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Abstract

The offshoring of production by multinational firms has expanded dramatically in recent decades, increasing the potential for economic growth and technological transfers. What determines the location of such offshore production? How do the policies and characteristics of countries affect these decisions? Do firms choose specific countries because of their policies or because they are more familiar with them? In this paper, we use a very rich dataset on Danish firms to analyze how their decisions regarding offshore production depend on institutional characteristics and firm-specific bilateral connections with these countries. We find that institutions that enhance investor protections and reduce corruption increase the probability of offshoring, while those that introduce regulatory constraints in the labor market discourage it. We also show that offshoring activities are more likely for firms that have developed networks in the country of destination.

Key words: Offshoring, product market, labor regulations, network, fixed costs.
JEL code: F16, J38, J24

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1 Introduction

The rapid increase in offshoring has been one of the most notable trends in the labor markets of several developed countries over the last three decades. The driving forces of firm offshoring have been extensively studied (Bernard and Jensen, 1999). Still, the factors that contribute to determining domestic firm boundaries are highly debated (Barba Navaretti et al., 2011). Firms' decisions regarding offshore production may be described by heterogeneous firm models of trade such as the one proposed by Melitz (2003). In these theoretical models, the probability of engaging in offshore production is a negative function of the entry cost that the firm has to pay to a destination country to engage in offshore production. High fixed cost of operating a business (e.g. due to lengthy bureacuratic procedures or inefficient financial institutions in the destination country) may discourage firms from offshoring production activities in some countries and direct them to other countries with lower costs.

Many empirical studies based on firm-level data show that firms engage in trade activities only if their productivity levels are high enough to cover the fixed costs (see Sofronis K. Clerides, 1998; Bernard and Jensen, 1999; and Greenaway and Kneller, 2004, among many others). None of these studies has identified the factors determining firms' fixed costs for offshoring production or measured the impact of these costs on firms' propensity to offshore. Partial exceptions can be identified in the literature focusing on foreign direct investment (FDI). Olney (2013) uses a cross-country database compiled by the OECD to show that US firms have larger FDI presence in countries with more liberal employment protection legislation. On the other hand, Antras et al. (2009) study how the cross-border activities of global firms relate to institutional settings with varying investor protections and levels of capital market development. Their model predicts that arm's length technology transfers are more common than the deployment of this type of technology through foreign affiliate activity in host countries where investor protections are stronger. Moreover, Antras et al. (2009) show that the share of activity abroad financed by capital flows from multinational parents is decreasing in the quality of investor protections in host economies.

Our study is closely related to these studies, and more generally analyzes the role of an ample set of institutions and policies in the destination countries in affecting the extensive and the intensive margin of offshoring from Danish firms. Besides analyzing labor market and investor protection we also consider indices of corruption, measures of excessive bureaucracy and the weak enforcement of standards during the registration process of new companies as those may increase the fixed and operating costs of firms (Djankov et al., 2002). Similarly, lax enforcement, such as difficulties in obtaining or recovering credit, or problems in enforcing contracts may hurt economic activity and reduce returns to investments (Acemoglu

et al., 2005).

In our analysis we then focus on the role of individuals in the offshoring firm who are familiar with the destination country, namely immigrants from those countries. We estimate if their presence and the size of the group affects the probability and the scale of offshoring in their countries of origin. The presence of a network of foreign workers from specific countries can help firms gather information and navigate the local bureaucracy and culture to comply with burdensome regulations or to obtain better access to credit. More generally, networks can help firms reduce information asymmetries and set-up costs that arise from venturing abroad (Peri and Requena-Silvente, 2010).

Therefore, this paper has three main goals. First, we test, among a large set of institutional settings, which ones affect the fixed costs of operating a business abroad and consequently influence firms' offshoring decisions. Second, we distinguish institutions and policies that reduce propensity to offshore from those that create an 'offshoring-friendly' business environment and increase offshoring. Third, we analyze whether firms' networks in destination countries reduce the fixed costs facilitating bilateral offshoring activites and whether the network of immigrants is more or less effective in promoting offshoring in the presence of some of the institutional features analyzed above.

To answer these research questions, we use three main datasets. The first one is the Doing Business database compiled by the World Bank (see Djankov et al., 2002), which is a cross-country database with information on regulations in over 160 countries for the period 2006-2012. This dataset covers business regulations in the following areas: starting a business, registering property rights, obtaining credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency. This database also includes information on labor market regulations regarding hiring practices, hours worked, redundancy rules and minimum wage provisions. We develop a country-specific measure for corruption from the Worldwide Governance Indicators (WGI) project for the period 2006-2012 (Kraay, 2010). The third data source is a Danish employer-employee matched dataset that covers the universe of individuals and firms in the manufacturing sector for the same period. This dataset is especially well suited for studying firms' offshoring decisions, since it allows international trade transactions to be measured at the firm level (Hummels et al., 2014a) rather than at the country level (Olney, 2013). This dataset also includes extensive information on firms' workforce characteristics, which provides an excellent opportunity for identifying the networks of the foreign workers in each firm.

Our main results suggest that business and labor market regulations have opposite effects on offshoring activities. Business regulations are beneficial for the extensive margin of offshoring. A lack of credit coverage and the inadequate protection of creditors' property

rights result in high fixed costs for offshoring. Accordingly, business regulations that enhance credit coverage and resolve insolvency issues in destination countries tend to increase domestic firms' propensity to offshore. This is an interesting finding that substantiates a widely spread negative view about business regulations (see e.g. Djankov et al., 2002) and suggests that such regulations may be needed to ensure business quality. Conversely, labor market regulations have a negative impact on the propensity to offshore: stringent measures of employment protection increase firms' labor costs, which affect negatively firms' extensive margin of offshoring. This result is in line with the general view that employment protection regulations increase labor market frictions and/or labor costs. Furthermore, we find that a lack of control of corruption in the destination country highly reduces firms' probability of offshoring to that destination. The impact of all these institutions on firms' intensive margins, conditional on offshoring, is never statistically significant. This is consistent with the hypothesis that regulations and corruption affect the fixed, rather than the variable, costs of accessing a foreign market. We also find that a firm's network, measured by the share of workers from a foreign country, has a significant positive effect on the extensive margin of offshoring in that country, consistent with its role in reducing fixed costs of offshoring.[1] Several refinements of the network variable confirm the role played by foreign workers in promoting offshoring activities at the bilateral level. We also find that the positive impact of networks is magnified (attenuated) in destination markets with high levels of credit risk (corruption). In this respect it looks like a thick network of immigrants can in part compensate for high credit risk, possibly ensuring a level of trust and knowledg that reduces credit risk. On the other hand immigrants may warn their firms of high level of corruption in their own countries so that the negative effect of corruption on offshoring is enhanced in firms with a larger network from the country.

In the next section we present a conceptual framework for the fixed costs of offshoring. Our empirical strategy is explained in Section 3. The data and summary statistics are then discussed in Section 4. We present our results in Section 5 and conclude in Section 6. The figures and tables are provided in the Appendix.

[1] Our findings are different from those in Ottaviano et al. (2018), who find a negative effect of network at the bilateral level. That paper focuses on service trade and emphasizes that imported service tasks can be substituted by immigrants working in the firm. We explore instead the offshoring of production activities for a representative sample of firms in the manufacturing industry, where the information channle may be more important than task substytuion.

2 Theoretical Intuition

In this section, we present a simple theoretical model that describes the economic mechanism that this paper focuses on. We consider a multi-country economy, with a continuum of countries $i, j \in [0, 1]$. There are two sectors in this economy. One sector provides a single homogeneous good. This good is used as the numeraire, and its price is set at 1. This good is produced under perfect competition. The second sector supplies a differentiated good under monopolistic competition: each firm is a monopoly for the variety of good that it produces, and varieties are imperfect substitutes. All the countries produce both goods, which can be freely traded.

2.1 Demand

We assume the world is populated by a unit measure of consumers with identical preferences. The utility function of these consumers is increasing in the consumption of the homogeneous good x_o and in the quantity $q(x)$ of each variety x of the differentiated good, where X is the set of all the available varieties:

$$U = x_o^{1-\mu} \left(\int_{x \in X} q(x)^{\frac{\sigma-1}{\sigma}} \, di \right)^{\left(\frac{\mu\sigma}{-1+\sigma}\right)}. \tag{1}$$

$\sigma > 1$ is the elasticity of substitution between varieties, μ is the share of income devoted to consumption of the differentiated good (so $1 - \mu$ represents the consumer's expenditures devoted to x_o). Consumers choose the demand for the differentiated good that maximizes their utility (1) subject to their budget constraint. In this typical Dixit-Stiglitz framework, the (inverse) demand function for a single variety is

$$p(x) = Aq(x)^{-\frac{1}{\sigma}}, \quad where \quad A = \left(\frac{P^{1-\sigma}}{\mu} \right)^{-(1/\sigma)}. \tag{2}$$

The inverse demand function (2) features an index A of the market size of the differentiated sector, which is increasing in the price index P:

$$P = \left(\int_{x \in X} p(x)^{1-\sigma} \, dx \right)^{1/1-\sigma}. \tag{3}$$

2.2 Offshoring and supply

Regarding the supply of the differentiated good, in each country, there is a continuum of firms z; these firms are heterogeneous in their productivity $\theta_z \in [0, 1]$ and produce a single variety of the differentiated product. The production technology of firms includes both headquarter tasks, h, and manufacturing tasks, m. Headquarter services are performed locally and thus identify the home country of the firm. The manufacturing tasks are supplied everywhere and can be performed in different countries, i.e., *offshored* abroad.

We assume that labor is the only factor of production in the economy. Labor is supplied inelastically in all countries and used both to produce the homogeneous good and to perform the tasks necessary to produce the differentiated good. Perfect competition in the homogeneous sector and free trade imply that wage rates are set at their reservation level and equalized across countries, so that they can be set equal to one.

Let us now consider a firm in country i that offshores production to foreign country j. We use the following Cobb-Douglas production function:

$$x_{ij}(z) = \theta_z (h)^{1/2} (\lambda_j m)^{1/2}. \tag{4}$$

The output of firm z from country i depends on its productivity, ${\theta_z}^2$, the local headquarter's inputs, h, and the manufacturing inputs, m, which are offshored to country j. $\lambda_j > 1$ is the efficiency of the labor inputs available in country j in terms of the performance of manufacturing tasks. We assume that $\lambda_i = 1$, so $\lambda_j > 1$ implies that firms can access more efficient manufacturing inputs by offshoring production. Finally, note that the production function (4) features technology that is equally intensive for manufacturing and headquarter services.

All firms incur a positive fixed cost $f > 1$ when they start production. An additional positive fixed cost, $r_j > 0$, is paid by firms when they offshore production to country j, e.g., due to a different functioning of the institutions there (such as weaker enforcement of judicial institutions, higher regulatory constraints, and higher levels of corruption), information frictions, and linguistic barriers. However, some of these entry costs are attenuated when a firm has a specific network in country j (e.g. created by the firm's workers who originate from country j), $0 < \phi_{zj} \leq 1$.[3]

[2]As the productivity distribution is country-specific, we should also add subscript i. However, for the sake of simplicity, we omit it, and as we focus on country i, this does not reduce expositional clarity.

[3]The combined assumptions of $f > 1$, $r_j > 0$ and $0 < \phi_{zj} \leq 1$ imply that the network benefits do not

The profit function of an offshoring firm is

$$\pi_{ij}(z) = px_{ij}(z) - (h+m) - (f + r_j - \phi_{zj}). \tag{5}$$

We now substitute demand (2) and the production function (4) into (5). After some simplifications, we obtain:

$$\pi_{ij}(z) = A\left(\theta_z (h)^{1/2} (\lambda_j m)^{1/2}\right)^{\frac{-1+\sigma}{\sigma}} - (h+m) - (f + r_j - \phi_{zj}). \tag{6}$$

The firm chooses h and m to maximize (6). From the first order conditions, we obtain the input demand for the offshoring firm:

$$m^*(z) = h^*(z) = \left(\frac{A}{2}\right)^{\sigma} \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} \lambda_j^{\frac{\sigma-1}{2}} \theta_z^{\sigma-1} \tag{7}$$

where $m^* = h^*$ follows because headquarters and manufacturing services have the same intensity in the production function. If we substitute (7) back into (6), then we obtain the equilibrium profits of the offshoring firm:

$$\pi^*_{ij}(z) = 2^{1-\sigma} A^{\sigma} \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} \left(\frac{1}{\sigma-1}\right) \lambda_j^{\frac{1}{2}(\sigma-1)} \theta_z^{(\sigma-1)} - (f + r_j - \phi_{zj}). \tag{8}$$

From the condition $\pi^*_{ij}(z) > 0$, we derive the productivity threshold faced by firms that offshore production abroad:

$$\theta > \hat{\theta}_{zj}, \quad where \quad \hat{\theta}_{zj} = \frac{2\sigma}{(\sigma-1) A^{\frac{\sigma}{-1+\sigma}} {\gamma_j}^{1/2}} \left(\sigma\left(f + r_j - \phi_{zj}\right)\right)^{\frac{1}{-1+\sigma}} \tag{9}$$

Only firms characterized by a productivity level $\theta > \hat{\theta}_{zj}$ that is sufficiently high will find it profitable to offshore production to country j. According to (9), $\hat{\theta}_{\mathrm{zj}}$ depends on the size of the differentiated good sector (A); therefore, we define the following lemma.

Lemma : *More firms will offshore production when the size of the differentiated sector increases, i.e.,* $d\hat{\theta}_{zj}/dA < 0$.

When the size of the differentiated sector increases, more firms will be needed to satisfy the increased demand for consumption. Put differently, as $\hat{\theta}_{zj}$ decreases, more firms will find

completely offset the fixed costs. These assumptions are necessary to guarantee economies of scale for the firms.

it profitable to offshore production.

