

# Determinants of Offshoring: Empirical Evidence from Ireland<sup>1</sup>

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## Abstract

We analyse determinants of an enterprise's decision to offshore business activities using an unique data set for enterprises in Ireland over the period 2001-2006. Our results suggest that, on average, other things equal, larger, more productive enterprises, foreign-owned enterprises and those which used information and communication technologies (ICT) were more likely to offshore. Furthermore, characteristics of the import source region had an important influence on enterprise offshoring behaviour, with offshoring to regions outside of the advanced European Union's economies being less likely. Further, we find that patterns of offshoring differed between service and manufacturing enterprises. Finally, it appears that the type of business function that was offshored impacted on the strength of the link between the enterprise's decision to offshore and offshoring determinants.

Keywords: Offshoring; Internationalisation; Core and support business functions.

JEL Classification: F14, F23, D22

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<sup>1</sup> This paper is part of the SERVICEGAP project funded by the European Commission under the 7<sup>th</sup> Framework Programme, Grant Agreement No. 244522. This research uses statistical data from the Central Statistics Office (CSO) of Ireland. The permission for controlled access to confidential micro data sets has been granted in line with the Statistics Act, 1993. The use of these statistical data does not imply the endorsement of the CSO in relation to the analysis or interpretation of the statistical data. We would like to thank CSO statisticians Kevin Phelan, Barra Casey and Andrew Murray for support with data and for clearing files.

## 1 Introduction

Over the past two decades, technological advances have led to the reduction of transport and communication costs which in turn have enabled a greater fragmentation and internationalisation of production. In recent years, there has been an increasing trend in the offshoring of services.

While the academic and policy attention have focused primarily on labour market effects of offshoring, robust empirical evidence on the factors driving offshoring including enterprise and location characteristics is still scarce. This evidence informs enterprise strategy and policy design aiming at maximizing benefits from global sourcing and global value chains.

The decision to outsource certain business activities previously undertaken in-house has been analysed by Coase (1937). However, the interest in understanding factors driving international outsourcing or “offshoring” is more recent (Grossman and Helpman 2002; Antràs and Helpman 2004; Grossman and Rossi-Hasenberg 2008).

This paper examines the links between the decision to offshore business activities and enterprise and offshore location characteristics. To this purpose, we use an unique data set for the period 2001-2006 obtained by linking three enterprise surveys conducted by the Central Statistics Office in Ireland: the International Sourcing Survey, the Census of Industrial Production, and the Annual Services Inquiry.

Our research results identify a number of factors which influence an enterprise’s offshoring decision. Furthermore, we find that these factors differ for manufacturing and service enterprises. In addition, our evidence suggests that the determinants of offshoring vary depending on the type of the business function that was offshored.

More specifically, we find that, on average other things equal, larger, more productive enterprises, enterprise with international activities, and enterprises with higher ICT investment per employee and those which had a website were more likely to offshore business activities. The characteristics of the import source region appear to matter, with offshoring to regions outside of the EU15<sup>2</sup> being less likely. In addition, we find that core business activities were more likely to be offshored compared with other business functions. These results carry over to the separate analysis of service enterprises. However, for manufacturing enterprises, the results show that the size of the enterprise, industry competition, and type of activity offshored, source country specific effects and industry effects were significantly related to an enterprise’s decision to offshore.

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<sup>2</sup> Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, United Kingdom.

The results of the separate probit regressions for each type of business function<sup>3</sup> offshored for manufacturing and service enterprises uncover some interesting facts. The results show that the size of the enterprise was important for manufacturing enterprises who decided to offshore distribution, ICT, and engineering services. Larger service enterprises are found to have a higher propensity to offshore distribution, marketing, and ICT and administration service support functions. Also, labour productivity was positively related to the offshoring of a number of support business functions for service enterprises. Foreign ownership was positively associated with the offshoring of a number of business functions for all service enterprises but not for manufacturing enterprises. Finally, we find evidence to suggest that enterprises solely located in the less developed Border, Midland and Western region had a lower propensity to offshore.

The rest of this paper is structured as follows. Section 2 discusses the theoretical and empirical underpinnings of our analysis. Section 3 presents our empirical methodology. Next, in Section 4 we discuss the data that we use. Section 5 discussed the empirical results. Finally, Section 6 concludes.

