

Heyman, Fredrik; Gustavsson Tingvall, Patrik

Working Paper

The Dynamics of Offshoring and Institutions

IFN Working Paper, No. 919

Provided in Cooperation with:

Research Institute of Industrial Economics (IFN), Stockholm

Suggested Citation: Heyman, Fredrik; Gustavsson Tingvall, Patrik (2012) : The Dynamics of Offshoring and Institutions, IFN Working Paper, No. 919, Research Institute of Industrial Economics (IFN), Stockholm

This Version is available at:

<https://hdl.handle.net/10419/81504>

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.

IFN Working Paper No. 919, 2012

The Dynamics of Offshoring and Institutions

Fredrik Heyman and Patrik Gustavsson Tingvall

The Dynamics of Offshoring and Institutions

Fredrik Heyman*

Patrik Gustavsson Tingvall**

April 24, 2012

Abstract

Previous research has recognized that weak institutions can hamper investments and alter patterns of trade. However, little is known about the impact of institutional quality on offshoring. This is surprising, given that offshoring has become an important part of many firms' internationalization strategy. This study uses detailed Swedish firm-level data on production and trade in combination with a large set of institutional measures of the target economies to study the relationship between institutional quality and offshoring. The results suggest that weak institutions are negatively related to offshoring in general and to offshoring of R&D-intensive goods in particular. Furthermore, firms that are able to establish long-term contracts do so by starting small and successively deepening their engagements. These results are robust to a large number of econometric specifications and various measures of institutional quality.

JEL: F14; F23; P48

Keywords: Offshoring; Institutional quality; Firm-level data

Acknowledgments: Fredrik Heyman gratefully acknowledges financial support from the Swedish Research Council and the Jan Wallander and Tom Hedelius Foundation; Patrik Gustavsson Tingvall gratefully acknowledges financial support from the Torsten Söderbergs Research Foundation.

* Research Institute of Industrial Economics, Sweden, fredrik.heyman@ifn.se.

** Ratio Institute, Sweden, patrik.tingvall@ratio.se.

1. Introduction

Within the last two decades, the study of institutions has moved from a marginal topic to a vibrant area of economic research. The bulk of this research focuses on the relationship between institutions and economic growth, but the question of how institutions impact trade and foreign direct investment (FDI) is also receiving increased attention. For instance, the influence of institutions on international trade has recently been estimated to be even stronger, than the impact of tariffs (Chang (2010); Belloc (2004); Anderson and Marcoullier (2002); Márquez et al. (2010) and Levchenko (2007)).

One reason that institutions might have such a strong impact on trade is that international exchange does not occur anonymously or without personal interaction (Nunn, 2007). Before trade takes place, agents must first agree on a contract. Because perfectly designed contracts are often not feasible, agents are left with imperfect realizations, and the subsequent contract costs can be substantial. There are several mechanisms through which institutions can significantly reduce contract costs: they can reduce the risk of opportunistic behavior, enhance law enforcement, secure property rights, reduce corruption and clarify labor market regulations.¹ Institutions can also influence the costs of monitoring and control. As noted by North (1991), good institutions may reduce the risk of defection of the other party and allow for more complex and efficient ways of organizing production and trade. Considering that contract costs can often determine whether a cross-border relationship will be established, institutions are of critical importance and can be considered as a source of comparative advantage.

Institutional quality not only affects the choice of country and traded volumes in a static way but also has dynamic effects. Search cost based models emphasize that institutional quality affects the dynamics of how the volume of trade will evolve. In countries with weak institutions, the average contract length is relatively shorter, and firms tend to start with small volumes that they successively increase as they develop a relationship with their contractual partner (Raush and Watson (2003); Aeberhardt et al. (2010) and Araujo and Mion (2011)).

In this paper, we analyze the relationship between institutions and offshoring. Offshoring gives rise to trade in intermediate inputs. Hence, inputs that were previously produced in-house are relocated to an agent in a different jurisdiction. Bearing in mind that

¹ See e.g. Hakkala et al. (2008), North (1991) and Massini et al. (2010).

international offshoring can involve the transfer of management control, institutional barriers can have a strong effect on offshoring (see e.g., Antràs (2003); Antràs and Helpman (2004); Grossman and Helpman (2003; 2005); Chen et al. (2008) and Antràs and Helpman (2006)).

Despite the central role that institutions play in offshoring, empirical evidence documenting this role remains scarce.² One exception is Niccolini (2007), who studies the impact of institutions on trade between US firms and their foreign affiliates (in-house offshoring). Using institutional data from Kaufman et al. (2005), Niccolini (2007) finds that weak institutions hamper trade in intermediate goods but that the impact that such institutions have on the final consumption of goods is less clear. Considering that contract costs are higher when negotiating with an external supplier than with an internal agent within the own corporation, these results are suggestive but may not fully capture the impact of cross-border and cross-firm contract costs.

One explanation for the lack of empirical evidence on the relationship between offshoring and institutions is the difficulty of measuring offshoring. However, a series of empirical papers analyzing institutions and total trade exist, many of which have been performed at the industry or country level. Examples include Anderson and Marcouiller (2002) and Ranjan and Lee (2007), who find that institutions affect bilateral trade flows. Focusing on differences in the legal system, Turrini and van Ypersele (2010) find that legal system differences have an impact on trade. Méon and Sekkat (2006) show that corruption, rule of law, government effectiveness and lack of political violence are positively correlated with manufactured goods export. Regarding the US, Depken and Sonara (2005) find that US exports are positively correlated with economic freedom in the rest of the world. Finally, focusing on dynamic effects, Aeberhardt et al. (2010) and Araujo and Mion (2011) find that better institutions can reduce hazard rates and affect the dynamic pattern of trade.

As indicated, the literature analyzing the relationship between institutions and international trade is growing, but several gaps remain. The present study adds to the literature on institutions and trade in several ways. First, by explicitly focusing on institutions and offshoring, we analyze a relationship that has so far received limited attention in the

² In contrast with the literature on institutions and offshoring, the empirical literature on institutions and FDI is relatively large. Many of these studies 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 and corruption/institutions include Habib and Zurawicki (2002), Egger and Winner (2006) and Hakkala et al. (2008), which all find corruption to be detrimental to FDI. Acknowledging that corruption can be seen as a general index of institutional quality, evidence suggests that weak institutions (e.g. those with a corrupt environment) hamper ingoing FDI.

empirical literature. Given the increased possibilities nowadays to vertically differentiate the production chain, this knowledge gap is surprising.

Second, most previous studies have focused on one or a few institutional variables such as rule of law, freedom to trade internationally or corruption. Although they are correlated, we show that the impact of different institutional variables can differ, leading to different conclusions depending on the measure of institutional quality being used. We argue that to deepen our current understanding of institutions, it is important to first consider the impact of a large number of institutional measures and then attempt to disentangle the differential impact of institutions. By analyzing 21 institutional variables collected from approximately 200 countries, we are able to take a closer look at this issue. Furthermore, we apply factor analysis to uncover the underlying structure of our large set of institutional variables.

Third, research on how the impact of institutions on offshoring differs across sectors is absent. To fill this gap, we analyze whether sensitivity to institutional quality differs with respect to the R&D intensity and to the contract intensity of offshored inputs. Studying the relationship between institutions and offshoring along these dimensions allows us to consider firm heterogeneity and sectoral differences.

Fourth, the question of how institutions affect the dynamics of offshoring has previously been unexplored. We therefore take a closer look at this issue and analyze (i) how the institutional quality of the target economy affects the selection and duration of contracts and (ii) how the volume of offshored inputs changes depending on whether the contractual partner is located in a country with well-developed or poorly developed institutions. We also provide a comparison of firms that continued offshoring with firms that did not and analyze whether there are systematic differences in the learning curve with respect to how sensitive they are to institutional quality.

Finally, our analysis is based on detailed firm level data combined with country data. These types of data are rare in the related literature. The data allow us to apply several econometric approaches, limiting the risk of the results being biased by the choice of econometric method used.

Our results, based on a large set of institutional measures, suggest a positive relationship between institutional quality and firm-level offshoring. We also present evidence

on sector and firm heterogeneity with regard to the impact of weak institutions. Regardless of the econometric specifications used and type of institution analyzed, we find that R&D-intensive firms are relatively sensitive to institutional quality in the target economies. In contrast, no such relationship is observed for firms in industries with low R&D expenditures. Similar results are found when we consider the R&D intensity of inputs.

Analyzing the dynamic effects, we find that offshoring agreements with countries with weak institutions are of shorter duration and have smaller volumes than those with countries that have well-functioning institutions. Furthermore, we find that that in long-term relationships, the sensitivity to institutional quality decreases as firms develop a relationship with their contracting partner. As a mirror process to this learning process, the volume of offshore inputs increases relatively rapidly during the first years of the contract and then levels out. Therefore, careful firms that begin small and learn how to handle foreign institutions are often the most successful in terms of maintaining long-term relationships with foreign suppliers.

The paper is organized as follows. Definitions and the theoretical link between offshoring and institutions are presented in Section 2; our empirical approach is presented in Section 3, along with a discussion of the key econometric considerations. Section 4 describes the data and presents descriptive statistics. The results are presented in Section 5, and the paper ends with concluding remarks in Section 6.

2. Offshoring and Institutions: Concepts and Theory

Outsourced offshoring of production gives rise to trade in intermediate inputs. Hence, inputs that previously have been produced in-house can be relocated to external agents in foreign jurisdictions. This is often described as “outsourced offshoring.”³ Theoretical models typically focus on *outsourced offshoring*, whereas empirical investigations are often unable to distinguish between *in-house offshoring* and *outsourced offshoring*, implying that the latter often covers (total) *offshoring*, measured in terms of intermediate imports. In this paper, we will follow the latter definition.

³ 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).

When considering the concept of institutions, it is difficult to find a commonly accepted definition. One influential definition of institutions is formulated by Douglas North, who writes, “*Institutions are the humanly devised constraints that structure political, economic and social interaction*” (North (1991), p. 97). How informal norms and traditions impact the formulation of laws and regulations are discussed in Williamson (2000). He argues that subjective measures of institutional quality are influenced by culture, informal norms and values, factors that need to be considered when comparing scores given to different countries.

The time dimension also matters. In setting up a contract, both *ex ante* and *ex post* costs are involved. For instance, after a contract is signed, protecting intellectual property rights (IPR) and monitoring quality and deliverance become crucial, whereas before the contract is signed, fixed costs such as market access are more important. In most cases, institutions can influence both types of costs. This means that institutions can have both static and dynamic effects on entry and volumes.

In considering institutions and offshoring, one influential theoretical framework for analyzing firms’ choice whether to offshore or not is the Grossman-Hart-Moore (GHM) property rights model (see Hart and Moore (1990); Grossman, Sanford and Hart (1986) and Hart (1995)). In these models, the importance of ownership as a catalyst for trade to take place is analyzed in a world of incomplete contracts.

In the spirit of GHM, Antràs (2003) builds a property-rights model for outsourcing in which he demonstrates that it is relatively difficult to outsource capital-intensive inputs. Antràs and Helpman (2004) add a heterogeneous firm model setting in the spirit of Melitz (2003) and show that firms not only have to choose between producing in-house or outside the firm (outsourcing) but also must choose between producing at home or abroad. Grossman and Helpman (2003; 2005) show that a good contracting environment improves the probability of offshoring. Other papers in the field include Chen et al. (2008), who analyze the trade-off between FDI and offshoring, and Antràs and Helpman (2006), who discuss the nexus between the quality of contractual institutions and the choice between outsourced offshoring and integrated production. One conclusion of these papers is that better contracting institutions favor offshoring, often at the expense of FDI.

