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Dynamic Effects of Corruption on Offshoring

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Abstract

For international outsourcing to occur, agents from different jurisdictions must agree on a contract. Using Swedish firm-level data, we analyze offshoring and how a firm's choice of target country and the dynamics of offshored volumes are affected by corruption. The results suggest that corruption is a deterrent to offshoring and that internationalized firms trading with many countries use their flexibility to avoid corrupt countries. Furthermore, firms that are able to establish long-term contracts do so by starting small and successively deepening their engagements.

JEL: D22; F23; L24

Keywords: corruption; offshoring; gravity; firm-level data

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1. Introduction

Within the last two decades, corruption has moved from a marginal topic to a vibrant area of economic research. It has been shown that corruption distorts markets, undermines democracy, increases the costs of doing business by up to ten percent and hampers investments and allocation efficiency. In 2001, bribes alone accounted for an estimated $1 trillion, and the global cost of corruption is estimated at five percent of world GDP. It has also been shown that corruption is a good indicator of overall institutional quality. Can we expect respect for Intellectual Property rights (IPR) and transparency in public decision making to coexist with corruption? It is easily understood why corruption is viewed as a global issue of concern. However, there could also be a positive side to corruption, the so-called grease-the-wheel hypothesis, whereby in countries with cumbersome regulations, corruption may work to improve efficiency and growth. However, the overall impression is that the negative aspects of corruption dominate.[2]

As a response to the devastating effects of corruption, a series of national and international treaties and institutions has been established, including treaties such as the Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (OECD), the Convention on Corruption (EU) and the Declaration against Corruption and Bribery in International Commercial Transactions (UN). Examples of international organizations engaged in this movement include the Organization for Economic Co-operation and Development (OECD), United Nations Development Program (UNDP), Asian Development Bank (ADB), the United Nations Centre for International Crime Prevention (CICP) and Transparency International.[3]

Along with the accelerating interest in corruption, the availability of data that measure corruption has also increased. Measuring corruption is, in itself, challenging. How can we disentangle mismanagement from illegal behavior when the transaction is a secret to the firm? Therefore, a commonly used approach is to calculate perception indices. An alternative route is to draw on hard data such as the number of convicted officials. The pros and cons of these approaches are lively discussed. From a practical point of view, it has been shown that different measures of corruption are highly correlated with each other, and empirical results appear to be robust with respect to the choice of the measurement of corruption; see Mocan (2007), Abramo (2008), Azfar and Knack (2003) and Neelam (2001).

[2] See, e.g., Huntington (1968), Lui, 1985, Méon and Weill (2008), Roeelfsema and Zhang (2009) and Bardhan, (1997).

[3] United Nations Department of Public Information (2000) and Lebelle (2008).

Commonly used measures of corruption include the Transparency International Perception Index, the Kaufman et al. (1999) Perception Index (included in the World Bank data on governance), the International Country Risk Guide (ICRG) Index and the Global Competitiveness Report (GCR) corruption index.

In parallel with the increased interest in corruption and the availability of related data, the number of empirically oriented papers analyzing various aspects of corruption is also increasing.[4] However, earlier studies have failed to analyze corruption and its impact on offshoring. This is surprising because offshoring is considered an activity that is sensitive to corruption and other factors that increase the contract cost. One explanation for the lack of empirical papers on offshoring and corruption is perhaps related to difficulties in measuring offshoring.

The intuition why institutions have an impact on international offshoring is that offshoring does not occur without personal interaction (Nunn, 2007). For offshoring to occur, agents from different jurisdictions must agree on a contract. For the principal, one reason for engaging in corrupt behavior and to pay bribes for permits and services is that it can shorten lead times. However, the total cost of corruption can be difficult to predict because "deliverance" is uncertain and renewed "claims" can occur. It has also been found that corruption is correlated with opportunistic behavior and that theft and waste of project funds are relatively commonly in corrupt environments. Therefore, corruption increases needs for monitoring and control. Other uncertain costs include fines and costs that occur if an issue is taken to court. There is also a risk of missed contracts due to a loss of reputation. Obviously, there's a moral side that also needs to be considered. Bearing in mind that international offshoring can involve transfer of management control, decision making and firm-specific knowledge, it is plausible that corruption can be decisive in determining whether a cross-border relationship will be established. It should also be considered that the impact of corruption is likely to be greatest when sensitive information is involved. For standardized jobs, corruption is less likely to be an issue.[5]

To date, there is lack of evidence regarding the relationship between corruption and international offshoring. One related exception is Niccolini (2007), who studies the impact of institutions on trade performed by US firms with their affiliates abroad (FDI/in-house offshoring). Using Kaufmann institutional data, Niccolini (2007) finds that weak institutions

[4] Examples of topics in the "corruption literature" include corruption and economic growth, FDI, trade, determinants of corruption and how to fight corruption. See, e.g., Dreher and Herzfeld (2005).
[5] Hakkala et al. (2008), North (1991), Massini et al. (2010) and the Global Infrastructure Anti-Corruption Centre (2009).

hamper trade in intermediate goods, whereas the impact on final consumption goods is less clear. Considering that contract costs are greater when negotiating with an external supplier than with an agent within the corporation, these results may be indicative, although they may not fully capture the impact, of cross-border, cross-firm contract costs.

In contrast to corruption and offshoring, there are a number of empirical papers on institutions, corruption and FDI. Many of these papers use measures of perceived corruption to reflect institutional quality (see, e.g., Mocan (2004), Abramo (2008), Dahlström and Johnson (2007) and Caetano and Calerio (2005)). Other studies on FDI, corruption and institutions include those by Habib and Zurawicki (2002), Egger and Winner (2006) and Hakkala et al. (2008), who all found corruption to be detrimental to FDI. Therefore, acknowledging that corruption can be viewed as a general index of institutional quality, evidence suggests that weak institutions (a corrupt environment) hamper ingoing FDI. Regarding trade, Méon and Sekkat (2006) used the governance data of Kaufmann et al. (1999) and found that corruption, rule of law, government effectiveness and lack of political violence were all positively correlated with exports in manufactured goods. Further evidence and surveys suggesting that corruption is detrimental to trade are found in the World Bank (2000) and in Bandyopadhyay and Roy (2007). As a comparison, it has been shown that the influence of institutions on international trade has been estimated to be even stronger than that of tariffs (see Chang (2010); Belloc (2006); Anderson and Marcoullier (2002); Márquez et al. (2010) and Levchenko (2007)). To conclude, the overall impression is that corruption is detrimental to trade and FDI and that the negative impact is greatest for developing countries.

We add to this literature in several ways. First, by explicitly focusing on corruption and offshoring, we analyze a relationship that has been overlooked by the empirical literature.

Second, research is lacking on how the sensitivity to corruption differs across different types of firms. We analyze whether large global firms with international networks react differently to corruption than smaller firms and the role of international networks.

Third, the effect that corruption has on the dynamics of offshoring remains unexplored. We examine this issue and analyze how corruption in the target economy affects the selection and duration of the contracting relationship and how the volume of offshore inputs develops, depending on whether the contractual partner is located in a corrupt or in a corruption-free environment. We also compare firms that have maintained offshoring with those that have cancelled their offshoring and analyze whether there are systematic differences in the learning curve regarding how sensitive firms are to corruption.

Finally, our analysis is based on detailed firm-level data combined with country data. These types of detailed data are rare in the previous literature. The data allow us to apply several different econometric approaches, thus limiting the risk that the results will be driven by the choice of econometric method.

