

Karpaty, Patrik; Gustavsson Tingvall, Patrik

Working Paper

Offshoring of Services and Corruption: Do Firms Escape Corrupt Countries?

Working Paper, No. 2/2011

Provided in Cooperation with:

Örebro University School of Business

Suggested Citation: Karpaty, Patrik; Gustavsson Tingvall, Patrik (2012) : Offshoring of Services and Corruption: Do Firms Escape Corrupt Countries?, Working Paper, No. 2/2011, Örebro University School of Business, Örebro

This Version is available at:

<https://hdl.handle.net/10419/244470>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



ÖREBRO UNIVERSITY
SWEDISH BUSINESS SCHOOL

WORKING PAPER

2/2011

Offshoring of Services and Corruption: Do Firms Escape Corrupt Countries?

Patrik Karpaty and Patrik Gustavsson Tingvall

Economics

ISSN 1403-0586

<http://www.oru.se/Akademier/Handelshogskolan/Forskning/Publikationer/Working-papers>

Örebro University
Swedish Business School
701 82 Örebro
SWEDEN

Offshoring of Services and Corruption: Do Firms Escape Corrupt Countries?

May 2012

Patrik Karpaty, Örebro University

Patrik Gustavsson Tingvall, The Ratio Institute, Stockholm¹

Abstract

In this paper, we analyze how the offshoring of services by Swedish firms is affected by corruption in target economies. The results suggest that firms avoid corrupt countries and that corruption reduces the amount of offshored services. In addition, the sensitivity to corruption is highest for poor countries, and large and internationalized firms are the ones that tend to be the most sensitive to corruption.

JEL: C23; D22; F23; L24

Keywords: Corruption; Services; Offshoring; Gravity model; Firm level data

Acknowledgments: Helpful suggestions from Fredrik Heyman, Research Institute for Industrial Economics, and Ari Kokko, Copenhagen Business School, and participants at “The role of business services for innovation, internationalization and growth” conference in Rome (2-3 December, 2010) are gratefully acknowledged.

¹ Financial support from Jan Wallander’s and Tom Hedelius’ Research Foundation and Torsten Söderbergs Research Foundation are gratefully acknowledged by both authors.

1. Introduction

In many countries, the service sector today accounts for two thirds of GDP or more, and services account for about twenty percent of world exports (Lejour and Smith 2008, UNCTAD 2009). The relatively low share of services in world exports can partly be explained by the fact that only ten percent of service output is traded, while the corresponding number for materials is over fifty percent. Lejour and Smith (2008) argue that this is not only due to non-tradability in services. They claim that services constitute a larger share than the directly measurable twenty percent of trade because services implicitly enter into trade as inputs in the production of traded goods. As an example, Lejour and Smith (2008) argue that in OECD countries, almost forty percent of the employment in the manufacturing sector can be considered as working with services.²

Despite the large and growing importance of the service sector, trade in services is relatively unexplored. Here, we analyze a specific type of trade in services, namely, imports of offshored services and how offshoring of services is affected by corruption in the target economies.

From the perspective of international economics, corruption is often portrayed as a barrier to offshoring, trade and investment. The intuition why corruption have an impact on international offshoring of services 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 common 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 goodwill loss. 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

² In the year 2000, the service sector’s contribution to total value added in the OECD countries was 70%, which was close to the service sector share for Sweden (69.4 percent) in the same year. The share of services in world exports has stayed around 20% during the last two decades (Lejour and Smith 2008, UNCTAD 2009).

be considered that the impact of corruption is likely to be greatest when sensitive information is involved. For standardized tasks, corruption is less likely to be an issue.³

Turning to the service sector, it is argued that knowledge in that sector is closely related to people and, therefore, relatively difficult to protect by patents (Miles, 2006). Moreover, for services to be tradable, it is likely that they have the potential to be codified, standardized and modulated (fragmented).

There are no empirical studies on the relation between corruption and offshoring of services. 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). Niccolini (2007) finds that weak institutions 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 cross-border, cross-firm contract costs.

Contrary to offshoring and corruption, there are a series of papers analyzing FDI. For example, Habib and Zurawicki (2002) and Egger and Winner (2006) both find corruption to be detrimental to FDI. There seems to be evidence suggesting that the effect of corruption is nonuniform. Hakkala *et al.* (2008) find corruption to be more detrimental to horizontal FDI than to vertical FDI, and Smarzynska and Wei (2000) find corruption to alter the composition of FDI by shifting investment toward joint ventures rather than wholly owned affiliates. 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 countries.

Analyzing corruption and trade, Méon and Sekkat (2006) used the World Bank 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. Similar results were found by Bandyopadhyay and Roy (2007). Acknowledging that corruption can be viewed as a general index of institutional quality, evidence suggests that weak institutions (a corrupt environment) hamper both inward FDI and trade.

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

³ North (1991), Massini *et al.* (2010) and the Global Infrastructure Anti-Corruption Centre (2009).

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 other firms.

Third, we analyze whether the impact of corruption is uniform across rich and poor countries and different types of services.

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 services. Moreover, the negative impact of corruption is the highest for poor countries, while large and internationalized firms seem to use their flexibility to avoid corrupt countries. Taken together, this adds yet another argument for the importance of fighting corruption.