Finally, institutional quality also has a composition effect. One result 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

important features of a specific transaction, the required contract necessarily becomes complex, time-consuming and expensive to formulate.

As described above, there are also dynamic effects to be considered. Search cost models emphasize that a reduction in search costs can facilitate trade (contract completion) and that well-functioning institutions can alleviate such frictions (see Raush and Watson (2003); Aeberhardt et al. (2010) and Araujo and Mion (2011)). An important implication of these models is that institutional quality affects not only the mode of entry and probability of contract completion but also how volumes evolve over time. In countries with weak institutions, the average contract will be relatively short, and foreign firms will begin with small volumes that are successively increased as they begin to know their contractual partner (De Groota et al. (2005); Rauch and Watson (2003); Araujo and Mion (2011) and Eaton et al. (2011)).

In sum, theoretical models suggest that (i) weak institutions are negatively related to offshoring, (ii) the sensitivity of offshoring to weak institutions varies across different types of firms, and (iii) the evolution of offshoring is affected by institutional quality. 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. We therefore continue with a discussion of that model.

3. Empirical approach

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

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

where M_{ij} represents 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 limited, but since the late 1970s, several theoretical developments have emerged.⁴ It is now well recognized that

⁴ Important contributors include Anderson (1979), who formally derived the gravity equation from a differentiated product model, and Bergstrand (1985, 1989), who derived the gravity model in a monopolistic competition setting.

this model is consistent with several of the most common trade theories (Bergstrand (1989), Helpman and Krugman (1985), Deardorff (1998), and Baldwin and Taglioni (2006)).

In the following sections, we discuss two important issues in the empirical application of the gravity model, namely, the presence of fixed effects and how to address selection and zero trade flows.

3.1. Fixed effects

We begin with a discussion of fixed effects. Anderson and Van Wincoop (2003) apply a general equilibrium approach and demonstrate that the traditional specification of the gravity model suffers from an omitted variable bias. This shortcoming is because the model does not consider the effects that relative prices have on trade patterns. Anderson and Van Wincoop argue 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 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 institutional 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 institutional quality 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 simultaneously keeping the key variables of the model 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.

An alternative solution has been suggested by Plümer and Troeger (2007). 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.⁵ However,

⁵ 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 simultaneously use cross-sectional variation.

several researchers have recently questioned the FEVD model (Greene (2011a; 2011b) and Breusch et al. (2011a; 2011b)).⁶

To determine how sensitive the 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 the influence of unobserved heterogeneity and fixed effects on the results.

3.2. Selection and zero trade flows

A second concern stems from the recognition that all firms are not equal. Some firms trade and some do not, and selection in trade is not random. More formally, Melitz (2003) and Chaney (2008) show how trade selection is affected by sunk costs and productivity. Because barriers to trade vary, both the volume of previously traded goods and the number of traded goods will change. Helpman, Melitz and Rubinstein (HMR) (2008) describe how changes in trade are related to changes in both the intensive and the extensive margins of trade and 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 model and extended with a parameter controlling for the fraction of exporting firms (heterogeneity).

The unit of observation in our study is firm-country pairs; therefore, the data obviously contain many observations with zero trade. This means that if selection into offshoring is not random, failing to adjust for selection may lead to biased results. To account for zeros and selection, we elaborate with two types of models.

First, we apply the Heckman type of selection model including the HMR specification. For the exclusion restriction in the Heckman models, we use data on skill intensity and export intensity at the firm level.⁷ Testing for the exclusion restriction indicates that these variables are valid.

⁶ 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, Plümer and Troeger (2011) emphasize the finite sample properties of the model and illustrate its advantages 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.

⁷ 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 productive and skill-intensive firms are more

Second, we estimate different multiplicative count data models. When using multiplicative models, we do not have to perform a logarithmic transformation of the gravity model, implying that zeros are naturally included (see Santos, Silva and Tenreyo (2006)). Among the family of multiplicative models, several alternatives are possible. We base our final choice of model on the appropriate tests. A Vuong test comparing a zero-inflated negative binomial model (ZINB) with a negative binomial model supports the ZINB model. Likelihood-ratio tests comparing the ZINB model with the zero-inflated Poisson model strongly favor the ZINB model, and summary statistics of the offshoring variable show that its unconditional variance is much larger than its mean. This in turn suggests that the ZINB model is superior to the Poisson model. 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)).⁸

3.3. *Econometric modeling of institutional indices and factor analysis*

Our analysis covers 21 measures of institutional quality. To add structure to the analysis, we divide the institutional variables into three sub-groups: (i) *Politics*, (ii) *IPR and Rule of law*, and (iii) *Business freedom*. In addition to these subgroups, we also construct a *Total index* that consists of all of the institutional variables. From this grouping, we create two types of indices measuring institutional quality. First, we normalize all institutional variables to range between 0 and 10, in which higher numbers indicate “better” institutions, and for each group we calculate the unweighted mean by measuring the annual average score that each country receives. This means that all of the measures of institutional quality receive the same weight. Definitions of the variables are available in the Appendix.

As a refinement to the unweighted mean values, we apply factor analysis to create institutional indices.⁹ We use factor analysis to combine information from our different institutional variables into a single variable (factor). Factor analysis allows us to keep track of

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

⁸ The ZINB model gives rise to two types of estimations and then combines them. First, a logit model is estimated, predicting whether a certain observation belongs to the group of zero offshoring. Second, a negative binomial model is generated that predicts the probability of a count belonging to observations with non-zero offshoring flows.

⁹ For an introduction to factor analysis, see Kim (1979), Bandalos and Boehm-Kaufman (2009) and Ledesma and Valero-Mora (2007).

how much each factor affects the total variation and of the contribution of each underlying variable. To select how many factors to use, we apply the Kaiser criteria to assess only factors with an eigenvalue equal to or greater than one. In our case, this implies one factor loading for *IPR and Rule of law* and *Business freedom* and two factor loadings for institutions covering *Politics* variables and the *Total index*. To obtain factors that are not correlated to each other (in the case of having more than one factor to summarize the variability), we apply an orthogonal rotation.¹⁰

Next, we evaluate the relative importance of the different institutional variables for each factor. Information on the relative importance in terms of factor loading is displayed in Table 1. The table shows that for the *Politics* factors, the variables Democracy, Institutionalized Democracy and Combined Polity Score are most important for Factor 1, whereas Factor 2 is primarily defined by Government Efficiency, Regulatory quality and Political stability. For *IPR and Rule of law*, we observe that all variables related to IPR have approximately the same loadings. Regarding the factor capturing *Business freedom* the institutional variables Freedom to trade, Freedom of the world index and Access to sound money have relatively large factor loadings, whereas loadings stemming from Fiscal freedom are almost irrelevant, both for the *Business freedom* index and the *Total index*. Finally, the figures suggest that the factors absorb most of the variation of the underlying variables, with no proportion lower than 0.84 for the different groupings of institutions.¹¹

-Table 1 about here-

3.4. Relationship-specific interactions

As noted above, institutions can be considered as a factor of comparative advantage. Nunn (2007) builds on Raush (1999) and constructs a relation-specificity (*RS*) index that examines, for different types of goods, how common personal interaction between buyer and seller is in contract completion. Nunn shows that countries with well-developed institutions have a comparative advantage in goods that are intensive in buyer-seller interactions.

¹⁰ As a robustness check, we used the so-called oblique rotation (see Abdi (2003); Harman, 1976; Jennrich & Sampson, 1966; and Clarkson & Jennrich, 1988)). Results are not altered when applying this alternative rotation of the factors (results available on request).

¹¹ When using two factors, we sum the proportion from the ingoing factors.

Several papers have studied how relationship-specific interactions and investments affect the various decisions of a firm.¹² Given the close ties between offshoring, relationship-specific interactions and contractual completion, not controlling for relationship-specific interactions may lead to misleading results. We therefore follow Nunn and others and interact measures of a country's institutional quality with the relationship-specificity index.

3.5. Other variables and model specification

Bergstrand (1989) discusses the relevance of including measures of income or factor prices in the gravity model. To control for income, Anderson and Van Wincoop (2003) include population because rich countries tend to use a greater share of their income on tradables and because for a given GDP, a larger population implies a lower per capita income. Considering the role played by factor prices in offshoring decisions, failing to include a measure that captures factor price differences may lead to an omitted variable bias. We therefore include population in our model.¹³ We also include an ownership variable that indicates whether a firm is a multinational enterprise (MNE). To account for firm-level gravity, we apply firm sales. Firm level productivity is measured using the Törnquist index. Finally, to control for trade resistance, in addition to distance and fixed effects, we include information on tariffs defined at the most disaggregated (product) level. Because of the hierarchical structure of the data, all estimations are performed with robust standard errors clustered by country.

Based on the above discussion of the empirical formulations of the gravity model, our analysis will be based on several econometric specifications. We will present results based on OLS, a ZINB model, a Heckman selection model, a Heckman-Melitz-Rubinstein model (HMR) and a Heckman FEVD model. With this as a background, a representative log-linear OLS model takes the following form:

$$\ln(\text{Offshoring}_{ijt}) = \alpha + \beta_1 \ln(Y_{jt}) + \beta_2 \ln(q_{it}) + \beta_3 \ln(\text{Dist}_{jt}) + \beta_4 [(\text{Inst})_{jt} (\text{RS})_i] + \beta_5 (\text{Tariff}_{jt}) + \beta_6 \ln(\text{Pop}_{jt}) + \beta_7 (\text{TFP}_{it}) + \beta_8 (\text{MNE}_{it}) + \sum_r \beta_r D_r + \gamma_t + \varepsilon_{ijt} \quad (2)$$

¹² Examples include Altomonte and Békés (2010), analyzing trade and productivity; Casaburi and Gattai (2009), examining intangible assets; Ferguson and Formai (2011), analyzing trade, firm choice and contractual institutions; Bartel, Lach and Sichernan (2005), analyzing outsourcing and relationship-specific interactions; and Kukenova and Strieborny (2009), analyzing finance and relationship-specific investments.

¹³ For further discussion, see Greenaway et al. (2008) and the references therein.

In the equation, $Offshoring_{ijt}$ refers to the imports of offshored material inputs by firm i from country j at time t , Y is the GDP of the target economy, q is firm size measured as total sales, $Dist$ is the geographical distance, $Inst.$ is our measure of institutional quality, RS is the relations-specific index, $Tariffs$ is the trade-weighted tariff barrier, Pop is population, TFP is firm productivity, MNE is a dummy variable for multinational firms, D_r is a set of regional/country dummies, γ_t is period dummies and ε is the error term.

4. Data, variables and descriptive statistics

Firm-level data

The firm-level data originate from several register-based data sets from Statistics Sweden that cover the entire private sector. First, the financial statistics (FS) contain detailed firm-level information on all Swedish firms in the private sector. Examples of included variables are value added, capital stock (book value), number of employees, total wages, ownership status, profits, sales and industry affiliation.

Second, the Regional Labor Market Statistics (RAMS) includes data on all firms. The RAMS also adds firm information on the composition of the labor force with respect to educational level and demographics.¹⁴

Finally, firm level data on offshoring originate from the Swedish Foreign Trade Statistics, collected by Statistics Sweden and available at the firm level and by country of origin from 1997 to 2005. Data on imports from outside the EU consist of all trade transactions. Trade data for EU countries are available for all firms with a yearly import above 1.5 million SEK. According to the figures from Statistics Sweden, the data incorporate 92 percent of the total trade within the EU. Material imports are defined at the five-digit level according to NACE Rev 1.1 and grouped into major industrial groups (MIGs).¹⁵ The MIG code classifies imports according to their intended use. In this analysis, we use the MIG definition of intermediate and consumption inputs as our offshoring variable.