The results of this study suggest that corruption is a deterrent for both the choice of destination country and the volume of offshored material inputs. Moreover, global firms that are already offshoring to several countries seem to use their flexibility to avoid corrupt countries. Analyzing the dynamic effects of corruption, we find that offshoring agreements with corrupt countries have shorter durations and smaller volumes than corresponding flows with countries that are relatively corruption-free. Furthermore, the volume of offshore inputs increases relatively rapidly during the first two years of the contract and thereafter levels out. Finally, we find that long-term relationships are dominated by firms that are relatively sensitive to corruption. Therefore, careful firms that begin small and learn how to handle foreign institutions are most successful in maintaining long-term relationships with foreign suppliers.

The paper is organized as follows. In Section 2, definitions are presented, and the theoretical link between corruption and offshoring is discussed. In Section 3, we present data, describe the gravity model and discuss econometric considerations. The results are given in Section 4, and Section 5 concludes the paper.

2. Outsourcing and corruption: Theory and concepts

Outsourced offshoring of production give rise to trade in intermediate inputs. Therefore, inputs that previously have been produced in-house are relocated to an agent in a different jurisdiction, and although domestic offshoring may be an option, most attention is focused on situations in which an external foreign supplier is involved. This is often described as "outsourced offshoring."[6] When we study theoretical models of offshoring with corresponding empirical analyses, theoretical models typically focus on *outsourced offshoring*, whereas empirical investigations are often unable to distinguish between *in-house offshoring* and *outsourced offshoring*, meaning that the empirical analysis often covers (total) *offshoring*, measured as imports of intermediates, a definition that we will follow.

Although corruption is a commonly used term, it is difficult to find a precise and commonly accepted definition of it. A common theme is that corruption involves the misuse

[6] Offshoring or outsourcing to a foreign identity includes (i) outsourced offshoring (outsourcing to a foreign external supplier) and (ii) in-house offshoring (FDI – within the corporation).

of a public office for private gain in a way that alters the rules.[7] Corruption may also occur in daily business life without any direct intervention from public agents. Therefore, we can include a dimension in which corrupt behavior occurs among individuals who are in control of assets that are not their own (e.g., business people who make decisions on behalf of the owners of capital). This wider scope of corruption is reflected in the perceived corruption measures we use here (the World Bank corruption index).

There are several mechanisms through which corruption affects an economy and a firm's incentive to offshore. A fundamental argument against corruption is that it leads to a misallocation of contracts. Resources are moved from the most efficient agents to less efficient ones. That is, even if corruption is viewed as an auction, there is no guarantee that the most efficient bidder is willing to lay the highest bid. Or, as noted by Rose-Ackerman (1997), the highest briber may be the one who is most willing to compromise on quality. Direct costs for corruption include costs for bribes and time consumed in such affairs and negotiations. As previously noted, there are also uncertainties such as the need to pay for more bribes, the uncertainty of deliverance, the risk of being taken into court and the loss of goodwill. However, the contract issue concerns not only the principal, but it also concerns the agent. The standard hold-up problem recognizes that the receiving party often must make contract-specific investments, when complete contracts cannot be enforced, this leads to underinvestment. In this case, it is understood that corruption works as an obstacle, reducing the trust in the system and aggravating the problem of underinvestment (Ornelas and Turner, 2008).

One influential theoretical framework for analyzing the offshoring decisions of firms is the Grossman-Hart-Moore (GHM) property rights model.[8] In this model, ownership is the key for trade in different types of goods to take place. Based on GHM, Antràs (2003) built a property-rights model for outsourcing in which he demonstrated that it is relatively difficult to outsource capital-intensive inputs. Antràs and Helpman (2004) built on the heterogeneous firm model of Melitz (2003) and showed that firms not only have to choose between producing in-house or outside the firm (outsource) but also between producing at home or abroad. Grossman and Helpman (2003, 2005) showed that a good contracting environment improves the probability of offshoring. Other papers in this area of research include Chen et al. (2008), who analyzed the trade-off between FDI and offshoring, and Antràs and Helpman (2006), who discussed the nexus between the quality of contractual institutions and the choice

[7] See, e.g., Kain (2001) and Svensson (2005).
[8] See, e.g., Hart and Moore (1990), Grossman, Sanford and Hart (1986) and Hart (1995).

between outsourced offshoring and integrated production. One conclusion drawn from these papers is that better contracting institutions favor offshoring, often at the expense of FDI.

Corruption may also be considered to have composition effects. A conclusion drawn from Grossman and Helpman (2002), Antras (2003) and Feenstra and Hanson (2005) is that sensitive tasks are not easily outsourced. The reason for this difficulty is that to ensure IPR, quality, deliveries and other important features of the transaction, the contract easily becomes complex, time-consuming and expensive to formulate. If the contract cost is a money issue, it may be argued that large firms are better equipped than small firms to handle a corrupt environment, partly because of their higher bargaining power but also because they have the ability to pay.

Another mechanism through which corruption affects offshoring is in terms of search costs. Search cost models emphasize that a reduction in search costs can facilitate trade and that corruption and institutions can alleviate such frictions (see, e.g., Raush and Watson (2003), Aeberhardt et al. (2010) and Araujo and Mion (2011)). An important implication derived from these models is that corruption and institutional quality not only affect the mode of entry and probability of contract completion but also affect how the volume of trade and offshored inputs will evolve. In corrupt countries, the average contract length will be relatively short, and firms will begin with small volumes and successively increase the volume as they begin to know their contractual partner. As a consequence, trade flows with corrupt countries will be characterized by small volumes and short contracts. However, when a relationship is maintained, trading volumes will increase more rapidly (see, e.g., Belloc (2006), De Groota et al. (2005), Depken and Sonora (2005), Rauch and Watson (2003), Araujo and Mion (2011) and Eaton et al. (2009).

In summary, theoretical models suggest that corruption is likely to serve as a deterrent to offshoring, the sensitivity to corruption varies across different types of firms and the dynamics of the evolution of offshoring are affected by corruption in the target economy. To empirically tackle issues in which different types of trade are involved, the gravity model of trade has proven to be a good point of departure, and we therefore continue with a discussion of that model.

3. Empirical approach

We base our empirical analysis on the gravity model, which has been proven to explain trade remarkably well. In its elementary form, the gravity model can be expressed as:

$$M_{ij} = \mathrm{T}(r)\frac{Y_i Y_j}{d_{ij}^{-\varepsilon}} \qquad (1)$$

where M_{ij} are imports to country i from country j, Y_i Y_j is the joint economic mass of the two countries, d_{ij} is the distance between them and $T(r)$ is a proportionality constant (Tinbergen (1962)). Theoretical support for the model was originally poor, but since the late 1970s, several theoretical developments have emerged. The model was advanced by Anderson (1979), who formally derived the gravity equation from a differentiated product model. An additional important development was provided by Bergstrand (1985, 1989), who derived the gravity model in a monopolistic competition setting. It is now recognized that the model is consistent with several of the most common trade theories.[9]

Bergstrand (1989) highlighted the relevance of per capita income and its use as a proxy for factor prices and intensities.[10] Considering the role played by the factor price in offshoring decisions, failing to include a measure that captures factor price differences may lead to omitted variable bias. We follow the common principle of including population in the model.[11] We also include an ownership variable indicating whether a firm is a multinational enterprise (MNE). To account for firm-level gravity, we apply firm sales. Finally, to control for trade resistances, in addition to distance and fixed effects, we include information on tariffs defined at the most disaggregated (product) level. In the empirical application of the gravity model, there are two important issues that demand attention, that is, fixed effects and zero trade flows.

