FDI and Corruption: Does corruption matters?

May 2010

First Draft

Preliminary and incomplete

Do Not Quote

Patrik Gustavsson Tingvall

Stockholm School of Economics.

Abstract

Introduction

Since the creation of GATT in 1947 average tariffs in manufactured goods has gone down from levels at the 30-70 percent bracket to just a few percentages. As a consequence, other barriers to trade have become relatively more important and one factor that has received increasing attention is corruption. From the view of international economics, corruption is portrayed as a barrier to trade and investment. With its negative impact on business life corruption can alter patterns of trade and investment. The increased attention to corruptions has also led to increased availability of indices measuring of corruption. It is therefore not a surprise that we now can see a steadily increasing number of articles analyzing various aspects of corruption. However, there is one blank spot, namely corruption and its impact on offshoring. This is surprisingly since offshoring is thought of as sensitive to the contract cost. To be precise, if there are difficulties to finalize a contract that ensure: deliveries, intellectual property right protection (IPR), quality, etc. firms tend to favor FDI (or even stay at home) to offshoring. To some extent, this trade of between offshoring and FDI may help to explain the sometimes unexpected (non-negative) results found on corruption and FDI; corruption may simply redirect potential offshoring decisions toward FDI.[1] One should though bear in mind that the impact of corruption is likely to be greatest when sensitive information is involved. For standardized jobs, offshoring is likely to be less of an issue.

When analyzing trade flows, the gravity model is a natural candidate to depart from and we use the gravity model to analyze a specific type of trade, material offshoring. More specifically, using detailed firm level data with information on firms' offshoring and country selection we analyze how the choice of country to offshore to and the amount of offshored inputs is affected by corruption. In addition, using firm level data we are likely

[1] See e.g. Hakkala et al., (2008) and Caetano and Calerio (2005).

to encounter observations with zero trade flows. In the estimation of the gravity model these zeros are challenging. Offshoring can be thought of as a two step procedure where we in the first round make the decision whether to offshore or not and to whom and in the second step on the volume. This two-step decision procedure naturally involves zero trade flows and in combination with the multiplicative nature of the gravity model the (two step) zero inflated poisson (zip) estimator, suggested by e.g. Burger *et al.* (2009) is the preferred estimator. For the analysis we utilize detailed firm level data on production and offshoring for Swedish firms covering the period 1997-2005, data which is merged with characteristics of the target countries, including various measures of corruption and governance.

Much of the theoretical work on offshoring (and FDI) focus on how the contract cost affects the decision between international outsourcing and FDI. This trade off is highlighted in Antràs and Helpman (2004), Grossman and Helpman (2002, 2003), Grossman *et al.*, (2005) and Chen *et al.*, (2005). Antràs and Helpman (2006) explicitly discuss how the quality of contractual institutions impacts the choice between international outsourcing and integrating the production of an intermediate good. It is shown that better contracting institutions favor international offshoring on behalf of FDI. In line with this, Wei (2005) portrait corruption as an obstacle for economic development reducing the allocation of government spending. Hence, to the extent that corruption decreases the quality of contractual institutions we expect corruption to be detrimental to international offshoring. However, there might also be a positive side of corruption. For example, Huntington (1968) argues that in poor developing countries with cumbersome regulations corruption may work like oil in the machinery improving efficiency and growth (see also Lui, 1985, and Bardhan, 1997). However, the overall impression is that the negative aspects of corruption dominate.

Moving to the empirical literature the relation between corruption and offshoring is still unexplored. However there are a number of papers focusing on the sister activity of offshoring namely FDI. For example, Habib and Zurawicki (2002) and Egger and Winner (2006) both find corruption to be detrimental to FDI. However there seems to be evidence for the effect of corruption to be non-uniform. Hakkala *et al.*, (2008) find corruption to be more detrimental to horizontal FDI than to vertical FDI. Smarzynska and Wei (2000) find corruption to alter the composition of FDI by altering FDI investments toward joint ventures instead of establishing a wholly owned affiliate. Dahlström and Johnson (2007) and Caetano and Calerio (2005) both find the impact of corruption on FDI to be negative and significant, but only for developing (and generally speaking more corrupt) countries. Looking at Japanese FDI into the relatively homogenous and corruption clean EU region, Delios *et al.*, (2005) do not find any direct impact of corruption on FDI, instead they suggest that not only corruption but a broader context including institutions should be considered. Looking at the relation from the other direction, Larraín and Tavares (2004) find that FDI can work as a vehicle fighting corruption. To conclude, the overall impression is that corruption seems to be detrimental for FDI and that the negative impact is largest for developing countries. In addition, corruption does not only affect the volume of FDI but also the type and composition of foreign direct investments.

Hence, we may expect a negative relation between corruption and offshoring. This question can be further disentangled. First, does corruption mainly affect the decision whether to offshore or not or is the impact mostly bound to the choice to offshore or the volume and what sign will come up? In addition, is the impact uniform across highly corrupt and less corrupt countries and different types of firms? Results on the offshoring behavior of Swedish firms suggest that…[Results to be inserted]

The paper is organized at follows.