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

2. Concepts and the link between offshoring and corruption

2.1 Services

When thinking about services, one should note that the service sector contains a wide set of industries including, for example, retail trade, telecommunication, transportation, renting of machinery, finance, insurance, real estate, hotels and restaurants. The diversity of the service sector has been highlighted by Miles (2006) and Howells and Tether (2004), who claim that some services are more like manufacturing in the sense that they are technology intensive or involved in the production of materials.⁴ Despite the heterogeneity, however, there are some fundamental differences between manufacturing and services. As is well known, many services are intangible, invisible and perishable (Mattoo and Stern 2008). This means that service activities often are non-storable and less tradable than material goods (Mattoo and Stern 2008; Miles, 2006). However, many business services including technical drawings, call

⁴ As Drucker (1977) points out, non-technological innovations “are at least as important as technological innovations.”

centers, computer programs and engineering designs, are highly tradable and therefore easily offshored.

Among the characteristics that are recognized to increase the tradability of a service is the possibility to codify, standardize and fragment the service into modules. These trade-enhancing characteristics also enhance the possibility to vertically fragment the production and outsource parts of the production of a service. The creation of Internet webpages, rather than IT services in general, can be taken as one such example (Miles, 2006). We might here note that progress made in the IT sector has played a key role for the growing trade in services and that in contrast to the manufacturing sector, knowledge in the service sector is closely related to people and, therefore, relatively difficult to protect by patents (Miles, 2006). Hence, for offshoring of services containing sensitive information to take place, a key issue to consider is how to avoid opportunistic behavior and to protect the knowledge from leakage, which leads us to corruption.

2.2 Corruption

Although the term corruption is well known, it is difficult to find a precise and commonly accepted definition of it. A common theme is that corruption involves misuse of public officials for private gain in a way that alters the rules. Corruption is often divided into grand corruption and petty corruption, where grand corruption refers to situations where the political elite exploit their power for economic gain, while petty corruption refers to how appointed bureaucrats handle their responsibilities (Kain, 2004). If the cost of corruption is about money and the ability to pay, it may be argued that large firms are better equipped than small firms to handle a corrupt environment because they have the ability to pay and have greater bargaining power.

Corruption may also occur in daily business life without any direct intervention from public agents. Therefore, we may add a dimension where corrupt behavior occurs among individuals who are in control of assets that are not their own (e.g., business people that make decisions on behalf of the owners of capital). This wider scope of corruption is reflected in the perceived corruption measures used here.

Arguments that corruption is detrimental to an economy include the ideas that corruption leads to a misallocation of contracts and that resources are reallocated 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. Corruption also increases the uncertainty under which firms are working, increases the costs in terms of time and money spent on bribery and complicates contractual relations. In addition, there is a social, legal and moral dimension of corruption. Hence, corruption not only increases the cost of operating in a country but also affect subcontracting relations. The opposite view, that corruption may be beneficial for an economy, rests on the assumptions that governmental officials can be more helpful when paid directly and that corruption allows business people to avoid restrictions that would otherwise discourage investments.⁵ Hence, the extent to which corruption is harmful for business life and growth is partly an empirical issue.

2.3 The link between service offshoring and corruption

Offshoring is defined as outsourcing an activity or a task to a foreign entity. This, in turn includes (i) outsourced offshoring (outsourcing to a foreign external supplier) and (ii) in-house offshoring (vertical FDI—within the corporation).

One influential theoretical framework for analyzing the offshoring decisions of firms is the Grossman-Hart-Moore (GHM) property rights model.⁶ In this model, ownership is the key for trade in different types of goods. 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) and Grossman and Helpman (2002, 2005) 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. Moreover, low-productivity firms outsource domestically, while mid-productivity firms can outsource from foreign suppliers. At the top of the ladder we find the highest-productivity firms that may chose vertical FDI. Further, Grossman and Helpman (2003, 2005) showed that a good contracting environment improves the probability of offshoring, often at the expense of FDI. Antràs (2005) claimed that as a product or service becomes routinized, the firm first considers FDI, and when the product has become sufficiently standardized, the firm may decide to outsource to an external supplier. Finally, Antràs and Staiger (2012) shows that economic integration of particular importance for offshoring to take place. From this it is straightforward to see that firms' are expected to primarily consider offshoring of routinized and simple tasks to corrupt countries while

⁵ See e.g., Shleifer and Vishny (1993) and Wei (2005).

⁶ See, e.g., Hart and Moore (1990), Grossman, Sanford and Hart (1986) and Hart (1995).

advanced tasks are more likely to be directed to corruption free environments (Antràs and Helpman, 2006).

The contract issue concerns not only the offshoring partner but also the receiver. The standard hold-up problem recognizes that the receiving partner must often make contract-specific investments, Williamson (2000) and Hart (1995). When complete contracts cannot be enforced, this will lead to underinvestment. Here, it is understood that corruption works as an obstacle, reducing the trust of the system, and therefore, aggravating the problem of underinvestment, see, e.g., Ornelas and Turner (2008). Another way to look at this issue is to consider who the legal proprietor is. If the *supplier* is the legal proprietor of a service product, then it is the supplier who takes the risk that intellectual property rights may be foregone. In a corrupt country, this risk is typically higher than in less corrupt countries. If, however, the *client* is the legal proprietor, the risk of taking damage mainly falls on the client. In any case, corruption reduces the probability that a corrupt country will be chosen as a target country. Corruption not only makes the country less attractive, but it also affects the pool of firms that are able to compete for offshoring contracts.

To empirically tackle issues that involve various types of trade, the gravity model of trade has proven to be a good point of departure, and therefore, we continue with a discussion of that model.

