data on Foreign Direct Investment (FDI) between 49 home countries and 167 host countries with corruption levels ranging from 1.30 to 9.70 on Transparency International's Corruption

Perceptions Index for the period 2005-2009. Our results confirm that both corruption levels and differences in corruption levels between home and host countries influence the likelihood and size of FDI flows between any two countries. Low levels of corruption in host countries lead to larger and more frequent FDI outflows while low levels of corruption in host countries also have a positive effect on the frequency and size of FDI inflows. Differences in home and host country levels of corruption also affect the likelihood and size of bilateral FDI. The larger the differences in national corruption levels, the less likely and smaller are is the FDI between the countries as predicted by our model.

In the next section of this paper, we present a brief literature survey and intuitive explanation of our model and then construct a formal model of corruption and MNC investment activity. Section III is devoted to the empirical test of the model, including data description, methodology, empirical results and a number of robustness checks. Section IV concludes.

II. General Model of Corruption and MNCs' Competitive Advantage

A. Literature Survey and an Intuitive Explanation of How Corruption Influences FDI

There is, by now, a vast literature relating the institutional environment, meaning the quality of institutions or the extent of corruption, to economic performance. In the case of foreign direct investment (FDI), in corrupt host countries foreign investors encounter an environment where they face dangers of predation by both the government and by private agents, a lack of protection for their property, including intellectual property and where contracting and exchange with other economic agents is both costly and subject to considerable risk. Such an environment imposes costs on firms and thus productivity and innovation suffer. As a result, foreign investors are less likely to invest in such countries. On the other hand, countries with good institutions, where corruption and predation are controlled, will be both more attractive to foreign investors and have firms better equipped and more inclined to undertake investments abroad. With regard to FDI, a number of studies has examined the effects of corruption on the flows of FDI between countries.[1] The consensus of these studies is that high levels of corruption or weak institutions in host countries make them less attractive for foreign investors and thus reduce their FDI inflows.[2] High levels of corruption in home countries have effects that are more ambiguous. On the one hand, some observers argue that firms in corrupt countries may seek to escape such unfavourable business environments by investing in host countries that have better institutions; others argue that home-country corruption reduces FDI outflows because firms that operate in corrupt environments are unlikely to have the technology and skills needed to succeed in less corrupt environments.

There is also evidence that MNCs from countries with a given level of corruption tend to favor investments in host countries with similar levels of corruption, For example, Cuervo-Cazurra (2006) and Cuervo-Cazurra and Genc (2008) find that MNCs from developing countries tend to invest more in "least developed" countries where corruption is high. China's outward FDI is slanted toward host countries that have weak market institutions and high levels of state involvement in the economy (Buckley *et al*., 2007, and Morck *et al*,. 2008). The dominant

[1] See Al-Sadig (2009) for a review of some of this literature.

[2] For example, Hinnes (1995) , Wei (2000) and Javorcik and Wei (2009) find a negative effect of corruption on foreign direct investment inflows, although Henisz (2000) and Jiménez et al. (2011) find insignificant or positive effects.

explanation for this phenomenon is that "cultural distance" between countries, as measured by the difference between their respective levels of corruption, acts as a barrier to FDI. This effect of "cultural distance" on FDI is sometimes attributed to information asymmetries.[3] The greater the cultural distance between the home and the host country, the less able is the foreign investor to gain accurate knowledge of the host country's institutions, local customs and laws, thus leading to a less efficient use of the investor's resources.[4]

In this paper, we propose a different explanation for greater FDI between countries with similar levels of corruption or institutional quality. This explanation rests on the work of Dunning (1998), who argued that MNCs develop competitive competencies that reflect their home country environments. While Dunning may have had factors such a resource endowments, factor prices, the level of development and competition in mind as factors shaping the competitive competencies of MNCs, it likely that MNCs also develop competencies in dealing with their home country's level of corruption or institutional quality. Firms in corrupt countries will learn how to best deal with an environment characterized by predation, uncertainties in the security of transactions and ambiguous property rights. Conversely, they are less likely to seek to develop firm-specific advantages such as proprietary technologies, brand names, etc. since these will be largely unprotected in their home countries. These skills in coping with specific home-country institutions should be transferable to other countries where the firm decides to invest, but the value or transferability of the skill will depend on the level of corruption in the host country.

[3] The negative effects of information asymmetry on portfolio capital flows are examined by Portes et al. (2001), Portes and Rey (2005) and Gelos and Wei (2005). Habib and Zurawicki (2002) demonstrate the salience of cultural distance for FDI.

[4] The idea behind the "cultural distance" effect is related to Adam Smith's (Smith 1976 p. 454) early observations with respect to capital mobility discussed by Gordon and Bovenberg (1996).

If both home and host country have similar levels of corruption, the skills learned in the home country can provide valuable competitive advantages in the host country, but if the host country has a very different corruption level, the home country skills will yield smaller competitive advantages. Firms in countries with low levels of corruption will have little experience and ability in dealing with a corrupt environment, and they will develop firm-specific assets such as proprietary technology, brand names, etc. as the means for competing with other firms in their home country.[5]

Thus there are two potential ways in which corruption influences FDI flows. One is what we call the corruption environment effect (CEE), which reflects the effects of host- and home-country corruption levels on the productivity or economic efficiency that firms can achieve given the institutional quality of their host and home countries and which has been the foundation for the study of the effects of corruption on FDI flows. The second effect is what we call the skill-matching effect (SME), which is the effect on FDI flows of similarities between home- and host-country institutional quality and levels of corruption. In this paper, we propose a model that incorporates these two ways in which corruption influences MNCs' investment decisions. The model predicts that FDI flows will be greater for firms from home and host countries with lower levels of corruption, but that FDI flows will be greater the more similar are home and host countries in their levels of corruption. Moreover, differences in corruption levels will influence

[5] There is clear evidence that all these skills developed by MNCs in their home country then carry over to their ability to operate in similar environments in potential host countries (Hillman and Hitt, 1999; McWilliams, et al., 2002; Henisz, 2003).We do not exclude the possibility that firms can also learn such skills for coping with corruption in host countries rather than in their home country, but we view such effects as secondary.

both the likelihood of investment between any two countries taking place and the value of FDI that may take place.

B. A Model of Corruption and Foreign Direct Investment

In this section we develop a model that shows how firms' skills in dealing with home and host-country country corruption influence the pattern of bilateral FDI flows. To sharpen the focus on the role played by differences in cross-country corruption levels, our model makes simplifying assumptions that make home and host country corruption levels the only determinant of the pattern of bilateral FDI. Specifically, we assume that all nations are identical in terms of size, available production technologies, consumer preferences, endowments, etc. Countries are assumed to differ only in the level of corruption that prevails throughout the entire economy. Consequently, countries are distinguished by a value between 1 and 10 where a value of 1 signifies that a nation is most corrupt and a value of 10 signifies the one that is least corrupt. We assume that one country falls within each of the ten corruption categories.[6] Additionally, we treat the skills, experience or knowledge in coping with corruption like a public good so that their transfer and employment in another nation does not diminish the amount available for use elsewhere.

Each country serves as the home base for a group of MNCs that produce at home and abroad. Each of these groups is identified or referenced by their home country as in terms of *American* multinationals or *French* multinationals, etc. Moreover, from the perspective of consumers, the output of country 1's MNCs is similar to, but also different from, the outputs of

[6] The categorization is motivated by Transparency International's Corruption Perceptions Index that ranks nations in a similar way.

the other nine multinational groups operating in the host country. That is, in each host country, consumer preferences are Armington-like in that the product produced domestically by the home nation's multinationals and those produced by firms with parents from the other nine nations fall within the same broad product group, say manufacturing, but consumers treat each product as a different variety or product segment. Ignoring products outside this broad grouping, we adopt Cobb-Douglas preferences, where consumers in country j spend a fixed share, β_i, of their budget (Y) on each of the ten goods, yielding a utility U_j given by

$$Uj = \prod_{i=1}^{10} X_i^{\beta i}$$

where $\sum \beta_i < 1$. The advantage of this specification is that it yields simple product demand functions so that the amount of each product demanded, D_i is given by:

$$D_i = \beta_i Y \left(\frac{1}{P_i}\right) \qquad i = 1, \ldots, 10 \qquad Eq. 1$$

where P_i s the price of good i. In the ensuing analysis we assume that the β_i are identical for all countries and thus drop the subscript i.