2. Theoretical background and definitions

2.1 Outsourcing: the concepts

In the public debate outsourcing has been divided into a number of different subgroups. Outsourcing often involves subcontracting of an internal company function to an outside firm. However, outsourcing is more than an arms-length transaction. It involves a transfer of management control, decision making, and often also transfers of firm-specific knowledge to the external supplier. It is therefore easily understood that corruption can lead to firms holding back on international offshoring, in particular when sensitive information is involved. Most attention is focused on situations where there is a external foreign supplier. This phenomenon has been referred to as *international outsourcing* by Görg *et al.* (2005) while offshoring within the firm is labeled *inhouse offshoring* and it is important not to mix these up.[2] More specifically, in theoretical models, focus is typically on *international outsourcing* while empirical investigations often lacks the possibility to *disentangle inhouse offshoring* from *international outsourcing* meaning that *offshoring* is typically what's analyzed.

2.2 Corruption: the concept

Though the word corruption is well known it is difficult to find a precise and commonly accepted definition of corruption. However, a common theme is that corruption involves

[2] Note that inhouse offshoring therefore is a part of FDI.

misuse of public office for private gain in a way that alters the rules of the game.[3] To give the concept structure corruption has been be divided into different categories. One categorization used by e.g. Kain (2001), is to separate corruption into: (i) grand corruption, referring to situations where the political elite exploit their power for economic gain and economic policies that not are in the interest of interest of their principials. This is probably the most devastating type of corruption. Going one step down we have (ii) bureaucratic corruption, which refer to how appointed bureaucrats handle their responsibilities and their relation with their superiors. This is also known as "petty corruption". Finally we have (iii) legislative corruption referring to the extent to which the voting behavior of legislators can be influenced. Corruption may also occur in daily business life without direct intervention from public agents. In most instances these categories are interrelated; if the government is corrupt it is likely that lower instances are that too.

To uphold corruption there must co-exist discretionary power and rents (associated with this power) and a sufficiently low risk of detection. To be precise, if the probability of detection is high, we likely see a fairly clean system while if everybody is corrupt, no one have the incentive to act against the system. This dualism may contribute to explain the existence of so-called "corruption clubs".[4]

Arguments for corruption to be detrimental for an economy are that corruption leads to misallocation of contracts and resources moved from the most efficient agents to less efficient ones. Corruption also increases the uncertainty under which the firm is working and increases costs in terms of time and money spent on bribery. On top if this there is a social, legal and moral cost of corruption. Arguments for corruption to be beneficial rest on the argument that governmental officials can be more helpful when paid to directly and that it allow business

---

[3] See e.g. Kain (2001) and Svensson (2005).
[4] Herzfeld and Weiss (2007).

people to avoid red tape restrictions that otherwise discourage investments.[5] Hence, to some extent it is an empirical issue to what extent corruption is harmful for business life and growth. In our analysis we separate the impact of corruption to (i) how it affects the probability to chose a specific country and (ii) how it impact the mass of outsourced production activities.

3. Theorerical background and empirical strategy

The gravity model has traditionally been extensively used to analyze trade flows but its use has now been expanded into other trade related flows such as e.g. FDI location (see e.g. De Mello-Sampayo, (2005, 2009), Hejazi, W., (2005, 2009), and Shigeru and Umemura (2003)).[6] Here we analyze a specific type of trade, namely offshored material imports and how it is affected by corruption and we depart from the model of Anderson and van Wincoop (2003).[7] Their model is build on the assumption of constant elasticity of consumption preferences and goods being differentiated with respect to place of origin.[8] The Anderson and van Wincoop (2003) model is specified as. $M_{ij} = \mathrm{T}(r)\frac{Y_i Y_j}{d_{ij}^{-\varepsilon}}$ where M_{ij} is imports from country *i* to country *j*, $Y_i Y_j$ is the joint economic mass, d_{ij} is distance between the countries, and *T(r)* is the non-constant trade resistance term capturing a series of components that affect trade.[9] Anderson and van Wincoop (2003) empathize factors of trade resistance and we focus on corruption as

---

[5] See e.g. Shleifer and Vishny (1993), Wei (2005), and OECD (1989).

[6] Though not focusing on offshoring and corruption papers by: Banri *et al*., (2008), Gupta (2007), and Head *et al*., (2009), discuss how offshoring is related to distance. In addition Keller Yeaple (2009) discusses how gravity affects the location of hi-tech activities.

[7] It is well known that the gravity model is consistent with a several theories on trade and investment. This is highlighted in e.g. Anderson (1979), Bergstrand (1989, 1990), Helpman and Krugman (1985), Deardorff (1998) and Baldwin and Taglioni (2006). Recent developments of the gravity model include Helpman *et al*. (2008) who discuss asymmetric trade flows, zero trade flows, and productivity differences, and Chaney (2008) who adds firm heterogeneity in productivity and fixed export costs to the model.

[8] One key message of Andersson and Van Wincoop (2003) is that one needs to consider multilateral trade resistance. This point will be discussed in the section on econometric considerations.

[9] In the estimations we will augment the base-line model with per capita income. Bergstrand (1989) shows the relevance of per-capita income as and how it can proxy factor intensities, or alternatively, preferences as discussed by Linder (1961).