3. The gravity model, firm-level gravity, data and empirical strategy

The gravity is today a well-established vehicle for empirically analyzing trade flows, and the model has developed into other trade-related areas such as analyses of FDI (see, e.g., De Mello-Sampayo, (2005, 2009), Hejazi, (2005, 2009), and Shigeru and Umemura (2003)). Here, we analyze a specific type of trade, namely firms' imports of offshore services. In its

elementary form, the gravity model can be expressed as $M_{ij} = T(r) \frac{Y_i Y_j}{d_{ij}^{-\epsilon}}$, where M_{ij} are

imports from country i to country j , $Y_i Y_j$ is the joint economic mass, d_{ij} is distance between countries, and $T(r)$ —in the simple specification—is a proportionality constant (Overman *et al.*, 2003).

To capture trade remoteness and trade resistance, we include our key variable corruption as well as distance, various fixed effect variables (discussed below) and tariff rates defined at the most disaggregated (product) level. To control for income and that wealthy countries tend to use a larger share of their income on tradables we include population (see

Anderson and Van Wincoop (2003) and Bergstrand (1989)). To account for firm-level gravity and size effects, we apply the log of firm sales. Finally, to control for multinationality (MNE) we add a MNE dummy variable. The assumption is that firms that are already multinational (and have overcome the cost of crossing the border) have an advantage over purely national firms in arranging offshoring contracts. Direct inclusion of the full set of country-fixed effects makes it hard to estimate the impact of time-invariant effects. Instead, we take the commonly used approach and apply region-fixed effects (22 regions) to the model.⁷ With this as a background, a baseline OLS equation takes the following form:

$$\ln(O)_{ijt} = \alpha + \sum_f \beta_f \Gamma_{fit} + \sum_c \beta_c T_{cit} + \sum_r \beta_r \Omega_{rjt} + \lambda \Phi_{ijt} + d_r + \gamma_t + \varepsilon_{ijt} \quad (1.)$$

Here, O_{ijt} are imports by firm i of offshored services from country j , and Γ is a set of F firm characteristics including total factor productivity, MNE status and sales. Target country characteristics T include GDP and population. Ω contains measures of trade resistance including distance, tariffs, and corruption, Φ is the Mills inverse ratio (IMR) controlling for nonrandom selection into offshoring, d_r is a region dummy, γ_t is a period dummy and ε is the error term.⁸

3.1 Econometric considerations

In the estimation of the gravity model, there is no single estimation technique that has been shown to uniformly outperform all the alternatives. We therefore apply a set of different estimators and model specifications which allow us to evaluate the robustness of our results. This motivates a brief discussion of possible pitfalls.

As highlighted by the heterogeneous firm model (Melitz, 2003) points out that all firms are not equal and selection into offshoring is not random.⁹ A straightforward extension of this argument suggests that a Heckman type of model may be appropriate.¹⁰ Elaborating on the

⁷ See the Appendix for details on the 22 regions. The issue of unit and country-fixed effects will be further analyzed using Fixed Effect Variance Decomposition models, see below.

⁸ See the Appendix for variable definitions and sources.

⁹ Today, the heterogeneous firm model has emerged as the workhorse model of micro patterns of trade. For example, Melitz (2003), Bernard, Eaton, Jensen and Kortum (2003) and Chaney (2008) show how the interaction between firm-level productivity, fixed costs and barriers to trade governs the penetration into export markets.

¹⁰ For the exclusion restriction, we use data on skill intensity and export intensity of the firm. Testing for the exclusion restriction indicates that these variables are valid. Bernard and Jensen (2004) is an example in which skill intensity has been used to explain selection with respect to internationalization. The idea is that highly

heterogeneous firm model, Helpman, Melitz and Rubinstein (HMR) (2008) describe how changes in trade are related to fixed costs and changes in the intensive and the extensive margins of trade. They propose an extended Heckman model as a way to handle the bias that will be induced if the margins are not controlled for. We will apply the Heckman model including the HMR specification.

An alternative and increasingly popular method of handling zeros and selection is to turn to multiplicative count data models as these naturally allow zeros to enter the model (see Santos, Silva and Tenreyo (2006)). Among the family of multiplicative models capable of handling excess zeros, test suggest the zero-inflated negative binomial model (ZINB).¹¹ Two appealing features of the ZINB model are that it is less sensitive to heteroskedasticity than the Heckman model and that it does not rely on an exclusion restriction (Santos, Silva and Tenreyo (2006)).

Another issue, highlighted by Anderson and Van Wincoop (2003), is fixed effects. They demonstrated that the traditional specification of the gravity model suffers from an omitted variable bias. Anderson and Van Wincoop argued that the inclusion of importer and exporter fixed effects, would yield consistent parameter estimates. However, there is also a cost for using fixed effects because they eliminate time invariant information in the data. For example, geographical distance is time invariant and will therefore drop out from fixed-effects regressions. In addition, variables such as corruption quality exhibit little variation over time and will therefore be estimated with large standard errors when using only within variation. In our context, this is unfortunate because cross-sectional differences help us understand the relationship between corruption and offshoring. Furthermore, the Heckman model is not defined under a fixed effect framework (Greene, 2001).

A common way to handle fixed effects is to include various region-specific dummy variables, so that some fixed effects are controlled for while simultaneously keeping the key variables of the model in the estimations.

An alternative solution of how to handle fixed effects has been suggested by Plümper and Troeger (2007, 2011). They present the fixed-effects variance decomposition (FEVD) estimator as a way to handle time-invariant and slowly changing variables in a fixed-effects model framework. 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

productive and skill-intensive firms are more internationalized than other firms. Similarly, exporters have overcome the internationalization barrier and are therefore more likely to engage in international offshoring.