¹⁴ The plant level data are aggregated at the firm level.

¹⁵ MIG is a European Community classification of products: Major Industrial Groupings (NACE rev1 aggregates).

All firm level data sets are matched by unique identification codes. To make the sample of firms consistent across the time period, we restrict our analysis to firms in the manufacturing sector with at least 50 employees.

Data on country characteristics

GDP and population are collected from the World Bank database. GDP data are in constant 2000 USD prices. Data on distance are based on the CEPII distance measure, which is a weighted measure that takes into account internal distances and population dispersion.¹⁶ Finally, tariff data are obtained from the UNCTAD/TRAINS database. Detailed information on these variables is presented in the Appendix. Given that there are different timeframes for the different data sets, we limit our analysis to the period from 1997 to 2005.

Institutional data

Measuring institutional characteristics and addressing the problems associated with capturing the quality of institutions are challenging. There are reasons to believe that several institutional variables are measured with error, which can influence results. Another issue is that many institutional variables are correlated with each other, making it difficult to estimate regressions that include many different institutions. Finally, the coverage across countries and over time differs widely among institutional variables. This could make results sensitive to the choice of variables. We tackle these potential problems by (i) using data on a large number of institutional variables and from many different data sources and (ii) using unweighted (country averages) and weighted (factor analysis based) indices.

Institutional data are drawn from several different sources, which include the World Bank database, Freedom House, the Polity IV database, the Fraser Institute and the Heritage Foundation¹⁷. We divide institutions into three main groups: *Politics*, *IPR* and *Rule of law* and *Business freedom*. Detailed information on the institutional variables used in our study is available in the Appendix.

¹⁶ More information on CEPII's distance measure is found in Mayer and Zignago (2006).

¹⁷ Detailed information on institutional data can be found at the Quality of Government Institute (<http://www.qog.pol.gu.se/>).

The data from the Fraser Institute consist of variables associated with economic and business freedom.¹⁸

The Freedom House provided us with data on institutional characteristics covering a wide range of indicators of political freedom. These include broad categories of political rights and civil liberties.

Data from the Polity IV database consist of variables that measure concepts such as institutionalized democracy and autocracy, polity fragmentation, regulation of participation, and executive constraints.

Variables related to economic freedom are provided by the Heritage Foundation. The Heritage Foundation measures economic freedom according to ten components cores, which are then averaged to obtain an overall economic freedom score for each country.

Finally, we consider the Worldwide Governance Indicators (WGI) developed by Kaufman et al. (1999) and supplied by the World Bank. WGI contain information on six measures of institutional quality: corruption, political stability, voice and accountability, government effectiveness, rule of law, and regulatory quality. Because of limited coverage across countries and over time, not all available measures are retained. This constrains our analysis to the period from 1997 to 2005, for which we assess 21 institutional variables. Definitions for all of the variables are available in the Appendix.

5. Results

5.1. Which institutions matter?

Table 2 presents the basic results for the impact of a large number of institutional variables. To obtain an overview of the individual impact for each institutional variable, we start by showing results when they are included one by one in separate regressions. The institutional variables are divided into three main groups: *Politics, IPR and Rule of Law* and *Economic Freedom*.

¹⁸ Included variables from the Fraser Institute in our analysis are *Legal structure and Security of property rights*, *Freedom to trade internationally* and *Access to sound money*.

- Table 2 about here -

In Table 2, each column corresponds to a specific econometric specification. The first three columns present OLS results with different fixed effects. Column 4 shows results from using a zero-inflated negative binomial model (ZINB), columns 5-6 show results from the Heckman selection model, column 7 shows results from the Heckman-Melitz-Rubinstein model (HMR), and column 8 shows results from the FEVD model. Control variables in the gravity equations (not shown) are *Distance*, *GDP*, *Population*, *Tariffs*, *MNE status*, *Firm size*, and *Firm TFP*. All estimations include industry dummies at the 2-digit level and year fixed effects.

Starting with the OLS specifications, we first observe that the political variables are positively and significantly related to the level of firm offshoring. Studying the specifications with region or country fixed effects (columns 1 and 2), the estimated coefficients show that a one-point increase in the political indices is associated with an increase in offshoring in the range of 7 to 16 percent. Despite differences in how the institutions are measured, the estimated coefficients are remarkably similar, with a point estimated close to 10 percent. Comparing the politics variables, we see that *Regulatory quality*, *Government effectiveness* and *Political stability* have the highest impact on offshoring. The highly positive impact of these politics variables on a firm's offshoring decision is consistent with previous theories that have stressed the importance of good and stable institutions on contract enforcements. This is especially true in our setup because the right-hand-side institutional variables interacted with the Nunn (2007) industry-specific measure of the proportion of intermediate goods that are relationship specific. It is worth noting that the strongest association with offshoring is found for *Regulatory quality*, a variable that captures measures of market-unfriendly policies as well as excessive regulations in foreign trade and business development. These factors are of critical importance when making decisions about contracts with foreign suppliers.

Similar results apply to our estimations on institutions capturing IPR and Rule of law. The three different variables in this group are all positively and significantly related to the amount of firm offshoring. Again, independent of which variable we examine, the quantitative effects remain remarkably similar across the different measures of IPR and Rule of law.

Our final group of institutional characteristics captures the different aspects of economic and business freedom. A positive and in most cases significant effect are found for the different business freedom variables. The highest point estimates are obtained for the variables that capture business and investment freedom.

Results found in the first two columns (with regional and country fixed-effects, respectively) are similar. This suggests similar variation across countries within the 22 regions. Given these results, the complexity of the models presented later in this paper, and the large dataset size (>1.5 million observations), we use a 22-region fixed-effects approach in the following estimations. Column 3 presents the OLS results based on firm-country fixed effects. Again, all institutional variables are positively related to offshoring. One difference is the higher standard errors, which imply a lack of significance in many cases. One drawback with this specification is that it relies only on within-firm variation, which in our case is highly restrictive (see Table A1 for figures on within- and between-firm variation).

Based on the discussion in Section 2, we continue in the subsequent columns with a set of econometric specifications that take into account several problems in estimating gravity equations. Our first challenge is to address the large number of zero offshoring observations. Of a total of approximately 1.6 million firm-country-year observations, approximately 123,000 observations have positive trade flows. To handle this, we start by using a multiplicative model that does not require a logarithmic transformation of the gravity model (see, e.g., Santos Silva and Tenreyro (2006)). Column 4 presents the results derived from using a ZINB model with regional fixed effects.

Starting with our politics variables, we see that the point estimates using ZINB are lower compared with our different OLS specifications. This result is similar to that reported in Burger et al. (2009), who analyzed different Poisson models in the case of excess zero trade flows. The largest difference between applying the zero-inflated negative binomial model compared with OLS is in the results for the business freedom variables. There is a lack of statistical significance for several of these variables.

In columns 5 and 6, we apply a Heckman selection model. As with the ZINB model, firm export ratio and the share of workers with tertiary education are used as exclusion restrictions. Comparing the results from the Heckman selection model in column 6 with the corresponding OLS results in column 1 reveals clear similarities. The quantitative effects are somewhat larger when selection is taken into account. For instance, a one-point increase in

political stability and government effectiveness is associated with an increase in firm offshoring of approximately 19 percent.

We continue in column 7 with results from estimating a HMR model. The HMR model is estimated as a Heckman model augmented by a term that captures firm heterogeneity (see Section 3). Adding the firm heterogeneity term to the Heckman selection model leads to somewhat larger point estimates than with the standard Heckman model (comparing columns 7 and 6). The qualitative message is the same: there is a positive relationship between the quality of institutions and offshoring.

The final column in Table 2 shows the results from an FEVD model that controls for unit fixed effects. An advantage with this model is that time-invariant and slowly changing time-varying variables in a fixed-effects framework can be included. We apply the FEVD model to see whether controlling for fixed effects alters the results compared with using the 22-region dummies. The results from the FEVD are similar to those obtained from the Heckman selection and HMR models, suggesting that even though estimations with regional fixed effects do not absorb all fixed effects, the observed results are not affected.

5.2. Unweighted institutional indices

To compare and investigate the importance of *Politics, IPR and Rule of law* and *Business freedom* and all of the institutional variables taken together, we continue in Tables 3 and 4 with summary indices of the institutional variables presented in Table 2. This enables us to determine which group of institutional variables is most important in firms' decisions to outsource production. The use of summary indices also makes us less dependent on individual institutional variables, in terms of both what they measure and the risk of possible measurement errors. In Table 3, we use unweighted means of the institutional variables presented in Table 2.¹⁹ We then continue with factor analysis. The results based on factor analysis are presented in Table 4.

- Table 3 about here -

¹⁹ The range of all institutional variables is normalized to 0-10, such that a high number indicates good institution.

Starting with the unweighted index of political variables, we observe that all of the models show a positive and significant relationship between the quality of different political and government variables and offshoring. There is some variation in the quantitative effects. The ZINB models generally result in lower point estimates. Based on the Heckman selection model shown in column 5, a one-point increase in the index of politics variables is associated with a 15 percent increase in the level of offshoring. How does this effect relate to the impact of IPR and Rule of Law and Business freedom? Results for these two groups of institutional quality show a somewhat larger effect based on the two Heckman models. The largest effect is found for the index that captures different business characteristics in the countries from which the firms outsource production. This is consistent with the motives for offshoring in which a country's business climate might be more important than variables of politics/government effectiveness.

Table 3 also shows the gravity equation and control variables. The standard gravity variables have the expected signs and are statistically significant. Based on the Heckman model, we see that the level of offshoring is negatively related to the geographical distance. A 1 percent increase in geographical distance leads to a decrease in offshoring of approximately 1.8 percent. GDP and population both have positive signs.²⁰

5.3. Factor analysis

We continue in Table 4 with our results based on factor analysis. Results based on factor analysis are qualitatively similar to the results obtained for unweighted indices in Table 3.

- Table 4 about here -

²⁰ As discussed in Burger et al. (2009) and shown in Anderson and Van Wincoop (2003), one problem with the standard gravity model specifications is the impact of omitted variable bias. This bias arises from not taking into account relative prices. Not considering so-called multilateral trade resistance can lead to biased results. Our response to this is to use detailed data on tariffs and a set of dummy variables. The tariff variable has the expected sign and is negative and significant in our Heckman specification. The estimated elasticities range between -1.7 and -3.1.

Starting with our two types of Heckman models, we see that estimated coefficients for both factors capturing our politics variables are positive and significant. The point estimates for Factor 2 are higher than for Factor 1 (0.90 vs. 0.23). As seen in Table 1, political Factor 1 explains a larger share of total variation than does political Factor 2. As described in Section 3, Factor 2 is primarily defined by Government efficiency, Regulatory quality and Political stability. These are the same variables that, according to the results in Table 2, have the strongest relationship with offshoring. In contrast, the variables Democracy, Institutionalized democracy and Combined Polity score are most important for Factor 1. These all have somewhat lower point estimates individually, as shown in Table 2.

Continuing with the factors for *IPR and Rule of Law* and *Business freedom*, Table 4 also presents positive and significant effects for these institutional areas. The same is found for our combined total factors, which consist of all underlying institutional variables.²¹ In summary, the results shown in Table 4 confirm what we found in the earlier regression tables, namely, a positive and robust relationship between institutions and offshoring. However, once again, the exact quantitative effects seem to vary somewhat across specifications and between institutional areas. Finally, Table 4 also shows evidence of a weaker relationship when a zero-inflated negative binomial model is estimated (see columns 1-4). This applies to both the magnitude of effects and the statistical significance.