a barrier to trade in offshored inputs. More specifically, Grossman and Helpman (2004) in their trade-in-task model show that price differences between countries are not enough to generate offshoring. In their north-south outsourcing model Grossman and Helpman (2003) show that low-wage country's cost advantage as a receiver of offshoring contracts may be offset by factors such as corruption, poor legal environment, lacking infrastructure, or lack of skilled labor. A recent model pointing in the same direction is Antras and Helpman (2006) who shows that the prevalence of offshoring increases with the quality of the contractual institutions of the recipient countries. One should also consider what type of goods that will be offshored and what kind of firms that are likely to be capable of handling corruption. A conclusion drawn from Grossman and Helpman (2002a), Antras (2003), and Feenstra and Hanson (2005) are that sensitive tasks not are easily outsourced. From this one may conclude that the ability to handle a corrupt environment also matters. Large firms are less likely to be less negatively affected by corruption because partly because their higher bargaining power but also because they possess the ability to pay.[10] With this as a background our baseline gravity equation takes the following form [11]:

$$M_{ijt} = \mathrm{T}(r)\alpha * Y_j^{\beta_1} \ln(D_j)^{\beta_2} (corrupt_{jt})^{\beta_3} \Pi_m (F_{mit})^{\beta_{4m}} \Pi_n (C_{nit})^{\beta_{5n}} \nu_j \gamma_t \varepsilon_{ijt} \qquad \text{(eq.1)}$$

Where M_{ijt} is our offshoring measure defined as import of inputs/sales by firm (i) from country (j), *Y is GDP* (we allow the income elasticity to differ from unity), D_j is the distance

[10] The trade off between in-house production and subcontracting (or outsourcing) is also discussed by McLaren (2000) and Grossman and Helpman (2002b). For surveys, see e.g. Spencer, (2005), Trefler (2005) and Helpman (2006). One key element differentiating FDI from offshoring is that outsourcing allows the firm to avoid the fixed set-up cost that is related to FDI while outsourcing requires the firm to formulate a contract with a foreign subcontractor. Other theoretical contributions that considers the choice between FDI and outsourcing are Grossman and Helpman (2002a), Antras (2003), and Feenstra and Hanson (2005).

[11] One may end in a very similar model specification departing from other theories. For example Hakkal *et al.,* (2008) sets up a simple model of FDI (and offshoring). Modeling corruption as a cost to FDI they end up with a gravity type of equation containing trade (FDI) as a function of distance, market size, and corruption as a trade resistance term.

to country *j, corrupt* is an index of the level of corruption*,* γ_t is a period dummy, ν_j is a fix country effect, and ε_{ijt} is the disturbance term, ***F*** is a set of firm specific variables such as: *capital intensity*, *firm size*, *profits*, *export intensity, skill intensity* and *competition.* ***C*** is a set of country characteristics including measures of *corruption* and *governance* (*rule of law, governmental efficiency* and *regulatory quality*). Market size if captured by *GDP*, and labor cost (factor price) by *per capita income*, industrial structure and technical capacity is proxied with *energy intensity* (per capita energy use) and share of the workforce with *tertiary education.* The expected impact of the GDP variable is positive and that of geographic distance is negative, as posited by the gravity model. For corruption our a priori expectation is a negative sign, however, as there are arguments for corruption to ease business the relation may be non-linear.

3.1 Econometric considerations

The estimation of gravity models is complicated by at least three issues.

Firstly, it is necessary to decide how to handle observations with zero trade, one solutions discussed by e.g. Helpman *et al*. (2008) is to apply a Heckman type of two step procedure. The underlying motivation for a two step approach is that the offshoring decision can be decomposed to (i) the decision whether to offshore or not, and to whom, and then (ii) the volume. Having that said, for the second best country we may observe zero trade whereas if the first alternative not would have been possible we would have seen positive trade. Hence, for observed zeros there are implicit non-zero probability trade flows. To this end the two step procedure is a step forward.

Instead of relying on a Heckman approach we will apply a two step Poisson model. Comparing the Heckman model with the Poisson model within a gravity set-up, the Poisson model have some appealing features. As pointed out by e.g.Westerlund and

Wilhelmsson (2009) and Burger *et al.*, (2009), the gravity model is defined in multiplicative form while the Heckman model imposes a log-linearization of the model. As is well know, the Jensen's inequality implies that and that the concavity of the log function creates a downward bias when using OLS and as shown by Haworth and Vincent (1979) the antilogarithms is downward biased leading to under-estimation of large trade flows (Flowerdew and Aitkin, 1982). Further, the Poisson model is less sensitive to non-homoscedasticity (Santos and Tenreyro (2006)and it does not rely on an exclusion restriction.[12]

The zero inflated Poisson (zip) model let us model the choice of target country separately from the mass of imported offshored goods. Our data include all Swedish firms with at least 50 employees with recorded imports off material inputs and the set of possible countries is all countries from which Sweden have imports of offshored materials from. Since most firms offshore to only one or a few countries the data contain more than 95% of zero valued trade flows.

Our second concern deals with fixed effects and modeling of the multilateral trade resistance term (MRT). Anderson and Van Wincoop (2003) showed that bilateral trade is affected by multilateral trade costs and that omitting these may lead to an omitted variables bias. This argument is discussed at some length by e.g. Baldwin and Taglioni (2006). As shown by Anderson and Van Wincoop (2003) and Feenstra (2004) country-specific fixed-effects are in line with the theoretical concerns and yields consistent parameter estimates. However, if the MRT vary greatly over time, country-specific dummies will control for time-wise average effects only and interacting country fixed effects with period dummies removes may therefore remove this bias. To this end Benedicitis and Vicarelli (2009) show that

[12] Similarly to the Heckman model, the estimation process of the zero-inflated Poisson model consists of a logit/probit (the zero-inflated part) and a Poisson regression. An alternative to the Poisson model is the negative binominal model. However, as shown by Burger et al., (2009), the Poisson model is shown to on average being preferred to the negative binominal model.

attempts to fully control for cross-country heterogeneity and to evaluate the effect of policy using dummy variable hardly possible (making a long story short, almost all variation is swept out by the dummies, in addition we easily end up with an extremely large number of coefficients to estimate).[13] In our case the MRT issue is softened up since we are only looking at imports to and our time span is rather short, 1997-2005. With this as a background our main strategy is to use the commonly accepted country dummy approach to control for the MRT. Moreover, including country specific fixed effects makes region, cultural and other time-invariant characteristics superfluous.