¹¹ See the results section.

regressor, thereby controlling for fixed effects. This allows us to control for fixed effects and simultaneously use cross-sectional variation. However, several researchers have recently questioned the FEVD model (Greene (2011a; 2011b) and Breusch et al. (2011a; 2011b)).¹²

We apply the FEVD estimator in a Heckman framework and use the results to explore whether results from models with region dummies are robust as compared to a FEVD specification where unobserved heterogeneity is accounted for.¹³

3.2 Data

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 data sets from Statistics Sweden: the financial statistics data (FS) and the Regional Labor Market Statistics (RAMS) provide us with information on firms' inputs and results, such as sales, value added, capital stock, number of employees, education, ownership and industry affiliation.

Data on imports of services cover all service transactions and all firms. Trade in services is collected by the Swedish Riksbank and is separated into eleven categories. Our analysis deals with offshoring and we therefore exclude; public services, insurances, personally delivered services, cultural services, travel funds and transportation services from our definition of offshored services. Hence, following Crinò (2007) (except for the exclusion of insurances), we measure offshored services as imports of; communication services, financial services, computer and information services, royalties and license fees and other business services. To these groups, we also append construction services (which has become increasingly internationalized).¹⁴

Prior to 2003, data on trade in services was collected by the Swedish Riksbank and covered all firms, but since 2003 the data collection is overtaken by Statistics Sweden, and since then, only for a sample of firms. In addition, the matching of the different service categories registered by the Swedish Riksbank and Statistics Sweden is uncertain.

¹² The criticism of the FEVD estimators is based on their asymptotic properties and bias, and suggests that they underestimate 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 (2007, 2011) emphasize the finite sample properties and illustrate its advantages with an extensive set of Monte Carlo simulations. The debate suggests that there are reasons to be cautious in the interpretation of results from the FEVD estimator. We use it as a robustness test.

¹³ For an individual firm, the level of corruption and the other country characteristics are likely to be taken as given. We have applied the commonly used approach of lagged covariates to handle endogeneity. According to the definition of strong exogeneity, shocks in period (t) have no impact on (t-1) (which could be the case if there was perfect foresight). See, e.g., Hendry (1995) and Greenaway *et al.* (2008). The estimate of corruption is almost unaffected and remains positive and strongly significant. Results available on request.

¹⁴ As a robustness test, we will consider different sub-groups of service offshoring (see Table 4)

Country characteristics are collected from the World Bank. For corruption, we use the Governance Indicators corruption index developed by Kaufmann et al. (1999) and supplied by the World Bank, a higher value indicates less corruption, and we therefore label the corruption variable used in the regressions as “*corruption freeness*”. Additional country characteristics include population and 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 so as to take internal distances and population dispersion into account.¹⁵ For details of the variables, see the Appendix. Due to different time frames for the data sets, we limit the analysis to the period 1997-2002.

4. Results

4.1. Description

Comparing firms that enter into service offshoring relationships and those that do not, Table A2 reveals that offshoring firms are relatively large, productive¹⁶, skill intensive and overrepresented by MNEs. This is expected because entering into service offshoring relationships requires the firm to overcome a number of obstacles associated with entering international markets. Further, out of 3.6 million observed firm-country pairs, only about 41,000 observations (or 1.1 percent) are nonzero trade flows. Looking at firms involved in service offshoring most firms’ offshore services from one country (38%), or only a handful of countries. Looking at top offshorers, the top two percent firms are sourcing from more than twenty countries with a maximum notation of 119 countries recorded for a single firm (see Table A2).

4.2 Results

Considering the large fraction of zero and self selection into offshoring our point of departure is a set of selection models.

[Table 1 about here]

In Table 1 we present the regression results. All estimations include 21 region dummies, industry dummies at the 2-digit level and year fixed effects. Control variables are Distance,

¹⁵ More information on CEPII’s distance measure is found in Mayer and Zignago (2006).

¹⁶ TFP is measured by the Törnquist index. For details, see the appendix and Karpaty and Tingvall (2010).

GDP, Population, Tariffs, MNE status, Firm size, and Firm TFP. The same probit/selection model is applied in all selection models; hence the selection equation is presented just once.¹⁷ The selection equation suggests that corruption is a deterrent for the choice of the target country.

As pointed out by Anderson and Van Wincoop (2003) and others, fixed effects may be of importance. The Heckman model is not defined in a fixed model set-up and might therefore suffer from an omitted variable bias. To analyze whether control for unobservable fixed effects alters the results we apply the FEVD model. The FEVD is a special case of the Hausman-Taylor IV method where we control for unobservables by including a vector of estimated unobservable fixed effects as a right hand side regressor (the variance decomposition variable (\square), here in a Heckman selection model framework (Breusch et al. (2011a; 2011b; Plümper and Troeger (2007; 2011)).

Comparing results from the Heckman-FEVD model with the standard Heckman model and the HMR specification reveals that even though estimations with regional fixed effects do not absorb all fixed effects, the results are not affected. To be precise, moving from the Heckman model to the HMR specification and the Heckman FEVD model the estimated impact of corruption is decreased from 0.12 to 0.10 and 0.08 respectively; in all specifications, the impact of corruptions is highly significant.¹⁸

To further analyze the robustness of results we apply the ZINB estimator which allows us to relax the exclusion restriction criteria and to directly include all zeros in the estimation. Results from the ZINB model in Table 1 are in line with the log linear models suggesting that corruption is a deterrent to service offshoring though the estimated impact of corruption is about twice as high in the ZINB model as compared to the Heckman model.

Turning to the control variables, we note that most of the control variables are significant with the expected sign. Nearby countries with large markets attract offshoring; multinational-, large- and productive firms seem to be more prevalent to enter into service offshoring relationships than are other firms. Some less expected results are the lack of significance of tariffs and the population variable.