According to equation (9), the number of offshoring firms also depends on the efficiency of country j in tasks m (λ_j), the internal economies of scale (f), the institutions of the destination country (r_j) and the networks that are available in the destination country (ϕ_{zj}). To analyze these effects, it is convenient to compare the offshoring condition (9) with the one that domestic firms in country i have to meet to engage in production locally. If the manufacturing tasks are completed locally, then firms are not exposed to different institutions (i.e., $r_i = 0$). In addition, they are able to maximize local network benefits (i.e., $\phi_{zi} = 1$). However, these firms can only access labor inputs that have low efficiency (i.e., $\lambda_i = 1$):

$$\theta > \overline{\theta}_{zi}, \quad where \quad \overline{\theta}_{zi} = \frac{2\sigma}{(\sigma-1)A^{\frac{\sigma}{-1+\sigma}}} \left(\sigma\left(f-1\right)\right)^{\frac{1}{-1+\sigma}}. \tag{10}$$

It easily follows that the number of offshoring firms relative to non-offshoring firms depends on the following ratio:

$$\Theta^{off} = \frac{\overline{\theta}_{zi}}{\hat{\theta}_{zj}} = \left(\frac{f-1}{f+r_j-\phi_{zj}}\right)^{1/(\sigma-1)} \lambda_j^{1/2}. \tag{11}$$

From (11), we obtain three theoretical predictions that provide the basis for our empirical strategy:

Proposition 1: *The number of offshoring firms decreases when institutional fixed costs increase, i.e.,* $d\Theta^{off}/dr_j < 0$.

Proposition 2: *The number of offshoring firms increases when the size of the network in the destination country increases, i.e.,* $d\Theta^{off}/d\phi_{zj} > 0$.

Proposition 3: *The number of offshoring firms increases when the efficiency of* m *tasks increases in the destination country, i.e.,* $d\Theta^{off}/d\lambda_j > 0$.

The intuitions derived from this simple theoretical framework serve the sole purpose of guiding the empirical analysis on the effects of institutions and networks on firms' offshoring decisions. In the next section, we conduct an empirical test of these theoretical predictions.

3 Empirical Strategy

The primary objective of our empirical analysis is to formally test Propositions 1 and 2. We construct an empirical specification where changes in the fixed costs associated with institutions in the destination country j and the strength of the firm i's networks in j affect firm i's offshoring decisions. Our baseline specification is the following bilateral regression equation:

$$Off_{ijmct} = \alpha + r'_{jt-1}\beta + \gamma\phi_{ijt-1} + X'_{it-1}\zeta + \theta_i + \theta_j + \theta_{mt} + \theta_c + \epsilon_{ijt} \tag{12}$$

where Off_{ijmct} measures either the extensive margin of offshoring (i.e., the decision to offshore to destination j) or the intensive margin of offshoring (i.e., the volume of offshoring activities to destination j conditional on offshoring) of firm i in manufacturing industry m localized in municipality c at time t. As we clarify later in the data section, the detailed Danish custom data allow us to measure offshoring as the purchases of inputs belonging to the same industry as that of production firms.

The first set of explanatory variables in equation (12) is the vector r_{jt-1}, which includes the institutional fixed costs, e.g. due to labor, business, credit regulations and corruption in destination country j at year $t-1$ (see the data section below for a detailed description of these institutional costs). Changes in national regulations and corruption levels are therefore used to mimic changes to the bilateral costs of offshoring, which are external to Denmark and vary across destination countries. The idea is that several countries still have inefficient institutional settings that prevent the enforcement of contracts, and property rights limit competition or keep production costs at a high level. When these inefficiencies become smaller (larger) in a country, e.g., as a result of national policy making, (Viscusi et al., 2005), the costs of operating a business in that country decrease (increase). We can therefore use regulatory reforms to simulate changes in cross-border firm investments. These changes can reasonably be considered to be exogenous from the perspective of a single enterprise. In this respect, the effects on Danish firms are fairly comparable to tariff reductions (increases), as Danish firms have a very limited influence on the outcome of reform processes outside of Denmark. A potential threat to this identification strategy is that shocks originating with Danish firms could affect the markets and the regulatory frameworks of their foreign suppliers or foreign customers. These shocks could be an issue for a large country, such as the United States, but Denmark is a small country of less than six million people and represents a small share of trade, both in the aggregate and for individual partners and products (Hummels et al., 2014a). It is important to note that all the variables included in the vector r_{jt-1}

are lagged one period to account for the fact that companies cannot immediately adjust offshoring activities in response to changes in destination markets' institutions.

Equation (12) also includes the explanatory variable ϕ_{ijt-1}, which proxies for the strength of firm i's networks in destination country j. This variable is computed as the firm's share of foreign workers from country j at time $t-1$. Unobserved firm-specific shocks could influence both the hiring of foreign workers and offshoring. Firms that intend to offshore to a destination country may intentionally hire foreign workers from that country, which is the most obvious source of endogeneity and introduces a spurious positive bias in our network coefficient. We therefore pursue an instrumental variable approach that addresses these endogeneity issues. Specifically, the instrument is the predicted share of foreign workers in municipality c, which represents the home of the firm at time $t-1$. Specifically, we use a shift-share approach by assigning the number of immigrants in a given year to the municipalities where their countrymen were located in 1996, i.e., ten years before our sample starts:

$$\phi^{IV}_{jct-1} = \frac{F_{jt-1} * (F_{jc96}/F_{j96})}{P_{c96}} \tag{13}$$

where F_{jt-1} is the national stock of immigrants from country j in period $t-1$. These immigrants are allocated to municipality c based on the share of migrants from the same country j in year 1996 (i.e., F_{jc96}/F_{j96}). This approach assumes that new immigrants migrate to cities mainly based on family and friend networks rather than changing local economic conditions, which could be endogenous. By construction, the instrument relies on the predetermined distribution of immigrants across municipalities in 1996 and the subsequent tendency of new migrants to reside in migrant enclaves. This product is then normalized by total employment in the municipality c in 1996 (P_{c96}) to generate a predicted network variable at the municipality-year level.[4] Figure 1 plots the bilateral share of foreign workers in a municipality against its instrument. A significant positive relationship reassures that our instrument is a strong predictor of the bilateral share of foreign workers in the firm. This figure offers a visual inspection of the first-stage IV coefficients that are discussed later in the section (5).

[Insert Figure 1 about here]

It is possible that the distribution of migrant workers across local labor markets in the base year reflects endogenous economic factors that are persistent over time. We test for

[4]See Card (2005) for additional details on the shift-share approach.

this potential violation of our exclusion restriction in Table 1. Long-run changes within the municipality in our bilateral instrument are not correlated with the pre-sample trends in the destination-specific offshoring outcomes. Specifically a change in the instrument from 2006 to 2012 at the municipality level is unrelated to the pre-2000 trend of the extensive margin of offshoring (column 1) or the pre-2000 trend of the intensive margin of offshoring (column 2). However, column 3 shows that our bilateral instrument is a strong predictor of the network variable at the municipality level. Changes in our instrumental variable are in fact positively correlated with changes in the bilateral share of foreign workers (column 3).

[Insert Table 1 about here]

Equation (12) allows us to directly test Propositions 1 and 2. The test of Proposition 1, on the effect of institutional fixed costs on firms' offshoring can be summarized by the following hypothesis:

Hypothesis 1: $\beta < (=)0$ for the extensive (intensive) margin of offshoring. The coefficient β measures the bilateral impact of an increase in the fixed costs associated with institution r on the decision of firm i to offshore in country j. This coefficient is predicted to be negative (zero), as the extensive (intensive) margin of the offshoring is assumed to be negatively related to (independent from) an increase in the fixed cost of offshoring.

Notice that this prediction implies a negative effect of fixed institutional costs on the extensive margin of offshoring only. Proposition 1 is in fact derived in a Melitz-type theoretical framework, in which the fixed costs affect the firms' decisions to offshore production tasks and not the firms' offshoring volumes (conditional on offshoring).

The empirical test of Proposition 2, on the effects of networks on firms' offshoring, can be summarized by the following hypothesis:

Hypothesis 2: $\gamma > (=)0$, for the extensive (intensive) margin of offshoring. The coefficient γ measures the impact of a network between firm i and destination j , which can help firm i decrease the total fixed costs of offshoring to that destination. This coefficient is predicted to be positive (zero), as the extensive (intensive) margin of the offshoring is assumed to be positively related to (independent from) a decrease in the fixed cost of offshoring.

This prediction states that a strong bilateral network between firm i and destination j is expected to facilitate its cross-border transactions with j. Networks with country j are

assumed to help firm i reduce all the fixed costs rather than only those associated with each regulation r. This assumption is consistent with the notion that foreign workers bring with them knowledge and contacts in their country of origin that promote bilateral trade relations. Note also that this prediction only considers the extensive margin.

While they are not subject to a formal empirical test, Lemma and Proposition 3 regarding the role of market size and firm productivity offer a theoretical micro-foundation for our empirical specification. The vector of firm level controls X_{it-1} includes firm productivity, capital intensity, foreign ownership, the number of offshoring destinations and size. Furthermore, the same vector also considers detailed workforce characteristics, such as employees' average education level, age, tenure and work experience. Moreover, the detailed nature of our dataset allows us to include a comprehensive set of fixed effects, including firm fixed effects, θ_i, industry by year fixed effects, θ_{mt}, destination fixed effects, θ_j, and municipality fixed effects, θ_c. Finally, the standard errors are clustered at the destination-municipality-year level.

4 Data

We use three main data sources. The first one is *Doing Business*, a cross-country database that provides information on approximately 160 countries over the period 2006-2012. This dataset was developed by the World Bank, follows the methodology proposed by Djankov et al. (2002), and is constantly updated and expanded. This database covers business and credit regulations in the following areas: starting a business, registering property rights, paying taxes, trading across borders, obtaining credit, and protecting minority investors. This database also measures labor market regulations on hiring practices, hours worked, redundancy rules and minimum wage provisions.[5] The second dataset includes information on a country-specific measure of corruption, which is obtained from the WGI project (Kraay, 2010). This measure is based on the inverse of the estimated governance component related to the "control of corruption", i.e., a higher indicator in our dataset corresponds to higher levels of perceived corruption.[6]

[5]Recent updates of this dataset include information on business regulations on the provision of electricity, construction permits and labor market regulations on severance payments. However, we do not consider these regulations in this analysis as they are available for a large group of countries only from 2014 on.

[6]The original Control of Corruption (CC) indicator captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as the "abduction" of the state by elites and private interests. We use the inverse of this estimated governance indicator in standard normal units, ranging approximately from -2.5 (low levels of perceived corruption) to 2.5 (high levels of perceived corruption).

The third dataset combines the following three main registers on firms and their employees, which are collected by the official Danish statistical institute (Danmarks Statistik): the "Integrated Database for Labor Market Research" (*IDA*), the "Accounting Statistics Register" (*FirmStat*), and the "Foreign Trade Statistics Register" (*Udenrigshandelsstatistikken*).

The *IDA* is a longitudinal employer-employee register that compiles information on the age, gender, nationality, education, occupation, and wages of individuals aged 15-74 between 1980 and 2012. The information is updated once a year in week 48. Apart from deaths and permanent migrations, there is no attrition in the data. The individual information in *IDA* is used to measure detailed workforce composition characteristics at the firm level, as explained in the next section. Among other things, this information includes the share of foreign workers from each destination country j, the share of male employees, and the workers' average age, education level and work experience. Because we can track people over time, we can also establish the average tenure of all employees since 1980.

FirmStat is a firm register that provides the annual value of capital stock, the productivity and the industry affiliation of firms over the period 1995-2012.[7] These data capture some of the salient firm-level characteristics included in all of our regression models, which are described in the next section.

The "Foreign Trade Statistics Register" includes import purchases (and export sales) and the number of imported (exported) products at the firm level over the period 1995-2012. These data are available both for specific destinations and aggregated over all destinations. Import (and export) volumes are recorded in the Danish kroner (DKK) according to the 8-digit combined nomenclature as long as the transaction is worth at least $7,500$ DKK or involves goods whose weight is at least $1,000$ kg.[8]

From the population of all firms, we retain only manufacturing firms with at least 10 employees. Thus, we obtain an unbalanced panel of approximately $2,000$ firms over the period $2006 - 2012$. Regardless of its offshoring status, each firm is assigned to all 160 destinations, for which the Doing Business dataset is not missing any information on business or labor market regulations.

[7] Capital stock includes the sum of the value (in the Danish kroner) of land, buildings, machines, equipment and inventory. Firm productivity, which is the most important predictor of firms' internationalization in recent trade theory, is calculated as turnover per employee in logarithmic scale (i.e., labor productivity). We deflate all the monetary values using the World Bank's GDP deflator, with 2005 as the base year. Approximately 16 percent of the firms in the final sample have imputed accountings. Excluding these observations from the main sample provides almost identical results to those reported in the paper. These additional results are available on request from the authors.

[8] $7,500$ DKK are valued at about $1,000$ euros at the time of writing. Since the introduction of the euro currency, the Danish Central Bank has adopted a fixed exchange rate policy vis-a-vis the euro.

Using data from the Foreign Trade Statistics Register, we construct a firm-level measure of offshoring. Following Hummels et al. (2014b), we use a "narrow offshoring" measure that is constructed as the sum of imports for the same product category as firm exports and domestic sales.[9] This narrow measure of offshoring rule out the imports of raw materials that are inconsistent with standard definitions of offshoring.[10] We look at two aspects of offshoring. First, we analyze whether regulations and networks affect the decisions of firms to begin offshoring production activities in a destination market (i.e., the extensive margin of offshoring). Second, in order to corroborate the interpretation on the results obtained for the extensive margin, we also estimate the impact of institutions and networks on firms' values of bilateral offshoring, conditional on firms already offshoring in a destination market (i.e., the intensive margin of offshoring).

Figure 2 presents evidence on the distribution of offshoring across manufacturing industries in Denmark. We report the twelve industries with the highest share of offshoring firms. Offshoring is common in routine, lower-skilled industries such as motor vehicles, machinery and equipment, basic metals and textiles, where more than forty percent of firms offshore.[11] We deem these descriptive statistics to be reasonable because they are consistent with existing findings that the offshoring of routine, lower-skilled jobs is relatively common (Hummels et al., 2014b), and they indicate that our measure is successfully capturing offshoring in the data.