3.2 Data

The analysis is based Swedish firm level data matched with international data on various country characteristics. The firm level data is made up of three linked register-based data sets from Statistics Sweden. The financial statistics data set (FS) contains detailed information on all Swedish private sector firms with at least 50 employees. Examples of variables included are value added, capital stock (book value), number of employees, total wages, ownership, profits, sales and industry sector. Second, the regional labor market statistics data set (RAMS) describes the labor force with respect to gender, educational level and demographics. Third, data on imports of materials are collected for all firms with an import value above a 2.2 million SEK (approx. 240 000 EUR). This data is available for the period, 1997-2007. Material imports are classified according to country of origin and item and is defined at the five-digit level according to NACE Rev 1.1. and grouped into Major Industrial Groups (MIG).[14] The MIG code classifies imports with respect to their intended use. In the analysis

[13] Other approaches to control for MRT include a two step approach suggested by, Anderson and van Wincoop (2003) that solves for MRT as a function of observables. Other suggestions include calculating a GDP weighted remoteness index and finally fixed effects regression approach suggested by Feenstra (2002, 2004). Helpman, Melitz and Rubinstein (2008) use fixed effects to control for MRT.

[14] MIG - European Community classification of products: Major Industrial Groupings (NACE rev1 aggregates).

we will use the MIG definition of intermediate inputs as our offshoring variable. Due to different time frame for the variables used we limit the main analysis to the years 1997-2005.

Country specific variables are collected from a number of sources. To measure corruption we have (i) the World Bank *Control of Corruption (CC) index which* captures perceptions of the extent to which public power is exercised for private gain, including both petit and grand forms of corruption. Secondly we have the *Corruption Perceptions Index* (CPI) collected by *Transparency International*. Similarly to the World Bank index this is also perception based. The methodology for CPI is discussed at length in Graf Lambsdorff (2005). Here we will limit ourselves to saying that it is a composite index where a 10 indicates the lowest possible level of corruption and 0 the highest corruption level. For pedagogical reasons we have multiplied both corruption indices with -1 such that a higher level indicate a higher level of corruption, this facilitates comparison with papers such as Hakkala *et al.* (2008). Knack and Azfar (2002) discuss a set of corruption indices, as it turns out they show that despite methodological differences, in all practical terms the difference between the indices is minor. The major difference across corruption indices is the coverage. Additional country characteristics include population, educational level, GDP, agricultural dependency, energy intensity, and governace indicies such as rule of law, regulatory effeicney and governace effeicency. Country data is collected from the World Bank, Governance Indicators and World Bank, National Statistics. For measuring the distance we will use the CEPII distance measure which is weighted so as to take internal distances and population dispersion into account. More information on CEPII's distance measure if found in Mayer and Zignago (2006).

4. Results

4.1 Basic models

Table 1 presents the results from our basic models. As a benchmark, we start with an OLS model. The variables are divided into country and firm characteristics respectively. A first glance at the results reveals that the significance of corruption found in OLS estimation 1 is upset by the inclusion of country dummies and unit fixed effects (estimations 2-3). In estimation 4 and onward we estimate zip-models and separate the choice of country to offshore to from the mass of offshored inputs. If corruption works as a fixed cost, the impact of corruption will be focused to the inflation/logit model while the impact on the poisson model is less clear. If corruption, on the other hand, works like an increased marginal cost the impact of corruption is likely to show up not only in the choice function but also as a volume effect in the import Poisson model.

In estimation 4-6 we augment the models in a stepwise manner. In Estimation 4, in we leave country characteristics outside while we in estimation 5 swap the set-up and exclude firm characteristics frome the model and finally in estimation 6 we estimate a full model with both firm and country characteristics. As seen in Table 1, the significance of the corruption variable seems to be sensitive to the inclusion/exclusion of other country characteristics. The inclusion of country dummies and time varying country characteristics upset the significance of corruption which in the full model not is significant in the choice nor the Poisson model.

As discussed above, it is not clear cut whether the positive “oil-in-the-machinery effect” or the negative risk and allocation effects of corruption dominates. One may therefore argue that the impact of corruption is lokely to be non-linear. In estimation 7 we explore the non-linear hypothesis. The results suggests a non-linear hump shaped relation between corruption and the mass off offshored material inputs while the selection indicates a positive effect of corruption on the choice of country. That is, the more corrupt a country is the more likely it is that it is that it is chosen. However, once an offshoring contract is established, the negative impact of corruption comes through by lower levels of offshored inputs.

Fore firm and country control variables we note that

[Comments for control variables, to be inserted]

4.2. Heterogeneity

As discussed above, the impact of corruption may vary across countries and firms and in this section, starting with the country dimension we analyze the issue.

Separating countries into high and low corrupt countries (with a about 50% of the observations in each group) we immediately see that the impact of corruption differs across highly and low-corrupt countries. The negative volume effect of corruption is only significant for highly corrupt countries while the volume effect is non-significant in less corrupt countries. When it comes to the choice of country we find that being corrupt increases the possibility of achieving an offshoring contract and this pattern goes for both high and low corrupt countries. Further, the positive impact seems to be even stronger for the group more corrupt countries. A possible reason for this finding is that offshoring of non-sensitive tasks is not expected to be severely affected by corruption and that most of what is offshored is not sensitive tasks that may reveal the core technology of the firm. In addition, since countries and regions often compete for FDI and offshoring contract firms may take advantage of corrupt behavior playing out competitors against each other. Hence, firm' capacity of handling corruption may impact choice of country. We therefore continue and analyze how firm characteristics impact on the sensitivity of corruption.