¹⁷ In the Heckman specifications variables used as exclusion restrictions; the share of skilled labor and export intensity are highly significant, and significant results for the Mills ratio and the test of independent equation ($\rho = 0$) suggests that selection into service offshoring is not random and that the selection models are justified.

¹⁸ R^2 is highest in the FEVD model suggesting that unit effects contain information but that the quantitative results are not altered. The estimate of the variance decomposition variable has the expected value on 1.

4.3 Heterogeneity

To the extent that corruption works as a fixed cost, large firms should be better equipped than small firms to handle corruption, not only because they can afford to pay, but also because of their bargaining power. A hypothesis would therefore be that large firms, MNEs and experienced service offshorers should be relatively well equipped to handle a corrupt environment. On the other hand, these relatively powerful firms can, with relative ease, use their networks and relocate away from difficult markets. The alternative hypothesis is therefore that they are not *less* but *more* sensitive to corruption than are other firms. To some extent, it is therefore an empirical question whether the sensitivity to corruption differs between various types of firms.

[Table 2 about here]

The results for different types of firms are presented in the left panel in Table 2. As shown above, results are not sensitive to the choice of estimation technique and to save space we continue and present results from Heckman models only.

The overall conclusion from results in Table 2 is that the selection sensitivity does not differ greatly between different types of firms whereas there are indications of a systematic difference on the intensive margin. Looking at the volume, large firms, MNEs and firms offshoring services to many markets are all relatively sensitive to corruption. The estimated sensitivity is positive for large firms and even negative for small firms. Comparing MNEs and non-MNEs a similar pattern occurs; non-MNEs seem to be (significantly) attracted to corrupt countries whereas the impact is non-significant for MNEs. Given that the sample of non-MNEs, by definition, excludes the possibility of in-house offshoring, we would therefore expect these firms to be *more* rather than *less* sensitive to corruption than are other firms. Hence, these results strengthen our previous findings that large and internationalized firms use their experience and networks to avoid corrupt countries. This line of reasoning is further backed up when we group firms with respect to how many countries they are sourcing from. The more countries a firm is sourcing from, the higher is the sensitivity on the intensive margin.

To sum up, the difference across different types of firms in their sensitivity to corruption is more pronounced in the volume equation than in the selection. One interpretation is therefore that firms do not fully consider the downside of corruption before they enter a market and therefore do ex post volume adjustments. Since large multinationals

have a greater network and more sourcing alternatives, if they find a market cumbersome, they can at a low cost adjust volumes and compensate using alternative suppliers.

The possibility to draw on low wages is a key argument for offshoring.¹⁹ We therefore continue and in the right panel in Table 2 separate countries with respect to income levels. Again, looking at the selection there is no apparent systematic differences while results for the intensive margin suggest that volumes are most sensitive to corruption in poor countries. Because large firms and MNEs are the ones that enter into large scale service offshoring and these firms are the most sensitive to corruption, this adds yet another argument for the importance of fighting corruption, especially in poor and heavily corrupt countries.

Finally we in Table 2 analyze the service- vs. manufacturing firm division. The results are clear; service sector firms are less sensitive to corruption on the intensive margin while there is no clear difference in the selection.

As discussed above, high tech services are likely to be more sensitive to corruption than services not containing sensitive information. However, the tradability of services also matters. For a given level of sensitive information, services that are easily traded are more likely to be offshored than services that are difficult to trade. To investigate this issue further we therefore analyze each group of offshored service, as classified by Statistics Sweden. The different classes are: Communication services, Royalties and licenses fees, Computer and information services, Financial services, Other business services and Construction services. That is, we have results for various types of business services and construction services. The results are presented in Table 3.

[Table 3 about here]

Again, results in Table 3 do not reveal any great differences in the selection step whereas the volume equation support some of the arguments put forward previously. The highest sensitivity against corruption is found for communication services, royalties and licenses fees, computer and information services which are services that can be characterized as knowledge intensive. The lowest sensitivity against corruption is found for other business services and construction services which are categories that are less likely to contain sensitive information. A maybe surprising result is the negative coefficient found for financial services indicating that offshoring destinations of financial services is overrepresented by relatively corrupt

¹⁹ Other motives for offshoring include e.g. the possibility to draw on specialized suppliers, risk- and cost minimization.

countries. A possible explanation to this result may be that tax regulations (that we lack information on) may override corruption. To sum up, we are inclined to suggest that knowledge intensive services are more sensitive to corruption than other services.

5. Summary and conclusion

In this paper, we analyzed how corruption in target economies affects offshoring of services by Swedish firms. To be precise, we analyzed how corruption affects the choice of country and the volume and composition of offshored services. To this end, we used detailed Swedish firm-level including detailed information on trade in services that are data combined with a set of country characteristics. To the best of our knowledge, this is the first paper tackling this issue empirically.

During the analysis, we tackle the selection and “zero-valued trade” problem and the fixed effects issue. Using different estimators and model specifications we make sure that the results not are driven by the choice of a specific estimator. Applied models include the Heckman model, The HMR specification of the Heckman model, the ZINB estimator and a FEVD model applied in a selection model framework. Throughout these operations the results are clear. Corruption is a deterrent for both the choice of country and, given that a country has been selected, for the amount of services offshored. However, the impact of corruption is not uniformly distributed across different types of firms and countries.

Large firms, MNEs and firms offshoring to several countries are more sensitive to corruption than are other firms. This suggests that large firms use their international network to relocate from cumbersome markets. In addition, results suggest that the impact of corruption is most severe for poor countries. Considering that many heavily corrupt countries also are relatively poor and that large firms are both sensitive to corruption and important offshorers, sourcing large volumes, this adds to the list of arguments for the importance of fighting corruption.