The production side of the model assumes that all firms within this 'manufacturing' product segment populated by these ten groups of multinationals share the same Cobb-Douglas production technology where the output, Qi is given by:

$$Qi = A\, K_i^{\alpha k} L_i^{\alpha l} \qquad i = 1, \ldots, 10$$

where αk and αl are, respectively, the capital and labor factor shares and K and L are the capital and labor inputs respectively and A is total factor productivity. This production function yields a tractable conditional factor demand function for capital. Letting w and r represent, respectively,

Comment [J1]: Jose: I think we need to define X and to clean up the subscripts – what is i for example --- it is an index of countries and of goods which is confusing to the reader the wage and rental rate for capital, the solution to the standard cost minimization problem yields the following demand for capital:

$$Ki = \left[\frac{w\ \alpha k}{r\ \alpha l}\right]^{\alpha l/(\alpha l+\ \alpha k)} \left[\frac{Qi}{A}\right]^{1/(\alpha l+\ \alpha k)}$$

which simplifies to

$$Ki = \left[\frac{w\ \alpha k}{r\ \alpha l}\right]^{\alpha l} \left[\frac{Qi}{A}\right] \qquad i = 1, \ldots 10 \qquad\qquad Eq. 2$$

if $\alpha k + \alpha l = 1$. These expressions, known as conditional input demand equations, indicate each investing firm's optimal or desired capital stock.

Having described the production and demand side of the model, we now turn to the treatment of corruption and its impact on investment. We can proceed in one of two ways. One is to treat corruption as a tax on the sale of a final good. This would be appropriate, for instance, in those cases where corruption is facilitated by the physical presence of each unit so that the additional costs per unit are in turn transferred to consumers in terms of higher prices. An alternative approach is to treat corruption as causing a reduction in total factor productivity (A). Here, productivity declines as producers divert time, energy, and resources to addressing the demands placed on them by a corrupt environment and, as a result, they produce less output from a given level of inputs. Both approaches lead to identical results in our framework, and thus, without loss of generality, we treat the effects of corruption akin to the imposition of a tax on the final good.[7]

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[7] In this formulation we follow Wei (2000), who also views corruption as imposing a tax on the foreign investor and estimates the tax-equivalent of a host country's level of corruption.

In the analysis that follows below, we assume that two broad influences impact the magnitude of the corruption tax that a multinational from country *j* faces when operating its affiliate in country *i*. This tax, denoted as τij, will reflect the skill matching identified by Dunning's (1998) and the corruption environment effect. We model each effect as follows.

The skill-matching effect depends on two factors. First, it depends directly on $|Ci - Cj|$, the absolute value of the difference in corruption levels between the home country, the location where the multinational gained its experience in addressing corruption, and the host nation. The more similar the source and receiving nation's corruption ratings, the lower is the value of $|Ci - Cj|$ and hence the lower the implicit tax rate on foreign MNCs. Alternatively, the more dissimilar the respective ratings, the higher the value of $|Ci - Cj|$ and the higher the tax. This specification reflects the assumption that multinationals are more successful in overcoming corruption in their new production location if they originate from a nation characterized by a similar level of corruption.

Second, in terms of the skill-matching effect, we also consider the breadth or span of applicability of the skills learned in one setting to those in a different setting. In other words, the corruption-tax level may be low if the host and source nation have a similar corruption level, but how close must the host country's corruption level be to the source nation's level? To capture the transferability of the skills learned in the home-country setting to the host country, we introduce the parameter δ. If the skills learned coping with the home-country level of corruption are unique to that environment, that is, are specific to a given level of corruption, then δ has a low value, say 1, meaning that skills learned in a nation with corruption level 3 may not be very applicable in a nation with a corruption classification only one level higher (corruption level 4) or lower (corruption level 2). On the other hand, if the skills are easily transferable and relevant across a broader range of corruption environments, so that δ has a higher value, say 5, then skills learned in a nation with one level of corruption may be to a greater or lesser extent also applicable in a host nation with a corruption classification that is somewhat different from that of the home country. In the extreme, skills learned in a host country could be so highly applicable in any nation that the corruption tax becomes irrelevant, in which case δ = 10. To capture the importance of the span of applicability of skills gained coping with corruption, we scale $|Ci - Cj|$ by (10 – δ) where δ is assumed to range from 1 to 10. Putting these two elements together, the skill-matching (SME) component of the corruption tax is

$$SME = 1 + (\frac{1}{\lambda})(10 - \delta)\ |Ci - Cj| \qquad \textit{Eq. 3}$$

where λ is a scalar used to parameterize the corruption "tax" rate. In our numerical examples below, we set λ = 180, and the maximum "tax" rate is thus 45%, which occurs when δ = 1 and $|Ci - Cj|$ = 9.

The corruption environment (CEE) component is straightforward to model. Clearly, all else the same, a host nation with a higher level of corruption should be impose greater costs on firms than one with less corruption.[8] Thus,

$$CEE = (\frac{1}{\emptyset})(10 - C_i) \qquad \textit{Eq. 4}$$

[8] So as not to complicate the model unnecessarily, we ignore the effect of home country corruption on FDI flows, although we include it in our empirical tests.

Consequently, $(\frac{1}{\emptyset})$ is the estimate of the tax rate associated with a 1 point difference between home and host country corruption levels. Combining the SME and CEE effects, we have

$$\tau ij = 1 + \left(\frac{1}{\emptyset}\right)(10 - C_i) + (\frac{1}{\lambda})(10 - \delta)\,|Ci - Cj| \qquad \textit{Eq. 5}$$

Note that, for the home country, the skill matching effect does not apply because $C_i = C_j$, but the corruption environment effect (CEE) does apply to the home country firms so that the home country firms face a tax, , which is given by

$$\tau i = 1 + \left(\frac{1}{\emptyset}\right)(10 - C_i) \qquad \textit{Eq. 6}$$

and, for the least corrupt country, $\tau i = 1$.

The final set of assumptions pertains to the market conditions under which the various firms operate. We abstract from general equilibrium effects so that the home and multinational firms are price takers in the host-nation product and factor markets. This means that all firms take factor prices, the wage rate *w* for labor and the rental rate *r* for capital, as set exogenously. It also means that all firms are price takers in their respective product market and that they set price equal to marginal cost. In light of the earlier assumptions regarding the similarity of the technology, all of these firms have the same unit cost. The competitive pricing conditions are such that the marginal cost, *c*, or price of the *i-th* good of the host-country (*h*) producer, $P_{h,i}$ given by:

$$P_{h,i} = \left[\frac{w}{\alpha l}\right]^{\alpha l}\left[\frac{r}{\alpha k}\right]^{\alpha k}\left[\frac{1}{A}\right] = c\,\tau i \qquad \textit{Eq. 7a}$$

and

$$P_{m,j} = \left[\frac{w}{\alpha l}\right]^{\alpha l}\left[\frac{r}{\alpha k}\right]^{\alpha k}\left[\frac{1}{A}\right]\ \tau ij = \boldsymbol{c}\,\tau ij \qquad \textit{Eq. 7b}$$

Comment [J2]: Again, the subscripts here are confusing – what are m and j?

for the output of the multinational firms. Foreign firms will encounter a higher implicit tax due to the SME effect, which will raise their costs and thus the price of their products in the host country, and this will reduce host-country demand for their product. As we noted earlier, corruption could reduce the production efficiency of multinationals, which would be captured by a reduction in *A*. This also would lead to a higher price, which confirms our earlier comment regarding the similarity of the two approaches to modeling the effects of corruption.

We are now able to derive an expression that indicates how the desired level of investment in a particular country is impacted by the degree of corruption in the host country. We begin by substituting Equations 7a and 7b, the price equations, into the set of product demand equations identified as Equation 1. Doing so allows us to determine the values of the Q_i's or industry outputs for the home firms and each of the multinational sectors. These values are in turn substituted into the conditional factor demands as given by Equation 2 to obtain, *K**, the desired stocks of capital of home-country firms' and multinational firms' respectively:

$$K^*_{h,i} = \left(\frac{1}{\tau ij}\right) \left(\frac{\beta Y}{r}\right) \left[\frac{\alpha k}{\alpha l}\right]^{\alpha l} / \left(\left[\frac{\alpha l}{\alpha k}\right]^{\alpha k} + \left[\frac{\alpha k}{\alpha l}\right]^{\alpha l} \right) = \boldsymbol{c} \left(\frac{1}{\tau i}\right) \qquad \textit{Eq. 8a}$$

$$K^*_{m,i} = \left(\frac{1}{\tau ij}\right) \left(\frac{\beta Y}{r}\right) \left[\frac{\alpha k}{\alpha l}\right]^{\alpha l} / \left(\left[\frac{\alpha l}{\alpha k}\right]^{\alpha k} + \left[\frac{\alpha k}{\alpha l}\right]^{\alpha l} \right) = \boldsymbol{c} \left(\frac{1}{\tau ij}\right) \qquad \textit{Eq. 8b}$$

It is evident that the *K**s are functions of corruption levels across countries as captured by the τij term. Higher levels of τij , whether due to higher levels of corruption and thus greater CEE effects or to greater SME effects resulting for greater differences in home-host corruption levels, reduce the amount of foreign investment that MNCs desire to undertake.