[Insert Figure 2 about here]

The most popular offshoring destinations over the period 2006-2012 are reported in Figure 3. Most of the neighbouring countries are included in the top 12 destinations of Danish offshoring. The EU is in fact the recipient of 58 percent of Danish offshoring, with Norway, Germany and Sweden representing the top three destinations. These patterns are consistent with the known fact that most offshoring takes place among developed countries. Many of the neighboring Eastern European countries are included in the top 20 destinations of Danish offshoring. Poland, Latvia, Lithuania and the Czech Republic, in fact, represent some of the largest recipients of Danish offshoring.

[Insert Figure 3 about here]

[9]The first 6-digits of the Combined Nomenclature in the *Foreign Trade Statistics Register* are aggregated to the 4-digit level to considerably improve consistency over time.

[10]In the sensitivity analysis, we use an alternative "broad offshoring" measure that includes all the imports of a given firm in a given year, independently of the product code.

[11]These findings are consistent with a distinct measure of offshoring based on survey data for Denmark (Bernard et al., 2017a).

4.1 Descriptive statistics

Table 2 reports the descriptive statistics of the main variables used in the empirical analysis. According to our destination-specific definition of offshoring, the average offshoring rate at the firm level across all destination countries is 3 percent. Focusing on the intensive margin of offshoring, we see that the average volume of offshoring to each destination, conditional on offshoring, is approximately 30,000 dkk at the firm level.

[Insert Table 2 about here]

Given the detailed employer-employee matched data, we are able to control for an extensive set of firm and workforce-level characteristics. First, we are able to measure our network variable, ϕ_{ijt-1}, as the firm share of foreign workers from country j at time $t-1$. Second, we can extend our specification with the following firm level controls: productivity, size, capital intensity, the number of offshoring destinations, multi-establishment and foreign ownership dummies. We also consider employees' nationality, gender, occupation, average age, education, tenure, and work experience. The summary statistics for the networks and control variables are reported at the bottom of Table 1.

Table 3 reports the main descriptive statistics for the measures of fixed costs associated with the institutions of the country of destination. These costs are derived from the indicators of labor, business and credit regulations collected by the World Bank at the country level. Specifically, the labor regulations include the following: i) whether fixed term contracts are prohibited for permanent tasks; ii) the maximum number of working days per week, calculated as 7-the maximum allowed number of working days; iii) whether employers must notify or consult a third party before a collective dismissal of employees; and iv) the minimum wage (measured as the ratio of the minimum wage relative to median wages). We combine the labor regulations with the principal component analysis (PCA) to calculate an index that summarizes the institutional costs due to labor market rigidity. The business regulations include the following: i) the time required to start a business (in days); ii) the time required to register property (in days); iii) the time required to prepare and pay taxes (in hours); and iv) the time required to export goods (in days). The corresponding PCA index is also reported in the same table. Finally the credit related costs in our empirical analysis include the following: i) the lack of private credit bureau coverage (percent of adults), computed as 100-private credit bureau coverage; ii) the lack of an investors' protection index, calculated as 10-business extent of disclosure index (the disclosure index ranges from 0=less disclosure to 10=more disclosure); iii) the cost of enforcing contracts (percent of claims)[12] and viii) the

[12]The cost is recorded as a percentage of the claim, which is assumed to be equivalent to 200 percent

rate of insolvency, calculated as 100-the recovery rate (cents on the dollar). The PCA index of credit risk is obtained by combining these credit related items. The last row of Table 2 shows the main descriptive statistics of our country-specific corruption index, which is based on the inverse of the estimated control of corruption indicator (Kraay, 2010).

[Insert Table 3 about here]

Figure 4 shows how the regulations and our measure of corruption described in Table 3 changed from 2006 to 2012 across different destination countries by plotting the index in a given area in 2006 against the same index in 2012 for a given economy. A few things are worth noting. First, there are substantial time-series variations in each index as the large majority of destination countries do not lie on the 45-degree line, which is exactly the temporal variation we will exploit in our empirical analysis. Second, whereas most of the destination countries have experienced a reduction in business regulations and credit risk over the sample period, the trends for the index of labor market rigidity and our measure of corruption are less clear-cut.

[Insert Figure 4 about here]

Figure 5 shows the destination countries with the highest index along each of the four dimensions described in Table 3. It is interesting to note that 5 destinations with the highest index of business regulations (Angola, Chad, Haiti, Iraq, Ukraine and Venezuela) are among the countries with the highest credit risk scores, as reported in the two second and third panels, respectively. Furthermore, the second and fourth panels of Figure 5 reveal that the 5 destinations with the highest corruption index are also among the countries featuring the highest credit risk. We do not observe the same overlap across destinations if we compare the country ranking in terms of the index of labor market rigidity to the other three rankings. This result is confirmed by the fact that there is a relatively low and negative correlation between the index of labor market rigidity and the other three indexes, whereas the index of business regulation is highly and positively correlated with the index of credit risk and the corruption index.[13]

[Insert Figure 5 about here]

of income per capita or 5,000 dollars, whichever is greater. Three types of costs are recorded: court costs, enforcement costs and average attorney fees.

[13]The correlation coefficient between the index of labor market rigidity and the index of business regulation (index of credit risk) is -0.22 (-0.26). The correlation coefficient between the index of business regulation and the index of credit risk (corruption index) is 0.56 (0.70).

Our main hypothesis suggests that regulations entailing higher institutional costs, higher levels of perceived corruption or a weaker network will reduce a firm's extensive margin for offshore production abroad. To provide preliminary insights into these relationships, Figure 6 shows separate scatter plots of our indexes of labor market rigidity, business regulations, credit risk, corruption and networks against the extensive margin of offshoring at the destination-year level. A statistically significant negative (positive) relationship is evident between our indexes (the network) and the average share of firms that offshore at the year-destination level. Consistent with our hypothesis, the number of offshoring firms decreases (increases) when the institutional fixed costs (networks) increase. Furthermore, Figure 7 plots our indexes and networks variable against the average log of offshoring values at the year-destination level. The intensive margin of offshoring does not correlate with either the institutions or the network. This result does not contradict our theory, which predicts a negative (positive) relationship between institutional costs (networks) and the extensive margin of offshoring only. It is encouraging that such significant relationships emerge in the data, even though they are raw. Next, we examine whether these results hold in a more rigorous empirical specification that controls for a large set of confounding factors.

[Insert Figures 6 and 7 about here]

5 Results

In what follows, we first discuss the main results regarding the impact of institutions and networks on firms' extensive and intensive margins of offshoring. They are obtained from the estimation of equation (12). We then investigate how institutions and networks interact with each other. Then, we show extensions, checks and refinements of the main results.

5.1 Main results

Table 4 presents the baseline results showing the impact of regulations and networks on the extensive margin of offshoring. In column 1, we report a specification showing the impact of regulations, corruption and networks on the extensive margin of offshoring after controlling for only industry by year, firm and municipality fixed effects. In this basic specification, we see that the presence of employment protection measures, weaker credit coverage, a lower resolving insolvency index and higher corruption in the destination market at time $t-1$ leads to a significant decrease in the bilateral probability that a firm will offshore to that

destination at time t.[14] None of the business regulations are significantly associated with the bilateral probability of offshoring.[15] In contrast, our network variable is positively associated with the firm's extensive margin at the bilateral level. In Columns 2-4, we sequentially include firm-level controls (such as labor productivity) and destination country fixed effects in the specification. Furthermore the network variable is instrumented for by using its shift-share prediction, as described in equation (13).[16] The coefficients for the institutions remain unchanged after controlling for the numerous firm characteristics and fixed effects, whereas the instrumented coefficient estimated on the network variable is of smaller size, which is consistent with the upward bias hypothesis highlighted in the methodological section. The same coefficients are never statistically significant when we consider the intensive margin, conditional on the decision to offshore (see Columns 5-8).[17]

We interpret all these results as being consistent with our two main hypotheses, which are highlighted in the methodological section. On one hand, in line with Hypothesis (1), the presence of restrictive employment protection legislations, high levels of perceived corruption, and the lack of credit coverage and credit solvency represent proxies for the institutional costs of offshoring to a certain destination country. These are some of the fixed costs that hinder the early stages of firms' offshoring (i.e., firms' extensive margin) but do not affect the volume of offshoring activities, conditional on having accessed a specific foreign market. On the other hand, consistent with Hypothesis (2), a firm's network in the country of destination helps the firm reduce the overall fixed costs (Peri and Requena-Silvente, 2010), which, in turn, positively affects the extensive margin but not the offshoring volume, conditional on offshoring. Furthermore, the estimated positive effect of labor productivity at the firm level on offshoring is intuitive and consistent with a Melitz-type theoretical framework when we focus on the extensive margin of the offshoring decision.

[Insert Table 4 about here]

To simplify the interpretation of our main results, we now present the effects of regulations identified by using the aggregate PCA indexes, which are calculated as highlighted in

[14] To simplify the comparison across the magnitudes involved in each estimation, all the regression tables show standardized coefficients estimated on the z-score of each explanatory variable.

[15] This result is likely due to the fact that our credit variables are highly correlated with business regulations. If we estimate a simpler specification in which credit and business regulations are entered separately in the extensive margin equation, we find that they are all significantly and negatively associated with the bilateral probability of offshoring.

[16] The first-stage results, which are reported in the bottom panel of Table 4, show that the instrument has a significant positive impact on our network variable.

[17] Very similar results are obtained by using an alternative measure of intensive margin, which is calculated as the share of destination-specific imports in total imports.

the previous section. Column 1 of Table 5 includes the coefficients estimated for the index of labor market rigidity, business regulations and credit risk in the most complete specification for the extensive margin. These results are in line with the findings obtained with the disaggregated measures: although business regulations do not affect the extensive margin, an increase in labor market rigidity and credit risk in the destination country significantly reduces the firm's bilateral probability of offshoring.[18] Quantitatively, our regression analysis suggests that a one standard deviation increase in the index of labor market rigidity[19] at time $t-1$ will lead to a 0.007 decrease in the probability of offshoring, i.e., a 20 percent decrease in the firm's extensive margin of offshoring.[20] The impact of credit risk is about half this much: the firm's bilateral probability of offshoring is reduced by 10 percent at time t when there is a one standard deviation increase in the related index at time $t-1$.[21] Consistent with the results reported in Table 4, our measure of corruption negatively affects the probability of offshoring: a one standard deviation increase in the corruption index decreases the extensive margin by approximately 3 percent.[22] Furthermore, the presence of a network in the country of destination at the municipality in which the firm is localized at time $t-1$ positively affects the extensive margin. According to the instrumented coefficient, a one standard deviation increase in the firm's network leads to a 0.010 increase in the probability of offshoring, which corresponds to an increase of approximately 32 percent in the extensive margin. We deem that all the effects estimated on our measures of institutional costs and networks are sizeable from an economic point of view. In fact, these effects have a similar or stronger predictive power than the one estimated on productivity: a one standard deviation increase in the firm's productivity is in fact associated with only a 3 percent increase in the probability of offshoring.

[18] As mentioned in Section 4.1, destinations with high credit risk also tend to have numerous business regulations, which may explain the lack of significance observed for the index of business regulations. In fact, when we add these indexes separately in the main specification, the estimated coefficients are all negative and statistically significant. These additional results are available on request from the authors.

[19] This approximately corresponds to an increase in labor market rigidity from the level of Austria, whose average index is at the median of the distribution, to that of Portugal, whose average index is at the 95th percentile of the distribution.

[20] This figure is calculated by dividing our standardized coefficient by 100 for the average firm's probability of offshoring reported at the bottom of Table 5.

[21] This approximately corresponds to an increase in credit risk from the level of Germany, whose average index is at the median of the distribution, to that of Macedonia, whose average index is at the 95th percentile of the distribution.

[22] This approximately corresponds to an increase in the corruption index from the level of France, whose average index is at the 25th percentile of the distribution, to that of Azerbaijan, whose average index is at the 90th percentile of the distribution.

5.2 Refinements of the main results: the role of interactions

In the next step, we proceed by exploring whether the institutional indexes interact with the network variable in column 2 of Table 5 .[23] Such exercise reveals whether the presence of a network of immigrants plays a stronger role in countries where local institutions are particularly poor. This may be because in cases of poor institutional features the network provides information to reduce risk or to increase knowledge. We find a positive and significant interaction between the network variable and the credit risk index. This suggests that the positive effect of a network is magnified in destinations characterized by high credit risk. Networks are more effective in promoting offshoring to those destination markets with higher credit risk. This result suggests that a local network may act as a substitute for institutions that guarantee creditors (i.e., reduce the costs associated with credit risk) and increase the firm's bilateral probability of offshoring to a certain destination. On the other hand we do not find significant effect of interactions between networks and the other two indices. Furthermore, the measure of corruption interacts negatively with the network variable: the positive effect of networks is in fact reduced in destinations characterized by high levels of corruption. Networks are therefore less effective in promoting offshoring in corrupt environments and vice versa.

To simplify the interpretation of all these findings, we plot the estimated marginal effect of our network variable on the extensive margin against the whole distribution of the two indexes of credit risk and corruption. Specifically, the top (bottom) panels of Figure 8 report the estimated marginal effects of our network against the standardized index of credit risk (corruption) by setting the indexes of business regulations, labor market rigidity and corruption (credit risk) at respectively the 25th, 50th and 75th percentile of the distribution of these indexes.[24] These plots confirm the substitutability (complementarity) between our network variable and the index of credit risk (the corruption index), given that the im-

[23] The interactions of our regulation indexes with the network variable are instrumented by their interactions with the shift share prediction described in equation (13).