References

- 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. (2003), “Firms, Contracts, and Trade Structure,” *Quarterly Journal of Economics*, 118(4), 1375-1418.

- Antràs, P. (2005), "Incomplete Contracts and the Product Cycle," *American Economic Review*, 95(4), 1054-1073.
- Antràs, P., and Helpman, E. (2004), "Global Sourcing," *Journal of Political Economy*, 112(3), 552-580.
- Antràs, P., and Helpman, E. (2006), "Contractual Frictions and Global Sourcing," NBER working papers, No. 12747.
- Antràs, P., and Staiger, R.W. (2012), "Offshoring and the Role of Trade Agreements," Forthcoming, *American Economic Review*.
- Bandyopadhyay, S., & Roy, S. (2007), "Corruption and trade protection: evidence from panel data". Federal Reserve Bank of St. Louis. Working paper No. 2007-022.
- 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, Jeffrey H. (1989), "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade," *Review of Economics and Statistics*, 1(1), 143-53.
- Bernard, A. B., Eaton, J., Jensen, B. and Kortum, S. (2003), "Plants and Productivity in International Trade", *American Economic Review*, 93(4), 1268-1290.
- Bernard, A. and Jensen, J.B. (2004), "Why some firms export", *Review of Economics and Statistics*, vol. 86, pp.561-569.
- Breusch, T., Kompas, T., Nguyen H.T.M., & Ward, M.B. (2011a), "On the Fixed-Effects Vector Decomposition," *Political Analysis*, 19(2) 123-134 doi:10.1093/pan/mpq026.
- Breusch, T., Kompas, T., Nguyen H.T.M., & Ward, M.B. (2011b), "FEVD: Just IV or just Mistaken," *Political Analysis*, 19(2), 165-169 doi:10.1093/pan/mpr012.
- 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", *Spatial Economic Analysis* 4(2), 167-190.
- 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.
- Crinò, R. (2007), "Skill-Biased Effects of Service Offshoring in Western Europe", No 205, KITeS Working Papers, KITeS, Centre for Knowledge, Internationalization and Technology Studies, Università Bocconi, Milano, Italy.
- 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.
- 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.
- Dreher, A., and Herzfeld, T. (2005), "The Economic Costs of Corruption: A Survey and New Evidence", Available at SSRN: <http://ssrn.com/abstract=734184>.

- Drucker, P. (1977), *Management*, London: Pan.
- 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 effects and the gravity equation: Consistent methods for estimation", *Scottish Journal of Political Economy*, 49(5), 491-506.
- Feenstra, R.C. (2004), "Advanced International Trade: Theory and Evidence", Princeton University Press, Princeton.
- Feenstra, R. C., and G. H. Hanson. (2005), "Ownership and Control in Outsourcing to China: Estimating the Property Rights Theory of the Firm", *Quarterly Journal of Economics* 120(2), 729-762.
- Flowerdew, R. and M. Aitkin. (1982), "A method of fitting the gravity model based on the Poisson distribution", *Journal of Regional Science*, 22(2), 191-202.
- Greenaway, D., Gullstrand, J., and Kneller, R. (2008), "Firm Heterogeneity and the Gravity of International Trade", University of Nottingham, GEP, Discussion Papers No. 08/41.
- Greene, W. (2001), "Estimating Econometric Models with Fixed Effects," New York University, Leonard N. Stern School Finance Department Working Paper Seires 01-10, New York University, Leonard N. Stern School of Business.
- Greene, W. (2011a), "Fixed Effects Vector Decomposition: A Magical Solution to the Problem of Time-Invariant Variables in Fixed Effects Models?," *Political Analysis*, 19(2), 135-146.
- Greene, W. (2011b), "Reply to Rejoinder by Plümper and Troeger", *Political Analysis*, 19(2), 170-172.
- Grossman, Gene M., and Esteban Rossi-Hansberg. 2008. "Trading Tasks: A Simple Theory of Offshoring." *American Economic Review*, 98(5), 1978-97.
- Grossman, G.M., and Helpman, E. (2002), "Integration versus Outsourcing in Industry Equilibrium," *Quarterly Journal of Economics*, 117(1), 85-120.
- Grossman, G.M., and Helpman, E. (2003), "Outsourcing versus FDI in Industry Equilibrium," *Journal of the European Economic Association*, 1(2-3), 317-327.
- Grossman, G.M., and Helpman, E. (2005), "Outsourcing in a Global Economy," *Review of Economic Studies*, 72(1), 135-159.
- Grossman, G.M., Sanford, J., and Hart, O. D. (1986), "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 94(4), 691-719.
- 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 Statistics*, 90(4), 627-642.
- Habib, M., and Zurawicki, L. (2002), "Corruption and Foreign Direct Investment," *Journal of International Business Studies*, 33(2), 291-307.
- Hardin J.W. (2002), The robust variance estimator for two-stage Models. *The Stata Journal*, 2(3), 253-266.
- Hart, O.D. (1995), "Firms, Contracts and Financial Structure," Oxford Clarendon Press.
- Hart, O.D., and Moore, J. (1990), "Property Rights and the Nature of the Firm," *Journal of Political Economy*, 98(6), 1119-58.
- 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(5), 327- 335.
- Helpman, E., Melitz, M., Rubinstein, Y. (2008), "Estimating trade flows: trading partners and trading volumes", *Quarterly Journal of Economics*, 123(2), 441-487.
- Hendry, D.F. (1995), *Dynamic econometrics*. Oxford University Press, Oxford.