Several conclusions flow from Equations 8a and 8b. Note that, in the absence of corruption in all countries, τij = 1, and the desired capital stock for both home and host nation multinationals in each country would be the same and would reflect traditional considerations such as factor prices, technology and demand. Under our assumptions regarding identical endowments, tastes and technology of production, this means that each country's MNCs would invest in all other countries and they would have the same size of production facility and charge the same price in all countries, including in their home country. With inter-country differences in corruption levels, the CEE effect will result in smaller desired capital stocks for both foreign and home-country firms in more corrupt countries. The skill matching effect implies that the optimal capital stock, K_i^*, in county *i* is highest for the host country multinational since there is no skill matching tax on domestic firms (compare Equations 5 and 6). MNCs from other countries will have smaller desired capital stocks in the host country than does the host country firm, with MNCs from countries that that differ the most from the host country in their corruption level having the smallest desired capital stocks.

The implications of the model can be easily demonstrated by Table 1 and Figure 1. In Table 1 we abstract form the CEE effect to highlight the effects of the SME effect. If we divide the desired level of the capital stock for a multinational from home country *j* by that for the host country multinational, we obtain an indicator of the extent of foreign firms' desired investment relative to the corresponding level for the host country multinational. Table 1, Panels A and B show the results from this calculation for δ = 2 and δ = 8, respectively. Two patterns are immediately evident. First, excepting the two end values of corruption, 1 and 10, each row has an inverted-U shape in both Tables. The largest desired size of affiliates in the host country occurs when the source-country corruption level is closest to the corruption level of the host nation. The second pattern is that the higher δ, that is, the greater the span or range over which skills coping with corruption are applicable, the higher the MNC investment in any given country. For instance, the second entry in row 1 of Table 1 Panel A indicates that MNCs from source country 2 only desire a capital stock that is 71% of the host country's own firms, whereas in row 1 of Table 1b, these multinationals would desire 91% of the host country investors' capital stock. If MNCs' skills at dealing with corruption are applicable over a broader range of host-country environments, indicated by a higher value of δ as in Table 1b, differences in corruption levels between the home and host country have a less dampening effect on the desired stock of investment. Thus, in Table 1 Panel B all the percentages are higher than those in Table 1 Panel A.

Figure 1 adds the general corruption environment effect to the skill-matching effect. The lines for each host nation still have peaks, but the peaks occur at higher and higher levels as we move rightward in the direction of less home-country corruption. This means that MNCs from less corrupt countries will desire larger affiliates in other less corrupt countries than they would in more corrupt countries even if the differences in corruption level were of the same absolute value. The model thus reflects the general negative effect of corruption on economic activity since even host-country MNCs in corrupt countries have a lower desired level of investment in their own nation than they would in the absence of corruption.

An unresolved issue for an empirical test of this model is that it predicts that each home country will invest in all potential host countries. But the predicted investment in some hosts may be a very small fraction of the size of the parent company's capital stock in its home country, implying that foreign affiliates could be very small relative to the parent firm. However, there is a large literature on the way in which MNCs chose to serve foreign markets.[9] This literature suggests that there is a minimum size for affiliates, and if the host country does not provide a market large enough to meet the production of such an affiliate, then licensing or selling of technology, franchising and exports will replace FDI as the more profitable means of serving this market and no FDI will take place. Like the concept of minimum efficient scale (Scherer et al. 1975), there may be a minimum investment threshold that the desired capital stock must satisfy before an MNC decides to enter a host nation's market through FDI. The effect of this assumption on the model's predicted bilateral FDI is shown in Table1 Panel A. If we assume that the required minimum desired capital stock in any host country is 33 percent of the of the size of the home firm in the least corrupt country, then there are desired affiliate sizes that meet this condition, and they are denoted in bold face. Such investments are thus likely to occur. However, there are also desired affiliate sizes that are less than 33% of the desired capital stock in the home country, and, as they do not meet the minimum size requirement, they are thus not likely to take place. In cases where MNCs face large differences in corruption levels between home and host countries they may choose not to undertake bilateral FDI.

To sum up, our model predicts that, ceteris paribus, differences in the corruption level between home and host countries reduce the desired volume of bilateral FDI, and, if there is a minimum viable size for foreign affiliates, bilateral investment between such pairs of countries may be less likely to take place altogether. Moreover, countries with either very high or very low

[9] See Pyo, 2010 for a recent survey.

levels of corruption may also expect to receive or undertake fewer investment projects in total, but less corrupt countries will undertake larger FDI projects than do more corrupt ones.

III. An Empirical Test

In this section, we focus on empirically testing the predictions of our model for corruption and MNCs investment decisions. Our tests are based on bilateral foreign direct investment flows data obtained from the UNCTAD FDI database for the period 2005-2009.[10] Our sample includes FDI data for 49 home countries and 167 host countries, with corruption levels ranging from 1.30 to 9.70 (see Table 2). Data sets often used for MNCs decisions, at the firm level just incorporate few countries, thus very low variation in corruption levels.

The model developed in Section II demonstrates the effects of inter-country differences in corruption on MNCs' investment decisions. However, the model assumes that all countries are the same, in country size, endowments, level of development, location, etc. In our empirical work, we embed the theoretical insights of our model into a broader empirical model of MNCs investment, the so-called Knowledge-Capital Model of the Multinational Enterprise, or KK model, in order to account for the effects of these other drivers of FDI as well.

A. The Knowledge-Capital Model of the Multinational Enterprise

Theoretical models of trade and multinational firms distinguish between two types of multinational corporations (MNCs). Vertical MNCs engage in trade between the parent firm and foreign affiliates and seek to exploit international factor price differentials. This reflects the their

[10] We are implicitly assuming a rough correspondence between stock and flows of FDI.

desire to locate operations in foreign countries in order to obtain access to low-priced non-tradable or hard-to-trade inputs (Helpman, 1984; Helpman and Krugman, 1985). Horizontal MNCs seek to save on trade costs by serving markets through locally-based affiliates rather than through international trade (Markusen, 1984; Markusen and Venables, 2000). To take into account both motives for FDI, researchers often use the ‘‘knowledge-capital’’ (KK) model of foreign direct investment (Carr et al., 2001; Markusen, 2002). Depending on factor endowments, as well as on trade and investment impediments, the equilibrium configuration of horizontal and vertical MNCs and of national firms is endogenously determined.[11]

The econometric specification of the KK model proposed by Carr, et al. (2001), combines “horizontal” and “vertical” motivations for FDI. The model includes variables related with absolute and relative country size, bilateral trade costs, relative factor endowment and investment cost differences as key drivers of FDI. Specifications of the KK model often include additional variables such as tax policies and political risk that are specific to the FDI process and we consider some of these in our robustness tests.[12]

According to the knowledge-capital model (KK), the main drivers of FDI are: (1) absolute and relative country size, (2) transportation costs, measured by distance between countries as well as foreign plant set-up costs, and (3) relative factor endowment differences. The larger the home and the host countries' GDPs, the more probable it is that there will be FDI flows from country *i* to country *j* because a large host-country domestic market creates opportunities

[11] The role of hybrid or ‘‘complex’’ MNEs, which are neither purely horizontal nor purely vertical, has been emphasized by Ekholm et al. (2003), Grossman et al. (2003), Yeaple (2003) and Egger et al. (2004) and has been to some extent included in the KK model..

[12] Blonigen (2005) provides an argument for including such additional variables in the gravity equation specification as well as a discussion of the gravity equation’s shortcomings.

for capturing economies of scale and scope that promote the exploitation of firm-specific competitive advantages based on R&D, branding and the finer subdivision of production. A larger host-country GDP also attracts FDI because the costs of undertaking FDI are to some extent fixed, and thus investors will find larger host countries more profitable if they wish to expand sales at the least cost. Large economies are also likely to have a greater variety of specialized factors of production and resources that the foreign investor will find attractive. Following Egger and Winner (2006) we use the following variables to control for relative country size:

$$SUM_{ij} = GDP_i + GDP_j$$
$$GDP2_{ij} = 1 - (GDP_i / SUM_{ij})^2 - (GDP_i / SUM_{ij})^2$$

where GDP_i and GDP_j are the GDPs of the home and host countries in billions of 1995 US$ respectively.