[24] The standard errors of these marginal effects are calculated to account for all the covariance terms involved in the fully interacted specification, as in the following interaction specification:

$$\begin{aligned} Off_{ijmt} = \alpha + \gamma_1\phi_{ijt-1} + \beta_1 index\_labrig_{jt-1} + \beta_2 index\_busreg_{jt-1} + \\ \beta_3 index\_credrisk_{jt-1} + \beta_4 index\_corrup_{jt-1} + \gamma_2(\phi_{ijt-1})(index\_labrig_{jt-1}) + \gamma_3(\phi_{ijt-1}) \\ (index\_busreg_{jt-1}) + \gamma_4(\phi_{ijt-1})(index\_credrisk_{jt-1}) + \gamma_5(\phi_{ijt-1})(index\_corrup_{jt-1}) + X'_{it-1}\zeta + \theta_i + \lambda_j + \\ \eta_m + \rho_t + \epsilon_{ijt} \end{aligned}$$

The marginal effects of our network variable ϕ_{ijt-1} reported in the top panels of Figure 8 are calculated as follows:

$$\frac{dOff_{ijmt}}{d\phi_{ijt-1}} = \gamma_1 + \gamma_2 index\_\bar{labrig}_{jt-1} + \gamma_3 index\_\bar{busreg}_{jt-1} + \gamma_4 index\_credrisk_{jt-1} + \gamma_5 index\_\bar{corrup}_{jt-1}$$

pact of the former increases (decreases) as the credit risk index (corruption index) in the destination country becomes higher for given levels of the other indexes. Interestingly, the marginal effects plotted in the top (bottom) panels of Figure 8 reset to a lower (higher) level when we select higher moments of the corruption (credit risk) index. Furthermore, the estimated coefficients for our network variable retain their statistical significance along the whole distribution of the two indexes, i.e., credit risk and corruption.

[Insert Figure 8 about here]

Similar results regarding the interaction effects are obtained in a simpler specification, in which we only include the variable for the presence of labor employment protection and a PCA index of credit risk calculated by combining the variables on credit coverage and resolving insolvency (see column 3 of Table 5).

[Insert Table 5 about here]

Consistently our two main hypothesis, none of the coefficients discussed in Table 5 is precisely estimated in the regression for the intensive margins (columns 4-6).[25]

5.3 Refinements of the main results: alternate measure of networks

Our main analysis uses the bilateral share of foreign workers at the firm level to measure whether a firm has a network in the destination country. This section examines whether our results hold using alternative definitions for networks. Specifically, columns 3 and 4 of Table 6 use the firm's bilateral share of white-collar foreign workers at time $t-1$ as the network variable. Columns 5 and 6 focus on the share of blue-collar foreign workers. For these

where $index\_\bar{labrig}_{jt-1}$, $index\_\bar{busreg}_{jt-1}$ and $index\_\bar{corrup}_{jt-1}$ are alternatively set at either the 25th, 50th or 75th percentile of the corresponding index distribution. The variance in the marginal effects is calculated by considering the covariance across all the different indexes included in the main specification.

[25] We have also investigated whether there exists a significant interaction between the institution variables. Namely we have analyzed whether the presence of rigidities/imperfections in one dimension is magnified by the presence of rigidities in another dimension. The individual effects, estimated in this specification are consistent with the findings reported in column 1, and none of the interaction is significant at standard levels. These results, which are available on request from the authors, suggest that the linear specification is reasonably good for our institutional variables and each factor affects offshoring independently from the other.

estimations, we construct analogous instruments using the predicted immigration of white- and blue-collar workers in the municipality in which the firm is located at time $t-1$. The results obtained by using these two narrower definitions of networks are qualitatively similar to the main results re-reported in columns 1 and 2 for comparison purposes, i.e., networks significantly affect the extensive margin of offshoring but not its intensive margin. In terms of the magnitudes of these coefficients, the positive effect of the network provided by white-collar workers is stronger than that reported for the blue-collar workers. Specifically, a one standard deviation increase in the share of white-collar foreign workers doubles the bilateral probability of offshoring, whereas the same effect estimated on the blue-collar network is half as much as the one estimated in the main analysis, i.e., approximately 15 percent. These additional findings reveal that foreign workers in white-collar occupations (managers, middle managers and professionals) bring with them destination-specific knowledge that can promote offshoring activities in their country of origin more effectively compared to their blue-collar counterparts. Similarly, in columns 7 and 8 of Table 6, we estimate the impact of hiring managers from domestic companies that offshore to a specific destination country. Our results show that domestic firms poaching managers with destination-specific offshoring experience are 14 percent more likely to offshore to the same destination country at time t but do not feature higher offshoring volumes, conditional on offshoring. This poaching effect on offshoring is consistent with the findings reported in Mion et al. (2017), according to which export experience gained by managers in previous firms improves the export performance of their current firm. All these results combined together reveal that workers with destination-specific knowledge, which is either acquired from their country of origin or gained in previous companies, help domestic firms reduce the fixed costs of offshoring to a specific destination country, especially if they are in a white collar occupation.

Our main results on the network variable are also confirmed, when we use the base-year method to address the endogeneity of the network variable instead of relying on the shift-share instrumental variable approach. In columns 8 and 9, our network variable is measured as the firm-level bilateral share of foreign workers at the base-year, which should be predetermined with respect to the current offshoring decision. The base year is generally set at 2005, i.e., one year before the estimation sample starts. If a firm enters the market and imports at any time during our sample period, we treat its first year of existence as the pre-sample year and focus our estimation on the subsequent changes in offshoring. The results obtained from this alternative approach confirm the main results for the instrumental variable (IV), i.e., networks impact the bilateral probability of offshoring but not offshoring volumes. The size of the coefficient estimated on the extensive margin is twice as large as that obtained in the main analysis: a one standard deviation increase in the base year share

of foreign workers increases the current bilateral probability of offshoring by 60 percent.

Finally, columns 11 and 12 of Table 6 focus on the bilateral share of foreign workers in the municipality in which the firm is located at time $t-1$ rather than the number of foreign workers in the firm. The instrument, however, is still the shift-share prediction at the municipality level. Using the share of municipality-level immigrants is less specific, but the advantage is that firm-specific endogeneity issues are less severe. In addition, immigration may influence offshoring decisions not only directly through the hiring of foreign employees but also more generally by promoting the development of informal networks with foreign workers employed in other companies in the local labor market (which is proxied by the municipality in which the firm is located). The results obtained with this broader measure of networks are almost identical to the baseline results: a one standard deviation increase in the bilateral share of foreign workers within the municipality at year $t-1$ increases the extensive margin by 33 percent and the corresponding effect on the intensive margin is not statistically significant. Ultimately, the results in Table 6 demonstrate that our findings on the network effects are robust to a variety of alternate definitions.

[Insert Table 6 about here]

5.4 Additional sensitivity analysis

In this section we evaluate how the coefficients estimated for the institution and network variables change when we, for example, focus on specific sub-samples of firms or when we use alternative specifications for our index variables. To simplify the presentation of these sensitivity exercises, we only discuss the results obtained from the specification used in columns 1 and 5 of Table 5, i.e., the one featuring the PCA indexes of institutional costs (i.e., labor market rigidity, business regulations, credit risk and corruption) and the network variable.

5.4.1 Non-linear specifications

While our model predicts that lower institutional costs (stronger networks) in the destination markets are positively associated with the firms' bilateral extensive margin of offshoring, it is silent on the curvature of these relationships. To explore the existence of non-linearities in the effects discussed so far, we consider an additional specification, in which we add the squares of the institutional indexes and of the network variable. The results are reported in the first two columns Table 7. Our main results are confirmed: in all the specifications,

higher levels of labor market rigidity, credit risk and corruption in the destination market negatively influence the firm's bilateral probability of offshoring, whereas stronger networks are positively related to this probability. Furthermore, we find suggestive evidence in support of a convex relationship for the network variable and the labor rigidity and credit risk indexes. The existence of a non-linear relationship between offshoring and the corruption index is not supported by our results: the coefficient estimated on the corruption index in levels is in fact not precisely estimated. The results for the intensive margin reported in the second column of the same table confirm that offshoring volumes are not affected by either networks or institutions, conditional on offshoring.

5.4.2 Export outcomes

To gain more insights into the interpretation of our main results, we explore whether our indexes of institutional costs and the network variable affect firms' export behavior, measured by the extensive and intensive margins of exporting. The results are reported in the last two columns of Table 7 and suggest that the firm's probability of exporting to a specific destination market and its export volumes are not affected by the level of labor market rigidity in the destination country, but they are negatively influenced by the level of credit risk and corruption. This result acts as an interesting placebo test of our main empirical analysis. Consistent with our expectations, when shifting the focus from offshoring to the export decisions of firms, the destination country's credit risk still matters (as credit risk also affects exporting firms' investment decisions), while the destination country's labor market institutions have little bearing on export outcomes (as labor market rigidities in the destination country are not expected to affect exporting firms' labor costs). Corruption at the country of destination negatively affects both the extensive and intensive margin of exporting whereas business regulations are not relevant for export decisions. Furthermore, our network variable positively only affects the extensive margin of exporting. This last finding is consistent with the previous trade literature that documents the importance of immigrants ability to promote trade (Gould, 1994; Head and Ries, 1998; Rauch and Trindade, 2002; Briant et al., 2014; Peri and Requena-Silvente, 2010).

[Insert Table 7 about here]

5.4.3 Industry specific results

To check the robustness of our results to any residual differences between labor and capital intensive industries (which are possibly time-varying and thus are not accounted for in the

industry fixed effects in the baseline analysis), the first four columns of Table 8 report the results for labor and capital intensive industries separately. Here, labor (capital) intensive industries are defined as those with an average capital intensity below (above) the mean in the midpoint of our sample (i.e., 2009). This definition is used to investigate whether offshoring firms in labor intensive industries tend to react more to changes in destination countries' institutional costs or networks, given that in the large majority of cases, offshoring is used to reduce labor costs. In line with the main analysis, our index and network variables do not significantly affect the intensive margin for either group of industries, conditional on offshoring. As expected, we find that for firms in labor intensive industries, the propensity to offshore is more responsive to the destination country's labor market rigidity than it is for firms in capital intensive industries. In terms of the extensive margin, firms in labor intensive industries also seem to be more reactive to changes in credit risk than firms in other industries. The point estimates imply that a one standard deviation increase in labor market rigidity in a destination country leads to a 48 percent decrease in the bilateral probability of offshoring for labor intensive firms, whereas a one standard deviation increase in credit risk decreases the same probability by half as much. The effects on the extensive margin for capital intensive firms are respectively a 2.5 percent decrease and approximately a 3 percent decrease. The coefficient estimated for the business regulations index is never statistically significant, and the magnitudes involved in the corruption and network variables are comparable across the two groups of industries.

The sample we used for the baseline estimates included only pure manufacturing firms because our measure of offshoring (using imported inputs) may be not entirely relevant if applied to the service industry (Hummels et al., 2014b). However, former pure manufacturing firms may offshore all of their production activities and thus switch to the service industry. These "factory-less goods producing" firms (FGPFs) are companies that no longer directly control the production and assembly of goods in-house but are still involved in design, R&D, engineering, supervision of third-party production, branding, marketing and distribution (Bernard and Fort, 2015). The number of firms switching from manufacturing to service industries is non-negligible and can explain approximately half of the recent decline in Danish manufacturing employment (Bernard et al., 2017b). This type of extreme offshoring acts as an incentive to check whether the results are similar if estimated on a sample of service firms. In line with the main analysis performed on the manufacturing sector, for service firms, we find that the estimated coefficients for our index of labor market rigidity, credit risk and corruption are negative and statistically significant in terms of only the extensive margin, as reported in the last two column of Table 8. In addition, the results for business regulations, the network variable and its interaction with institutions are consistent with those obtained

from the sample of manufacturing firms. This result provides clear evidence that performing the analysis on firms in the service industry does not change the conclusions of the main analysis.

[Insert Table 8 about here]

5.4.4 Sample specific results

It may be argued that the imports of non-exporting firms are less likely to feature actual offshoring activities relative to exporting firms' imports. To check whether our measure of offshoring is somehow weakened by the presence of non-exporting firms, in Table 9, we re-estimate our main regression by excluding these firms from the sample. The results obtained from this refinement confirm the estimated coefficient on all of our variables of interest are qualitatively very similar to the ones estimated in the main analysis.

Another concern is that our sample of destinations countries is very heterogeneous, e.g., in terms of the enforcement capabilities of their political institutions (Acemoglu et al., 2005). Therefore, the response of offshoring to institutional costs or networks may not not be homogeneous across macro geographical groups. To address this concern, we split the sample into developed and developing destination countries. The results obtained from these sub-samples are reported in the last four columns of Table 9. It appears that the impact of labor market rigidity, credit risk, corruption and networks on offshoring is indeed stronger for developing destination markets than for developed countries. A one standard deviation increase in the index of credit risk, for example, triggers a 36 (17) percent increase in the bilateral extensive margin if we focus on developing (developed) countries as destination markets.

[Insert Table 9 about here]

5.4.5 Offshoring measures

We now test the consistency of our results by using alternative measures of offshoring in Table 10. First, in columns 1 and 2, we use a broad offshoring measure defined as the total value of imports by a firm in a given year, regardless of the industry. As discussed in the data section, this is not our preferred measure of offshoring; however, the results using this offshoring definition are similar to our baseline findings, even if the coefficients are higher. For example, a one standard deviation increase in credit risk in the destination country leads

to a 20 percent decrease in the probability that a firm will offshore to the same destination (remember the previous estimate using the narrow definition of offshoring was 10 percent), but it does not affect the log of offshoring volumes, conditional on offshoring.

Second, we construct a new measure of offshoring using a completely different dataset compiled by the National Bank of Denmark (Esperian). This dataset includes firm-level information on outward FDI activity. Specifically, this variable identifies countries in which Danish firms have majority-owned foreign affiliates. Using this information, we construct an extensive margin offshoring variable that measures whether a Danish firm has any foreign affiliates abroad. The benefit of using this approach is that it specifically measures the firm's foreign activities. However, this measure does not measure offshoring to foreign arms length suppliers that are outside the boundaries of the firm. Moreover, the Esperian data does not indicate whether a particular import transaction originates from a controlled affiliate or an uncontrolled third party. We are therefore able to check the validity of our main results only in relation to the extensive margin of offshoring. Finally, the Esperian data are available only for a sub-sample of our data. The third column of Table 10 reports the results using this alternative FDI-based offshoring measure. Consistent with our baseline results, we find that credit risk negatively affects firms' bilateral probability of offshoring, whereas our network variable has a positive effect (although marginally significant) on the extensive margin. The magnitudes involved are, however, much smaller than the baseline results. Furthermore, the coefficients estimated on the index of labor market rigidity and corruption are not precisely estimated. The signs of all these coefficients, however, confirm the baseline results.