Offshore outsourcing involves signing a contract with an external supplier. One may therefore expect that firmas' that are experienced in formulating such contracts should be able to better handle a corrupt environment. We therefore split our data with respect to how many countries a firm is offshoring to. As seen in Table 2 there are distinct differences across the groups. Starting with the volume effect we find that for firm offshoring to only one or two to four destinations are not significantly afeected bu corruption, the volume effect is only significant for firms offshoring to more than four different countries and for these multiple offshorers we can re-create the non-linear (hump shaped relation) between offshring and corruption also found in the full model in Table 1. Moving to the choice function we find a different pattern where multiple offshorers (more than four contries) are then only group where the choice of country is unaffected by corruption. For firm offshoring to less than countries there is a tendenct of a U-shaped pattern between corruption and choice of country. Hence, the often suspected negative impact of corruption on offshoring is rather found on the volume effect while the impact of corruption on choice of country is less clear with a tendency to be even positive.

In the context of offshoring and corruption an important distinction pointed out in theoretical models is between inhouse offshoring and offshore outsourcing. In the former case, control of sensitive information is kept within the company making offshoring to corrupt countries, from a technology leakage point of view, less risky than offshored outsourcing to an external agent. Though we lack information on wether the supplier is internal or external to the firm we split the sample into MNEs and non-MNEs. By definition, non-MNEs do not have and affiliates abroad which for this group exclude the possibility of inhouse offshoring. Hence, if technology leakage is an important factor we expect the negative impact of corruption to be strongest for non-MNEs. As seen in Table 2, results for MNEs and non-MNEs are similar to each other.

Finally we seekt to analyze wether the impact of corruption differs between small and large firms, where one would expect larger firms to be more capable of handeling a coorupt environment and potential differences between manufacturing and service sector firms. The conclusion from theis operation is that we can not detect any substantial differences between small and large firms and nor between service and manufacturing sector firms. In general we here find non-significant volume effects of corruption and a tendency of a positive impact of corruption on country choice.

Put together results found here indicates that firms do not avoid to form offshoring contracts with suppliers in corrupt countries. One interpretation of this i, that technology leakage not is a central issue for offshoring or that most of what is being offshored not involve sensitive information. Lokking at the volume effect of corruption we either find the relation to be non-significant or hump-shaped. Toghether with results from the choice model the results suggest that even though corruption not have a large impact on the choice of destination country, after the choice of country is done, at large levels of corruption the impact of corruption on the offsoring is negative while at moderate levels of corruption, corruption may work as a oil in the machinery not restricting the mass of offshored material inputs.

5. Summary and conclusion

[to be inserted]

Table 1. Corruption and material offshoring. Dependent variable, imports of offshored material imputs.

Variable	1. OLS	2. OLS	3. FE	4. ZIP Firm only Poisson	4. ZIP Firm only Inflate	5. ZIP Country var Poisson	5. ZIP Country var Inflate	6. ZIP Full Poisson	6. ZIP Full Inflate	7. ZIP Full Poisson corr^2	7. ZIP Full Inflate corr^2
	Country Characteristics										
ln(distance)	-500028 (-27.29) ***	-2258161 (-5.25) ***	n.a.	-0.8714 (-1.02)	3.9587 (11.84) ***	17.112 (4.73) ***	-0.4463 (-0.00)	14.721 (3.64) ***	-0.3897 (-0.25)	13.149 (3.36) ***	-0.2284 (-0.15)
ln(GDP)	285976 (25.85) ***	-867348 (-0.92)	-2294938 (-4.57) ***			-3.5401 (-2.48) **	-0.3822 (-0.01)	-2.7497 (-1.74) *	-0.0474 (-0.08)	-2.7786 (-1.80) *	0.0184 (0.03)
ln(Pci)	-201473 (-5.21) ***	628401 (0.70)	1794694 (3.78) ***			4.0090 (2.80) ***	-0.2436 (-0.00)	3.1447 (2.02) **	-0.4637 (-0.81)	3.2916 (2.21) **	-0.5697 (-0.95)
Corruption	-613960 (-18.52) ***	2860.2 (0.02)	31448.8 (0.46)	-0.3615 (-2.10) **	0.0592 (0.83)	-0.1049 (-0.76)	-0.0146 (-0.00)	-0.0767 (-0.55)	-0.0338 (-0.46)	0.4678 (1.91) *	-0.1643 (-1.42)
Corruption^2										-0.1851 (-2.65) ***	0.0678 (1.75) *
Agriculture	20723 (6.03) ***	-3467.7 (-0.23)	5698.1 (0.74)			-0.0850 (-2.38) **	0.0675 (0.09)	-0.0952 (-2.39) **	0.0693 (4.58) ***	-0.0909 (-2.30) **	0.0688 (4.63) ***
Share tertiary education	4948.9 (4.99) ***	4095.1 (0.92)	1108.0 (0.48)			0.0105 (2.79) ***	0.0001 (0.00)	0.0117 (3.11) ***	0.0002 (0.16)	0.0110 (2.99) ***	0.0004 (0.27)
Energy intensity	-17.75 (-1.72) *	241.47 (2.42) **	275.67 (5.40) ***			0.0003 (6.65) ***	0.0008 (0.04)	0.0003 (6.44) ***	0.00004 (1.11)	0.0003 (6.44) ***	0.00005 (1.29)
Export ratio							-0.0072 (-0.03)		-0.0063 (-2.96) ***		-0.0061 (-2.84) ***

Table 1. (Continued). Corruption and material offshoring. Dependent variable, imports of offshored material imputs.