The role of distance between countries is ambiguous. On one hand, FDI is used to overcome high transportation costs for low-value bulky goods or for non-tradable services, and, in this case, distance between the home and host countries has a positive effect on FDI. On the other hand, proximity also has a positive effect on FDI because proximity implies similar tastes and consumption patterns, promoting FDI that will increase sales in the host country. The literature on FDI suggests that not only is proximity a driver of FDI, but that adjacency of the home and host countries is also a particularly important stimulus to FDI. Consequently, in our model we use both distance and adjacency as separate explanatory variables so that:

$DIST_{i,j}$ = distance between the capitals of countries i and j

$ADJ_{i,j}$ = 1 if countries i and j are adjacent, 0 otherwise

The existence of international factor endowment differences is also an important motive for FDI (Helpman 1984; Markusen and Maskus 2002). As a measure of differences in skill endowments we use the differences between home and host countries values in the Human Development Index (HDI). The HDI has been published since 1990 by the United Nations Development Programme in their *Human Development Reports*. The HDI aims to provide a broader characterization of "development" by aggregating country-level attainments in life expectancy and education as well as income levels. Our measure of skill endowment differences, based on the HDI, is defined as follows:

$$SK_{ij} = HDI_i - HDI_j$$

The second set of drivers of FDI according to the KK model home- and host-country trade costs. We use a host country's imports as percentage of the GDP of the host country as a measure of host-country trade costs such as tariffs, and we call this variable $TChost_j$. For home-country trade costs we use the home-country external balance of goods and services and refer to this variable as $TChom_i$. Higher trade costs in the host country should stimulate FDI, as foreign firms will need to serve the market through affiliates rather than through foreign trade. Higher trade costs in the home country will make resource-seeking FDI less attractive for home country firms because they will find it more difficult to import components, parts and finished goods from foreign affiliates into the home country.

Our benchmark model will incorporate the all the KK variables described above. In order to test the empirical implications of our general model of corruption and MNCs competitive advantage as described in Section II, we will incorporate measures of corruption into the KK model.

B. Data

The explanatory variables described above come from the World Bank's *World Development Indicators* CD-ROM. As in many of the studies of bilateral FDI mentioned above, our home and host country corruption measure is the Transparency International Corruption Perceptions Index (CPI).[13] The bilateral investment flows, measured in US $, are taken from the UNCTAD FDI database, and we employed data for 2005-2009. There are 43 home countries and 167 host countries. The home countries encompass a broad variety of country sizes, locations, levels of development and corruption levels. The host countries include a large proportion of existing countries. The bilateral distances are obtained from the French Research Center in International Economics' (CEPII) Geodist data set.

Descriptive statistics of the FDI flows in our sample are presented in Table 3. Positive FDI flows represent 20.58% of our sample, negative flows are 6.63% of all observations, and, thus, 72.80% of observations consists of zero FDI flows. There is significant time variation in FDI flows. The size of positive flows peaks in 2007 and 2008, with the average bilateral investment flow close to 2 billion dollars, although the spread, as is to be expected is quite large. Positive flows drop to an average value of 752 million dollars in 2009 due to the global financial crisis. Negative investment flows, meaning either divestitures or a decline in the value of foreign affiliates, account for a small part of our observations and the dollar value of these flows is small

[13] Cuervo-Cazurra (2006), and Wei (2000) find that substituting other measures of corruption for the CPI does not change their conclusions regarding the effect of corruption on FDI.

relative to the positive investment flows. In Table 4 we present descriptive statistics of the corruption index by year and host or home country. The average value of the index is stable over time for both host and home countries. There is a small difference between the average level of corruption of home and host countries. Home countries have a higher average corruption index, meaning that they are less corrupt than are the host countries. Nevertheless, Table 4 shows that both home- and host-country samples encompass countries with a broad range of corruption levels.

C. Estimation

The theoretical results developed in section II imply that the skill-matching effect and the corruption environment effect have a negative effect on desired levels of multinational firms' capital. Following our theoretical model, we define the skill-matching and corruption environment variables as follows:

$$SMEi,j = 1 + (\frac{1}{\lambda})(10 - \delta)\,|Ci - Cj| = |Ci - Cj| \qquad \textit{Eq. 9}$$

$$CEE = (\frac{1}{\emptyset})(10 - C_i) = 10 - C_i \qquad \textit{Eq. 10}$$

$$HCC = (\frac{1}{\beta})(10 - C_i) = 10 - C_i \qquad \textit{Eq. 11}$$

Comment [J3]: Shouldn't all these variables have i, j subscripts? Can someone do that?

The stuff highlighted in yellow makes no sense. I think we need to say that the SME effect is captured by what is in yellow and that its parameter estimate then reflects the stuff in front of it. The same for CEE. By the way if the estimates coefficient for SME is 1 + ….., then shouldn't the estimated coefficient be >1?????

The variables C_i and C_j are home and host countries' CPI indexes. The parameters λ and $\emptyset$ are values of the parameters of the theoretical model which cannot be calculated from the parameter estimate of Equation 9. Similar case is the number 1, in the *SME* equation. The parameter δ is defined as the 'breadth' or span of applicability of the skills learned in one country to those in a different country. We assume that δ is constant over time and across country pairs in our empirical exercise, and it, too, cannot be computed from the value of the regression coefficient for Equation 9.[14] Equation 10 measures the effect of host country corruption on FDI inflows. The regression coefficient of this variable is thus equal to $(\frac{1}{\emptyset})$, and it is an estimate of the implicit tax or reduction in firms' productivity caused by home-country corruption, Finally, Equation 11 measures the effect of host country corruption on FDI outflows from that country and the regression coefficient is equal to $(\frac{1}{\beta})$, the change in outward FDI with respect to home country corruption.

Comment [J4]: How? I am not convinced.

Incorporating the corruption effects into the KK model yields the following specification:

$$FDI = \alpha + \beta KK_{ij} + \lambda_1 SM + \lambda_2 CE + \lambda_3 Home\_corr + \varepsilon_{it} \qquad Eq.\ 12$$

Comment [J5]: FDI needs i, j subscripts as do SME (I, j) CEE (needs the host country subscript and HCC needs the home country subscript. Also, TC host and TC home should have only one subscript not 2. Fabrisio, can you fix this. Somehow I am not able to get into your equations.

Where KK variables include: $SK_{ij}, ADY_{ij}, DISTL_{ij}, SUM_{ij}, GDP2_{ij}, TChost_{ij}, \mathrm{TChome}_{ij}$; as described before. According to our model, less corrupt countries will attract larger FDI flows. But, more important, we expect to observe larger FDI flows between countries with similar corruption levels, and the coefficient of the variable SME captures this effect.

[14] We analyze the possible effects of non-constant δ in the next section.

Estimating the KK model of bilateral FDI flows presents some econometric issues. One such issue is the fact that many bilateral investment flows are zero because there are no investment flows between many countries in a given year and there are also negative flows, for example in cases where foreign affiliates are sold off to host-country investors. To better accommodate the nature of our FDI data and to establish the robustness of our results, we use two estimation methods. We estimate the KK model by using OLS with all FDI flows, including all positive, negative and zero FDI observations and also by using a Tobit estimation where the censoring is at 0. Results using the two estimation techniques are reported in Table 5.

The parameter estimates for the KK model, with or without the corruption variables, are significant and in accord with theoretical expectations. Moreover, for both models, the inclusion of the corruption variables does not change the KK parameter estimates much, which suggests that the corruption variables do not serve as proxies for some of the KK variables. The Corruption Environment effect (CEE) coefficients are negative and significant for both estimation methods. This negative coefficient means that more corrupt countries receive smaller FDI inflows as our model predicts. The OLS estimate of the CEE coefficient yields an implicit tax of of 9%, meaning that a one point increase in the host countries CPI raises the cost of doing business in that country by 9 percent or reduces total factor productivity by that amount. This estimate is not different from the estimates of the corruption tax on foreign investors obtained by Wei (2000). The similarity of estimates given different specifications and samples suggests that this result is robust. The home country corruption effect (HCE) is also significant and at a value of -0,05 suggests that it is also a significant determinant of bilateral FDI flows. A one point worsening of a country's CPI imposes a 5% tax or reduction in total factor productivity on a home country's investments abroad.

Finally, the coefficient for the skill matching effect SME is negative, meaning that the greater the difference in corruption levels between the home and host countries, the less likely or smaller bilateral FDI will be. Note that the coefficients for CEE and SME are similar in magnitude. This means that the effect on FDI of the skill-matching component of the "corruption tax" is comparable to the effect of the general corruption environment variable in its effect because a one point improvement in the corruption level has about the same effect on FDI as a one point change in the difference in corruption levels between a pair of countries.