[Insert Table 10 about here]

6 Conclusions

This paper explores how institutions and networks affect firms' offshoring outcomes by using a large and representative sample of manufacturing firms in Denmark over the period 2006-2012. Our empirical analysis shows that at least two regulatory areas are beneficial for the extensive margin of offshoring: high fixed offshoring costs are in fact associated with a lack of credit coverage, poor protection of creditors' property rights and high levels of corruption. Accordingly, regulations of the destination market that reduce credit risks and corruption tend to increase firms' propensity to offshore. Conversely, regulations that increase labor market rigidity have a negative impact on firms' offshoring. Stringent employment protection measures increase firms' labor costs, which negatively affect firms' extensive margin of offshoring. The impact of these regulations on firms' intensive margins, conditional on

offshoring, is never statistically significant. This result corroborates the hypothesis that institutions affect the fixed costs of accessing a foreign market. Our results also suggest that firms' networks in destination countries have an independent fixed-cost reducing effect on the extensive margin. Several refinements of the network variable confirm the role played by foreign workers in promoting offshoring activities at the bilateral level. However, the positive impact of networks is magnified (attenuated) in destination markets with high levels of credit risk (corruption).

References

Acemoglu, D., Johnson, S., and Robinson, J. A. (2005). Institutions as a Fundamental Cause of Long-Run Growth. In Aghion, P. and Durlauf, S., editors, *Handbook of Economic Growth*, volume 1 of *Handbook of Economic Growth*, chapter 6, pages 385–472. Elsevier.

Antras, P., Desai, M. A., and Foley, C. F. (2009). Multinational Firms, FDI Flows, and Imperfect Capital Markets. *The Quarterly Journal of Economics*, 124(3):1171–1219.

Barba Navaretti, G., Bugamelli, M., Schivardi, F., Altomonte, C., Horgos, D., and Maggioni, D. (2011). *The Global Operations of European Firms - The Second EFIGE Policy Report*. Number 581 in Blueprints. Bruegel.

Bernard, A. B., Fort, T., Smeets, V., and Warzynski, F. (2017a). Offshoring and Reorganization. *Mimeo University of Aarhus*.

Bernard, A. B. and Fort, T. C. (2015). Factoryless Goods Producing Firms. *American Economic Review*, 105(5):518–23.

Bernard, A. B. and Jensen, J. B. (1999). Exceptional Exporter Performance: Cause, Effect, or Both? *Journal of International Economics*, 47(1):1 – 25.

Bernard, A. B., Smeets, V., and Warzynski, F. (2017b). Rethinking Deindustrialization. *Economic Policy*, 32(89):5.

Briant, A., Combes, P.-P., and Lafourcade, M. (2014). Product Complexity, Quality of Institutions and the Pro-Trade Effect of Immigrants. Sciences Po publications info:hdl:2441/781v6i5nuc9, Sciences Po.

Card, D. (2005). Is the New Immigration Really so Bad? *The Economic Journal*, 115(507):F300–F323.

Djankov, S., Porta, R. L., de Silanes, F. L., and Shleifer, A. (2002). The Regulation of Entry. *The Quarterly Journal of Economics*, 117(1):1–37.

Gould, D. M. (1994). Immigrant Links to the Home Country: Empirical Implications for U.S. Bilateral Trade Flows. *The Review of Economics and Statistics*, 76(2):302–16.

Greenaway, D. and Kneller, R. (2004). Exporting and Productivity in the United Kingdom. *Oxford Review of Economic Policy*, 20(3):358–371.

Head, K. and Ries, J. (1998). Immigration and Trade Creation: Econometric Evidence from Canada. *Canadian Journal of Economics*, 31(1):47–62.

Hummels, D., Jorgensen, R., Munch, J., and Xiang, C. (2014a). The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data. *American Economic Review*, 104(6):1597–1629.

Hummels, D., Jorgensen, R., Munch, J., and Xiang, C. (2014b). The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data. *American Economic Review*, 104(6):1597–1629.

Kraay, Aart Kaufmann, D. M. M. (2010). *The worldwide governance indicators : methodology and analytical issues*. The World Bank.

Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71(6):1695–1725.

Mion, G., Opromolla, L. D., and Sforza, A. (2017). The diffusion of knowledge via managers' mobility. *CESifo Working Paper Series No. 6256.*

Olney, W. W. (2013). A Race to the Bottom? Employment Protection and Foreign Direct Investment. *Journal of International Economics*, 91(2):191 – 203.

Ottaviano, G. I., Peri, G., and Wright, G. C. (2018). Immigration, Trade and Productivity in Services: Evidence from U.K. Firms. *Journal of International Economics*, 112:88 – 108.

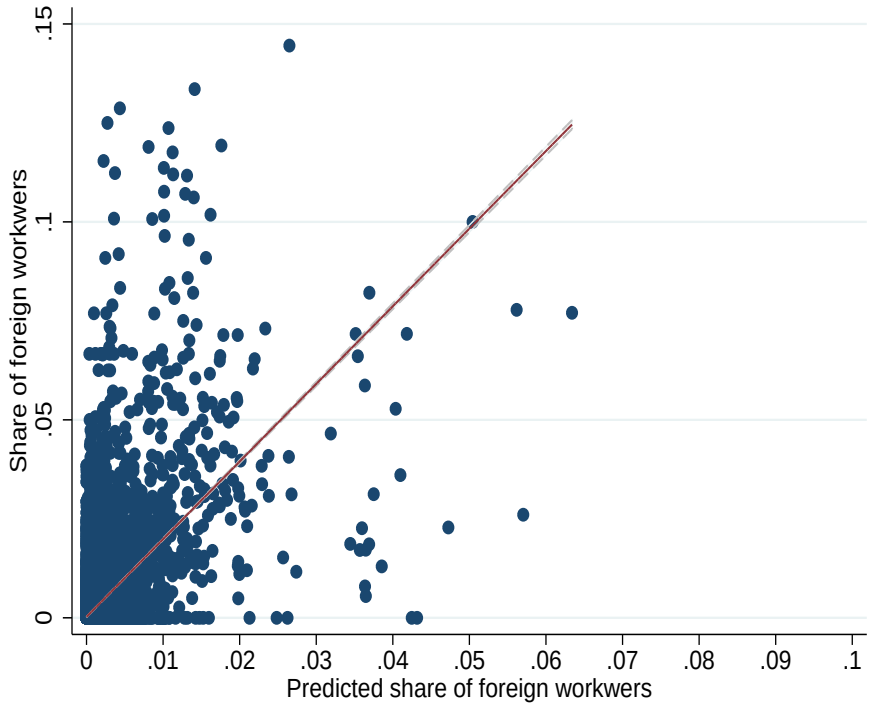
Peri, G. and Requena-Silvente, F. (2010). The Trade Creation Effect of Immigrants: Evidence from the Remarkable Case of Spain. *Canadian Journal of Economics*, 43(4):1433–1459.

Rauch, J. E. and Trindade, V. (2002). Ethnic Chinese Networks In International Trade. *The Review of Economics and Statistics*, 84(1):116–130.

Sofronis K. Clerides, Saul Lach, J. R. T. (1998). Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco. *The Quarterly Journal of Economics*, 113(3):903–947.

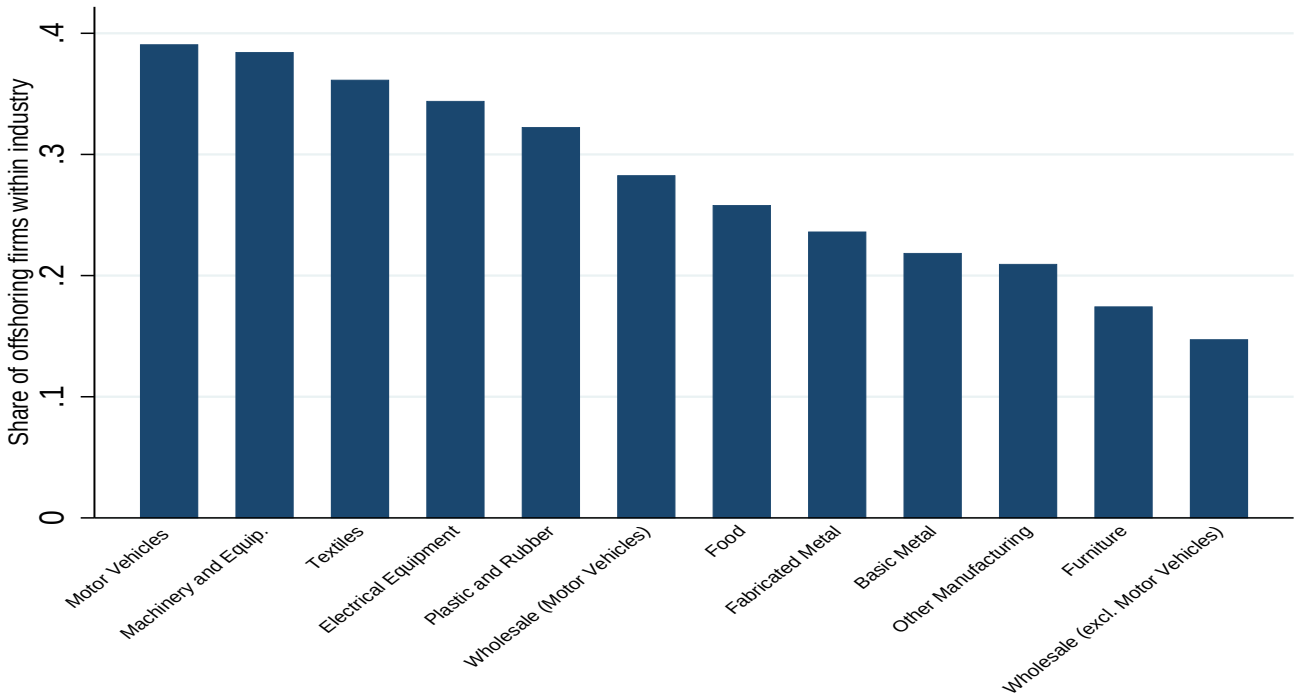
Viscusi, W., Harrington, J. E., and Vernon, J. M. (2005). *Economics of Regulation and Antitrust, 4th Edition*, volume 1. The MIT Press, 4 edition.

Figure 1: Bilateral share of foreign workers and its instrument



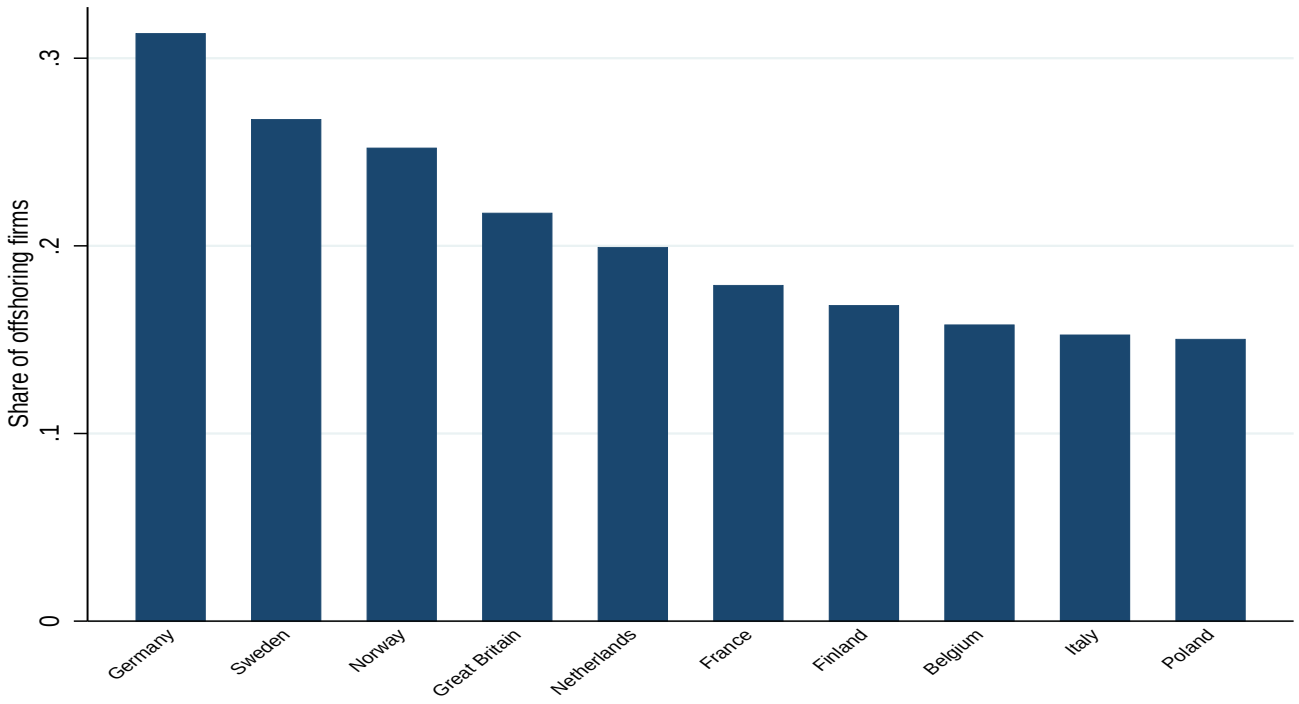
Notes: The bilateral share of foreign workers in a given municipality and year is reported on the vertical axis. The predicted bilateral share (IV) of foreign workers in a given municipality and year is reported on the horizontal axis.