## **2 Theoretical and Empirical Framework**

In this section we discuss theoretical and empirical insights that underpin our analysis of determinants of offshoring.

One of the main motivations for offshoring identified in the theoretical literature is the opportunity for enterprises to save on production costs. Grossman and Rossi-Hansberg (2008) develop a model that examines the potential productivity gains which accrue from offshoring that is motivated by international factor cost differentials. In their model, firms can benefit from labour cost differentials in different countries by offshoring tasks that are produced by low skilled labour more cheaply abroad than at home. However, the benefits of offshoring must be weighed against the coordination and monitoring costs of completing the task abroad. They find that firms that use low skilled labour intensively can gain relatively more in terms of profits and productivity and increase demand for the less offshorable labour inputs.

In the closely related theoretical literature on the determinants of the firm's organisation mode, Grossman and Helpman (2002) and Antràs and Helpman (2004) are particularly relevant. Grossman and Helpman (2002) examine the choice between outsourcing and firm integration. In determining their organisational mode, firms, which are assumed to be equally productive, are faced with the trade off between the costs of running a large and less specialised organisation versus the search

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<sup>3</sup> The considered business functions include: core business functions and support services functions such as: distribution; marketing; information and communication technologies; administration; engineering; R&D; other support services.

and monitoring costs of an input supplier. The authors show that outsourcing is likely to be more prevalent in some industries than in others. Outsourcing is more likely to be viable in large firms and in large economies. Also, in competitive markets outsourcing requires a high per unit cost advantage for specialised input producers relative to integrated firms, while in markets with less competition, outsourcing depends on the comparison of the fixed costs between specialised producers and integrated firms.

Antràs and Helpman (2004) model organisation choices of profit-maximising firms, accounting for the behaviour of the input supplier, given imperfect contract enforcement. Each input sourcing mode is associated with a respective fixed cost which only the more productive firms can overcome. In this framework, decisions regarding trade, investment and organisational choices are interdependent. Görg et al. (2008) also emphasise that “better” firms are more likely to offshore given that upfront sunk costs are involved. Wagner (2011) analyses the effects of offshoring on German manufacturing firms performance and shows that “better” firms self-select into offshoring. He identifies offshoring firms as being larger, more productive, more human capital intensive and more export intensive relative to non-offshoring firms.

We earlier acknowledged that the most productive firms are capable of overcoming the fixed costs associated with offshoring. Implicit in our discussion was that the source country characteristics affect the cost of offshoring and influence the offshoring decision. Also the costs of offshoring to potential source countries are likely to differ by source country. Movement towards greater global integration through trade agreements involving the reduction of tariffs and non-tariff barriers between countries has had a dramatic impact on trade costs between countries. This, in turn, has increased the relative viability of offshoring to countries covered by such agreements. However, with the elimination of these trade barriers there is limited scope for potential gains from future trade agreements. In this context, a recent strand of the literature emphasises the importance of country trade facilitation characteristics such as the efficiency customs, ports, transport infrastructure, regulation, and ICT infrastructure. Such factors influence the speed, efficiency and cost with which inputs are delivered and are particularly important in global supply chains where delays and costs can be transmitted throughout the value chains, Nordas et al. (2006).

Access to skilled talent and specialised technologies in the source country are also expected to influence firms’ offshoring behaviour. As reviewed in Ceci and Masciarelli (2010), these factors are strategic considerations faced by firms which enable them to benefit from the science and technology infrastructure of the host country, (Farrell et al. 2006; Bunyaratavej et al 2007; Manning, 2008).

Bunyaratavej et al. (2007) investigate the determinants of the location of services offshoring. Drawing on the international business research, they identify the cost of doing business abroad, liability of foreignness and institutional factors as defining the rationale for offshoring. Lower labour costs and human capital are found to matter in choosing a location for services outsourcing while the use of telecommunications technology lessens the need of firms to be near major markets. In line with the institutional theory literature, which emphasises the role institutions play in lowering transaction costs and information costs and facilitating interactions, they find that firms have a higher propensity to offshore to locations where culture, education and infrastructure closely resemble their home country.