Our model also predicts that MNCs from a given home country are not lonely likely tio invest less in aa host country whose CPI difers greatly form that of the home country, but they are also less lileluy to nverst in that host country. We test this g hypothesis using a Probit estimation where FDI= 1 if a bilateral FDI flow is positive and 0 otherwise. The results are reported in Table 7. The estimates of the marginal effects of the corruption variables are all significant. An increase in the difference between home and host country CPIs has a negative effect on the probability of FDI taking place between the two countries that is comparable to the effect of an increase in the corruption level of the host country. Thus, both in terms of its effect on the volume of FDI flows and on their direction, the SME effect plays a significant role in determining the pattern of FDI.

D. Economic significance of Corruption

In this section we evaluate the economic significance of the skill-matching and corruption environment effects. We use Equation 11 as our benchmark model with parameters estimated using OLS. We begin by interpreting the estimated coefficients from our benchmark model. According to this model, an increase of one unit in host a host country's CPI implies an average decrease of 90 million US dollars of yearly bilateral (?) FDI flows through the CEE effect. Since the average positive FDI flow in our sample is 940.524 million US dollars, this implies that MNCs reduce their investment flows on average by 9.5% for each unit increase in the host country CPI.

Similarly, an increase of one unit in the difference between the CPIs of the home and host countries, causess, through the SME effect, an average reduction of 60 million dollars of yearly bilateral FDI flows. This implies that, ceteris paribus, multinational corporations invest less in countries with dissimilar corruption levels, reducing their investments on average by 6.5% for each additional unit of corruption difference.

To further explore the effect of the ~~skill~~ SME effects, we study how the empirical estimates change for different levels of home and host country corruption~~, our objective is to~~ to gain a better understanding of the economic implications of the skill matching effect for a pair of average home and host countries.

We start by estimating the FDI flows as predicted by Equation 11 for an average home and home country pair, with a given level of corruption, as follows:

$$F\hat{D}I_{ij} = \hat{\alpha}_c + \hat{\beta}\overline{KK_{ij}} + \hat{\lambda}_1 SM_{ij} + \hat{\lambda}_2 CE_j + \hat{\lambda}_3 Home\_corr_i$$

Comment [J6]: Fix to HCC

where $\overline{KK}$ stands for the average values of all variables in the KK model. The values for SM, CE and $Home\_corr$ are the integers from 0 to 10 representing the different levels of corruption. Thus $F\hat{D}I_{ij}$ will represent the predicted FDI flows from home country *i* to host country *j*, where home country

Comment [J7]: HCC

i is an average home country, and host country j is an average host country. In order to disentangle the SM effect we set the parameter $\hat{\lambda}_3$=0, and estimate FDI again, we refer to this predicted value as $F\hat{D}InoSM_{ij}$. We compute the pure effect of SME as the difference between $F\hat{D}I_{ij}$ and $F\hat{D}InoSM_{ij}$. We calculate the relative effect of SM as a percentage of $F\hat{D}I_{ij}$, and report it in Table 6 Panel A, for different combinations of home and host country corruption. The Ttable shows the percent reduction of FDI flows caused by the SME effect. For example for home countries with the same level of corruption as the host country, the SM effect is equal to zero, thus FDI flows are not reduced by the SM effect. However for countries with very large differences in corruption levels their FDI flows can be reduced by more than half.

Our last step is to multiply the percentage reduction in FDI flows ~~motivated~~ caused by the SME effect by the observed average FDI flows for different levels of home and host country corruption. These values in US million dollars are reported in Table 6 Panel B, are our estimates of the reduction in FDI flows per year for different levels of home and host country corruption (?). Since less corrupt countries in general receive more FDI inflows, the~~ir~~ impact pof the SNE effect in dollar terms will be larger. For example we estimate that a country with CPI=9 may reduce its FDI flows to the most corrupt countries by around 200 million dollars a year. For a country with CPI=3, this reduction is in the order of 30 million dollars since the typical FDI flow to such a country is already small..

E. Robustness

In this subsection we address additional estimation concerns to evaluate the robustness of our results. Given the large number of zero FDI flows, we recognize that our results may be driven by sample selection bias. Suppose that the propensity of a home-country firm to invest in a given host country is determined by the variables in Equation 11. If this propensity reaches a given threshold value, we will observe FDI flows between these two countries. However, if this propensity is low we will observe zero FDI flows. In order to deal with this potential problem, we use the Heckman (1979) selection model. We model the FDI flows as a two-stage process. First, in what we call the Location Choice Model, the investor selects the host countries in which to invest. Then, using what we call the FDI Outflows Model, she determines the amount to be invested. The first stage of the Heckman model is as follows:

$$FDI^{*} = \alpha + \beta KK_{ij} + \lambda_1 SM + \lambda_2 CE + \lambda_2 Home\_corr + \varepsilon_{ij} \qquad Eq.\ 12$$

$$FDIpro_{ij} = 1 \ if \ FDIpro_{ij}^{*} \geq C$$

$$FDIpro_{ij} = 0 \ if \ FDIproL_{ij}^{*} < C$$

where FDI_{ij}^{*} is a non-observable variable that measures the incentives for investors in country *i* to undertake FDI in country *j*. Investors in country *i* will invest in country *j* only if the endowments, distance, the level of economic development, etc. and the levels of corruption in the two countries make the investment sufficiently advantageous. If the propensity to invest is larger than the threshold value C, ($FDIpro_{ij}^{*} \geq C$), then we will observe FDI from county *i* to country *j*. $FDIpro_{ij}$ is a dummy variable equal to 1 if country *j* receives FDI from country *i* and 0 otherwise. The variables of KK_{ij} represent characteristics of countries *i* and *j* as specified by the KK model, the corruption variables are as before, and ε_{ij} is the random error. We estimate the parameters of the LC Model using Probit.

In the second stage we model the effect of corruption on the volume of bilateral FDI flows. Specifically, we propose a FDI Outflows Model, or OM model that is specified in a way similar to the model in ~~Eq. (4),~~Equation 11 although we add a selectivity regressor obtained from stage 1, the estimation of the LC model, yielding the following specification:

$$FDI = \alpha + \beta KK_{ij} + \lambda\lambda_1 SM + \lambda_2 CE + \lambda_3 Home\_corr + \lambda_4 Mills_{ij} + \varepsilon_{ij} \qquad Eq. \ 13$$

Comment [J8]: Change to HCC, Is the coefficient for SM right – 2 lambdas?

where , FDI_{ij} , the dependent variable, is the observed positive FDI outflow from home country *i* to host country *j* measured in ~~billions~~ millions (?) of US$. We include in our model specification a selectivity regressor denoted by $Mills_{ij}$. We include this selectivity regressor in order to control for possible sample selection in our data in the sense of Heckman (1979). The selectivity regressor corresponds to the Inverse Mill's ratio of the fitted values of the location choice model (Eq. 5), where:[15]

$$Mills_{ij} = \frac{\phi\left(\alpha + \beta KK_{ij} + \lambda_1 SM + \lambda_2 CE + \lambda_3 Home\_corr\right)}{\Phi\left(\alpha + \beta KK_{ij} + \lambda_1 SM + \lambda_2 CE + \lambda_3 Home\_corr\right)}$$

and ϕ and Φ are the standard normal probability and cumulative density functions respectively.

Comment [J9]: we use this letter already in the theoretical part of the paper, but it is standard notation for the Mills ratio, so we should pick another variable/letter in the theory part for this

Comment [m10]: *do not think this can cause any confusion, . But we can also change the notation here instead* ***Please use some other Greek letters***

[15] The independent variables included in the location choice model (Eq. 5) are not exactly the same as the ones included as explanatory variables in Eq. 11. The use of exactly the same variables would lead to multicollinearity problems. Thus, we use a different measure of factor endowment differences SK for Eq. 6. Following Egger and Winner (2006) we control for factor endowment differences using the absolute value of the differences between home and host countries per capita GDPs:

$$SK_{ij} = abs\left(\frac{GDP_i}{POP_i} - \frac{GDP_j}{POP_j}\right)$$

Results of these estimations are reported in Table 8. Once again, the coefficient for the difference in corruption levels is negative and significant in both models, meaning that both the likelihood and amount of FDI between two countries is negatively influenced by the differences in their corruption levels. The host-country and the home-country corruption level coefficients are both negative as above; less corrupt hosts are more likely to receive FDI and the inflows will be larger, while more honest home countries are more likely to undertake FDI, and, when they do, their investments are larger. In the location choice model, the coefficients for differences in home-host corruption and host-country corruption are of the same magnitude and same sign, which shows that the skill matching and general corruption environment effects both play an similar role in determining the location of FDI. However, in the FDI Outflows Model (labeled VOLUME in Table 8), the host corruption coefficient is over 5 times as large as the corruption differences coefficient, indicating that the size of investments, once the decision to invest in a country is made, is much more sensitive to host-country corruption than to differences in home and host corruption levels. Comparing the Probit results for location in Tables 6 and 8 suggests that correcting for selection bias is appropriate.