Figure 2: Sectors with the largest share of offshoring firms on average (2006-2012)



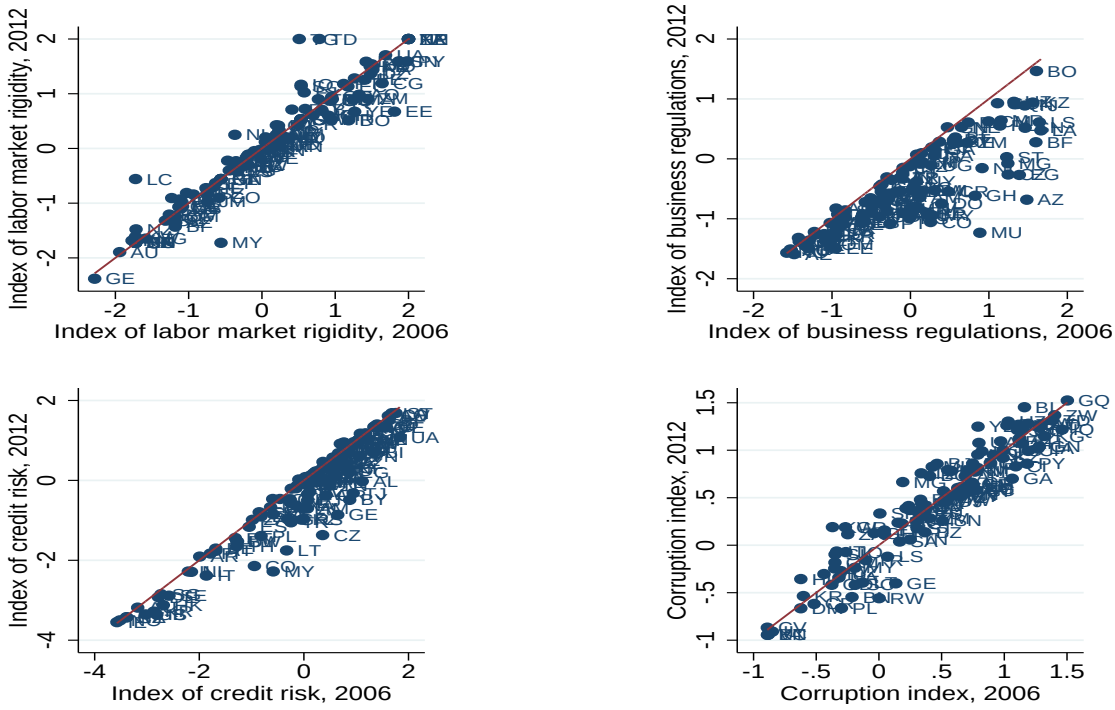
Notes: Authors' calculation using data from the Danish Integrated Database for Labor Market Research.

Figure 3: Destination countries with the largest share of offshoring firms on average (2006-2012)



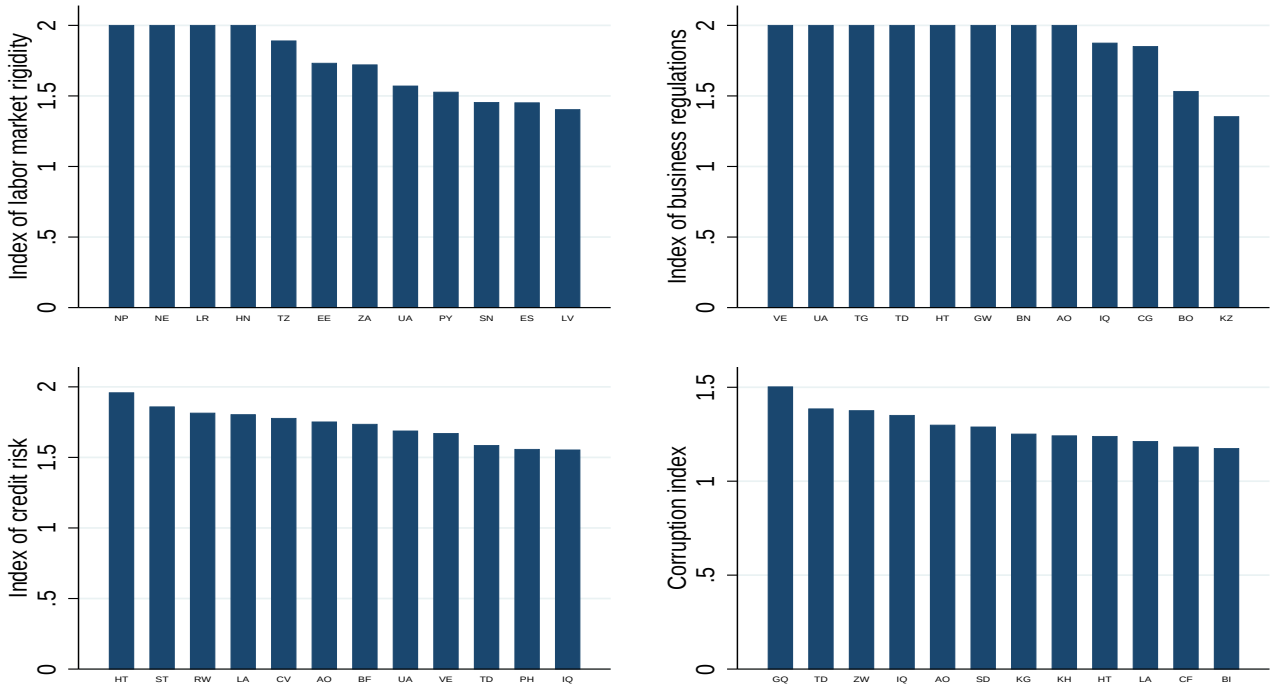
Notes: Authors' calculation using data from the Danish Integrated Database for Labor Market Research.

Figure 4: Regulations and corruption by destination country in 2006 and 2012



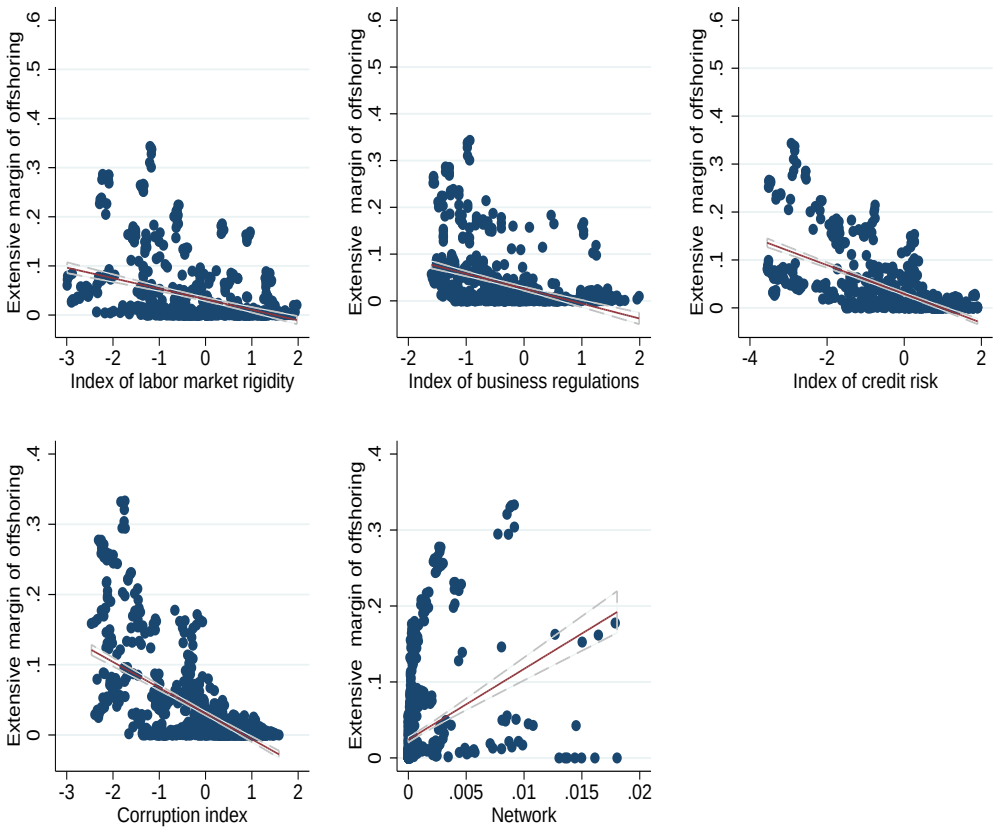
Notes: The index of labor market rigidity is estimated by combining all the labor regulations (limits on fixed term contracts; limits on working days per week; employment protection measures; and the minimum wage) with principal component analysis. The index of business regulations is estimated by combining all the business regulations (the time it takes to open a business; the time it takes to register property; the time it takes to pay taxes; the time it takes to export goods) with principal component analysis. The index of credit risk is estimated by combining all the credit regulations (100-credit coverage; 10-investor protection; enforcing contracts; 100-resolving insolvency) with principal component analysis. The corruption index is the inverse of the estimated control of the corruption indicator.

Figure 5: Destination countries with the highest regulation and corruption indexes



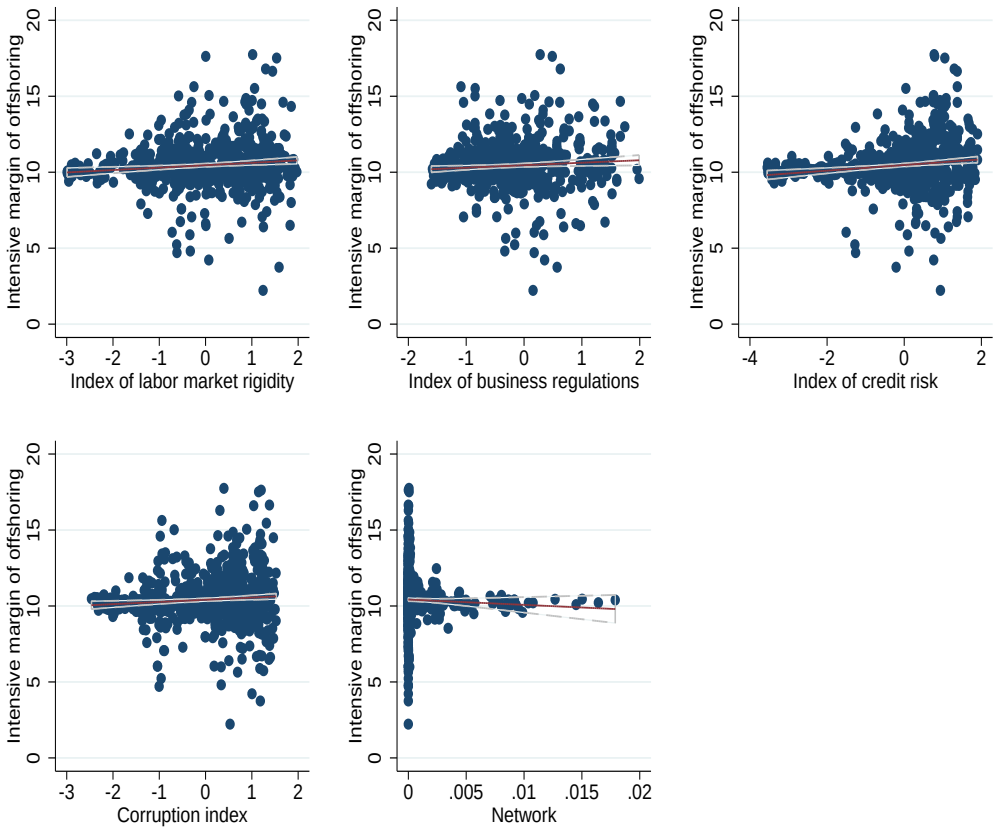
Notes: The index of labor market rigidity is estimated by combining all the labor regulations (limits on fixed term contracts; limits on working days per week; employment protection measures; and the minimum wage) with principal component analysis. The index of business regulations is estimated by combining all the business regulations (the time it takes to open a business; the time it takes to register property; the time it takes to pay taxes; the time it takes to export goods) with principal component analysis. The index of credit risk is estimated by combining all the credit regulations (100-credit coverage; 10-investor protection; enforcing contracts; 100-resolving insolvency) with principal component analysis. The corruption index is the inverse of the estimated control of the corruption indicator.

Figure 6: Extensive margin of offshoring, institutions and network



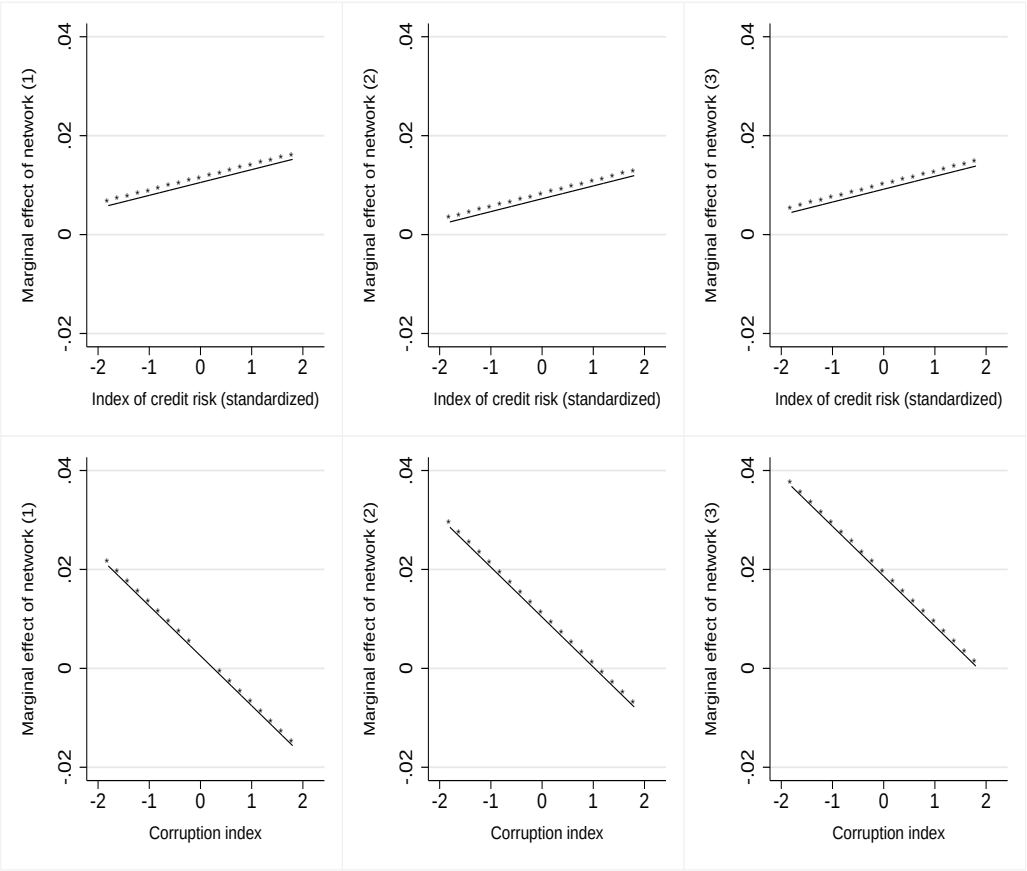
Notes: The share of firms that offshore at the year-destination level are reported on the vertical axis. The index of regulations or the network variable at the year-destination level are reported on the horizontal axis. A network is measured as the firm-level bilateral share of foreign workers.