3.1. Fixed effects

Regarding fixed effects, Anderson and Van Wincoop (2003) applied a general equilibrium approach and showed that the traditional specification of the gravity model suffers from an omitted variable bias because it does not consider the effects of relative prices on trade patterns. Anderson and Van Wincoop argued that a multilateral trade resistance term (MTR) in the form of importer and exporter fixed effects would yield consistent parameter estimates. However, there is also a cost for using fixed effects since they eliminate time invariant information in data. For example, geographical distance is time invariant and will therefore drop out from fixed-effects regressions. In addition, variables such as corruption and other

[9] See, e.g., Bergstrand (1989), Helpman and Krugman (1985) and Baldwin and Taglioni (2006).
[10] For a given GDP, a larger population implies a lower per capita income and lower wages.
[11] Anderson and Van Wincoop (2003) included population as a control for income and openness because rich countries tend to use a greater share of their income on tradeables. See also Greenaway et al. (2008) and references therein.

country characteristics exhibit little variation over time and will therefore be estimated with large standard errors when using within variation only. In our context, this is unfortunate because cross-sectional differences in corruption help us to understand the link between corruption and offshoring.

A common way to handle fixed effects is to include various region-specific dummy variables, so that some fixed effects are controlled for while, at the same time, the key variables of the model are kept in the estimations. Another approach to control for fixed effects and the impact of changing relative prices is a two-step approach suggested by Anderson and Van Wincoop (2003), in which MTR is solved for as a function of observables. Feenstra (2002, 2004) discusses the calculation of GDP-weighted remoteness indices and fixed-effects regressions as possible solutions to the problem.

An alternative solution has been suggested by Plümper and Troeger (2007). They present the Fixed Effect Variance Decomposition (FEVD) estimator as a way to handle time-invariant and slowly changing variables in a fixed-effects model framework.[12] However, several researchers have recently questioned the FEVD model (Greene (2011a, 2011b), Breusch et al. (2011a, 2011b)). The criticism of the FEVD estimators concerns its asymptotic properties and bias, suggesting that it underestimates standard errors and that the FEVD model is a special case of the Hausman-Taylor IV procedure. In defense of the FEVD model, Plümper and Troeger (2011) emphasize the finite sample properties of the model and illustrate the advantages of the model with an extensive set of Monte Carlo simulations. The issue is yet to be resolved, but the debate suggests that there are reasons to be cautious in the interpretation of results from the FEVD estimator.

To determine how sensitive results are to fixed effects, we estimate models with varying degrees of control for fixed effects. As a robustness test, we also apply the FEVD estimator to explore how unobserved heterogeneity and firm-level fixed effects influence results.

3.2. Selection and zero trade flows

Our second concern stems from the recognition that all firms are not equal. Some firms engage in offshoring, and some do not, and selection into offshoring is not random. Melitz (2003) and Chaney (2008) showed how selection into trade is affected by sunk costs and

[12] The idea of the FEVD estimator is to extract the residuals from a fixed-effects model, construct a variable that captures unobserved heterogeneity and use this as a regressor, thereby controlling for fixed effects. This allows us to control for fixed effects and, at the same time, use cross-sectional variation.

productivity. Therefore, as barriers to trade vary, both the volume and number of previously traded goods will change. Helpman Melitz and Rubenstein (HMR) (2008) describe how changes in trade are related to changes in both the intensive and the extensive margin of trade, and they propose a way to handle the bias that will be induced if the margins are not controlled for. The HMR model can be expressed as a Heckman selection model extended with a parameter that controls for the fraction of exporting firms (heterogeneity).[13]

The unit of observation in this study is firm-country pairs, and thus, the data contain observations with zero trade. To be precise, 97% of the observations are zero-valued. This means that if selection into offshoring is not random, failing to adjust the regressions for selection may lead to biased results.

To account for selection, we elaborate with various estimators. First, we apply a Heckman selection model that is compared with the HMR specification. To further analyze the sensitivity of fixed effects in the Heckman model, as a robustness test, we apply the FEVD-estimator in a Heckman framework. If results from the FEVD model deviate from those of the Heckman model, we may take this as an indication of a lack of control for fixed effects.[14] To further evaluate the sensitivity of the inclusion of fixed effects, we estimate the OLS model with varying control for fixed effects. For the exclusion restriction in the Heckman models, we use data on skill intensity and export intensity at the firm level.[15] Tests for the exclusion restriction indicate that these are valid. It is well known that the Heckman model is not valid in a fixed-effect framework.[16]

With these concerns as a background, a representative log-linear OLS model takes the following form.

[13] We use firm-level data that allow us to directly control for firm-level productivity. It is therefore plausible to, a priori, assume the HMR specification to produce results similar to the traditional Heckman model.

[14] When estimating the Heckman-FEVD model, we note that Mills ratio is an estimated regressor, which adds uncertainty to the model. Murphy and Topel (1985) suggest a standard error correction when estimated variables are included. More recently, Hardin (2002) showed that the sandwich estimator, which is built under less restrictive assumptions and is efficient against a wide range of non-spherical distortions, is asymptotically identical to the Murphy-Topel estimator. We might also consider the hierarchical structure of our data and cluster standard errors by country. The cluster adjustment used here also imposes the sandwich correction and therefore adjusts for the built-in uncertainty in estimated variables.

[15] Bernard and Jensen (2004) is an example in which skill-intensity has been used to explain selection into internationalization. The idea is that highly productive and skill-intensive firms are more internationalized than other firms. In a similar vein, exporters have overcome the internationalization barrier and are therefore more likely to engage in international offshoring.

[16] Greene (2001).

$$\ln(O)_{ijt} = \alpha + \beta_1 \ln(Y_{jt}) + \beta_2 \ln(q)_{it} + \beta_3 \ln(Dist)_{jt} + \beta_4 (Corruption)_{jt} + \beta_5 (Tariff)_{jt} + \beta_6 \ln(Pop)_{jt} + \sum_r \beta_r D_r + \gamma_t + \varepsilon_{ijt} \quad (2)$$

where O_{ij} is imports of offshore material inputs by firm *i* imported from *j*, *Y* is the GDP of the target economy, q is firm size measured as total sales, *Dist* is the geographical distance, *Corruption* is a measure of the level of corruption where a higher value indicates better governance (lower level of corruption), *Tariffs* is the trade-weighted tariff barrier, *Pop* is the population, D_r is a set of regional/country dummies, γ_t is period dummies and ε is the error term.

3.3 Data and description

The analysis is based on Swedish firm-level data that are matched with a set of country characteristics. Firm-level data consist of a set of linked, register-based datasets from Statistics Sweden. The financial statistics data (FS) and regional labor market statistics (RAMS) contain detailed information on the inputs and results of firms, such as value-added, capital stock, number of employees, education, wages, ownership, sales and industry affiliation. For non-EU trade, data on material imports cover all transactions, and for intra EU-trade, import data are collected for all firms with a total import value above 2.2 million SEK (approx. 240,000 EUR).[17] Material imports are classified according to country of origin and item and are defined at the five-digit level according to NACE Rev 1.1 and grouped into major industrial groups (MIG).[18] The MIG code classifies imports with respect to their intended use. In the analysis, we use the MIG definition of intermediate and consumption inputs as our offshoring variable.

Country characteristics are collected from the World Bank. For corruption, we use the Kaufman perceived corruption index taken from the World Bank (WB) governance data.[19] A higher value indicates less corruption, and therefore we label the corruption variable

[17] To reduce the potential bias induced by threshold values on imports, we consider only firms with at least 50 employees in the analysis.

[18] MIG – European community classification of products: Major Industrial Groupings (NACE rev1 aggregates).