Next, we consider the possibility of omitted-variables bias. If important country-specific variables are omitted from our regression and are correlated with corruption levels, our estimation results will be biased. Fortunately, our data is a panel and controlling for omitted variables can be done by including country fixed effects. Results controlling for home-country fixed effects are presented in Table 9, for the OLS, and Tobit Models (Eq. 11) and the Heckman model of Eq. 13.[16] Results are robust to all specifications.

Finally, we analyze the effect of including alternative specifications of the KK model variables and the inclusion of other nontraditional variables in the regression. First (Table 10, columns 1 and 2), we follow Carr *et al*. (2001) and incorporate interaction terms in order to capture possible non-linear relations between variables that measure differences in endowments and trade barriers (column 1) and also include investment costs in the host country (column 2), in the KK model. As a proxy for investment cost we use the Economic Freedom of the Word Index (EFWI), developed by the Fraser Institute and we refer to this measure as $ICHost_j$. According to the Fraser Institute, the EFWI measures the degree to which the policies and institutions of countries are supportive of economic freedom by summarizing countries' information from five broad areas: (1) size of government, (2) legal structure and security of property rights, (3) access to sound money, (4) freedom to trade internationally and (5) regulation of credit, labor, and business. Third, Perez et al. (2011) find that an important non-traditional driver of FDI is money laundering, and host countries that are money laundering centers tend to attract higher levels of FDI. Because money laundering activities may be related to home- and host-country corruption levels, failure to control for these effects may bias our results. We use the measure of money laundering used by Perez et al. (2011), and we estimate results for two different specifications that control for money laundering, (Table 10 columns 3

[16] We do not control for fixed effects in the Probit model since the dependent variable is not continuous, however the Probit model is the first stage of the Heckman selection model. We report Heckman model results controlling for fixed effects.

and 4).[17] In each specification, the coefficient for the variable *Money*, which is set to one if the host country is considered a money laundering center, is positive and significant, meaning that countries that allow or facilitate money laundering do receive more FDI.

FDI can be also be motivated by similarities between home and host country economic environments, especially similarities in wealth and infrastructure. Cuervo-Cazurra and Genc (2008) address this issue emphasizing possible advantages an MNE from a poor home country can gain from investing in a poor host country, because such MNEs have experience in meeting the needs of low income populations. Similarly, an MNE that has more experience working in a home country with inefficient markets or a poor business infrastructure will have more success investing in a similar business environment. Based on this intuition we include unemployment (UNEMP) as measure of the efficiency with which a host country's markets function, and the number of internet connections for every 1000 habitants (INTER) as a measure of the host's infrastructure. We compute the absolute value of the differences between home and host countries and add them to our model (Table 10 column 5). The unemployment variable is negative and significant, meaning that countries with less efficient markets receive less FDI. The last column of Table 9 reports the results for a model that includes all the variables in the previous columns and also controls for country fixed effects. Our main results are robust to these changes in specifications.

IV. Conclusions

[17] They define a country as a money laundering center if it is listed as a "jurisdiction of primary concern" in the *International Narcotics Control Strategy Report* of the US Bureau for International Narcotics and Law Enforcement Affairs.

In this paper we have developed and tested a model of the influence of home and host-country corruption on FDI. Our results show that host-country corruption has a negative effect on the volume and likelihood of FDI inflows and that thes effects are, in economic terms, quite large. Corruption also influences the skills that a firm acquires in its home-country environment; firms from corrupt countries will become adept at dealing with corruption while firms from less corrupt countries will be less adept. Thus, firms from a corrupt host country are able to transfer these skills to their affiliates in other corrupt countries, and this effect steers FDI toward countries with similar levels of corruption. Our empirical results corroborate the model predictions. Additionally, home-country corruption also seems to reduce the likelihood and volume of outward FDI.

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Table 1: Corruption and Desired Capital Stocks of Foreign Investors in Various Host Countries

(as % of desired home-country firm's desired capital stock)

Panel A: Skill-Matching Effect Only (**δ=2**)

		Home Country Corruption Ranking									
		1	2	3	4	5	6	7	8	9	10
Host Country Corruption Ranking	1	**100%**	**71%**	**56%**	**45%**	**38%**	**33%**	29%	26%	24%	22%
	2	**71%**	**100%**	**71%**	**56%**	**45%**	**38%**	**33%**	29%	26%	24%
	3	**56%**	**71%**	**100%**	**71%**	**56%**	**45%**	**38%**	**33%**	29%	26%
	4	**45%**	**56%**	**71%**	**100%**	**71%**	**56%**	**45%**	**38%**	**33%**	29%
	5	**38%**	**45%**	**56%**	**71%**	**100%**	**71%**	**56%**	**45%**	**38%**	**33%**
	6	**33%**	**38%**	**45%**	**56%**	**71%**	**100%**	**71%**	**56%**	**45%**	**38%**
	7	29%	**33%**	**38%**	**45%**	**56%**	**71%**	**100%**	**71%**	**56%**	**45%**
	8	26%	29%	**33%**	**38%**	**45%**	**56%**	**71%**	**100%**	**71%**	**56%**
	9	24%	26%	29%	**33%**	**38%**	**45%**	**56%**	**71%**	**100%**	**71%**
	10	22%	24%	26%	29%	**33%**	**38%**	**45%**	**56%**	**71%**	**100%**

Panel B: Skill-Matching Effect Only (**δ=8**)

		Home Country Corruption Ranking									
		1	2	3	4	5	6	7	8	9	10
Host Country Corruption Ranking	1	100%	91%	83%	77%	71%	67%	63%	59%	56%	53%
	2	91%	100%	91%	83%	77%	71%	67%	63%	59%	56%
	3	83%	91%	100%	91%	83%	77%	71%	67%	63%	59%
	4	77%	83%	91%	100%	91%	83%	77%	71%	67%	63%
	5	71%	77%	83%	91%	100%	91%	83%	77%	71%	67%
	6	67%	71%	77%	83%	91%	100%	91%	83%	77%	71%
	7	63%	67%	71%	77%	83%	91%	100%	91%	83%	77%
	8	59%	63%	67%	71%	77%	83%	91%	100%	91%	83%
	9	56%	59%	63%	67%	71%	77%	83%	91%	100%	91%
	10	53%	56%	59%	63%	67%	71%	77%	83%	91%	100%

We report the predicted FDI in the host country as percentage of total host country investment. We only consider the Skill Matching Effect. In Panel A, δ=2, and in Panel B δ=8. Other model parameter values: are λ = 20, ϕ = 20.

Table 2: Home and Host Countries

Home Countries (49): Australia, Austria, Belgium, Bulgaria, Belarus, Brazil, Canada, Switzerland, Chile, China, Cyprus, Czech, Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Iceland, Israel, Italy, Japan, Lithuania, Latvia, Macedonia, Malaysia, Netherlands, Norway, New Zealand, Oman, Poland, Korea Republic of, Portugal, Romania, Russian Federation, Sweden, Thailand, Turkey, United States.