Figure 7: Intensive margin of offshoring, institutions and networks



Notes: The share of firms that offshore at the year-destination level are reported on the vertical axis. The index of regulations or the network variable at the year-destination level are reported on the horizontal axis. A network is measured as the firm-level bilateral share of foreign workers.

Figure 8: Marginal effects of networks on the extensive margin of offshoring



Notes: The marginal effects of networks are estimated from the interaction specification as reported in column (3) of Table 4. In the top (bottom) panels, the marginal effect of networks (1) is calculated by interacting our network variable with the index of credit risk (corruption) and setting the index of labor market rigidity, business regulations and corruption (credit risk) at the 25th percentile of their distributions. In the top (bottom) panels, the marginal effect of networks (2) is calculated by interacting our network variable with the index of credit risk (corruption) and setting the index of labor market rigidity, business regulations and corruption (credit risk) at the median of their distributions. In the top (bottom) panels, the marginal effect of networks (3) is calculated by interacting our network variable with the index of credit risk (corruption) and setting the index of labor market rigidity, business regulations and corruption (credit risk) at the 75th percentile of their distributions. "*" indicates significance at the 95% level.

Table 1: Pre-trends tests

	Δ Ext. Margin Offshoring (1995-2000)	Δ Int. Margin Offshoring (1995-2000)	Δ Share of Non-EU Img (2006-2012)
	(1)	(2)	(3)
Δ Non-EU Img IV (2006-2012)	0.638	22.722	0.885***
	(2.615)	(41.863)	(0.233)
N	15,425	15,425	15,425
R-sq	0.712	0.716	0.070

Notes: In columns 1 and 2 the dependent variable is the pre-sample trend (i.e. the change from 1995 to 2000) in destination-specific offshoring outcomes at the municipality level. In column 3 the dependent variable is the long-run change (2006 to 2012) in the bilateral share of foreign workers at the municipality level. Regressions also include municipality fixed effects. Standard errors in parentheses are clustered at the municipality level. Significance levels: ***1%, **5%, *10%. Significance levels: ***1%, **5%, *10%.

Table 2: Descriptive statistics

Variables	**Definition**	**Total**	
Trade variables		**Mean**	**Sd**
Extensive margin of offshoring	1, if the firm offshores	0.033	0.178
Intensive margin of offshoring	log of destination specific offshoring volumes	10.176	3.129
Extensive margin of exporting	1, if the firm exports	0.036	0.204
Intensive margin of exporting	log of destination specific export volumes	10.133	2.509
Destinations	total number of offshoring destinations	4.260	6.550
Network	firm level bilateral share of workers from the offshoring destination	0.001	0.009
Accounting variables:		**Mean**	**Sd**
Labor productivity	log of sales per employee	14.713	0.644
Number of employees	firm size in full time equilavents	66.215	202.630
Capital intensity	log of capital stock per employee	13.205	1.115
Multi	1, if the firm is a multi-establishment company	0.281	0.449
Foreign	1, if the firm is foreign owned	0.011	0.088
IDA Variables:		**Mean**	**Sd**
Foreigners	non-danish emloyees as a proportion of all employees	0.063	0.074
Male	male emloyees as a proportion of all employees	0.742	0.176
Age	employees' average age	44.192	3.316
Skill0	employees with compulsory education as a proportion of all employees	0.267	0.132
Skill1	employees with a secondary education as a proportion of all employees	0.619	0.126
Skill2	employees with a post-secondary/ tertiary education as a proportion of all employees	0.113	0.105
Tenure	average employees' tenure	7.798	3.408
Work experience	average employees' work experience	19.679	2.803
Managers	managers as a proportion of all employees	0.085	0.071
Middle managers	middle managers as a proportion of all employees	0.213	0.176
Blue collars	blue collars as a proportion of all employees	0.701	0.192
N		1,403,850	
Number of firms		2,100	

Notes: All descriptive statistics are calculated as averages over the period 2006-2012. Trade and accounting variables are in dkk and real terms, with 2005 as the base year.

Table 3: Labor, business and credit regulations

	Mean	Sd	Min	Max
Labor regulations				
Limits on fixed term contracts	0.388	0.487	0	1
Limits on working days per week	1.073	0.319	0	2
Employment protection measures	0.486	0.499	0	1
Minimum wage	0.305	0.251	0	1.779
Index of labor market rigidity	-0.067	1.086	-2.702	2
Business regulations				
Time to open a business	33.083	34.976	0.500	260
Time to register property	59.878	65.847	1	398
Time to pay taxes	293.562	221.891	0	2085
Time to export	23.633	16.298	6	102
Index of business regulations	-0.069	1.072	-1.601	2
Credit regulations				
100-Credit coverage	75.952	33.664	0	100
10-Investors' protection	4.985	2.463	0	10
Enforcing contracts	28.925	12.666	0.100	87.6
100-Resolving insolvency	64.546	23.708	8.800	100
Index of credit risk	-0.128	1.286	-3.552	1.900
Corruption index	0.018	1.013	-2.385	2.465
N		1,403,850		

Notes: Means and standard deviations are calculated as averages over the period 2006-2012. Labor regulations are respectively: i) Whether fixed contracts for permanent tasks are forbidden or not; ii) Maximum number of working days weekly (calculated as 7-maximum number of working days); iii) Notify/consult a third party to dismiss redundant worker; iv) Minimum wages, ratio of average wages. Index of labor market rigidity is estimated with principal component analysis by using all labor regulations. Business regulations are respectively: i) Time required to start a business (days); ii) Time required to register property (days); iii) Time to prepare and pay taxes (hours); iv) Time to import (days); v) Time to export (days). Index of business regulations is estimated with principal component analysis by using all business regulations. Credit regulations are respectively: i) Lack of credict coverage=100-Private credit bureau coverage (percent of adults); ii) Lack of investors' protection=10-Business extent of disclosure index (0=less disclosure to 10=more disclosure); iii) Enforcing contracts, cost (percent of claim); iv) Rate of insolvency=100- recovery rate (cents on the dollar). Index of credit risk is estimated with principal component analysis by using all credit regulations. Corruption index is the inverse of the estimated control of corruption indicator.

Table 4: Institutions, network and firm's offshoring

	Extensive Margin				Intensive Margin			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Labor regulations								
Limits on fixed term contracts$_{t-1}$	0.003054	0.001982	0.002126	0.002519	–0.046591	–0.059972	–0.057303	–0.055331
	(0.002233)	(0.003768)	(0.003893)	(0.003854)	(0.027879)	(0.037883)	(0.038522)	(0.038639)
Limits working days per week$_{t-1}$	–0.000009	0.000095	0.000212	0.000384	0.021727	0.022606	0.024306	0.025662
	(0.000261)	(0.004173)	(0.004318)	(0.004313)	(0.014749)	(0.021384)	(0.022046)	(0.022806)
Employment protection measures$_{t-1}$	–0.011524***	–0.010359***	–0.010764***	–0.004517***	–0.019111	–0.012724	–0.010615	0.079662
	(0.000266)	(0.000370)	(0.000386)	(0.001059)	(0.014192)	(0.015033)	(0.015149)	(0.030693)
Minimum wage$_{t-1}$	0.002694	–0.003026	–0.003156	–0.002490	0.031214	0.042080	0.037917	0.042466
	(0.002165)	(0.002754)	(0.002852)	(0.002780)	(0.031328)	(0.041490)	(0.042418)	(0.041427)
Business regulations								
Time to open a business$_{t-1}$	–0.001474	–0.001487	–0.001962	–0.002945	0.002562	0.008002	–0.001684	0.000050
	(0.001022)	(0.002761)	(0.002912)	(0.003052)	(0.036821)	(0.080203)	(0.078492)	(0.079155)
Time to register property$_{t-1}$	0.002560	0.003040	0.002912	0.003028	–0.013361	–0.021449	–0.023402	–0.023510
	(0.002249)	(0.003764)	(0.003883)	(0.003827)	(0.019884)	(0.036025)	(0.029861)	(0.029921)
Time to pay taxes$_{t-1}$	0.001204	0.001481	0.001758	0.001848	0.016948	0.004664	0.005053	0.004673
	(0.001191)	(0.002637)	(0.002727)	(0.002643)	(0.022342)	(0.031913)	(0.034325)	(0.033540)
Time to export$_{t-1}$	–0.003627	–0.004146	–0.004347	–0.002766	0.001968	0.055328	0.056919	0.060322
	(0.002180)	(0.002674)	(0.002768)	(0.002703)	(0.042805)	(0.051635)	(0.050651)	(0.051202)
Credit regulations								
100-credit coverage$_{t-1}$	–0.006327***	–0.005607***	–0.005847***	–0.002301***	0.029478	0.038518	0.044338	0.043336
	(0.000410)	(0.000620)	(0.000632)	(0.000717)	(0.024732)	(0.026804)	(0.023480)	(0.023775)
10-investors' protection$_{t-1}$	–0.005212	–0.004643	–0.004831	–0.004660	–0.001756	–0.009180	–0.008470	–0.009404
	(0.003273)	(0.004354)	(0.004497)	(0.004441)	(0.016453)	(0.033030)	(0.029279)	(0.029699)
Enforcing contracts$_{t-1}$	–0.003542	–0.005105	–0.005419	–0.004456	–0.016301	–0.018960	–0.012949	–0.010622
	(0.002214)	(0.003641)	(0.003812)	(0.003833)	(0.022928)	(0.033957)	(0.027537)	(0.027496)
100-resolving insolvency$_{t-1}$	–0.016670***	–0.018509***	–0.019038***	–0.010226***	0.0270471	0.032919	0.030986	0.023359
	(0.000334)	(0.000518)	(0.000539)	(0.000782)	(0.027251)	(0.027743)	(0.028630)	(0.101432)
Corruption index$_{t-1}$	–0.026812***	–0.027174***	–0.028087***	–0.022014***	0.021527	0.014754	0.013816	–0.027418
	(0.000400)	(0.000674)	(0.000701)	(0.000640)	(0.033217)	(0.035692)	(0.036587)	(0.113451)
Network$_{t-1}$	0.093466***	0.056507***	0.058366***	0.008551***	0.020248	–0.033134	–0.048132	–0.055689
	(0.012462)	(0.009928)	(0.010148)	(0.002671)	(0.019871)	(0.046791)	(0.048836)	(0.093258)
Labor productivity$_{t-1}$			0.001333**	0.001503**			0.095939	0.097605
			(0.000522)	(0.000526)			(0.069942)	(0.069877)
Industry by year, Firm and Municipality Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes
Firm Controls	no	no	yes	yes	no	no	yes	yes
Destination Fixed Effects	no	no	no	yes	no	no	no	yes
First Stage- F-stat on Instrument		26.08	26.65	26.73		31.23	31.65	32.02
First Stage-Network IV Coeff.		0.722*** (0.252)	0.753*** (0.265)	0.761*** (0.251)		0.701*** (0.221)	0.704*** (0.227)	0.699*** (0.217)
Mean Y	0.033	0.033	0.033	0.033	10.181	10.181	10.181	10.181
R-sq	0.122	0.122	0.122	0.125	0.286	0.286	0.287	0.287
N	1,403,850	1,403,850	1,403,850	1,403,850	46,282	46,282	46,282	46,282

Notes: Dependent variable in columns 1-4 (5-8) is the extensive (intensive) margin of offshoring. Results in columns 4-6 are based on the sample of offshoring firms, so that the dependent variable is conditional on offshoring. In columns 2-4 and 6-8, the network variable is instrumented by its shift-share prediction. All regression show coefficients estimated on the z-scores of each explanatory variable. Firm controls include: whether the firm is foreign-owned, a multi-establishment dummy, the log of capital stock per employee, the share of workers with secondary and tertiary education, the share of male workers, the share of managers and middle managers, employees' average age, tenure and work experience and firm size dummies. Standard errors are clustered at the municipality-destination-year level. Significance levels: ***1%, **5%, *10%.