[19] We have also estimated models using the *Corruption Perception Index* collected by Transparency International *(TI)*. Both indices are based on perceived corruption and results are not dependent on which index is used (results available on request). The major differences between the indices are in

used in the regressions as "corruption free." Additional country characteristics include population and the GDP collected from the World Bank database. Tariff data are obtained from the UNCTAD/TRAINS database, and for distance, we use the CEPII distance measure, which is weighted to take internal distances and population dispersion into account.[20] For details of the variables, see the Appendix. Because of different timeframes for the datasets, we limit the analysis to the period from 1997 to 2005.

An overview of the data described in Table A1-A4 reveals that the offshoring firms are relatively large, skill-intensive and overrepresented by MNEs. This is expected because becoming an offshorer requires that the firm overcome a number of obstacles. A less-expected result is that these firms also tend to have relatively low productivity. To some extent, this may be driven by the heavy weight that wood and forest products have in Swedish trade.

Observing the geographical distribution of Swedish offshoring, we find that although factor price differences are a primary driver for vertical specialization, 85% of material offshoring is directed toward Europe, where northern and western Europe account for 75% of the total offshoring. This suggests that offshoring, to a large extent, is about deliveries from specialized suppliers. Finally, in Table A2, we note that pair-wise correlations are relatively low, suggesting that multicollinearity does not appear to be a problem and that the WB and TI corruption indices are highly correlated.

4. Results

4.1 Basic models

Our starting point is the OLS estimations, in which we vary the degree of control for fixed effects. Therefore, we initially disregard selection. Estimation 1 in Table 1 is performed with regional dummies, and in estimations 2 and 3, we increase the control for fixed effects and apply country and unit (firm-country pair) fixed effects, respectively.

[Table 1 about here]

terms of coverage and time span. Because of its greater coverage, our first choice is the World Bank corruption index. Knack and Omar (2002) discuss a set of corruption indices and show that despite methodological differences, the difference between the indices is minor.

[20] More information on CEPII's distance measure is found in Magner and Zignago (2006).

Focusing on corruption, the inclusion of fixed effects beyond regional dummies removes the significance of corruption. This might not come as a surprise because most of the variation in this variable is driven by cross-country differences and not by variation over time (see Table A1),[21] an issue that will be addressed later. However, comparing models with country dummies versus fixed-effect estimations indicates that a further infusion of fixed effects from country dummies to the unit level (firm-country pairs) has no considerable impact. These initial results indicate that the modeling of fixed effects may be especially important for slowly changing country variables, such as corruption.

In estimations 4 through 6 in Table 1, we proceed to estimate models in which non-randomness into offshoring is controlled for. In the selection equation, note that of 6.3 million observations, approximately 0.2 million observations, or 3% are non-zeros. This reflects the fact that most firms offshore to only a small number of countries (see Table A4).

Considering that a fixed-effects version of the Heckman model is not defined, we analyze whether results from selection models are robust regarding the degree of control for fixed effects.[22] In estimation 3, we apply a Heckman model in which fixed effects are absorbed by time, industry and 22 region dummies. The results suggest that corruption is a deterrent both for the choice of target country and, given selection, for the volume of offshore material inputs. Therefore, contrary to Hakkala et al. (2008), who, for Swedish firms in some estimations, found the effect of corruption to be of the opposite sign for different types of FDI, we do not find any such contradictions. For the exclusion restriction, the export variable is significant, whereas the share of workers with post-secondary education (skilled workers) is insignificant.

As noted by Helpman, Melitz and Rubenstein (2008), firm heterogeneity adds to the complexity. As seen in Table 1, the HMR and Heckman specifications return similar results, with the major difference being that the HMR specification returns estimates of the distance variable that is closer to unity. Considering that we have detailed firm-level data available, there is limited capacity for the HMR specification to add information to the model.

As previously discussed, fixed effects can be problematic when handling slowly changing variables, such as corruption and other-country characteristics. We address this issue

[21] From Table 1 and Table A1, it may be noted that similar to corruption, the GDP also has a relatively large between variation but remains significant when unit-fixed effects are imposed. This suggests that both the level and growth of countries' GDP are important in explaining offshoring.

[22] The same selection equation is applied for the Heckman, HMR and Heckman-FEVD models. To save space, we suppress rho and lambda from the tables because these are positive and strongly significant in all Heckman models.

by applying the FEVD estimator in a Heckman framework. In Table 1, we see that the Heckman-FEVD model returns more efficient estimates than the standard FE model. In particular, insignificant results for the corruption variable become significant when using the FEVD framework, a result that highlights the efficiency problem attached to the standard fixed-effects model in the presence of slowly changing variables. An indication of the capacity of the variance decomposition variable to absorb unit effects is given by comparing R^2; when we switch from OLS regressions with region dummies to the Heckman-FEVD model, R^2 increases from 24% to 84%. In addition, the FEVD model has the same R^2 as the FE model with absorbed fixed effects, suggesting that the variance decomposition pick up unobserved heterogeneity.[23]

Comparing the Heckman-FEVD model with the HMR model and the Heckman specification, we see that the selection augmented FEVD model does not upset the results from other selection models. The estimated impact of corruption for the Heckman-FEVD variable is between the corresponding estimates for the HMR and the Heckman specifications, although it is closer to estimates found by the Heckman model. The similarity between the Heckman model and the FEVD model suggests that additional control for fixed effects above regional dummies does not alter the results. Considering that selection is an important feature of offshoring, the Heckman model is not valid under a standard FE framework and the results are robust with respect to both the choice of estimator and model specification, we proceed by estimating Heckman models and including our 22 regional dummies in the model.

For other control variables, we note that nearby countries with large markets attract offshoring, and multinational firms seem to engage in offshoring more than non-MNEs. Some unexpected results include the relatively frequent negative relationship between the firm's TFP and offshoring and the estimations suggesting a positive relationship between tariffs and offshoring. A possible explanation for the positive relationship between tariffs and offshoring may be found by first observing the population variable. The positive sign for the population variable indicates that offshoring is conditionally biased toward low-wage countries. Therefore, the positive sign on tariffs may be driven by the (conditionally) negative

[23] We apply the FEVD model in a Heckman model and note that the Mills ratio is an estimated regressor, which adds uncertainty to the model. Murphy and Topel (1985) suggest a standard error correction when estimated variables are included. Hardin (2002) found that the sandwich estimator is asymptotically identical to the Murphy-Topel estimator. We also consider the hierarchical structure of our data and adjust (cluster) standard errors by country. The cluster adjustment used here also imposes the sandwich correction and therefore adjusts for the built-in uncertainty in estimated variables.

relationship between income and offshoring and the fact that there may be tariffs for offshoring to low-wage countries that are not members of the EU.

4.2. Heterogeneity

As previously discussed, corruption can be thought of as a fixed cost (a one-time payment) or as an increased marginal cost requiring continuous outlays. If corruption works as a fixed cost, large firms have an advantage because they are more capable of paying (and have a higher bargaining power). At the other end of the scale, we have corruption as an increased marginal cost, in which the impact of corruption is independent of firm size. To the extent that the cost of "keeping up relations" increases by less than a one-to-one ratio with firm size, we expect to find an advantage for large firms. When exploring firm heterogeneity and firm characteristics, firm size is thus a factor of interest. Therefore, a hypothesis would be that large global firms with international networks should be relatively well equipped to handle a corrupt environment and, as a consequence, less sensitive to corruption. However, these firms can, with relative ease, use their network and relocate away from cumbersome markets. The alternative cost of switching suppliers is low if alternative suppliers are already in place. The alternative hypothesis is therefore that large firms are not less but more sensitive to corruption than other firms. This would be especially true if firms do not fully consider the downside of corruption when they enter a market, and problems develop after the operation has been in place for a while.