Variable	1. OLS	2. OLS	3. FE	4. ZIP Firm only Poisson	4. ZIP Firm only Inflate	5. ZIP Country var Poisson	5. ZIP Country var Inflate	6. ZIP Full Poisson	6. ZIP Full Inflate	7. ZIP Full Poisson corr^2	7. ZIP Full Inflate corr^2
		Firm level variables									
ln(K/L)	255959 (18.41) ***	255959 (18.43) ***	135484 (7.58) ***	0.5239 (3.79) ***	-0.0375 (-8.57) ***			0.5299 (14.06) ***	-0.0383 (-8.74) ***	0.5304 (14.07) ***	-0.0383 (-8.74) ***
ln(size)	747115 (46.19) ***	747115 (46.24) ***	551839 (14.83) ***	0.6179 (26.89) ***	-0.5321 (-68.97) ***			0.6140 (6.56) ***	-0.5329 (-68.79) ***	0.6142 (26.56) ***	-0.5329 (-68.77) ***
Profit ratio	10841 (0.97)	10841 (0.97)	10342 (1.19)	0.0178 (0.53)	0.0022 (0.63)			0.0203 (0.58)	0.0024 (0.68)	0.0204 (0.58)	0.0024 (0.68)
Export ratio	473232 (8.55) ***	473232 (8.56) ***	218492 (5.22) ***	0.3684 (6.16) ***	-0.6051 (-28.41) ***			0.3829 (6.36) ***	-0.6015 (-28.25) ***	0.3830 (6.37) ***	-0.6015 (-28.25) ***
Herfindahl index	7623.8 (1.14)	7623.8 (1.14)	-12722 (-3.21) ***	-0.0152 (-1.33)	-0.0196 (-7.48) ***			-0.0175 (-1.54)	-0.0194 (-7.36) ***	-0.0173 (-1.52)	-0.0194 (-7.35) ***
Share post-gymnasial education	6678.0 (4.44) ***	6678.0 (4.44) ***	-7290.3 (-2.53) ***	0.0026 (1.09)	0.0069 (5.23) ***			0.0020 (0.86)	0.0069 (5.21) ***	0.0020 (0.86)	0.0069 (5.21) ***
Share foreign labor									-0.4866 (-6.44) ***		-0.4861 (-6.43) ***
R&D-intensity									0.0119 (1.11)		0.0119 (1.11)
Manufacturing dummy									-1.5837 (-13.26) ***		-1.5831 (-13.26) ***
Period dummies	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry dummies	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country dummies	No	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Obs.	1 520 526	1 520 526	1 520 526	1 520 526	1 520 526	1 520 526	1 520 526	1 512 858	1 512 858	1 512 858	1 512 858

Table 2. Robustness test. Corruption and material offshoring. Dependent variable, imports of offshored material imputs.

	Poisson Model		Inflate Model		Control variables					
Model	Corrup Poisson	Corrupt^2 Poisson	Corrupt Inflate	Corrupt^2 Inflate	Period dum	Ind dum	Country dum	Firm controls	Country controls	Obs
Low corruption	-0.1845 (-0.33)	-0.0868 (-0.55)	0.2098 (0.57)	0.3007 (2.58) ***	yes	yes	yes	yes	yes	744 270
High corruption	-1.3195 (-2.49) **	-0.9312 (-1.44)	0.5255 (2.37) ***	0.6467 (3.70) ***	yes	yes	yes	yes	yes	768 588
L < 100	0.0094 (0.01)	-0.0731 (-0.38)	1.2575 (3.88) ***	-0.0140 (-0.15)	yes	yes	yes	yes	yes	663 821
L > 100	-0.3089 (-0.79)	-0.1346 (-1.20)	1.2942 (4.61) ***	0.0218 (0.25)	yes	yes	yes	yes	yes	849 037
No of imp. countries =1	1.1685 (0.53)	-0.6758 (-1.27)	0.8773 (-1.49)	0.3477 (1.95) *	yes	yes	yes	yes	yes	1 492 165
No of imp. countries =2-4	0.9881 (1.01)	-0.2782 (-1.16)	-0.3983 (-1.65) *	0.2646 (3.36) ***	yes	yes	yes	yes	yes	1 407 422
No of imp. countries >4	0.4974 (2.02) **	-0.2136 (-2.73) ***	-0.0958 (-0.80)	0.0265 (0.56)	yes	yes	yes	yes	yes	1 487 260
Manu sector	-0.3985 (-0.91)	-0.0868 (-0.67)	1.2595 (4.34) ***	0.0296 (0.34)	yes	yes	yes	yes	yes	906 688
Service sector	0.0371 (0.07)	-0.1841 (-1.20)	1.3611 (4.37) ***	-0.0356 (-0.35)	yes	yes	yes	yes	yes	606 170
MNEs	-0.2506 (-0.63)	-0.1429 (-1.21)	1.3054 (4.53) ***	0.0130 (0.15)	yes	yes	yes	yes	yes	866 504
Non-MNEs	-0.2221 (-0.29)	0.0244 (0.09)	1.2621 (3.92) ***	0.0043 (0.05)	yes	yes	yes	yes	yes	646 354

References

Anderson, J.E. (1979), \A theoretical foundation for the gravity equation, *American Economic Review*, 69, 106-116.