- Howells, J., and Tether, B. (2004), "Innovation in Services: Issues at stake and trends", ESRC Centre for Research on Innovation and Competition, Institute of Innovation Research, University of Manchester.
- Karpaty, P., and Tingvall P. (2011), "Service-sector competition, innovation and R&D", *Economics of Innovation and New Technology*, 20(1), 63-88.
- Kaufman, D., Kraay, A., and Zoido, P. (1999), "Aggregating Gouvernance Indicators," *World Bank Policy Research Working Paper*, No. 2195.
- Kain, A.K. (2001), "Corruption a Review," *Journal of Economic Surveys*, 15, 71-121.
- Lejour, A., and Smith, P. (2008), "International Trade in Services", Editorial Introduction, *Journal of Industry Competition and Trade*, 8(3), 169-180.
- Massini, S., Pern-Ajchariyawong, N., and Lewin A.Y. (2010), "Role of corporate-wide offshoring strategy on offshoring drivers, risks and performance," *Industry and Innovation*, 17(4), 337-371.
- Mattoo & Stern 2008). "A handbook of international trade in Services". Ed Mattoo, A., Stern, M., Zanini, G. Oxford University press.
- Mayer, T., AND Zignago, S. (2006), "Notes on CEPII's distance measures". MPRA Paper 26469.
- Melitz, M. (2003), "The impact of trade on intra-industry reallocations and aggregate industry productivity", *Econometrica*, 71(6), 1695-1725.
- Méon, P-G., and Sekkat, K. (2006), "Institutional quality and trade: which institutions? Which trade?," DULBEA Working Papers 06-06.RS, ULB, Université Libre de Bruxelles.
- Miles, I. (2006), "Innovation in Services. In *The Oxford Handbook of Service Industries*", ed. J. Fagerberg, D. Mowery and R. Nelson, 433-458. Oxford University Press.
- Niccolini, M. (2007), "Institutions and Offshoring Decision," CESifo WP. No. 2074.
- North D.C. (1991), "Institutions," *The Journal of Economic Perspectives*, 5(1), 97-112.
- Nunn, N. (2007), "Relationship-Specificity, Incomplete Contracts and the Pattern of Trade," *Quarterly Journal of Economics*, 122(2), 569-600.
- Ornelas, Emanuel. Amd Turner, John, L. (2008), "Trade Liberalization, outsourcing, and the hold-up problem," *Journal of International Economics*, 74(1), 225-241.
- Overman, H., Redding, S., and Venables, T. (2003), "The economic geography of trade, production, and income: a survey of the empirics", in *The Handbook of International Trade* (Eds) J. Harrigan and K. Choi, Blackwell Publishers, London, 353-87.
- Plümper, T. and Troeger, E.V. (2007), "Efficient estimation of time-invariant and rarely changing variables in finite sample panel analyses with unit fixed effects", *Political Analysis*, 15(2), 124-139.
- Plümper, T., and Troeger, V.E. (2011), "Reply to Rejoinder by Plümper and Troeger," *Political analysis*, 19(2), 170-072.
- Rose-Ackerman, S. (1997), "When is Corruption Harmful?," Background paper for World Development Report 1997.
- Santos Silva, J.C.M. and Tenreyro, S. (2006), "The log of gravity", *The Review of Economics and Statistics*, 88(4), 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.
- UNCTAD. (2009), "Handbook of statistics". New York and Geneva (United Nations).

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*.
Williamson, O.E. (2000), "The New Institutional Economics: Taking Stock, Looking Ahead", *Journal of Economic Literature*, XXXVIII 595-613.

Appendix

Table 1. Offshoring of services and corruption.
Dependent variable, imports of offshored services, 1997-2002.

Variable	Heckman		HMR	Heckman FEVD	ZINB
	Selection	Target	Target eq.	Target eq.	Target eq.
Corruption clean	0.2298 (0.008)***	0.1198 (0.032)***	0.1039 (0.038)***	0.0831 (0.037)**	0.2504 (0.063)***
<i>ln(distance)</i>	-0.4054 (0.009)***	-0.0269 (0.032)	-0.1473 (0.034)***	-0.1460 (0.035)***	-0.0274 (0.065)
<i>ln(GDP)</i>	0.2597 (0.007)***	0.1611 (0.028)***	0.1763 (0.035)***	0.1535 (0.027)***	0.2202 (0.053)***
<i>ln(Population)</i>	0.0162 (0.007)**	-0.0119 (0.027)	-0.0236 (0.033)	-0.0270 (0.023)	0.0202 (0.050)
MNE	0.1340 (0.007)***	0.0506 (0.023)**	0.0498 (0.029)*	-0.0913 (0.186)	0.2490 (0.044)***
<i>ln(Firm size) sales</i>	0.3450 (0.002)***	0.1608 (0.012)***	0.1608 (0.019)***	0.1100 (1.231)	0.4424 (0.015)***
<i>ln(TFP)</i>	0.0041 (0.001)***	0.0162 (0.002)***	0.0161 (0.002)***	0.0069 (0.040)	0.0378 (0.004)***
Tariffs	0.5791 (0.062)***	-0.2381 (0.188)	-0.4727 (0.200)**	-0.6057 (1.150)	0.1119 (0.359)
Share skill high	1.3843 (0.016)***	--	--	--	--
Export ratio	0.6761 (0.010)***	--	--	--	--
Mills Ratio	-0.3856 (0.037)***		-0.3927 (0.044)***	-0.5113 (0.151)***	--
ETA: Variance decomposition	--	--	--	1.000***	--
<i>z, z², z³</i>	--	--	yes	--	--
Industry dum.	yes	yes	yes	yes	yes
Period dum.	yes	yes	yes	yes	yes
Region dum.	yes	yes	yes	yes	yes
R²	--	--	0.15	0.79	--
Obs.	3 628 776	41 632	41 632	41 632	3 628 776

Note. Robust standard errors clustered by country-year within parenthesis (.). *, **, *** indicates significance at the 10, 5 and 1 percent level, respectively. Firms with at least 50 employees. p-val indep equations = 0.000. Vuong test of zinb vs. nb. p-val = 0.0000, all zinb models.