[Table 2 about here]

The results for different types of firms are presented in Table 2 and show an interesting but consistent pattern. Large firms, MNEs and firms that already offshore to several countries are more sensitive to corruption than their counterparts (small firms, non-MNEs and those that offshore to only one or a handful of countries). Although the differences between different types of firms are not dramatic, the results suggest that large and experienced offshorers use their networks and avoid corrupt countries. Given that large firms account for the bulk of offshoring and we often find relatively high levels of corruption in poor countries, this further supports arguments for fighting corruption.[24]

[24] As a stability test, we estimated models with both the WB and the International Transparency corruption (IT) index yielding nearly identical results. Because of the greater coverage of the WB index, this is our preferred choice. Estimations with the IT index are available on request.

The MNE versus non-MNE division strengthens this analysis. For non-MNEs with no affiliates abroad, our measure of offshoring cannot contain in-house offshoring. Both the contract cost and contract uncertainty are lower for in-house offshoring than for offshoring to an external agent. Therefore, it can be expected that non-MNEs should be more sensitive to corruption than MNEs. The reverse results found in this study strengthen the finding that MNEs and other large firms use their networks to avoid corrupt markets.

4.3. Corruption and the dynamics of offshoring

An interesting feature of search cost based models is their predictions on how trade will evolve. The main predictions are that initial volumes will be relatively small, particularly when countries with weak institutions are considered.[25] However, as time goes by, trading partners will learn to know each other, and volume will increase. Hence, the learning curve will feed into the volume of offshored inputs. In Table A6, we address this issue by grouping offshorers (and their trade with different countries) according to the duration of the trading relationship. To ease transparency of the results, the estimated coefficients for corruption are presented in Figure 1.

[Figure 1 about here]

Figure 1 reveals two interesting patterns. From the selection equation, we note that the longer a trading relationship is sustained, the more sensitive firms are to corruption. One interpretation is that careful firms, sensitive to corruption -in the entry decision, are the ones that are most successful in maintaining long-term relationships. However, from the volume equation we have another pattern namely, in long-term relationships, the sensitivity of volumes to corruption is the lowest. How can these two trends occur simultaneously? The key is learning. If firms in long-term relationships learn to handle foreign institutions, the sensitivity of volumes to weak institutions decreases over time, yielding a learning curve.[26] Therefore, we in Table A7 continue by analyzing, for a given contract length, how volumes

[25] A comparison of volumes reveals that the average size of offshoring trade flows with corruption-free countries is approximately17 times greater than the corresponding number for the group of the most corrupt countries.

[26] See Linders et al. (2005), Araujo and Mion (2011) Raush and Watson (2001) and Aeberhardt et al. (2010).

and the sensitivity to corruption evolves over time.[27] The results from this analysis are depicted in Figure 2A and 2B below.

[Figure 2A and 2B about here]

Figure 2A shows that the sensitivity of volume for corruption tends to decrease over time. In addition, this decreasing sensitivity over time implies, consistent with the results shown in Figure 1, that the average sensitivity will be lower for long-term contracts than for short-term contracts. Therefore, learning appears to occur. A final observation is that the learning curves for contracts of different lengths are fairly parallel. Therefore, it is difficult to see a steeper learning curve among offshorers with long-term relationships.

In the right panel, Figure 2B allows for an analysis of the prediction that firms start small and successively increase volume as they learn to know their contracting partner. The upward sloping trend supports the hypothesis of increasing volumes. A general observation is that trade flows increase relatively rapidly during the first two years and level out thereafter. For contracts that are cancelled, there is a tendency toward decreasing volume one or two years before the trade is cancelled. For long non-cancelled contracts, we note that the significance of the period dummies moves from negative and strongly significant to positive and non-significant. Therefore, there is a significant increase in volume.

A further prediction is that volumes in long-term relationships are expected to increase more rapidly if the agent is located in a corrupt country. This is because of cautiousness initial volumes with corrupt countries will be small. We focus on firms that sustain trade for at least six to eight years, (that is, they are still offshoring in the last year of observation. The results from this analysis are found in Table A7, and in Figure 3, we depict the estimated period-of-offshoring specific dummies for different types of countries.

[Figure 3 about here]

[27] Note that the choice of country is taken in the first year, and it therefore becomes relevant only for analyzing the evolution of the sensitivity of the volume of trade (the volume of offshored inputs).

Although we are focusing on long-term contracts, we cannot detect a faster increase in trade flows with corrupt countries. However, consistent with search cost based theories, trade with corrupt countries is characterized by relatively short contracts and low volumes. To be precise, Table 3 reveals that in offshoring with corrupt countries, approximately three of four offshoring flows (72 percent) last for one year, whereas the corresponding number for the group of least corrupt countries is 54 percent.

[Table 3 about here]

5. Summary and conclusion

Previous research on corruption has recognized that corruption can greatly distort markets, hamper investments and alter patterns of trade and investment. However, little is known about the impact of corruption on offshoring. Considering that offshoring is a key element in a firm's internationalization strategy and that offshoring is an activity in which firm-specific and sensitive information sometimes must be shared with an external agent in another jurisdiction, a lack of knowledge in this area is unfortunate.

Using detailed Swedish firm-level data combined with a set of country characteristics, we analyze how corruption in target economies affects the offshoring decisions of firms. The results suggest that corruption is a deterrent to both the choice of destination country and the volume of offshore material inputs.

Further, all firms are not identical in that they differ in their capacity to handle and tolerate corrupt environments. Specifically, large and financially strong firms are expected to be better equipped to handle corruption than small firms, partly because strong firms can carry the costs and also because of their bargaining power. At the same time, global firms can, with relative ease, use their network and relocate an activity. Therefore, the question of whether global firms are more or less sensitive to corruption than other firms is, to a large extent, empirical. The results suggest that large internationalized firms that already are offshoring to several destinations are the most sensitive to corruption. Therefore, global firms use their network to avoid corrupt environments.

Search cost based theories suggest that corruption not only has volume and selection effects, but the dynamics of how trade evolves are also affected. We find that the average trade flow with corrupt countries is of shorter duration and of smaller volume than corresponding flows with countries that are relatively corruption-free. Furthermore, as a

general observation, we find that flows of offshore inputs increase relatively rapidly during the first two years of trade and level out thereafter. For contracts that are cancelled, there is a tendency toward decreasing volume in trade one or two years before the trade is cancelled.

Comparing countries at different levels of corruption, we find no evidence that trade with corrupt countries develops differently from trade with countries with less corruption. The major difference in this respect is that contracts with corrupt countries are shorter and that volumes are smaller.

A final and interesting finding is that long-term relationships are dominated by firms that are relatively sensitive to corruption. Therefore, firms that are careful, start small and are able to learn how to handle foreign institutions are those that are most successful in maintaining long-term relationships with foreign suppliers. Thus, the overall conclusion is that corruption in target economies, in many different ways, is a deterrent to inward offshoring. Fighting corruption can both increase the volume of offshoring and prolong the duration of the average contract.

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Appendix

Table 1. Material offshoring and corruption. Basic models.
Dependent variable, material import of offshored materials, 1997–2005.