5.4. Offshoring and R&D

We continue to study which types of firms and inputs are most strongly affected by institutional characteristics in countries from which offshoring is conducted. We do this by using firm-level data on R&D expenditures. Our hypothesis is that R&D-intensive firms and inputs are relatively sensitive to institutional shortcomings.

It is known that R&D-intensive firms are typically seen as dependent on innovation and technology and that both production and innovation often involve tasks that are performed internally and with external partners. This implies that offshoring may include sensitive information and firm-specific technologies. Although such arrangements can reduce

²¹ Observing the combined total index, Factor 1 has the largest point estimates, captures most of the total variation in the total set of institutional variables and IPR plays a central role for the loadings in Factor 1 while loadings for Factor 2 are concentrated to a few political variables. One interpretation is that IPR and market conditions are more important in influencing offshoring than political freedom and human rights.

costs, there is also a risk that firms will suffer from technology leakage.²² Hence, for R&D-intensive firms and for firms that offshore R&D-intensive production, contract completion is crucial. Our hypothesis is therefore that high-technology firms and firms with R&D-intensive goods are expected to be relatively reluctant to offshore activities to countries with weak institutions and a reputation for not respecting IPR. We analyze this in Tables 5 and 6, where we present results related to how institutional quality in the target economies varies with respect to the R&D intensity of the offshoring firm and R&D content in the offshored material inputs. Table 5 focuses on the R&D intensity of the firms. Table 6, in contrast, focuses on the R&D intensity of the offshored material inputs.

- Table 5 about here –

To study the impact of the degree of R&D in production, we classify firms into two groups according to R&D intensity. Low R&D refers to firms in industries with R&D intensity below the median, whereas high R&D refers to firms in industries with R&D intensity above the median. Table 5 shows separate regressions for the two groups on different institutional areas and on different indices (unweighted and weighted based on factor analysis).

The results are clear. Regardless of econometric specification and type of institution studied, we find that firms in R&D-intensive industries are more sensitive to weak institutions than are firms in other industries. For firms in R&D-intensive industries, a strong relationship is found between institutional quality and offshoring. In contrast, no such relationship is observed for firms in industries with low R&D expenditures.²³ Considering that all institutional variables are interacted with the Nunn measure of intensity of relationship-specific industry interactions, these results imply that the sensitivity of firm production in terms of R&D expenditure has implications for how institutional quality affects a firm's choice of outsourcing location.

²² See, e.g. Adams (2005).

²³ We have also estimated models in which the institutional variables are interacted with R&D expenditures. The qualitative results remain the same.

Starting with our Heckman specifications, Table 5 demonstrates that the quantitative effects for the high R&D firms are of similar magnitude to the corresponding figures in Tables 3 and 4, in which the latter are estimated for all firms. For the ZINB estimations in column 1, there is a clear pattern of higher estimates in the high R&D group compared with the pooled estimates shown in Tables 3 and 4. Again, no effects of institutional characteristics are found among firms in low R&D industries.

Next, we analyze how the R&D-intensity of the inputs is related to institutional characteristics. The results are presented in Table 6.

- Table 6 about here -

In Table 6, low and high R&D levels refer to the R&D intensity of the offshored material inputs. Therefore, these regressions are based on observations with positive offshoring flows only. That is, we now have no observations with zero trade and no selection into offshoring to account for. We therefore present estimates based on OLS, negative binomial and FEVD estimations.

Again, results show clear differences between the two groups. A highly significant and positive effect of institutional quality is found for firms with higher than median R&D content in their offshoring. For the low R&D offshoring firms, no relationship between institution and offshoring is found.

In summary, the results shown in Tables 5 and 6 clearly indicate that R&D intensity and the sensitivity of both production and offshoring content are related to the importance of institutions in terms of offshoring activities.

5.5. The dynamics of offshoring and institutions

We first address the issue of the dynamic effects of institutional quality on offshoring by observing some descriptive statistics. Table 7 presents figures on the average volume of offshoring divided by contract length and institutional quality.

-Table 7 about here-

Although the average volume of offshore inputs is nearly four times larger for trade with countries with strong institutions than for those with weak institutions (450 vs. 124), Table 7 shows no overwhelming evidence of a difference in volumes between countries with strong or weak institutions for a given contract length. Instead, the differences in average volumes are driven by the distribution of contract duration. Large volumes are associated with long-term contracts, as shown in Figure 1, and long-term contracts are more common in trade with countries with strong institutions.

-Figure 1 about here-

The relation between institutional quality and contract duration can be further investigated by estimating regression equations according to contract length. To save space, we focus on the results from the Heckman models. The results from regressions, separated by contract length, are found in Table A2 and depicted in Figure 2.

-Figure 2 about here-

Figure 2 reveals two interesting patterns. From the selection equation, we note that the sensitivity of weak institutions increases with contract length. That is, firms' that in their decision to engage in offshoring from a specific country are sensitive to weak institutions are also the ones that are able to uphold a long-term relationship. Figures from the volume equation show a slightly different pattern. In this case, results tend to indicate an inverse U-shaped pattern with a low institutional sensitivity for long and short contracts.²⁴

²⁴ Figure 2 depicts the results from the total factors. Similar patterns are found for the area-specific factors (IPR, Business and Politics).

As discussed above, one interesting feature of the search cost based models is their predictions about the dynamics of trade. The main prediction is that trade with countries with weak institutions will be characterized by short-term contracts with relatively small initial volumes. However, as time goes by, the trading partners will learn to know each other, and these volumes will subsequently increase. Hence, institutional learning will feed into the volume of offshored inputs. Increases in volume are expected to be especially strong with partners in countries with weak institutions (Aeberhardt et al. (2010) and Araujo and Mion (2011)). In Table A3, we therefore focus on relatively long-term contracts (at least 6-8 years of offshoring). Our models allow for volume shifts in period-specific offshoring and over-time variation in the sensitivity to institutional quality. The regression results are found in Table A3 and depicted in Figure 3A-3B.

-Figures 3A-3B about here-

Figure 3A depicts the period dummy coefficients for firms that have offshored for at least 6 to 8 consecutive years, allowing for an analysis of the prediction that firms start small and successively increase their volume as they develop relationships with their contract partners. This upward-sloping trend supports the hypothesis of increasing volumes. According to Figure 3A, trade flows increase relatively rapidly during the first four years of a relationship and level out thereafter.

Figure 3B shows that as volumes increase, the sensitivity of volumes for weak institutions tends to decrease. This can be put in relation to results in Figure 2 where we observed a bell-shaped trajectory of volume sensitivity with respect to contract length. One interpretation of these results is that firms that do not take into account institutional quality will be overrepresented in the group of short contracts. Long-term contracts, in contrast, will consist of firms that are more sensitive to weak institutions but that, as time goes by, learn how to handle foreign institutions and become less sensitive to weak institutions. This type of process allows for the observed hump-shaped pattern depicted in the left-hand panel of Figure 2. Breaking down the analysis to different sub-indices reveals similar patterns.

5. Summary and Conclusions

Previous research on institutions has recognized that weak institutions can distort markets, hamper investments and alter patterns of trade and investment. However, little is known about the impact of institutional quality in target economies on offshoring. Given the importance of offshoring in a firm's internationalization strategy, the lack of knowledge in this area is unfortunate. Offshoring is an activity in which firm-specific and sensitive information must occasionally be shared with an external agent in another jurisdiction. It is therefore plausible to assume that institutional barriers can have a strong impact on offshoring.

Using detailed Swedish firm-level data combined with country characteristics, we analyze how a wide set of institutional characteristics in target economies affects offshoring by Swedish firms. Our results, based on a large set of institutional measures, indicate a positive relationship between institutional quality and firm-level offshoring. Institutional strength therefore strongly influences both the destination country and the volume of offshored material inputs.

We also present evidence on sector and firm heterogeneity with regard to the impact of institutional quality. Specifically, as is well known, R&D-intensive firms are dependent on innovation and technology such that R&D can be either performed in-house or outsourced. Although outsourcing arrangements may reduce costs, they come with the risk of technology leakage. We have therefore analyzed whether R&D-intensive firms and firms that offshore R&D-intensive goods are more sensitive to weak institutions than other firms. The results are clear. Regardless of the econometric specification used and the type of institution analyzed, we find a strong relationship between institutional quality and offshoring for firms with high R&D intensity. In contrast, no such relationship is observed for firms in industries with low R&D intensity. We also show that contractual intensity of the offshored input is of significance for the results.

Search cost based theories suggest that institutions not only have volume and selection effects but also that trade dynamics are affected. We find that the average trade flow in countries with weak institutions is shorter and of smaller volume than the corresponding flows in countries with well-developed institutions. Our results indicate that the flows of offshore inputs increase relatively rapidly during the first years of offshoring and level out thereafter. The sensitivity of institutional quality also decreases as firms become comfortable with the local markets and partners.

A final interesting finding is that firms that are relatively sensitive to weak institutions dominate long-term relationships. Firms that are most successful in maintaining long-term relationships with foreign suppliers are careful, start small and are able to learn how to handle foreign institutions. Therefore, the overall conclusion of this study is that the institutional characteristics of target economies can in many ways act as a deterrent to offshoring.

References

- Abdi. H. (2003), "Factor Rotations in Factor Analyses", Encyclopedia of Social Sciences Research Methods, (state: June 2006), 1-8.
- Abramo, C.E. (2008), "How Much Do Perceptions of Corruption Really Tell Us?" Economics, 2(3).
- Adams, J.D., (2005), "Industrial R&D Laboratories: Windows on Black Boxes?," The Journal of Technology Transfer, 30(2_2), 129-137.
- Aeberhardt, R., Ines, B., and Fadinger, H. (2010), "Learning, Incomplete Contracts and Export Dynamics: Theory and Evidence from French Firms," Working Paper 1006, Department of Economics, University of Vienna.
- Altomonte, C. and Békés, G., (2010), "Trade Complexity and Productivity," CeFiG Working Papers 12, Center for Firms in the Global Economy, revised 25 Oct 2010
- Anderson, J.E. (1979), "A Theoretical Foundation for the Gravity Equation", *American Economic Review*, 69(1), 106-116.
- Anderson J.E., and Marcoullier, D. (2002), "Insecurity and the Pattern of Trade: An Empirical Investigation," *The Review of Economics and Statistics*, 84(2), 342-352.
- 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., Helpman, E. (2004), "Global Sourcing," *Journal of Political Economy*, 112(3), 552-580.
- Antràs, P., Helpman, E. (2006), "Contractual Frictions and Global Sourcing". NBER working papers, No. 12747.
- Araujo, L., and Mion, G. (2011), "Institutions and Export Dynamics," Mimeo. Michigan State University and London School of Economics.
- Baldwin, R.E., and Taglioni, D. (2006), "Gravity for Dummies and Dummies for Gravity," CEPR Discussion Paper No. 5850.
- Bandalos, D.L. and Boehm-Kaufman, M.R. (2009). "Four common misconceptions in exploratory factor analysis." In Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences. Lance, Charles E. (Ed.); Vandenberg, Robert J. (Ed.). New York: Routledge. pp. 61–87.
- Bartel, A., Lach, S and Sichernman, N., (2005), "Outsourcing and Technological Change", NBER WP. No. 11158.