Table 5: Institutions, network and firm's offshoring, PCA and interaction specification

	Extensive			Intensive		
	[1]	[2]	[3]	[4]	[5]	[6]
Index of labor market rigidity$_{t-1}$	–0.005261***	–0.006665***		0.038024	0.036814	
	(0.000594)	(0.000741)		(0.065502)	(0.078576)	
Employment protection measures$_{t-1}$			–0.000563**			0.079926
			(0.000237)			(0.232903)
Index of business regulations$_{t-1}$	–0.001804	–0.000877		–0.112550	–0.084683	
	(0.001368)	(0.000660)		(0.069926)	(0.074462)	
Index of credit risk$_{t-1}$	–0.002681***	–0.003301***		0.146749	0.089441	
	(0.000752)	(0.000806)		(0.098345)	(0.091266)	
Index of credit coverage and resolving insolvency$_{t-1}$			–0.005282***			0.014989
			(0.001032)			(0.080317)
Corruption index$_{t-1}$	–0.001248***	–0.001146***	–0.001139***	0.051795	0.056158	0.061158
	(0.000369)	(0.000401)	(0.000402)	(0.045554)	(0.044785)	(0.045785)
Network$_{t-1}$	0.009258***	0.010504***	0.009712***	–0.069097	–0.151783	–0.163229
	(0.002472)	(0.002331)	(0.002204)	(0.091857)	(0.120298)	(0.096387)
Index of labor market rigidity$_{t-1}$ *network$_{t-1}$		0.005923			0.100075	
		(0.011695)			(0.192215)	
Index of business regulations$_{t-1}$ *network$_{t-1}$		0.004020	0.003756		–0.052586	–0.067498
		(0.002978)	(0.002349)		(0.108863)	(0.117634)
Index of credit risk$_{t-1}$ *network$_{t-1}$		0.002600**			0.178884	
		(0.001271)			(0.155873)	
Corruption index$_{t-1}$*network$_{t-1}$		–0.010095**	–0.008125**		–0.259207	–0.272790
		(0.004794)	(0.004014)		(0.171680)	(0.170749)
Employment protection measures$_{t-1}$*network$_{t-1}$			0.001087			0.003851
			(0.001771)			(0.003848)
Index of credit coverage and resolving insolvency$_{t-1}$*network$_{t-1}$			0.003302**			0.138962
			(0.001595)			(0.134078)
Labor productivity$_{t-1}$	0.001183***	0.001184***	0.001182***	0.079460	0.078757	0.078376
	(0.000357)	(0.000357)	(0.000356)	(0.086756)	(0.086875)	(0.086523)
Mean Y	0.033	0.033	0.033	10.181	10.181	10.181
R-sq	0.121	0.122	0.121	0.287	0.287	0.287
N	1,403,850	1,403,850	1,403,850	46,282	46,282	46,282

Notes: Dependent variable in columns 1-3 (4-6) is the extensive (intensive) margin of offshoring. All regressions show coefficients estimated on the z-scores of each explanatory variable and refer to the most complete specification. Index of labor market rigidity is estimated by combining all labor regulations with principal component analysis. Index of business regulations is estimated by combining all business regulations with principal component analysis. Index of credit risk is estimated by combining all credit regulations with principal component analysis. Standard errors are clustered at the municipality-destination-year level. Significance levels: ***1%, **5%, *10%.

Table 6: Network and firm's offshoring, alternate definitions of network

	Extensive [1]	**Intensive** [2]	**Extensive** [3]	**Intensive** [4]	**Extensive** [5]	**Intensive** [6]
Network (bilateral firm share of foreign workers)	0.008551***	–0.033134				
	(0.002671)	(0.046791)				
Network (bilateral firm share of foreign white-collar workers)			0.034510***	–0.148078		
			(0.005352)	(0.226586)		
Network (bilateral firm share of foreign blue-collar workers)					0.004678***	–0.019838
					(0.001669)	(0.026962)
First Stage- F-stat on Instrument	26.73	32.02	25.79	31.11	33.78	41.01
First Stage-Network IV Coeff.	0.761*** (0.251)	0.701*** (0.221)	0.472*** (0.042)	0.383*** (0.065)	1.140*** (0.127)	0.987*** (0.239)
Mean Y	0.033	10.135	0.033	10.135	0.033	10.135
R-sq	0.178	0.288	0.176	0.288	0.176	0.288
N	1,403,850	46,282	1,403,851	46,283	1,403,852	46,284
	Extensive [7]	**Intensive** [8]	**Extensive** [9]	**Intensive** [10]	**Extensive** [11]	**Intensive** [12]
Network (1, if managers poached from firms that offshore to country j)	0.138656***	–0.250548				
	(0.021312)	(0.270667)				
Network (bilateral firm share of foreign workers at the base year)			0.020347***	0.000425		
			(0.002299)	(0.004410)		
Network (bilateral share of foreign workers at the municipality level)					0.011646***	0.064152
					(0.000551)	(0.081345)
First Stage- F-stat on Instrument	-	-	-	-	27.98	32.35
First Stage-Network IV Coeff.	-	-	-	-	1.537*** (0.205)	2.120*** (0.385)
Mean Y	0.033	10.135	0.033	10.135	0.033	10.135
R-sq	0.176	0.288	0.176	0.288	0.176	0.288
N	1,403,850	46,282	1,403,851	46,283	1,403,852	46,284

Notes: In columns (1),(3),(5),(7),(9) and (11) the dependent variable is a dummy variable equal to 1 if firm has non zero offshoring volumes (broad definition). In columns (2),(4),(6),(8),(10) and (12) the dependent variable is the log of offshoring volumes, conditional on offshoring. In columns (1) and (2) the network variable is measured at time $t-1$ as in the baseline analysis and it's instrumented by its shift-share prediction as in the baseline analysis. In columns (3) and (4), the network variable is the firm bilateral share of white-collar foreign workers at time $t-1$ and it's instrumented by its shift-share prediction. In columns (5) and (6), the network variable is the firm bilateral share of blue-collar foreign workers at time $t-1$ and it's instrumented by its shift-share prediction. In columns (7) and (8), the network variable is the firm bilateral share of foreign workers at the base year. In columns (9) and (10), the network variable is a dummy equal to 1, if the firm poaches managers from firms that offshores to destination j at time $t-1$. In columns (11) and (12), the network variable is the bilateral share of foreign workers in the municipality c at time $t-1$ and it's instrumented by its shift-share prediction. All regressions show coefficients estimated on the z-scores of each explanatory variable and refer to the most complete specification. Standard errors are clustered at the municipality level. Significance levels: ***1%, **5%, *10%.

Table 7: Institutions and network, the role of non-linearities in the offshoring decisions and of export outcomes

	Offshoring		**Export**	
	Extensive [1]	**Intensive** [2]	**Extensive** [1]	**Intensive** [2]
Index of labor market rigidity$_{t-1}$	–0.004756***	0.004385	–0.024258	–0.338879
	(0.000436)	(0.099843)	(0.021569)	(0.252259)
Index of labor market rigidity$^2_{t-1}$	0.000806***	0.014632		
	(0.000260)	(0.074298)		
Index of business regulations$_{t-1}$	–0.000215	–0.058580	0.006661	0.074535
	(0.000552)	(0.086191)	(0.004868)	(0.045147)
Index of business regulations$^2_{t-1}$	0.000749	–0.043573		
	(0.000498)	(0.034185)		
Index of credit risk$_{t-1}$	–0.003436***	0.131934	–0.018241***	–0.031200
	(0.000636)	(0.130959)	(0.002045)	(0.037783)
Index of credit risk$^2_{t-1}$	0.002544***	0.002354		
	(0.000804)	(0.062133)		
Corruption index$_{t-1}$	–0.000062	–0.024040	–0.002204**	–0.111308**
	(0.000547)	(0.152086)	(0.000962)	(0.051552)
Corruption index$^2_{t-1}$	–0.002557***	0.038669		
	(0.000869)	(0.062198)		
Network$_{t-1}$	0.019900***	0.123127	0.027574***	0.111999
	(0.002451)	(0.165955)	(0.006645)	(0.082117)
Network$^2_{t-1}$	–0.002412***	–0.050437		
	(0.000345)	(0.030761)		
Mean Y	0.033	10.181	0.036	10.133
R-sq	0.179	0.291	0.385	0.391
N	1,403,850	46,282	1,403,850	144,701

Notes: Dependent variable in column 1 (2) is the extensive (intensive) margin of offshoring. Dependent variable in column 3 (4) is the extensive (intensive) margin of exporting. All regressions show coefficients estimated on the z-scores of each explanatory variable and refer to the most complete specification. Standard errors are clustered at the municipality-destination-year level. Significance levels: ***1%, **5%, *10%.

Table 8: Institutions, network and firm's offshoring, results by industry

	Labor intensive industries		**Capital intensive industries**		**Service industries trading merchandise**	
	[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
	Extensive	**Intensive**	**Extensive**	**Intensive**	**Extensive**	**Intensive**
Index of labor market rigidity$_{t-1}$	–0.009342***	–0.124779	–0.001055**	–0.279290	–0.002664***	0.013290
	(0.000973)	(0.137045)	(0.000407)	(0.253183)	(0.000356)	(0.035068)
Index of business regulations$_{t-1}$	0.000887	0.098059	0.001116	–0.415847	–0.000453	0.010822
	(0.000953)	(0.087409)	(0.000788)	(0.282987)	(0.000890)	(0.038427)
Index of credit risk$_{t-1}$	–0.004611***	–0.140198	–0.001201**	0.235629	–0.004396***	0.008424
	(0.001203)	(0.096101)	(0.000626)	(0.169324)	(0.000600)	(0.032060)
Corruption index$_{t-1}$	–0.000758**	0.147094	–0.001208**	–0.242397	–0.008368***	0.114904
	(0.000322)	(0.105655)	(0.000480)	(0.251844)	(0.000814)	(0.097453)
Network$_{t-1}$	0.011317***	–0.048889	0.021110***	0.214269	0.027426***	0.111188
	(0.003315)	(0.134705)	(0.003630)	(0.326278)	(0.004196)	(0.189153)
Mean Y	0.019	10.378	0.041	10.126	0.012	10.626
R-sq	0.192	0.334	0.128	0.274	0.097	0.431
N	529,444	10,116	874,406	36163	2,383,597	28,937

Notes: Dependent variable in columns 1-3 (4-6) is the extensive (intensive) margin of offshoring. All regressions coefficients estimated on the z-scores of each explanatory variable and refer to the most complete specification. Index of labor market rigidity is estimated by combining all labor regulations with principal component analysis. Index of business regulations is estimated by combining all business regulations with principal component analysis. Index of credit risk is estimated by combining all credit regulations with principal component analysis. We classify as "labor intensive" those industries with average capital intensity below the sample mean in the middle of the sample period. Standard errors are clustered at the municipality-destination-year level. Significance levels: ***1%, **5%, *10%.

Table 9: Institutions, network and firm's offshoring, results by sub-samples

	Exporting firms		**Developed destination countries**		**Developing destination countries**	
	[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
	Extensive	**Intensive**	**Extensive**	**Intensive**	**Extensive**	**Intensive**
Index of labor market rigidity$_{t-1}$	–0.007597***	0.036211	–0.052060**	–0.426927	–0.006979***	0.022112
	(0.000892)	(0.082354)	(0.023135)	(0.698491)	(0.000749)	(0.100866)
Index of business regulations$_{t-1}$	0.000759	–0.091759	–0.006992	–0.238628	0.001003	–0.104912
	(0.000703)	(0.076027)	(0.011348)	(0.274805)	(0.000697)	(0.090465)
Index of credit risk$_{t-1}$	–0.003755***	0.096030	–0.025886**	0.390200	–0.004936***	0.204307
	(0.000934)	(0.090833)	(0.011655)	(0.309809)	(0.000851)	(0.124140)
Corruption index$_{t-1}$	–0.001998**	–0.021581	–0.027655**	0.219605	–0.002221**	–0.184417
	(0.000774)	(0.128689)	(0.010583)	(0.230004)	(0.000597)	(0.201678)
Network$_{t-1}$	0.012378***	–0.128508	0.078192**	–0.869828	0.009048***	–0.103029
	(0.002497)	(0.122212)	(0.033512)	(0.728292)	(0.002038)	(0.146180)
Mean Y	0.037	10.176	0.152	10.144	0.014	10.244
R-sq	0.187	0.285	0.266	0.311	0.097	0.260
N	1,261,507	46,070	193,433	29,287	1,210,417	16,752

Notes: Dependent variable in columns 1-3 (4-6) is the extensive (intensive) margin of offshoring. All regressions coefficients estimated on the z-scores of each explanatory variable and refer to the most complete specification. Index of labor market rigidity is estimated by combining all labor regulations with principal component analysis. Index of business regulations is estimated by combining all business regulations with principal component analysis. Index of credit risk is estimated by combining all credit regulations with principal component analysis. Standard errors are clustered at the municipality-destination-year level. Significance levels: ***1%, **5%, *10%.

Table 10: Institutions, network and firm's offshoring, alternate offshoring variables

	Broad offshoring		**FDI-based definition**
	[1]	**[2]**	**[3]**
	Extensive	**Intensive**	**Extensive**
Index of labor market rigidity$_{t-1}$	–0.034499***	–0.270267	–0.000125*
	(0.002112)	(0.164527)	(0.000068)
Index of business regulations$_{t-1}$	0.003986	0.000223	0.000146
	(0.003412)	(0.041549)	(0.000123)
Index of credit risk$_{t-1}$	–0.014048***	0.017132	–0.000348**
	(0.00278)	(0.047458)	(0.000141)
Corruption index$_{t-1}$	–0.001931**	–0.114114	–0.000826
	(0.000809)	(0.090234)	(0.000498)
Network$_{t-1}$	0.032439***	0.110731	0.001125**
	(0.005400)	(0.079005)	(0.000641)
Mean Y	0.101	10.176	0.010
R-sq	0.413	0.351	0.106
N	1,403,850	156,761	1,403,850

Notes: In column (1) the dependent variable is a dummy variable equal to 1 if firm has non zero offshoring volumes (broad definition). In column (2) the dependent variable is the log of offshoring volumes (broad definition). In column (3) the dependent variable is the extensive margin based on information on outward FDI activity. All regressions show coefficients estimated on the z-scores of each explanatory variable and refer to the most complete specification. Index of labor market rigidity is estimated by combining all labor regulations with principal component analysis. Index of business regulations is estimated by combining all business regulations with principal component analysis. Index of credit risk is estimated by combining all credit regulations with principal component analysis. Standard errors are clustered at the municipality-destination-year level. Significance levels: ***1%, **5%, *10%.