Variable	1. OLS	2. OLS	3. FE	4. Heckman [(A)]		5. HMR[(B)]	6. Heckman FEVD [(C)]
				Selection	Volume	Volume	Volume
***ln*(distance)**	-0.8826 (-2.92)***	2.9472 (6.51)***	--	-0.7738 (-8.69)***	-1.5164 (-6.51)***	-1.0083 (-3.47)***	-0.8062 (-265)***
***ln*(GDP)**	0.0616 (0.31)	0.9456 (2.79)***	1.8554 (3.94)***	0.2501 (4.04)***	0.2961 (1.57)	0.6687 (3.59)***	0.1357 (6.17)***
***ln*(Population)**	0.4578 (2.12)**	-4.0547 (-3.56)***	-4.2786 (-2.39)**	0.0772 (1.27)	0.4951 (2.46)**	0.7972 (3.94)***	0.62846 (28.99)
Corruption free	0.3665 (1.81)*	-0.0163 (-0.09)	-0.1950 (-0.77)	0.2834 (5.14)***	0.5845 (2.82)***	1.4062 (6.14)***	0.6847 (23.04)***
MNE	0.2306 (4.47)***	0.2412 (4.78)***	0.0232 (1.01)	0.2576 (16.87)***	0.4763 (7.18)***	1.1394 (15.29)***	0.1140 (2.72)***
***ln*(Firm size) sales**	0.4520 (13.25)***	0.4518 (14.07)***	0.5570 (20.54)***	0.2447 (45.17)***	0.6514 (22.10)***	1.1998 (19.60)***	0.6317 (15.96)***
***ln*(TFP)**	-0.0204 (-4.27)***	-0.0207 (-4.37)***	0.0083 (3.19)***	-0.0082 (-8.46)***	-0.0270 (-5.58)***	-0.0439 (-8.74)***	0.0061 (1.37)
Tariffs	-4.1488 (-4.33)***	0.1014 (0.76)	0.3009 (1.59)	2.6767 (5.41)***	-2.3382 (-2.06)**	6.2451 (5.53)***	1.2944 (3.86)***
Share skill high				0.0400 (0.38)			
Export ratio				0.2578 (10.14)***			
ETA							1 (1691)***
Mills					(5.90)***	4.1898 (13.41)***	1.1229 (158.6)***
z, z^2, z^3						yes	
Industry dummy	yes	yes	yes	yes	yes	yes	Yes
Period dummy	yes	yes	yes	yes	yes	yes	Yes
Region dummy	yes	--	--	yes	yes	yes	Yes
Country effects	--	yes	--	--	--	--	--
Firm-country fe	--	--	yes	--	--	--	--
R^2	0.24	0.27	0.84			0.26	0.84
Obs.	202 449	202 449	202 449	6328 126	202 449	202 449	202 449

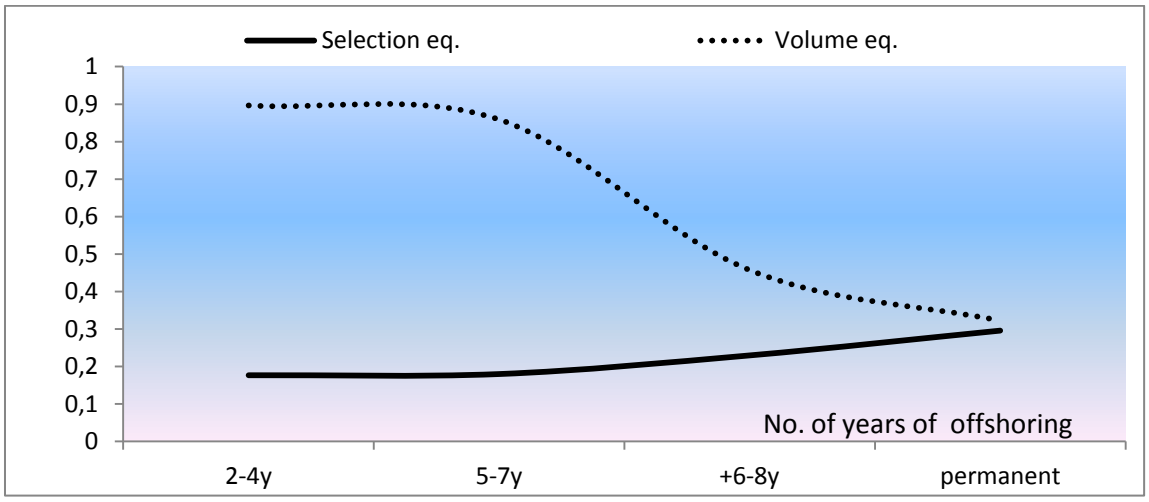
Note: t-values within parenthesis (.). *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. Firms with at least 50 employees. Robust standard errors clustered by country. Both rho and lambda are strongly significant in the Heckman model.

Table 2. The impact of corruption on different types of firms. Heckman models.[(A)]

	Firm ownership		Firm size		No. of sourcing countries		
Effect of corruption free	Non-MNEs	MNEs	Small firms	Large firms	< 8 countries	9-16 countries	+17 countries
(Volume eq.)	0.2563 (1.30)	0.7881 (3.68)***	0.6343 (3.02)***	0.6903 (3.29)***	0.2980 (2.82)***	0.4696 (4.37)***	0.6257 (5.69)***
(Selection eq.)	0.3792 (4.32)***	-0.1855 (-2.77)***	0.3333 (3.71)***	0.3333 (3.71)***	5.4201 (33.26)***	6.0236 (46.24)***	0.4948 (9.58)***

Notes: Large firms L > 500, small firms L<= 500 employees. Note: t-value within parenthesis ( ). *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. Standard errors clustered by country. Firms with at least 50 employees. All models include a full variable set-up including firm-, country-, trade-resistance variables and region, industry and period dummies. See Table 1.

Figure 1. The impact of corruption by contract length



Note: Estimated impact of corruption on offshoring, by contract length.
Years 2–4 and 5–7 contain results from trade flows that are ended. Years 6–8+ contain firms that offshore to a country for at least 6–8 years and are offshoring in the last year of observation. "Permanent" includes firms that offshore to a country throughout the period of observation. Estimates are from Table A6.

Fig 2A. The sensitivity of corruption.

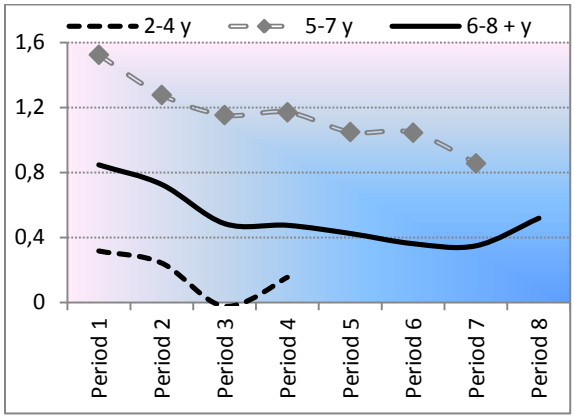
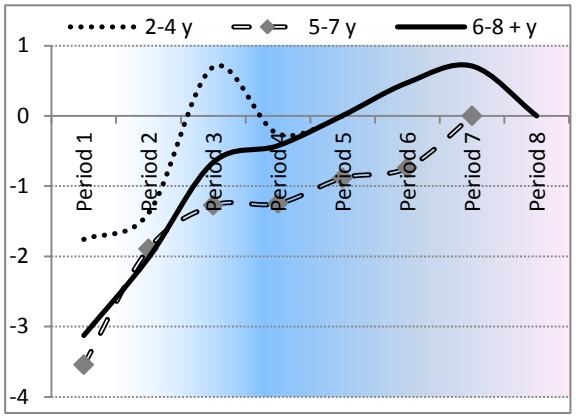
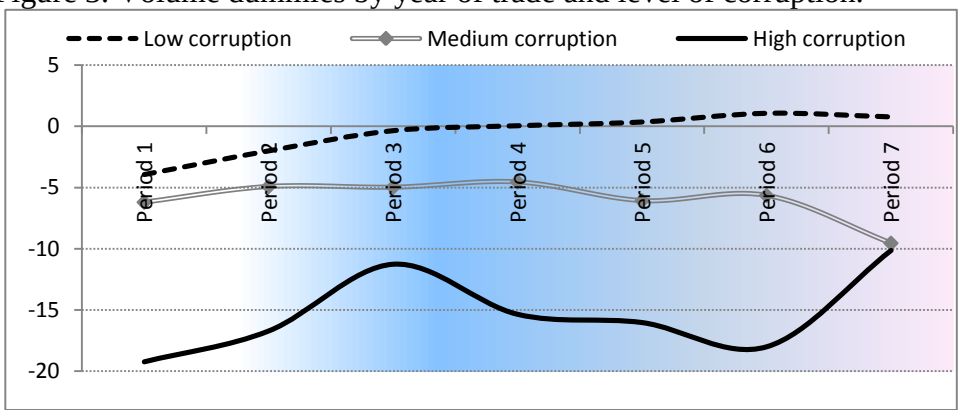