Host countries (167):

Afghanistan	Costa Rica	Indonesia	Namibia	South Africa
Albania	Croatia	Iran, Islamic Rep.	Nepal	Spain
Algeria	Cuba	Ireland	Netherlands	Sri Lanka
Angola	Cyprus	Israel	New Zealand	Sudan
Argentina	Czech Rep.	Italy	Nicaragua	Suriname
Armenia	Côte d'Ivoire	Jamaica	Niger	Swaziland
Australia	Denmark	Japan	Nigeria	Sweden
Austria	Djibouti	Jordan	Norway	Switzerland
Bahrain	Dominica	Kazakhstan	Oman	Syrian Arab Republic
Bangladesh	Dominican Rep.	Kenya	Pakistan	São Tomé and Princ.
Barbados	Ecuador	Kuwait	Palau	Tajikistan
Belarus	Egypt	Kyrgyzstan	Panama	Thailand
Belgium	El Salvador	Lao People's D.R.	Papua New Guinea	Togo
Belize	Equatorial Guinea	Latvia	Paraguay	Tonga
Benin	Estonia	Lebanon	Peru	Trinidad and Tobago
Bolivia	Ethiopia	Lesotho	Philippines	Tunisia
Bosnia and Herz.	Fiji	Liberia	Poland	Turkey
Botswana	Finland	Libya	Portugal	Turkmenistan
Brazil	France	Lithuania	Qatar	Uganda
Brunei Darussalam	Gabon	Luxembourg	Romania	Ukraine
Bulgaria	Gambia	Macedonia, TFYR	Russian Federation	United Arab Emirates
Burkina Faso	Georgia	Madagascar	Rwanda	United Kingdom
Burundi	Germany	Malawi	Saint Kitts and Nevis	Unit. Rep. of Tanzania
Cambodia	Ghana	Malaysia	Saint Lucia	United States
Cameroon	Greece	Maldives	Saint Vinc. & Grenadines	Uruguay
Canada	Guatemala	Mali	Samoa	Uzbekistan
Central Afric. Rep.	Guinea	Malta	Saudi Arabia	Venezuela
Chad	Guyana	Mauritania	Senegal	Vietnam
Chile	Haiti	Mauritius	Seychelles	Yemen
China	Honduras	Mexico	Sierra Leone	Zambia
Colombia	Hong Kong	Moldova, Rep. of	Singapore	Zimbabwe
Comoros	Hungary	Mongolia	Slovakia	
Congo, D.R.	Iceland	Morocco	Slovenia	
Congo	India	Mozambique	Solomon Islands	

Table 3: FDI Descriptive Statistics of the FDI Data Used in the Estimation
(million US dollars)

Positive FDI Net Flows

Year	Observations	Average	Std. Dev.	Min	Max
2005	1368	800.567	4,932.819	0.000	130,765.400
2006	1390	780.986	2,939.207	0.000	44,599.010
2007	1491	1,171.411	5,148.907	0.000	109,097.000
2008	1390	1,157.029	4,472.900	0.001	58,256.120
2009	1236	752.840	2,800.976	0.002	42,974.000

Negative FDI Net Flows

Year	Observations	Average	Std. Dev.	Min	Max
2005	500	-472.139	2,172.313	-28,935.370	-0.000
2006	394	-306.876	1,554.924	-26,000.620	-0.000
2007	420	-345.678	1,509.095	-22,450.240	-0.000
2008	413	-331,076	1,547.091	-21,064.200	-0.000
2009	487	-403.373	1,561.671	-23,147.780	-0.000

FDI Sample Composition

	Observations	Percentage	Average
Negative FDI flows	2,214	6.63	-377.299
Zero FDI flows	24,321	72.80	0
Positive FDI flows	6,875	20.58	940.524
Total	33,410	100	168.535

Table 4: Corruption Perceptions Index (CPI) Values for Home and Host Countries

Home Country CPI

Year	Observations	Mean	Std. Dev.	Min	Max
2005	6,803	6.20	2.35	2.40	9.70
2006	6,510	6.20	2.34	2.10	9.60
2007	6,552	6.23	2.19	2.10	9.40
2008	6,665	6.19	2.08	2.00	9.30
2009	6,880	6.16	2.11	2.20	9.40
All	33,410	6.19	2.22	2.00	9.70

Host Country CPI

Year	Observations	Mean	Std. Dev.	Min	Max
2005	6,215	4.14	2.19	1.70	9.70
2006	6,006	4.15	2.17	1.90	9.60
2007	6,384	4.06	2.12	1.70	9.40
2008	6,536	4.10	2.10	1.50	9.30
2009	6,708	4.14	2.15	1.30	9.40
All	31,849	4.12	2.15	1.30	9.70

Table 5: Parameter Estimates of Equation 11 using OLS and Tobit Estimators

	OLS		TOBIT	
VARIABLES	KKK	KKK+CORR	KKK	KKK+CORR
SK	-0.29***	0.34***	-4.79***	-3.91***
	(-7.15)	(5.77)	(-9.70)	(-8.33)
ADY	1.29***	1.30***	3.02***	3.23***
	(6.20)	(6.27)	(10.42)	(10.64)
DIST	-0.02***	-0.02***	-0.22***	-0.20***
	(-9.52)	(-9.28)	(-10.27)	(-9.98)
SUM	0.14***	0.13***	0.61***	0.56***
	(9.87)	(9.38)	(11.57)	(11.27)
GDP2	0.08***	0.02	1.14***	0.85***
	(3.07)	(0.95)	(8.83)	(7.57)
TChost	2.11***	1.02*	9.09***	4.83***
	(3.67)	(1.70)	(5.82)	(3.27)
TChome	2.91***	-0.08	48.16***	22.81***
	(3.01)	(-0.08)	(9.62)	(5.45)
Skill matching SME		-0.06***		-0.15***
		(-4.60)		(-6.26)
Corr. Environment CEE		-0.09***		-0.21***
		(7.76)		(7.34)
Corruption home HCE		-0.05***		-0.32***
		(4.95)		(11.94)
Constant	0.02	-0.46***	-4.40***	-6.44***
	(0.44)	(-8.15)	(-9.72)	(-10.14)
Observations	33,410	31,849	33,410	31,849
Adjusted R-squared	0.05	0.06		
Pseudo R-squared			0.102	0.107

We report regression coefficients for ordinary least squares regressions (OLS), and marginal effects for the Tobit regressions of the model in Equation 11. All variables are described in the text. KKK represents the model using only the Knowledge Capital (KKK) model variables, and KKK+CORR includes measures of the corruption environment and the skill-matching effects We also report corresponding t-statistics in parenthesis immediately below each coefficient.. Standard errors are robust to heteroskedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% levels

Table 6

Probit estimates of Equation 11

VARIABLES	PROBIT KKK	KKK+CORR
SK	-0.32***	-0.35***
	(-24.03)	(-17.72)
ADY	0.23***	0.26***
	(14.03)	(14.66)
DIST	-0.01***	-0.01***
	(-25.02)	(-23.07)
SUM	0.04***	0.04***
	(36.77)	(33.19)
GDP2	0.08***	0.07***
	(20.28)	(16.58)
TChost	0.37***	0.24***
	(4.36)	(2.63)
TChome	2.96***	1.59***
	(13.04)	(6.19)
Skill matching SME		-0.01***
		(-4.20)
Corr. Environment CEE		-0.01***
		(3.99)
Corruption home HCE		-0.02***
		(14.30)
Constant		
Observations	33,410	31,849
Pseudo R-squared	0.102	0.107

We report the marginal effects from a Probit of Equation 11. KKK represents the model using only the Knowledge Capital (KKK) model variables, and KKK+CORR includes also measures of the corruption effects. We also report corresponding t-statistics in parenthesis immediately after. Standard errors are robust to heteroskedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% levels

Table 7

Empirical Estimates of the Skill Matching Effects

We report empirical estimates of FDI flows motivated by the Skill matching effects. Panel A represents the percent reduction in FDI flows motivated by the SME effect relative to the total FDI flows predicted by our model. In Panel B, we report our empirical estimates of FDI flows average reductions in million of US dollars per year for an average country, for a given corruption level.

Panel A: Reduction in FDI for Different Levels of Home and Host Country CPIs

	Host CPI				
Home CPI	**1**	**3**	**5**	**7**	**9**
0	6%	17%	29%	40%	52%
1	0%	11%	23%	34%	46%
2	6%	6%	17%	29%	40%
3	11%	0%	11%	23%	34%
4	17%	6%	6%	17%	29%
5	23%	11%	0%	11%	23%
6	29%	17%	6%	6%	17%
7	34%	23%	11%	0%	11%
8	40%	29%	17%	6%	6%
9	46%	34%	23%	11%	0%
10	52%	40%	29%	17%	6%

Panel B

	Host CPI			
Home CPI	3	5	7	9
2	0.674	27.066	89.791	157.872
3	-	8.659	15.352	256.963
4	0.331	1.524	5.818	30.366
5	2.039	-	25.182	50.173
6	4.871	3.413	10.987	42.681
7	32.769	39.378	-	320.458
8	26.135	61.656	88.010	100.091
9	8.133	16.877	88.104	-

Table 8
Estimation using the Heckman selection model
We report regression coefficients for Heckman (1979) selection model regressions. Volume represents results of the second stage regression controlling for possible sample selection. Location includes results of the first stage Probit model. KKK represents the model using only the Knowledge Capital (KKK) model variables, and KKK+CORR include also measures of the corruption environment and the skill-matching effects We also report corresponding t-statistics in parenthesis immediately after. Standard errors are robust to heteroskedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% levels