- Belloc, M. (2006), "Institutions and International Trade: A Reconsideration of Comparative Advantage," *Journal of Economic Surveys*, 20(1), 3-26, 02.
- Bergstrand, J.H. (1985), "The Gravity equation in International trade: some microeconomic foundations and empirical evidence," *Review of economic and statistics*, 67(3),474.481.
- Bergstrand, J.H. (1989), "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade," *Review of Economics and Statistics*, 71(1), 143-53.
- Bernard, A., Jensen, J.B. (2004), "Why some firms export," *Review of Economics and Statistics*, 86(2), 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., 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.
- Casaburi, L. and Gattai, V., (2009), "Why FDI? An Empirical Assessment Based on Contractual Incompleteness and Dissipation of Intangible Assets," Working Papers 164, University of Milano-Bicocca, Department of Economics.
- Chang, H-J. (2010), "Institutions and Economic Development: Theory, Policy and History," *Journal of Institutional Economics*, 7(4), 473-498.
- Chen, Y., Horstmann, I., Markusen, J. (2008), "Physical capital, knowledge capital, and the choice between FDI and outsourcing," NBER Working paper No. 14515.
- Clarkson, D.B. and Jennrich, R.I., (1988), *Psychometrica* 53(2), 251-259.
- De Groota, H. L-F. Linders, G.A., Rietvelda, P., and Subramanian, U. (2005), "Institutional Determinants of Bilateral Trade Patterns," Tinbergen Institute Discussion Paper, No. 023/3.
- Deardorff, A.V., (1998), "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?" in Jeffrey A. Frankel (ed.), *The regionalization of the world economy*, Chicago: University of Chicago Press (1998): 7-22.
- Depken C.A., and Sonora R.J. (2005), "Asymmetric Effects of Economic Freedom on International Trade Flows," *International Journal of Business and Economics*, 4(2), 141-155.
- Eaton, J., Eslava, M., Krizan, C. J., Kugler, M., and Tybout, J. (2011), "A Search and Learning Model of Export Dynamics," Mimeo.
- Egger, P.H., 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., and Hanson. G. H. (2005), "Ownership and Control in Outsourcing to China: Estimating the Property Rights Theory of the Firm," *Quarterly Journal of Economics*, 120(2) 729–762.
- Ferguson, S. and Formai, S., (2011), "Institution-Driven Comparative Advantage, Complex Goods and Organizational Choice," Research Papers in Economics 2011:10, Stockholm University, Department of Economics.
- Greenaway, D., Gullstrand, J., Kneller, R. (2008), "Firm Heterogeneity and the Gravity of International Trade," University of Nottingham, GEP, Discussion Papers No. 08/41.

- 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, 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.
- Grossman, G.M., 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, 135-159.
- 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.
- Habib, M., Zurawicki, L. (2002), "Corruption and Foreign Direct Investment," *Journal of International Business Studies*, 33(2), 291-307.
- Hakkala, K., Norbäck P-J., Svaleryd, H. (2008), "Asymmetric Effects of Corruption on FDI: Evidence from Swedish Multinational Firms," *The Review of Economics and Statistics*, 90(4), 627-642.
- Harman, H. H. (1976), "Modern Factor Analysis", 3rd ed. Chicago: University of Chicago Press.
- Helpman, E., Melitz, M., Rubinstein, Y. (2008), "Estimating trade flows: trading partners and trading volumes," *Quarterly Journal of Economics*, 123(2), 441-487.
- Helpman E., and Krugman P.R. (1985), Market Structure and Foreign Trade, The MIT Press. Massachusetts Institute of Technology.
- Jennrich, R.I., and Sampson P.F., (1966). "Rotation for Simple Loadings", *Psychometrica* 31, P. 313-323
- Kaufman, D., Kraay, A., and Zoido, P. (1999), "Aggregating Governance Indicators," *World Bank Policy Research Working Paper* No. 2195.
- Kaufmann, D., Kraay, Aart and Massimo, M., (2005), "Governance matters IV : governance indicators for 1996-2004," Policy Research Working Paper Series 3630, The World Bank.
- Kim, J-O., (1979), "Introduction to Factor Analysis: What It Is and How To Do It". Sage Publications, Inc, Thousands Oaks, USA.
- Kukenova, M. and Strieborny, M., (2009), "Investment in Relationship-Specific Assets: Does Finance Matter?," MPRA Paper 15229, University Library of Munich, Germany.
- Ledesma, R.D. and Valero-Mora, P., (2007), "Determining the Number of Factors to Retain in EFA: an easy-to-use computer program for carrying out Parallel Analysis." *Practical Assessment, Research and Evaluation*, 12(2) 1-11.
- Levchenko, A.A. (2007), "Institutional Quality and International Trade," *Review of Economic Studies*, 74, 791-819.
- Mayer, T., Zignago, S. (2006), "Notes on CEPII's distance measures," www.cepii.fr
- Márquez-Ramos, L., Mart'inez-Zarzoso, I., and Suárez-Burgute, C. (2010), "Trade Policy Versus Institutional Trade Barriers: An Application using "Good Old" OLS," *The Open-Access, Open-Assessment E-Journal*. <http://hdl.handle.net/1902.1/16723>

- 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.
- 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.
- Mocan, N. (2007). "What Determines Corruption? International Evidence from Microdata," *Economic Inquiry*, 46(4), 493-510.
- 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.
- Plümper, T., and Troeger, V.E. (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, 170-72.
- Ranjan, P., and Lee, J.Y., (2007). "Contract Enforcement and International Trade," *Economics and Politics*, Wiley Blackwell, vol. 19(2), pages 191-218, 07.
- Rauch, J.E., (1999), "Networks versus markets in international trade," *Journal of International Economics*, 48(1), 7-35.
- Rauch, J.E. & Watson, J. 2003, "Starting Small in an Unfamiliar Environment", *International Journal of Industrial Organization*, 21(7), 1021-1042.
- Silva, S., João M. C., and Tenreyro, S., (2006), "The Log of Gravity," *Review of Economics and Statistics* 88 (2006): 641-58.
- Tinbergen, J., (1962), "Shaping the World Economy: Suggestions for an International Economic Policy". New York: The Twentieth Century Fund.
- Turrini, A., and Ypersele, T.V., (2010), "Traders, Courts, and the Border Effect Puzzle," *Regional Science and Urban Economics* 40, 81-91
- Williamson, O.E., (2000), "The New Institutional Economics: Taking Stock, Looking Ahead", *Journal of Economic Literature*, XXXVIII 595-613.

Appendix

Table 1. Factor determinants: Rotated factor loadings (orthogonal rotation): Top factors in bold style, bottom factors in cursive.

Factor Determinant:	Factor 1 Politics	Factor 2 Politics	Factor IPR/Law	Factor Business	Factor 1 Total	Factor 2 Total
Politics						
Political stability (WB)	<i>0.27</i>	0.74			0.70	0.36
Government efficiency (WB)	<i>0.35</i>	0.90			0.85	0.37
Regulatory quality (WB)	0.44	0.84			0.87	0.42
Civil liberties (FH)	0.81	0.51			0.45	0.83
Democracy (FH)	0.94	0.34			0.28	0.96
Political rights (FH)	0.89	0.41			0.35	0.91
Institutionalized democracy (IV)	0.92	<i>0.33</i>			0.25	0.94
Combined polity score (IV)	0.97	<i>0.21</i>			<i>0.14</i>	0.97
IPR/Law						
Legal structure, property rights (FI)			0.94		0.85	0.23
Property rights (HF)			<i>0.92</i>		0.85	0.29
Rule of Law (WB)			0.95		0.86	0.32
Business						
Freedom to trade internationally (FI)				0.82	0.76	0.36
Freedom of the world index (FI)				0.78	0.90	0.28
Reg of credit, labor and business(FI)				0.53	0.80	<i>0.19</i>
Access to sound money (FI)				0.78	0.72	0.24
Business Freedom (FH)				<i>0.23</i>	0.70	<i>0.21</i>
Economic freedom index				0.57	0.89	0.28
Financial Freedom (HF)				0.53	0.65	0.36
Fiscal freedom (HF)				<i>-0.03</i>	<i>-0.06</i>	<i>-0.15</i>
Investment freedom (HF)				0.62	0.58	0.39
Freedom to trade (HF)				0.54	0.53	0.31
Proportion	0.85	0.13	1.04	0.84	0.71	0.13

Notes: Institutional data are collected from several different sources: the World Bank database (WB), the Freedom House (FH), the Polity IV database (IV), the Fraser Institute (FI) and the Heritage Foundation (HF). Proportion measure the proportion of variance accounted for by the factor.

Table 2. Offshoring and Institutions: Institutional variables included one-by-one. 1997-2005

	OLS (22-region)	OLS with (country FE)	OLS (firm FE)	ZINB (22 region)	Heckman (22-region) Selection	Heckman (22-region) Volume	HMR (22-region)	Heckman FEVD (22-region)
POLITICAL VARIABLES								
Political stability	0.1240 (0.0270)***	0.1185 (0.0283)***	0.1049 (0.0603)*	0.0765 (0.0301)**	0.1097 (0.0120)***	0.1903 (0.0318)***	0.4068 (0.0427)***	0.2751 (0.0099)***
Government Eff.	0.1183 (0.0303)***	0.1048 (0.0244)***	0.1157 (0.0450)**	0.1920 (0.1276)	0.1196 (0.0106)***	0.1891 (0.0310)***	0.4175 (0.0418)***	0.2793 (0.0052)***
Reg. quality	0.1587 (0.0303)***	0.1143 (0.0261)***	0.2337 (0.0554)***	0.0658 (0.0335)**	0.1175 (0.0121)***	0.2282 (0.0363)***	0.4556 (0.0436)***	0.3167 (0.0055)***
Civil Liberties	0.0980 (0.0238)***	0.0975 (0.0226)***	0.0693 (0.0451)	0.0546 (0.0272)**	0.0581 (0.0181)***	0.1362 (0.1685)	0.2632 (0.0311)***	0.1795 (0.0077)***
Democracy	0.0845*** (0.0240)	0.0875 (0.0203)***	0.0422 (0.0402)	0.0584 (0.0259)**	0.0391 (0.0214)*	0.1111 (0.0298)***	0.2012 (0.0255)***	0.1455 (0.0034)***
Political rights	0.0859 (0.0252)***	0.0901 (0.0203)***	0.0535 (0.0408)	0.0565 (0.0249)**	0.0325 (0.0210)	0.1080 (0.0308)***	0.1831 (0.0256)***	0.1376 (0.0033)***
Institutionalized democracy	0.0733 (0.0241)***	0.0820 (0.0203)***	0.02869 (0.0348)	0.0539 (0.0242)**	0.0262 (0.0208)	0.0921 (0.0303)***	0.1569 (0.0226)***	0.1180 (0.0036)***
Combined Polity Score	0.0727 (0.0234)***	0.0781 (0.0199)***	0.0172 (0.0350)	0.0577 (0.0249)**	0.0309 (0.0212)	0.0943 (0.0287)***	0.1679 (0.0228)***	0.1232 (0.0030)***
IPR & LAW								
Legal structure, property rights	0.1339 (0.2593)***	0.0956 (0.0231)***	0.1606 (0.0484)***	0.0531 (0.0320)*	0.1069 (0.0099)***	0.1952 (0.0314)***	0.3933 (0.0385)***	0.2702 (0.0092)***
Property rights	0.1342 (0.0254)***	0.1013 (0.0244)***	0.2755 (0.1155)**	0.0520 (0.0313)*	0.1055 (0.0119)***	0.1958 (0.0307)***	0.3939 (0.0368)***	0.2714 (0.0082)***
Rule of Law	0.1257 (0.0248)**	0.1129 (0.0258)***	0.1332 (0.0568)**	0.0442 (0.0306)	0.1200 (0.0106)***	0.1957 (0.0325)***	0.4213 (0.0437)***	0.2817 (0.0053)***
ECONOMIC FREEDOM								
Freedom to trade	0.1424 (0.0301)***	0.1001 (0.0233)***	0.2112 (0.0529)***	0.0584 (0.0338)*	0.1091 (0.0081)***	0.2071 (0.0316)***	0.4190 (0.0381)***	0.2908 (0.0056)***
Freedom of the world index	0.1303 (0.0290)	0.1227 (0.0262)***	0.1553 (0.0624)**	0.0543 (0.0332)	0.1287 (0.0090)***	0.2070 (0.0317)***	0.4594 (0.0402)***	0.3067 (0.0068)***
Reg. of credit and business	0.1173 (0.0283)***	0.1300 (0.0285)***	0.0671 (0.0650)	0.0457 (0.0337)	0.1357 (0.0112)***	0.2000 (0.0338)***	0.4746 (0.0446)***	0.2999 (0.0076)***
Access to sound money	0.1289 (0.0246)***	0.1072 (0.0211)***	0.1893 (0.0434)***	0.0455 (0.0276)*	0.0987 (0.0075)***	0.1877 (0.0281)***	0.3810 (0.0348)***	0.2616 (0.0059)***
Business Freedom	0.1496 (0.0524)***	0.1030 (0.0304)***	0.1302 (0.0801)	0.0451 (0.0466)	0.0975 (0.0174)***	0.2064 (0.0579)***	0.3929 (0.0667)***	0.2076 (0.0099)***
Ec. freedom index	0.1371 (0.0347)***	0.1236 (0.0276)***	0.1642 (0.0740)**	0.0527 (0.0353)	0.1324 (0.0120)***	0.2164 (0.0375)***	0.4781 (0.0445)***	0.3162 (0.0068)***
Financial Freedom	0.0702 (0.0512)	0.1315 (0.0338)***	0.0214 (0.0744)	-0.0133 (0.0372)	0.0773 (0.0176)***	0.1209 (0.0521)**	0.2931 (0.0584)***	0.1890 (0.0093)***
Fiscal freedom	0.0355 (0.0473)	0.1071 (0.0284)***	-0.0953 (0.1115)	0.0454 (0.0376)	0.1120 (0.0143)***	0.1033 (0.0403)***	0.3271 (0.0412)***	0.1831 (0.0068)***
Investment freedom	0.1771 (0.0388)	0.0934 (0.0261)***	0.2012 (0.0514)***	0.0810 (0.0361)**	0.0714 (0.0164)***	0.2166 (0.0371)***	0.3455 (0.0397)***	0.2668 (0.0099)***
Freedom to trade	0.1035 (0.0281)***	0.0972 (0.0242)***	0.0536 (0.0439)	0.0663 (0.0298)**	0.0805 (0.0131)***	0.1537 (0.0300)***	0.3206 (0.0332)***	0.2156 (0.0088)***
Observations	122,836	122,836	122,836	1,579,751	1,579,751	1,579,751	1,579,751	1,579,751