Anderson, J.E., van Wincoop, E., 2003. Gravity with gravitas: A solution to the border puzzle. *American Economic Review* 93 (1), 170-192

Antràs, P., and Helpman, E, (2004), "Global Sourcing," *Journal of Political Economy*, 112:3, 552-580.

Antràs, P., and Helpman, E, (2006), "Contreacutal Frictions and Global Sourcing," NBER working papers, No. 12747.

Baldwin R., Taglioni, D. 2006. Gravity for dummies and dummies for gravity equations. NBER Working Working Paper No. 12516.

Banri Ito , Eiichi Tomiura , Ryuhei Wakasugi, (2008), "Offshoring and Trade in East Asia: Statistical Evidence", RIETI Discussion Paper Series 08-E -009.

Bardhan, Pranab, (1997), "Corruption and Development: A Review of Issues," *Journal of Economic Literature* 35:3, 1320–1346.

Benedictis, L.D., and Vicarelli, C., (2009). "Dummies, policies and heterogeneity in gravity. Mission impossible,". Mimeo, Presented at the European Trade Study Group (ETSG) conference, Rome, 2009.

Bergstrand. J.H., 1990. The Heckscher-Ohlin-Samuelson model, the Linder hypothesis, and the determinants of bilateral intra-industry trade. *Economic Journal*, 100(4), 1216-1229.

Burger, M.J., Van Oort, F.G., and Linders, G-J. M., (2009), "On the Specification of the Gravity Model of Trade: Zeros, Excess Zeros and Zero-Inflated Estimation", Erasmus Research Institute of Management (ERIM) Working Papers Series No. ERS-2009-003. Forthcoming, *Spatial Economic Analysis*.

Caetano, J.M.M., and Caleiro, A., (2005). "Corruption and Foreign Direct Investment, What kind of relationship is there?" Economics Working Papers 18_2005, University of Évora, Department of Economics (Portugal).

Chaney, T., 2008. Distorted gravity: The intensive and extensive margins of international trade'. *American Economic Review*, 98:4, 1707–1721.

Chen, Y., Horstmann, I., and Markusen, J., (2008), "Physical capital, knowledge capital, and the choice between FDI and outsourcing," NBER Working paper No. 14515.

Commonwealth Secretariat/World Bank Joint Task Force on Small States (2000), "Small States: Meeting Challenges in the Global Economy". Report of the Joint Task Force on Small States.

Dahlström, T., and Johnson A., (2007), ”Bureaucratic Corruption, MNEs and FDI,” CESIS Electronic Working Paper Series No. 82.

De Mello-Sampayo, F., (2005), “The Location of the United States' FDI under the Share Gravity Model”, *International Economic Journal*, 21(4), 491-519.

De Mello-Sampayo, F., (2009), “Competing-Destinations Gravity Model: An Application to the Geographic Distribution of FDI”, *Applied Economics*, 41(16-18). 2237-2253.

Deardorff, A., 1998. Determinants of bilateral trade: does gravity work in a neoclassical world? In: Frankel, J. (Ed.), The Regionalization of the World Economy, University of Chicago Press, Chicago, pp. 7-32.

Delios, A., Mudambi, R.and Navarra, P., (2005), ”Corruption and FDI: Japanese FDI inflows into the EU, 1996-2002”in, Corporate and Institutional Transparency for Economic Growth in Europe, (Ed) Lars Oxelheim. Elsevier, Amsterdam.

Egger, P.H., and Winner, H., (2006), ”How Corruption Influences Foreign Direct Investment: A Panel Data Study,” *Economic Development and Cultural Change*, 54(2), 459-86.

Feenstra R.C. (2002) Border e®ects and the gravity equation: Consistent methods for estimation, *Scottish Journal of Political Economy*, 49, 5.

Feenstra, R.C. (2004) Advanced International Trade: Theory and Evidence, Princeton University Press, Princeton.

Fisman, R., Gatti, R. (2002), ”Decentralization and Corruption: Evidence Across Countries”. *Journal of Public Economics*, 83(3), 325–345

Flowerdew, R. and M. Aitkin (1982) A method of fitting the gravity model based on the Poisson distribution, *Journal of Regional Science*, 22, 191-202.

Graf Lambsdorff, Johann (2005), “The Methodology of the 2005 Corruption Perceptions Index”, Transparency International.

Grossman, G.M., and Helpman, E., (2002), ”integration versus Outsourcing in Industry Equlibrium,” *Quartelry Journal of Economics*, 117:1, 85-120.

Grossman, G.M., and Helpman, E., (2003), ”Outsourcing versus FDI in Industry Equlibrium,” *Journal of the European Economic Association*, 1(2-3), 317-327.

Grossman, G.M., Helpman, E., and Szeidl, A., (2005), ”International intrafirm production decisions: Complementaries between outsourcing and foreign sourcing,” *The American Economic Review*, 95(2), 19-24.

Hakkala, K., Norbäck P-J., and Svaleryd, H., (2008), ”Asymmetric Effects of Corruption on FDI: Evidence from Swedish Multinational Firms,” *The Review of Economics and Statisitics*, 90(4), 627-642.