Fig 2B. Volume dummies by year of trade.



Note: Estimated impact of corruption on offshoring by contract length and year.
Years 2–4 and 5–7 contain results from trade flows that are ended. Years 6–8+ contain firms that offshore to a country for at least 6–8 years and are offshoring in the last year of observation. "Period" refers to the number of years in the trading relationship. Estimates are taken from regressions in Table A7.

Figure 3. Volume dummies by year of trade and level of corruption.



Notes: Estimated impact of corruption on the volume of offshoring, by year. The results from firms that offshore to a country for at least 6–8 years and are still offshoring in the last year of observation. "Period" refers to the number of years in the trading relationship. Estimates are taken from regressions in Table A7.

Table 3. The distribution of the duration of offshoring relationships.

Duration →	**1y**	**2 y**	**3 y**	**4 y**	**5 y**	**6 y**	**7 y**	**8+y**
All countries	41%	20%	12%	9%	5%	3%	1%	8%
Low corruption	54%	15%	7%	5%	3%	3%	2%	10%
Medium corruption	67%	13%	4¤	5%	2%	1%	1%	6%
High corruption	72%	15%	5%	3%	1%	2%	1%	2%

Note: Figures based on offshorers that start to offshore by duration of observed trade flows.

Table A1. Variable description

Variable	**Mean**	**Stdv(be/within)**
	Country characteristics	
ln(GDP)	23.67246	24.7
ln(population)	15.85401	55.1
	Firm characteristics	
ln(offshoring)	5.421137	2.36
ln(sales)	12.06972	4.23
ln(TFP)	6.599014	1.79
Share skilled labor	.2465264	5.81
MNE	.398132	1.86
	Trade resistance	
Tariffs	.0043736	2.33
ln(distance)	8.429155	∞
Corruption free (WB)	3.067855	8.95

Note: The World Bank corruption index is rescaled to take positive values only [1–6], the International Transparency (IT) corruption index range [0–10]. For both indices, a high value indicates less corruption.

Table A2. Correlation

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**.10**
1. ln(offshoring)	1									
2. ln(distance)	-.20	1								
3. MNE	.08	.00	1							
4. ln(GDP)	.06	-.25	.00	1						
5. ln(pop)	.03	-.02	.00	.70	1					
6. Corruption free (WB)	.10	-.34	.00	.44	-.21	1				
7. Corruption free (IT)	.08	-.34	.00	.47	-.25	.97	1			
8. ln(Sales)	.17	.00	.33	-.00	-.00	-.00	-.01	1		
9. ln(TFP)	-.05	.00	-.02	.00	.00	.00	.02	.02	1	
10. Tariffs	-.14	-.03	.00	.36	.19	.25	.25	-.00	.01	1
11. Share skilled labor	-.18	.00	.08	-.00	-.00	-.00	-.01	.04	.29	-.01

Table A3. Regional division of offshoring

Region	% of total offshoring	Region	% of total offshoring
Western Europe	33.58	***Southern Africa***	0.08
Northern Europe	41.83	***Eastern Asia***	5.74
Eastern Europe	5.37	***Southern Asia***	1.84
Southern Europe	4.29	***Southeastern Asia***	0.97
Northern America	3.39	***Central Asia***	0.04
South America	0.92	***Western Asia***	0.89
Western Africa	0.14	***Australia and New Zealand***	0.37
Central America	0.04	***Caribbean***	0.08
Eastern Africa	0.05	***Polynesia***	0.00
Northern Africa	0.37	***Micronesia***	0.00
Middle Africa	0.01	***Melanesia***	0.00

Table A4. Comparative firm characteristics

No. of offshoring destinations	Cumulative frequency	Comparative firm characteristics	Offshorers/ non-offshorers	MNE /non MNEs	Manufacturing / non-manu.
1 destination	22 %	*ln*(offshoring)	n.a	3.54	2.94
5 destinations	52%	MNE	3.74	n.a.	1.74
10 destinations	74%	*ln*(sales)	1.08	1.08	1.02
20 destinations	95%	*ln*(TFP)	0.87	0.97	0.40
50 destinations	100%	Share skilled labor	1.13	1.16	0.61

Maximum number of simultaneous offshoring destinations observed by a single firm. 70

Table A5. Variables, construction and data source

Variable	Definition	Source
	Country characteristics	
ln(GDP)	*ln*(GDP), constant 200 USD	World Bank
ln(population)	*ln*(Total population)	World Bank
	Firm characteristics	
ln(offshoring)[(A)]	*ln*(imports); intermediate and consumption inputs according to MIG classification codes, unit by firm-country pair, constant prices	Statistics Sweden – Trade statistics
ln(sales)	*ln*(sales), constant prices.	Statistics Sweden – Financial statistics
ln(TFP)	Törnquist index, for details, see table note	Statistics Sweden – Financial statistics
Share skilled labor	Share of employees with at least tertiary education	Statistics Sweden – RAMS
MNE	Dummy variable indication foreign ownership, at least 50% of votes in foreign control	Statistics Sweden – Financial statistics
	Resistance to trade	
Tariffs	Weighted tariff rate by industry and country of origin	UNCTAD/TRAINS
ln(distance)	CEPII weighted distance measure	CEPII
Corruption free (WB)	Perceived corruption index, rescaled to [1–6], higher value indicates less corruption	World Bank

Note: *Total factor productivity.* We use the Divisia Törnqvist to calculate changes in firms' input mix (a non-parametric approach that corresponds to a translog production function). We calculate TFP as the ratio of deflated sales value to an index of input volumes (a Törnqvist quantity index of inputs). This index fulfills important properties such as invariance and independence; see, e.g., Diewert (1976, 1978). Rental prices for capital are computed according to Harper Berndt and Wood (1989). Capital stocks are calculated according to the Gelos and Isgut (2001) method. For details of the calculation of the productivity index, see Karpaty and Tingvall (2010).

Table A6. Offshoring, corruption and the duration of trade. Heckman models.