Notes: The dependent variable is log offshoring in all estimations except for the ZINB where offshoring is in levels. Estimations with one institutional variable included per regressions. Robust standard errors within parenthesis (.), clustered by country. *, **, *** indicate significance at the 10, 5 and 1 percent levels, respectively. Control variables, included but not shown are Distance, GDP, Population, Tariffs, Firm MNE-dummy, Firm size, Firm TFP. All estimations include industry (2-digit) and year fixed effects. 22 region, country and firm fixed effects indicate use of different regional/firm fixed effects. Additional inflator variables predicting zeros are Share of skilled labor and Firm export ratio. Vuong tests of zero inflated negative binomial (ZINB) versus negative binomial show support for the ZINB model. Likelihood-ratio tests comparing the ZINB model with the zero-inflated Poisson mode strongly favor the ZINB model. Variables defined as time invariant/slowly changing in FEVD-models include: Distance, industry dummies, institutional variables, GDP, population and tariffs.

Table 3. Offshoring and Institutions: Unweighted institutional index included one-by-one. Different models, 1997-2005.

	Zero inflated negative binomial				Heckman-target				Heckman FEVD			
Politics	0.0637 (0.0286)**				0.1481 (0.0287)***				0.2012 (0.0038)***			
IPR/Law	0.0514 (0.0514)				0.2035 (0.0323)***				0.2868 (0.0073)***			
Business	0.0547 (0.0364)				0.2144 (0.0384)***				0.3069 (0.0059)***			
All	0.0613 (0.0329)*				0.1938 (0.0314)***				0.2729 (0.0047)***			
ln(distance)	-0.7375 (0.2590)***	-0.7328 (0.2594)***	-0.7546 (0.2643)***	-0.7460 (0.2616)***	-1.7885 (0.2296)***	-1.7696 (0.2268)***	-1.8551 (0.2383)***	-1.8138 (0.2332)***	-2.5851 (0.0256)***	-2.5757 (0.0259)***	-2.6699 (0.0268)***	-2.6198 (0.0261)***
ln(GDP)	0.1518553 (0.0810)*	0.1484 (0.0924)	0.1722 (0.0902)*	0.1603 (0.0863)*	0.6748 (0.1061)***	0.6140 (0.0885)***	0.7034 (0.0944)***	0.6747 (0.0981)***	1.0958 (0.0132)***	1.0149 (0.0126)***	1.1238 (0.0138)***	1.0914 (0.0133)***
ln(population)	0.2024 (0.1129)*	0.2019 (0.1258)	0.1804 (0.1208)	0.1929 (0.1179)	0.1823 (0.1271)	0.2332 (0.1130)**	0.1587 (0.1131)	0.1835 (0.1187)	0.0786 (0.0061)***	0.1508 (0.0069)***	0.0562 (0.0067)***	0.0852 (0.0063)***
Tariffs	-1.1147 (0.8790)	-1.0688 (0.8861)	-1.089 (0.8893)	-1.0903 (0.8848)	-3.1436 (1.1570)***	-2.9001 (1.0734)***	-2.9517 (1.1627)***	-3.0253 (1.1484)***	-1.9919 (0.2460)***	-1.7537 (0.2432)***	-1.6731 (0.2517)***	-1.8213 (0.2476)***
ln(TFP)	0.01285 (0.0134)	0.01296 (0.0135)	0.0133 (0.0135)	0.0130 (0.0134)	-0.0557 (0.0083)***	-0.0566 (0.0082)***	-0.0566 (0.0085)***	-0.0564 (0.0084)***	0.0089 (0.0102),	0.0088 (0.0102)	0.0089 (0.0102)	0.0089 (0.0102)
MNE	0.2078 (0.0615)***	0.2078 (0.0617)***	0.2081 (0.0616)***	0.2077 (0.0616)***	0.4121 (0.0547)***	0.4099 (0.0541)***	0.4116 (0.0543)***	0.4113 (0.0544)***	0.0708 (0.0425)*	0.0749 (0.0420)*	0.0734 (0.0423)*	0.0721 (0.0424)*
ln(firm size)	0.6369 (0.0210)***	0.6380 (0.0210)***	0.6380 (0.0211)***	0.6375 (0.0210)***	0.6511 (0.0276)***	0.6489 (0.0275)***	0.6504 (0.0274)***	0.6503 (0.0274)***	0.9240 (0.0075)***	0.9236 (0.0075)***	0.9196 (0.0072)***	0.9222 (0.0073)***
Rho					0.3347 (0.0482)***	0.3308 (0.0475)***	0.3343 (0.0483)***	0.3339 (0.0482)***				
Lamda IMR					0.9239 (0.1643)***	0.9120 (0.1614)***	0.9227 (0.1644)***	2.7594 (0.0978)***	2.1148 (0.0355)***	2.1127 (0.0358)***	2.1039 (0.0349)***	2.1117 (0.0352)***
ETA									1(0.001)***	1(0.001)***	1(0.001)***	1(0.001)***
R ²									0.83	0.83	0.83	0.83
Observations	1 579 751	1 579751	1 579 751	1 579 751	122 836	122 836	122 836	122 836	122 836	122 836	122 836	122 836

Notes: The dependent variable is log offshoring in all estimations except for the ZINB model where offshoring is in levels. Robust standard errors within parenthesis (.), clustered by country. *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. All estimations include regional (22 regions), industry (2-digit) and year fixed effects. Additional inflate/selection variables predicting zeros are Share of skilled labor and Firm export ratio. Vuong tests of zero inflated negative binomial (ZINB) versus negative binomial show support for the ZINB model. Likelihood-ratio tests comparing the ZINB model with the zero-inflated Poisson mode strongly favor the ZINB model. p-val. test of independent equations = 0.000 for all selection models. Variables defined as time invariant/slowly changing in FEVD-models include: Distance, industry dummies, institutional variables, GDP, population and tariffs.

Table 4. Offshoring and Institutions: Factor analysis based institutional index included one-by-one. 1997-2005.

	Zero inflated negative binomial				Heckman-target				Heckman FEVD			
Factor 1 Politics	0.3045 (0.1386) **				0.2271 (0.1301) *				0.1959 (0.0204) ***			
Factor 2 Politics	0.1926 (0.1325)				0.9019 (0.15569) ***				1.2056 (0.0265) ***			
Factor IPR/Law	0.2438 (0.1584)				0.9211 (0.1677) ***				1.1318 (0.0492) ***			
Factor Business	0.2576 (0.1088) **				0.7343 (0.1266) ***				0.7191 (0.0544) ***			
Factor 1 All inst. variables	0.1924 (0.1298)				0.8700 (0.1626) ** *				1.1579 (0.0367) ** *			
Factor 2 All inst. variables	0.3188 (0.1321) **				0.3290 (0.1456) ** *				0.3123 (0.0211) ** *			
ln(distance)	-0.7290 (0.2554) ***	-0.7198 (0.2543) ***	-0.7328 (0.2525) ***	-0.7420 (0.2525) ***	-1.7836 (0.2339) ***	-1.7273 (0.2185) ***	-1.7932 (0.2270) ***	-1.9418 (0.2442) ***	-2.5523 (0.0259) ***	-2.5167 (0.0264) ***	-2.5925 (0.0273) ***	-2.8163 (0.0328) ***
ln(GDP)	0.1062 (0.0828)	0.0987 (0.1103)	0.1581 (0.0930) *	0.0928 (0.0813)	0.5121 (0.0844) ***	0.4401 (0.0874) ***	0.6643 (0.0878) ***	0.4837 (0.0879) ***	0.8653 (0.0126) ***	0.8198 (0.0172) ***	1.1080 (0.0146) ***	0.8585 (0.0137) ***
ln(population)	0.2553 (0.1193) **	0.2523 (0.1470) *	0.1971 (0.1256)	0.2687 (0.1178) **	0.3698 (0.1201) ***	0.4070 (0.1226) ***	0.1958 (0.1067) *	0.4008 (0.1236) ***	0.3300 (0.0075) ***	0.3400 (0.0155) ***	0.0677 (0.0079) ***	0.3573 (0.0096) ***
Tariffs	-1.0797 (0.8401)	-0.9338 (0.8686)	-0.9800 (0.8620)	-0.9991 (0.8497)	-2.3750 (1.0086) **	-2.5026 (0.0079) **	-2.8134 (0.0194) ***	-2.2466 (0.1396) **	-0.9416 (0.2306) ***	-1.4560 (0.2375) ***	-1.7388 (0.2391) ***	-0.7859 (0.2445) ***
ln(TFP)	0.0132 (0.0139)	0.0131 (0.0139)	0.01428 (0.0138)	0.0140 (0.0141)	-0.0563 (0.0083) ***	-0.0553 (0.0082) ***	-0.0537 (0.0084) ***	-0.0556 (0.0085) ***	0.0086 (0.0102)	0.0087 (0.0102)	0.0090 (0.0102)	0.0083 (0.0102)
MNE	0.2102 (0.0619) ***	0.2073 (0.0615) ***	0.2058 (0.0608) ***	0.2113 (0.0611) ***	0.4094 (0.0541) ***	0.4066 (0.0544) ***	0.4103 (0.0550) ***	0.4105 (0.0547) ***	0.0665 (0.0423)	0.0768 (0.0420) *	0.0708 (0.0427) *	0.0779 (0.0423) *
ln(firm size)	0.6381 (0.0209) ***	0.6382 (0.0208) ***	0.6401 (0.0211) ***	0.6380 (0.0209) ***	0.6527 (0.0275) ***	0.6516 (0.0277) ***	0.6527 (0.0276) ***	0.6547 (0.0277) ***	0.9174 (0.0072) ***	0.9240 (0.0078) ***	0.9272 (0.0078) ***	0.9320 (0.0077) ***
Rho					0.3306 (0.0468) ***	0.3281 (0.0472) ***	0.6643 (0.0878) ***	0.3323 (0.0478) ***				
Lamda IMR					0.9108 (0.1588) ***	0.9120 (0.1614) ***	0.9107 (0.1651) ***	0.9157 (0.1621) ***	2.0522 (0.0348) ***	2.0797 (0.0372) ***	2.0974 (0.0376) ***	2.1236 (0.0378) ***
ETA									1(0.0007) ****	1(0.001) ****	1(0.001) ****	1(0.000) ****
R ²									0.83	0.83	0.83	0.83
Observations	1 579 751	1 579 751	1579751	1 579 751	122 836	122 836	122 836	122 836	122 836	122 836	122 836	122 836