Habib, M., and Zurawicki, L., (2002), ”Corruption and Foreign Direct Investment,” *Journal of International Business Studies*, 33(2), 291-307.

Haworth, J.M. and P.J. Vincent (1979) The stochastic disturbance specification and its implications for log-linear regression, *Environment and Planning*, 11, 781-90.

Head, K., Mayer, T., and Ries, J., (2009), ”How remote is the offshoring threat?” *European Economic Review,* 53, 429–444.

Hejazi, W., (2005), ”Are Regional Concentrations of OECD Exports and Outward FDI Consistent with Gravity?” *Atlantic Economic Journal*, 33:423–436

Hejazi, W., (2009), ”Does China receive more regional FDI than gravity would suggest?” *European Management Journal*, 27, 327– 335.

Helpman, E., Krugman, P., 1985. Market Structure and Foreign Trade. MIT Press, Cambridge, MA.

Helpman, E., Melitz, M., Rubinstein, Y., 2008. Estimating trade flows: trading partners and trading volumes, *Quarterly Journal of Economics*, 123(2), 441-487.

Herzfeld, T., and Weiss, C., (2007), ”Corruption Clubs: Empirical Evidence from Kernel Density Estimates,” *Applied Economics*, 39, 1565-1572.

Huntington, S.P., (1968), ”Political Order in Changing Socities,” New Haven, CT: Yale University Press.

Kain, A.K., (2001), “Corruption a Review,” *Journal of Economic Surveys,* 15, 71-121

Keller, W and Yeaple S.R., (2009), Gravity in the Weightless Economy”, CEPR Discussion paper No. 7553.   (Hi tech location)

Knack, S., and Omar, A., (2002), ”Trade intensity, country size and corruption,” *Economics of Governance*, 4, 1-18.

Larraín, F.B., and Tavares, J., (2004), Does Foreign direct Investment Decrease Corruption?” *Cuadernaos De Economica*, 41, 217-230.

Lui, Francis T., (1985), “An Equilibrium Queuing Model of Bribery,” *Journal of Political Economy* 93:4, 760–781.

Magner, Thierry and Zignago, Soledad (2006), “Notes on CEPII’s distance measures”, available (online) at: www.cepii.fr

Santos Silva, J.C.M. and S. Tenreyro (2006) The log of gravity, *The Review of Economics and Statistics*, 88, 641-58.

Shigeru T., and Umemura, T., (2003), ”Forces Underlying Trade Integration in the APEC Region: A Gravity Model Analysis of Trade, FDI”, *Journal of Economic Integration*, 18(1), 126-49.

Shleifer, A., and Vishny, R.W., (1993), “Corruption,” *The Quarterly Journal of Economics*, 108(3), 599-617.

Smarzynska B.K., and Wei S-J. (2000). "Corruption and Composition of Foreign Direct Investment: Firm-Level Evidence," NBER Working Papers 7969, National Bureau of Economic Research.

Svensson, J., (2005), “Eight questions about corruption,” *Journal of Economic Perspectives*, 19, 19-42.

Vrinda Gupta (2007), ”Are US Multinationals Making Rational Offshoring Decisions? A Gravity Model”, Watson Wyatt Technical paper: February 2007.

Wei, S-J., (2000), ”How Taxing is Corruption on International Investors?” *The Review of Economics and Statisitics*, 82(1), 1-11.

Wei, S-J, (2005), “Does Corruption Relieve Foreign Investors of the Burden of Taxes and Capital Controls?” *World Bank Policy Research Working Paper No. 2209.*

Westerlund, J., and Wilhelmsson, F., (2009), “Estimating the gravity model without gravity using panel data,” *Applied Economics*, 9, 1466-1483.

Appendix

Variables

Table A1.1.Country characteristics

Variable	*Definition*	*Source*
ln(distance)	*ln*(weighted distance between countries*)*	CEPII
ln(GDP)	GDP (constant 2000 US$)	World Bank
ln(Pci)	GDP per capita (constant 2000 US$)	World Bank
Corruption	-1*Corruption, high value = high corruption	World Bank governance indicators
Agriculture	Agriculture, value added (% of GDP)	World Bank, national statistics
Share tertiary education	Gross enrollment rate (%), tertiary, total	World Bank
Energy intensity	Energy use (kg of oil equivalent per capita)	World Bank, national statistics
Export ratio	Exports of goods and services (% of GDP)	World Bank, national statistics

Table A1.2. Firm and industry characteristics

Variable	*Definition*	*Source*
Material offshoring	Imports of production inputs	Statistics Sweden, Trade statistics
ln(K/L)	*ln*[Deflated book value, capital stock (buildings and machinery)/(No. of employees)	Statistics Sweden, Financial Statistics
ln(size)	*ln*(No. of employees)	Statistics Sweden, Financial Statistics
Profit ratio	Profit/sales	Statistics Sweden, Financial Statistics
Export ratio	Exports/sales	Statistics Sweden, Financial Statistics
Herfindahl index.	$H_{mt} = \left\{ \sum_{i=1}^{N} s_{it}^2 \right\}, \ where \ s_{it} = \frac{sales_{it}}{\sum_{i=1}^{N} sales_{it}}$ calculated at the 3-digit level	Statistics Sweden, Financial Statistics
Share post-gymnasial edu.	100*(egymn / tsys)	Statistics Sweden, Regional Labor Market Statistics
Share foreign labor	Share of labor force not born in Sweden	Statistics Sweden, Regional Labor Market Statistics
R&D-intensity	Expenditures on R&D/sales	Statistics Sweden, Financial Statistics