	KKK		KKK+CORR	
VARIABLES	VOLUME	LOCATION	VOLUME	LOCATION
SK	-21.92***	-1.27***	-28.10***	-1.35***
	(-7.54)	(-24.06)	(-7.10)	(-17.42)
ADY	2.03***	0.72***	4.00***	0.78***
	(8.21)	(14.45)	(12.16)	(15.43)
DIST	-0.18***	-0.05***	-0.29***	-0.05***
	(-9.74)	(-26.43)	(-13.39)	(-23.94)
SUM	0.46***	0.16***	0.70***	0.15***
	(13.60)	(50.33)	(16.65)	(45.57)
GDP2	0.82***	0.34***	0.95***	0.29***
	(6.96)	(21.85)	(7.22)	(17.90)
TChost	13.17***	1.47***	39.69***	6.18***
	(7.16)	(4.48)	(3.21)	(2.65)
TChome	48.26***	11.80***	0.04***	0.01***
	(6.05)	(11.48)	(4.59)	(5.58)
Skill matching SME			-0.09**	-0.02***
			(-2.09)	(-4.23)
Corrup. Environment CEE			-0.56***	-0.02***
			(14.74)	(3.97)
Corruption home HCE			-0.36***	-0.07***
			(11.33)	(14.36)
Constant	-1.72***	-0.83***	-10.27***	-1.23***
	(-3.46)	(-27.16)	(-12.60)	(-28.21)
Observations	33,410	33,410	31,849	31,849

Table 9

Regression controlling for Country fixed effects

We report regression coefficients for the models reported in Table 5, including country dummy variables to control for home country unobservable fixed effects. All model include Knowledge Capital (KKK) model variables, also measures of the corruption environment and the skill-matching effects We also report corresponding t-statistics in parenthesis immediately after. Standard errors are robust to heteroskedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% levels

VARIABLES	OLS	TOBIT	HECKMAN VOLUME
SK	0.32***	-4.53***	-27.67***
	(4.63)	(-8.52)	(-6.82)
ADY	1.32***	3.02***	4.14***
	(6.41)	(10.04)	(11.69)
DIST	-0.02***	-0.22***	-0.31***
	(-8.46)	(-9.66)	(-12.39)
SUM	0.25***	0.29***	0.69***
	(6.26)	(6.10)	(13.82)
GDP2	-0.11***	2.64***	1.76***
	(-3.00)	(8.63)	(8.57)
TChost	1.62***	11.68***	11.68***
	(2.69)	(6.87)	(5.26)
TChome	-2.55	-88.58***	11.84***
	(-1.50)	(-5.60)	(0.26)
Skill matching SM	-0.06***	-0.15***	-6.18***
	(-4.48)	(-5.45)	(-2.13)
Corrup. Environment	-0.08***	-0.14***	-0.53***
	(6.98)	(5.32)	(13.17)
Corruption home	-0.04	-0.06	-0.23
	(-0.90)	(-0.43)	(-1.21)
Constant	-0.04	-1.84	-6.66***
	(-0.29)	(-1.46)	(-3.91)
Observations	31,849	31,849	31,849
Adjusted R-squared	0.07		
Pseudo R-squared		0.166	

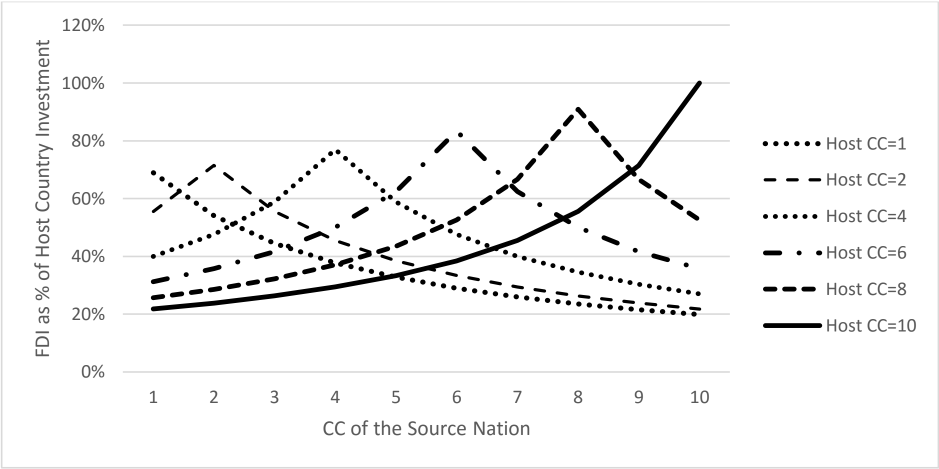
Table 10
Additional Robustness test
We report Tobit marginal effects coefficients for the model in equation 5, including several additional control variables as described in the text. All model include Knowledge Capital (KKK) model variables, also measures of the corruption environment and the skill-matching effects. Several versions of the KKK model are reported We also report corresponding t-statistics in parenthesis immediately after. Standard errors are robust to heteroskedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% levels

VARIABLES	KKK2 + CORR	KKK3 + CORR	KKK1+ CORR+MON 1	KKK1+ CORR+MON 2	KKK1 + CORR+UNEMP+INTER	KKK1+ CORR + ALL+ FIXED
SK	-0.02	1.15**	-3.38***	-3.15***	-2.33***	0.42
	(-0.06)	(2.38)	(-7.69)	(-7.37)	(-4.57)	(0.50)
ADY	3.20***	3.21***	3.10***	3.16***	3.25***	3.23***
	(10.66)	(10.61)	(10.47)	(7.98)	(10.13)	(7.40)
DIST	-0.20***	-0.19***	-0.21***	-0.19***	-0.22***	-0.19***
	(-9.89)	(-9.82)	(-10.05)	(-9.31)	(-9.58)	(-8.37)
SUM	0.72***	0.73***	0.52***	0.53***	0.58***	0.26***
	(11.42)	(11.42)	(11.15)	(9.95)	(11.26)	(3.27)
GDP2	0.81***	0.75***	0.43***	1.16***	0.51***	2.59***
	(7.28)	(7.02)	(4.65)	(7.88)	(5.23)	(8.78)
TChost	10.24***	11.31***	3.73***	0.71	4.40***	13.81***
	(6.19)	(6.09)	(2.64)	(0.36)	(2.64)	(4.22)
TChome	17.11***	15.65***	16.29***	34.23***	5.14	-92.19***
	(4.11)	(3.72)	(4.04)	(5.87)	(1.05)	(-5.20)
Skill matching SME	-0.06**	-0.02	-0.17***	-0.16***	-0.14***	-0.07**
	(-2.21)	(-0.75)	(-6.74)	(-6.85)	(-4.93)	(-2.12)
Corrup. Environment CEE	-0.27***	-0.28***	-0.23***	-0.22***	-0.28***	-0.22***
	(7.89)	(6.51)	(7.59)	(7.23)	(5.87)	(4.52)
Corruption home HCE	-0.22***	-0.20***	-0.30***	-0.30***	-0.32***	-0.31*
	(9.34)	(8.47)	(11.68)	(11.61)	(10.89)	(-1.70)
(GDPi-GDPj)*SK	-0.96***	-0.97***				-0.88***
	(-8.49)	(-8.27)				(-4.63)
TChost*SK^2	-0.11***	-0.21***				-0.13***
	(-4.66)	(-5.88)				(-2.83)
Money						1.14***
						(3.23)
Money*SK				-3.08		3.63
				(-0.77)		(0.73)
Money*ADY				-0.19		-0.48
				(-0.36)		(-0.79)
Money*DIST				-0.05***		-0.06***

				(-2.97)		(-3.33)
Money*SUM				0.02		0.14**
				(0.43)		(2.55)
Money *GDP2				-1.23***		-0.57***
				(-7.84)		(-3.76)
Money*TChost				3.82		0.51
				(1.37)		(0.14)
Money *TChome				-30.43***		4.39
				(-3.16)		(0.36)
Unemployment					-0.05***	-0.02**
					(-5.46)	(-2.30)
Internet					-0.00	0.00
					(-0.87)	(0.07)
Money			1.27***	2.23***		
			(9.86)	(6.29)		
IChost		0.00				
		(0.22)				
Constant	-6.99***	-7.16***	-6.43***	-6.72***	-6.16***	0.39
	(-10.21)	(-9.58)	(-10.12)	(-9.56)	(-9.76)	(0.23)
Observations	31,849	30,026	31,849	31,849	19,540	19,540
Pseudo R-squared	0.112	0.110	0.111	0.113	0.0803	0.135

Figure 1: Desired Capital Stock in Host Countries as a Function of Home Country Corruption Classification (CC)

(as % of Capital Stock Desired by the Home Firm in the Least Corrupt Country)



Note: δ= 2, other parameters as in Table 1.