Notes: The dependent variable is log offshoring in all estimations except for the ZINB model where offshoring is in levels. Robust standard errors within parenthesis, clustered by country. *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. All estimations include regional (22 regions), industry (2-digit) and year fixed effects. Additional inflate variables predicting zeros are Share of skilled labor and Firm export ratio. Vuong tests of zero inflated negative binomial (ZINB) versus negative binomial show support for the ZINB model. Likelihood-ratio tests comparing the ZINB model with the zero-inflated Poisson mode strongly favor the ZINB model. p-val. test of independent equations = 0.000 for all selection models. FEVD-models control for unit fixed effects. Variables defined as time invariant/slowly changing in FEVD-models include: Distance, industry dummies, institutional variables, GDP, population and tariffs.

Table 5. Offshoring and Institutions: Impact of differences in firms' R&D intensity

	ZINB	Heckman Selection	Heckman Target	Heckman FEVD
All institutions				
Unweighted index, low R&D	-0.0452 (0.0574)	0.1015 (0.0103)***	0.0790 (0.0388)**	0.0849 (0.0052)***
Unweighted index, high R&D	0.1020 (0.0455)**	0.0964 (0.0199)***	0.2657 (0.0428)***	0.3667 (0.0100)***
Factor 1, low R&D	-0.3450 (0.2586)	0.4212 (0.0713)***	0.3626 (0.2342)	0.3564 (0.0469)***
Factor 1, high R&D	0.2922 (0.1642)*	0.3109 (0.0690)***	0.8828 (0.1872)***	1.2676 (0.0441)***
Factor 2, low R&D	-0.1527 (0.3576)	-0.0278 (0.0997)	0.1043 (0.2148)	0.1320 (0.0327)***
Factor 2, high R&D	0.4058 (0.1520)***	-0.0316 (0.0721)	0.3194 (0.1723)*	0.2339 (0.0223)***
By institutional category				
Politics – low R&D Factor 1	-0.0564 (0.1930)	-0.0595 (0.0931)	-0.0716 (0.1911)	-0.0330 (0.0249)
Politics –High R&D Factor 1	0.3150 (0.1392)**	-0.0415 (0.0716)	0.2745 (0.1643)*	0.2617 (0.0250)***
Politics – Low R&D Factor 2	0.2821 (0.1687)*	0.5059 (0.0641)***	0.4931 (0.1871)***	0.3435 (0.0290)***
Politics – High R&D Factor 2	0.6789 (0.1568)***	0.3201 (0.0694)***	0.8874 (0.1920)***	0.8268 (0.0338)***
IPR – Low R&D Factor	-0.1623 (0.2433)	0.4509 (0.0636)***	0.5429 (0.1882)***	0.3982 (0.0363)***
IPR – High R&D Factor	0.22182 (0.2041)	0.2755 (0.0720)***	0.7592 (0.2056)***	0.6359 (0.0613)***
Business – Low R&D Factor	-0.1464 (0.2239)	0.2240 (0.0629)***	0.5135 (0.1389)***	0.3790 (0.0574)***
Business – High R&D Factor	0.2836 (0.1240)**	0.1232 (0.0490)***	0.6719 (0.1499)***	0.4885 (0.0646)***

Notes: The dependent variable is log offshoring in all estimations except for the ZINB model where offshoring is in levels. Robust standard errors within parenthesis (.), clustered by country. *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. All estimations include regional (22 regions), industry (2-digit level) and year fixed effects. Additional inflate variables predicting zeros are Share of skilled labor and Firm export ratio. Likelihood-ratio tests comparing the ZINB model with the zero-inflated Poisson mode strongly favor the ZINB model. P-val. test of independent equations = 0.000 for all selection models. Variables defined as time invariant/slowly changing in FEVD-models include: Distance, industry dummies, institutional variables, GDP, population and tariffs. Low R&D refers to firms in industries with R&D intensity below the median.

Table 6. Offshoring and Institutions: Impact of differences in the R&D intensity of firms' import.

	OLS	Negative binomial	Heckman FEVD
All institutions			
Unweighted index, low R&D	0.0408 (0.0251)	-0.0218 (0.0263)	0.0219 (0.0063) ^{***}
Unweighted index, high R&D	0.2002 (0.0364) ^{***}	0.1378 (0.0468) ^{***}	0.1610 (0.0047) ^{***}
Tot Factor 1, low R&D	0.2872 (0.1796)	-0.1823 (0.1094) [*]	0.2630 (0.0421) ^{***}
Tot Factor 1, high R&D	0.7636 (0.1605) ^{***}	0.4134 (0.1697) ^{**}	0.6860 (0.0364) ^{***}
Tot Factor 2, low R&D	0.1756 (0.1440)	0.1689 (0.1031)	0.1204 (0.0236) ^{***}
Tot Factor 2, high R&D	0.3787 (0.1468) ^{**}	0.4826 (0.1800) ^{***}	0.3561 (0.0246) ^{***}
By institutional category			
Politics – low R&D Factor 1	-0.0564 (0.1930)	0.1308 (0.1130)	-0.0309 (0.0247)
Politics –High R&D Factor 1	0.3150 (0.1392) ^{**}	0.4798 (0.1925) ^{**}	0.2955 (0.0250) ^{***}
Politics – Low R&D Factor 2	0.2822 (0.1688) [*]	-0.0659 (0.1033)	0.3119 (0.0279) ^{***}
Politics – High R&D Factor 2	0.6790 (0.1569) ^{***}	0.3897 (0.1865) ^{**}	0.6384 (0.0326) ^{***}
IPR – Low R&D Factor	0.3543 (0.1724) ^{**}	-0.0324 (0.1256)	0.3452 (0.0398) ^{***}
IPR – High R&D Factor	0.6023 (0.1816) ^{***}	0.3781 (0.2170) [*]	0.4841 (0.0609) ^{***}
Business – Low R&D Factor	0.4165 (0.1452) ^{***}	0.0194 (0.0858)	0.3632 (0.0562) ^{***}
Business – High R&D Factor	0.6067 (0.1435) ^{***}	0.4050 (0.1409) ^{***}	0.4223 (0.0623) ^{***}

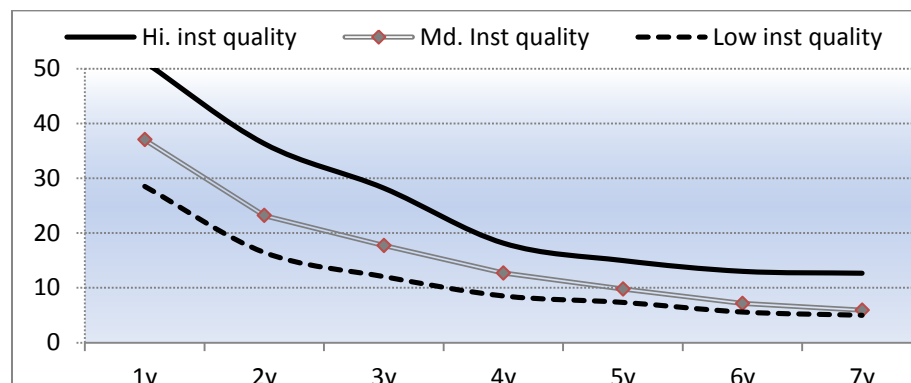
Notes: The dependent variable is log offshoring. Robust standard errors within parenthesis, clustered by country. *, **, *** indicate significance at the 10, 5 and 1 percent levels, respectively. Control variables, included but not shown are Distance, GDP, Population, Tariff, Firm MNE-dummy, Firm size, Firm TFP. All estimations include regional (22 regions), industry (2-digit) and year fixed effects. Additional inflate variables predicting zeros are Share of skilled labor and Firm export ratio. p-val. test of independent equations = 0.000 for all selection models. Variables defined as time invariant/slowly changing in FEVD-models include: Distance, industry dummies, institutional variables, GDP, population and tariffs. Low R&D refers to firms in industries with R&D intensity below the median.

Table 7. Average volume of offshoring, per contract length and institutional quality. Median values 1997-2005.

Contract length	Average Volume. High inst. quality	Average Volume. Medium inst. quality	Average Volume. Low inst. quality	Average volume. All.
1y	19	12	13	16
2-4y	76	65	70	73
5-7y	220	168	406	216
8+y	896	744	1172	880
Continuous offshorers	2 139	2 172	4 431	2 171
6-8y plus	872	819	950	866
Total average volume, all contract lengths	450	139	124	359

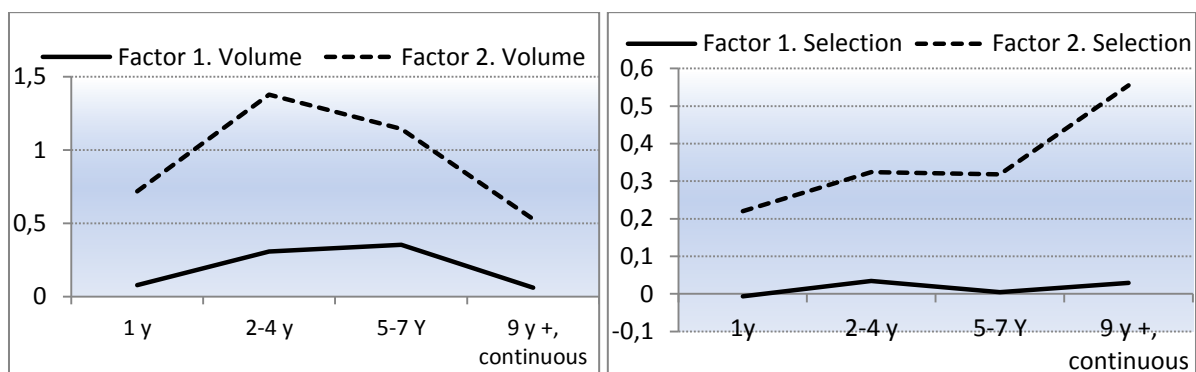
Notes: 1y, 2-4y and 5-7y represent offshoring flows that are started and cancelled. 8y+ offshore for at least eight years and are still offshoring in the last year of observation.