Table 2. Heterogeneity. Heckman models.
Dependent variable, imports of offshored services, 1997-2002.

	Estimated impact of corruption				
↓ Sample	Selection	Target eq.		Selection	Target eq.
Sample: Firms with 1- 8 sourcing countries	2.8144 (0.134) ^{***}	0.3519 (0.068) ^{***}	Sample: Country type Poor countries	0.1710 (0.034) ^{***}	0.0540 (0.065)
Sample: Firms with 9-16 sourcing countries	2.3347 (0.117) ^{***}	0.4824 (0.067) ^{***}	Sample: Country type Middle income	0.0740 (0.041) [*]	-0.0193 (0.087)
Sample: Firms with +17 sourcing countries	1.5457 (0.086) ^{***}	0.8247 (0.073) ^{***}	Sample: Country type Rich countries	0.2318 (0.018) ^{***}	-0.0836 (0.040) ^{**}
Sample: Firm type Small firms: L < 500	0.2179 (0.018) ^{***}	-0.1497 (0.037) ^{***}	Sample: Manufacturing sector firms	0.2157 (0.011) ^{***}	0.1973 (0.044) ^{***}
Sample: Firm type Large firms: L > 500	0.2519 (0.018) ^{***}	0.0236 (0.040)	Sample: Service sector firms	0.2574 (0.012) ^{***}	0.0391 (0.049)
Sample: Firm type MNEs	0.2348 (0.018) ^{***}	-0.0032 (0.038)			
Sample: Firm type Non-MNEs	0.2109 (0.018) ^{***}	-0.3152 (0.042) ^{***}			

Note. Robust standard errors clustered by country-year within parenthesis (.). *, **, ***, indicates significance at the 10, 5 and 1 percent level, respectively. Firms with at least 50 employees. All models include full variable set-up including firm-, country-, trade resistance variables and region-, industry, and period dummies, see Table 2.

Table 3. Service offshoring and corruption. By type of offshored service. Heckman models.

Heterogeneity	Estimated impact of corruption	
Service industry	Selection	Target eq.
Communication services	0.2011 (0.032)***	0.4382 (0.132)***
Royalties and licenses fees	0.0807 (0.033)**	0.1837 (0.166)
Computer and information services	0.1997 (0.039)***	0.1351 (0.117)***
Financial services	0.2273 (0.018)***	-0.0653 (0.038)*
Other business services	0.2077 (0.019)***	-0.1031 (0.036)***
Construction services	0.2629 (0.027)***	-0.3127 (0.174)*

Note. Robust standard errors clustered by country-year within parenthesis (.). *, **, ***, indicates significance at the 10, 5 and 1 percent level, respectively. 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 2.

Table A1. Variable description

Variable	Mean	Stdv(be/within)
<i>Country characteristics</i>		
<i>ln(GDP)</i>	24.01	37.0
<i>ln(population)</i>	16.09	77.1
<i>Firm characteristics</i>		
<i>ln(service offshoring)</i>	7.227	1.70
<i>ln(sales)</i>	12.01	4.90
<i>ln(TFP)</i>	6.948	2.18
Share skilled labor	0.231	7.72
MNE	0.406	2.08
Export ratio	0.176	2.59
<i>Trade resistance</i>		
Tariffs	0.006	2.36
<i>ln(distance)</i>	8.364	--
Corruption free	0.133	14.0

Table A2. Firm characteristics.

No. of offshoring destinations (offshoring firms)	Cumulative frequency	Comparative firm characteristics	Offshorers/ non-offshorers
1 destination	37	<i>ln(service offshoring)</i>	--
5 destinations	77	MNE	2.07
10 destinations	91	<i>ln(sales)</i>	1.08
20 destinations	98	<i>ln(TFP)</i>	1.06
50 destinations	100	Share skilled labour	1.76

Max no of simultaneous offshoring destinations observed by a single firm. 119

Table A3. Variables, construction and source

Variable	Definition	Source
<i>Country characteristics</i>		
<i>ln(GDP)</i>	<i>ln(GDP)</i> , constant 200 USD.	World Bank
<i>ln(population)</i>	<i>ln(Total population)</i> .	World Bank
<i>Firm characteristics</i>		
<i>ln(service offshoring)</i> ^(A)	Imports of services	The Swedish Riksbank
<i>ln(sales)</i>	<i>ln(sales)</i> , constant prices.	Statistics Sweden - Financial statistics
<i>ln(TFP)</i>	Törnqvist index, see Table notes.	Statistics Sweden – Financial statistics
Share skilled labor	Share of employees with at least tertiary education.	Statistics Sweden – RAMS
MNE	Swedish MNE or foreign owned firms (at least 50% of votes in foreign control).	Statistics Sweden - Financial statistics
<i>Resistance to trade</i>		
Tariffs	Weighted tariff rate by industry and country.	UNCTAD/TRAINS
<i>ln(distance)</i>	CEPII weighted distance measure.	CEPII
Corruption clean (WB)	The World Bank Kaufman index of perceived corruption.	World Bank

Note: *Total factor productivity*. We use the Divisia Törnqvist to calculate changes in firms' input mix (a non parametric approach which 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. For details of the calculation of the productivity index, see Karpaty and Tingvall (2010).