	2–4 y – cancelled		**5–7 y – cancelled**		**6–8 y – non-cancelled**		**9+ – permanent offshorers**	
	Selection	Target	Selection	Target	Selection	Target	Selection	Target
Corruption free	0.1761 (0.0431)***	0.8968 (0.2351)***	0.1793 (0.0493)***	0.8592 (0.2638)***	0.2291 (0.0733)***	0.4574 (0.2553)*	0.2953 (0.0857)***	0.3223 (0.2286)
***ln*(distance)**	-0.5378 (0.0759)***	-2.5658 (0.3861)***	-0.5952 (0.0770)***	-2.7302 (0.3377)***	-0.8381 (0.0790)***	-1.9954 (0.3124)***	-0.9604 (0.0992)***	-1.0715 (0.2209)***
***ln*(GDP)**	0.1835 (0.0479)***	0.8178 (0.2726)***	0.1336 (0.0509)***	0.3920 (0.2636)	0.2071 (0.0767)***	0.3351 (0.2244)	0.3545 (0.0827)***	-0.1713 (0.2207)
***ln*(pop.)**	0.0356 (0.0480)	0.4289 (0.2260)*	0.0689 (0.0490)	0.6653 (0.2330)***	0.1238 (0.0749)*	0.5450 (0.2328)**	0.0574 (0.0800)	0.7086 (0.2292)***
Tariffs	2.6387 (0.3963)***	2.4088 (1.4587)*	2.2001 (0.5419)***	2.1034 (1.2576)*	1.8078 (0.4949)***	-2.2785 (1.2500)*	2.2619 (0.4301)***	-1.4826 (0.7208)**
***ln*(TFP)**	-0.0141 (0.0019)***	-0.0872 (0.0146)***	-0.0057 (0.0029)*	-0.0259 (0.0179)	-0.0150 (0.0027)***	-0.0363 (0.0156)**	-0.0073 (0.0019)***	-0.0142 (0.0051)***
MNE	0.1569 (0.0112)***	0.6278 (0.0855)***	0.2098 (0.0238)***	0.7398 (0.139)***	0.2210 (0.0216)***	0.3500 (0.0807)***	0.4043 (0.0243)***	0.4262 (0.0470)***
***ln*(firm size)**	0.1565 (0.0064)***	0.7744 (0.1123)***	0.1631 (0.0096)***	0.7197 (0.0719)***	0.1991 (0.0084)***	0.7244 (0.0564)***	0.3347 (0.0118)***	0.6873 (0.0327)***
Export ratio	0.1795 (0.01761)***		0.0914 (0.0445)**		0.1631 (0.0355)***		0.2787 (0.0451)***	
Skill-intensity	0.2746 (0.0501)***		0.0528 (0.0676)***		-0.2742 (0.1532)*		-0.6222 (0.1867)***	
Inverse Mills Ratio	4.5980 (0.5021)***		4.2138 (0.4014)***		4.2138 (0.4014)***		0.5538 (0.1392)***	
Rho	0.9015 (0.0215)***		0.8954 (0.0202)***		0.8954 (0.0202)***		0.2508 (0.0546)***	
likelihood	-169 860		-47 880		-47 880		-252 473	
Obs.	6 151322	25 645	6 131 994	6 317	6 144 975	19 298	6 178 725	53 048

Note. t-values within parenthesis (.). *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. Firms with at least 50 employees. Robust standard errors clustered by country.

Table A7. Offshoring and corruption. Periodic development, Heckman models.

	All countries	All countries	All	Hi. corrupt countries	Md. corrupt countries	Low. corrupt countries	Hi. corrupt countries	Md. corrupt countries	Low. corrupt countries
Duration →	**2-4 y**	**5-7 y**	**6-8 + y**	**2-4 y**	**2-4 y**	**2-4 y**	**6-8 + y**	**6-8 + y**	**6-8 + y**
Volume equation									
Corruption free Period 1	0.3169 (0.0849)***	1.5243 (0.3506)***	0.8464 (0.2621)***	3.6366 (1.3273)**	0.4166 (0.5109)	0.4939 (0.1729)***	-0.7333 (2.9388)	0.8344 (0.9172)	0.8275 (0.2761)***
Corruption free Period 2	0.2426 (0.0693)***	1.2773 (0.3531)***	0.7261 (0.2702)**	1.0279 (1.0639)	0.8186 (0.3399)**	0.3966 (0.1495)**	-1.3440 (1.5642)	0.5963 (0.9437)	0.5318 (0.2695)**
Corruption free Period 3	-0.0237 (0.0536)	1.1532 (0.3549)***	0.4854 (0.2562)*	-2.6370 (1.5740)*	-0.3232 (0.4592)	-0.1317 (0.0925)	-3.5359 (1.5348)**	0.8413 (1.1809)	0.2650 (0.2572)
Corruption free Period 4	0.1545 (0.0793)*	1.1706 (0.3590)***	0.4750 (0.2514)*	-1.7554 (1.7541)	0.1557 (0.8239)	0.3035 (0.1842)*	-1.3621 (1.4343)	0.7257 (0.9821)	0.1795 (0.2450)
Corruption free Period 5		1.0491 (0.3673)***	0.4247 (0.2507)*				-0.6767 (1.9311)	1.4117 (0.8060)*	0.1397 (0.2546)
Corruption free Period 6		1.0449 (0.3735)***	0.3620 (0.2540)				0.5002 (2.0234)	1.2993 (0.8695)	0.0302 (0.2607)
Corruption free Period 7		0.8561 (0.4428)*	0.3491 (0.2582)				-2.7823 (1.7726)	2.7044 (1.0330)**	0.1226 (0.2927)
Dummy Period 1	-1.7596 (0.3858)***	-3.5442 (1.4853)**	-3.1267 (0.5654)***	-8.3703 (2.8394)***	-1.7733 (1.4824)	-2.6059 (0.8302)***	-19.2418 (8.1139)**	-6.1914 (3.1120)**	-3.9522 (0.9614)***
Dummy Period 2	-1.3859 (0.3115)***	-1.8945 (1.3943)	-2.0211 (0.5868)***	-2.7067 (2.3447)	-2.7602 (0.9695)***	-2.1380 (0.7179)***	-16.7232 (4.7528)***	-4.9079 (3.8539)	-2.0104 (0.8085)**
Dummy Period 3	0.6980 (0.2398)***	-1.2741 (1.3617)	-0.6623 (0.5111)	6.1519 (3.4424)*	1.4785 (1.3655)	1.2124 (0.4418)**	-11.2753 (4.6711)**	-4.9694 (4.8823)	-0.5371 (0.6684)
Dummy Period 4	-0.2588 (0.3730)	-1.2472 (1.3516)	-0.4242 (0.5021)	4.6166 (3.7380)	-0.1555 (2.5423)	-1.0042 (0.8885)	-15.3653 (7.4900)**	-4.5376 (4.2230)	0.0454 (0.6837)
Dummy Period 5		-0.8836 (1.2447)	0.0040 (0.4845)				-16.0386 (7.9240)**	-6.0631 (3.2569)*	0.3938 (0.7051)
Dummy Period 6		-0.7391 (1.2627)	0.4722 (0.4808)				-18.0159 (5.6879)***	-5.6373 (3.5102)	1.0670 (0.6229)*
Dummy Period 7			0.7100 (0.4907)				-10.1480 (3.6275)***	-9.5406 (3.5084)**	0.7719 (0.7909)
Selection equation									
Corruption	0.1663 (0.0423)***	0.1827 (0.0496)***	0.2296 (0.0732)***	0.2531 (0.0955)**	0.4049 (0.1120)***	0.0946 (0.0702)	0.0966 (0.1980)	0.4364 (0.1390)***	0.0974 (0.0920)

Note. t-values in parenthesis (.). *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. Firms with at least 50 employees. Robust standard errors clustered by country. All models include a full variable set-up including firm-, country-, trade-resistance variables and region, industry and period dummies. See Table 1.