Figure 1. The duration of contracts by institutional quality of target economy. Survival time of offshoring flows started in 1998.



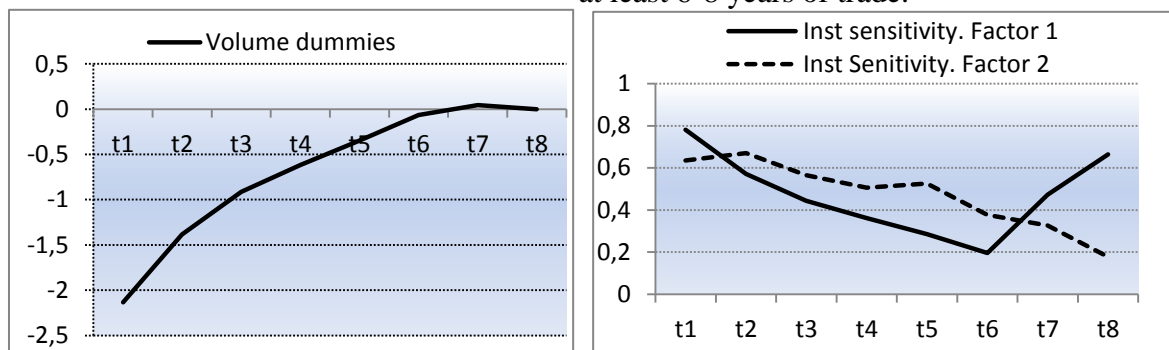
Notes: Survival rate of offshoring flows started in 1998. Divided by institutional quality.

Figure 2. The impact of institutional quality on selection and volumes separated by contract length. Total institutional factor 1 and 2.



Notes: Note: Estimates from Table A2 showing results from trade flows with contracts lengths that have ended after 1 year, 2-4 years and 5-7 years, respectively. 9 y +, continuous refers to continuous contracts (1997-2005) that have not expired. No information on starting year is available for these continuous contracts. Note that the depicted point estimates for Total Factor 1 are all individually significant at the 1 percent level. The corresponding figures for Total Factor 2 are not statistically significant. See Table A2 for details.

Fig 3A. Volume dummies by year of trade. Fig 3B. The sensitivity of institutional quality on offshoring separated by year of trade. Firms with at least 6-8 years of trade.



Notes: Estimates from Table A3 showing results from trade flows for firms with at least 6-8 years of trade. Total Factor 1 is positive and significant in periods 1-2 and insignificant thereafter. Factor 2 is positive and significant in periods 1-5 and insignificant thereafter. See Table A3 for details

Appendix

Table A1. Descriptive statistics 1997-2005.

Variable	Mean	Stdv total	Stdv be/w	Variable	Mean	Stdv total	Stdv be/w	Variable	Mean	Stdv total	Stdv be/w
Core variables				Political variables				Business			
ln(Distance)	8.39	0.91	--	Pol. Stab.	5.49	1.59	4.67	Trade freedom	7.26	0.87	2.64
ln(GDP)	24.4	1.98	22.8	Gov. Eff.	5.94	1.71	8.69	Freedom of the world	6.77	0.81	3.19
ln(Population)	16.46	1.50	40.5	Reg. qual.	6.00	1.52	6.19	Financial regulation	6.28	0.71	2.19
Tariffs	0.005	0.02	2.13	Civil Lib.	6.87	2.32	3.98	Sound money	7.95	1.38	1.95
ln(Firm offshoring)	5.64	3.03	2.28	Democracy	7.46	2.46	4.87	Business freedom	5.25	1.59	1.83
MNE status	0.57	0.49	1.66	Political Rights	7.19	2.85	4.27	Ec. freedom index	6.49	0.92	3.82
ln(Firm sales)	12.28	1.24	4.63	Inst. Democracy	6.88	3.18	4.29	Financial freedom	5.92	1.72	2.33
ln(Firm TFP)	3.41	1.78	1.90	Polity score	7.88	2.54	4.02	Fiscal freedom	8.17	0.89	2.77
Firm Skill intensity	0.18	0.14	4.68	Unweighted index	6.71	2.02	5.77	Investment freedom	6.18	1.56	2.22
Firm Export ratio	0.33	0.33	1.60	Factor 1	0.30	0.85	3.90	Freedom to trade	6.91	1.27	1.96
				Factor 2	0.21	0.95	6.33	Unweighted index	6.72	0.87	3.78
								Factor	0.09	0.87	2.00
				IPR/Law				All institutions			
				Legal structure	6.04	1.65	3.32	Unweighted index	6.60	1.30	6.6
				Property Rights	5.87	2.03	3.64	Factor 1	0.04	0.97	4.57
				Rule of law	5.73	1.71	10.4	Factor 2	0.06	0.97	3.92
				Unweighted index	5.88	1.72	5.73				
				Factor	0.01	0.93	6.2				

Notes: Descriptive statistics based on total regression sample at the firm-country-year level. Stdv total refers to total standard deviation. Stdv be/w is the between standard deviation divided by the within standard deviation.

Table A2. Heckman models. Estimations by contract length, 1997-2005.

	1 year	2-4 years	5-7 years	Continuous offshorers
Target equation				
Politics factor 1	0.0780 (0.1080)	0.3072 (0.1901)	0.3545 (0.3684)	0.0604 (0.2330)
Politics factor 2	0.7174 (0.1202)***	1.3782 (0.2097)***	1.1443 (0.4257)***	0.5279 (0.1454)***
IPR	0.7542 (0.1317)***	1.3254 (0.2397)***	1.0825 (0.4388)**	0.6335 (0.1587)***
Business	0.5209 (0.1197)***	0.9629 (0.1765)**	0.9006 (0.3129)**	0.5280 (0.1387)***
Total factor 1	0.6621 (0.1128)***	1.2118 (0.1875)***	1.3624 (0.3630)***	0.5813 (0.1731)***
Total factor 2	0.1167 (0.1080)	0.3725 (0.1809)*	0.4725 (0.3403)	0.2267 (0.2033)
Selection equation				
Politics factor 1	-0.0070 (0.0495)	0.0341 (0.0577)	0.0046 (0.0650)	0.0289 (0.1227)
Politics factor 2	0.2203 (0.0427)***	0.3245 (0.0477)***	0.3179 (0.0708)***	0.5553 (0.0835)***
IPR	0.1813 (0.0423)***	0.2894 (0.0482)***	0.2712 (0.0741)***	0.5454 (0.0786)***
Business	0.0918 (0.0402)**	0.1890 (0.0518)***	0.2113 (0.0794)***	0.1917 (0.0640)***
Total factor 1	0.2191 (0.0445)***	0.3192 (0.0545)***	0.3638 (0.0783)***	0.4854 (0.0894)***
Total factor 2	0.0007 (0.0478)	0.0370 (0.0581)	0.0078 (0.0636)	0.0618 (0.1294)

Notes: The first three columns refer to different contracts lengths that have ended after 1 year, 2-4 years and 5-7 years, respectively. The final column refers to continuous contracts (1997-2005) that have not expired. No information on starting year is available for these continuous contracts. Robust standard error clustered by country within parenthesis (.). *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. Control variables, included but not shown are Distance, GDP, Population, Tariffs, Firm MNE-dummy, Firm size, Firm TFP. All estimations include regional (22 regions), industry (2-digit) and year fixed effects. Additional selection variables predicting zeros are Share of skilled labor and Firm export ratio.

Table A3. Offshoring and institutions. Periodic development, by years of offshoring. Firms with at least 6-8 years of offshoring. Heckman models 1997-2005.

<i>Variables</i>	All instiutuions			Political Institutions			IPR		Business Institutions	
	<i>Factor 1</i>	<i>Factor 2</i>	<i>Period dummies</i>	<i>Factor 1</i>	<i>Factor 2</i>	<i>Period dummies</i>	<i>Factor</i>	<i>Period dummies</i>	<i>Factor 1</i>	<i>Period dummies</i>
Period 1	0.7819 (0.265) ^{***}	0.6360 (0.234) ^{**}	-2.1329 (0.503) ^{***}	0.4490 (0.2524) [*]	0.8034 (0.2784) ^{***}	-2.0846 (0.5078) ^{***}	0.7807 (0.2549) ^{***}	-2.2450 (0.5069) ^{***}	0.8163 (0.2280) ^{***}	-1.9395 (0.4654) ^{***}
Period 2	0.5709 (0.266) ^{**}	0.6697 (0.273) ^{**}	-1.3851 (0.441) ^{***}	0.5346 (0.2432) ^{**}	0.5964 (0.2804) ^{**}	-1.3274 (0.4520) ^{***}	0.5522 (0.2859) [*]	-1.4553 (0.4429) ^{***}	0.7858 (0.2300) ^{***}	-1.2937 (0.3969) ^{***}
Period 3	0.4439 (0.288)	0.5653 (0.267) ^{**}	-0.9128 (0.367) ^{**}	0.5494 (0.2746) ^{**}	0.3853 (0.2700)	-0.8142 (0.3756) ^{**}	0.3159 (0.2788)	-0.9362 (0.3631) ^{**}	0.6557 (0.2382) ^{***}	-0.8601 (0.3442) ^{**}
Period 4	0.3614 (0.307)	0.5067 (0.261) [*]	-0.6154 (0.302) ^{**}	0.4342 (0.2609) [*]	0.3452 (0.3032)	-0.5133 (0.3140)	0.2020 (0.2974)	-0.6338 (0.2932) ^{**}	0.4639 (0.2539) [*]	-0.5324 (0.2721) ^{**}
Period 5	0.2860 (0.331)	0.5266 (0.263) ^{**}	-0.3488 (0.250)	0.5144 (0.2871) [*]	0.2324 (0.2797)	-0.2241 (0.2606)	0.1147 (0.2899)	-0.3493 (0.2337)	0.6087 (0.2927) ^{**}	-0.3867 (0.2311) [*]
Period 6	0.1961 (0.350)	0.3767 (0.284)	-0.0656 (0.215)	0.3923 (0.3187)	0.1123 (0.3164) ^S	0.0919 (0.2462)	-0.0518 (0.3038)	-0.0584 (0.2038)	0.6959 (0.3538) ^{**}	-0.2467 (0.1811)
Period 7	0.4726 (0.411)	0.3274 (0.298)	0.0447 (0.178)	0.4102 (0.3719)	0.2772 (0.3656)	0.2115 (0.1913)	0.0663 (0.3483)	0.1129 (0.1706)	0.5110 (0.3699)	0.0362 (0.1734)
Period 8	0.6641 (0.511)	0.1775 (0.448)		-0.0125 (0.5377)	0.7737 (0.4541) [*]		0.2604 (0.3678)		0.7175 (0.5275)	
<i>Selection equation</i>										
Factor	0.2801 (0.075) ^{***}	-0.1337 (0.101)		-0.1523 (0.1025)	0.3258 (0.0718) ^{***}		0.2403 (0.0735) ^{***}		0.1299 (0.0655) ^{**}	

Notes: Results from trade flows for firms with at least 6-8 years of trade. Robust standard errors, clustered by country, within parenthesis (.). *, **, ***, indicate significance at the 10, 5 and 1 percent levels, respectively. All models include a full variable set-up including firm-, country-, trade-resistance variables and region, industry and period dummies. Additional selection variables predicting zeros are Share of skilled labor and Firm export ratio.