The specific role of information and communication technology (ICT) on the offshoring activity of firms has come in for particular attention in the literature. This is unsurprising given it is considered one of the key drivers of global trade and financial integration (Rae and Sollie, 2007). There are a number of channels through which ICT can directly reduce trade-related costs of offshoring.<sup>4</sup> First, ICT which is a General Purpose Technology, enables sellers to adapt and tailor their service to closely match the requirements of the buyers of the service. Second, ICT better facilitates the matching of producers and purchasers, (Grossman and Helpman, 2002). Finally, Autor et al. (2003) argue that ICT allows for the compartmentalisation of jobs into tasks some of which may be offshorable.

The empirical literature which examines the link between ICT and offshoring at the enterprise level is limited but results tend to suggest a positive relationship. (Abramovsky and Griffith, 2006; Rasel, 2012; Tomiura, 2005).<sup>5</sup> Abramovsky and Griffith (2006) investigate the effect of ICT on the enterprise's choice of organisational form for a sample of UK enterprises for the period 2001-2002. They show that enterprises with greater ICT investment and enterprises which order goods and services online are more likely to outsource and offshore business services. More recently, Rasel (2012) examines the relationship between ICT usage and the enterprise's offshoring decision. She distinguishes between the types of ICT used by the enterprise and whether the ICT-offshoring relationship differs between manufacturing and services enterprises. Basing her analysis on the ICT 2010 survey of German enterprises, she finds enterprises that use more software systems (i.e. ICT intensive enterprises) are more likely to offshore compared with less ICT intensive enterprises. The use of software solutions for supply chain management systems is particularly important for manufacturing enterprises who decide to offshore. For service enterprises, Enterprise Resource Planning software and e-commerce purchases are also found to be relevant for offshoring.

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<sup>4</sup> This summary on the ICT impact on offshoring is based on Rasel (2012)

<sup>5</sup> Benefratello et al (2009) in their analysis of a sample of Italian firms find the relationship between ICT investment and offshoring to be negative.

Biewen et al. (2012) analyse the impact of cost pressures and financial constraints on the decision to offshore services for German multinational enterprises over the period 2002-2008. They find that an enterprise is less likely to begin offshoring if it faces internal cost pressures due to a drop in sales and sales per employee, while enterprises who already offshore are likely to intensify offshoring activity. External credit conditions appear to have no significant impact on offshoring activity. They also find that firms source from countries with high GDP and low wages in the sector that supplies the service.

In summary, our review of the theoretical and empirical literature highlights factors both internal and external to the enterprise which are likely to influence its offshoring decision. Factors internal to the enterprise include labour productivity, size, ICT investment and usage, human capital intensity, trading experience, ownership. While factors external to enterprise that are likely to matter include the competitive pressure faced by the enterprise in an industry, other industry characteristics, host country characteristics and the location of the enterprise. The influence of these factors may differ depending on the type of business function offshored. Also the determinants of offshoring activity may differ for manufacturing and services firms.

### 3 Empirical Methodology

To estimate the determinants of an enterprise's offshoring decision, we estimate the following probit model:

$$Pr(OFF_{ijsc} = 1|Z) = \Phi(Z\beta + \delta_j + \lambda_s + \varphi_c + \vartheta_n + \varepsilon_{isc}) \quad (1)$$

$Pr(.)$  refers to the probability of the outcome and  $\Phi(.)$  is the normal cumulative distribution function. The dependent variable  $OFF_{ijsc}$  is a binary variable that is equal to one if an enterprise  $i$ , in sector  $j$ , offshores a business function  $s$  to region  $c$  during the analysed period, and it is zero otherwise.  $Z$  is a vector of enterprise characteristics which are expected to influence its decision to offshore. The explanatory variables included in the model specification are: size (SIZE), labour productivity (LPROD), wages per employee (WEMP), ICT investment per employee (ICT), ownership (FOREIGN), domestic exporter dummy (DOMEXP), and industry competition (HHI).

As discussed in Section 2, characteristics of the location country are likely to influence the firms' decision to offshore. For instance, some countries may have better trade facilitation infrastructure or large pools of skilled labour that increase the feasibility of a enterprise offshoring. We account for

these differences in source country characteristics by including source country dummies (i.e.  $\varphi_c$ ). To control for possible effects of enterprise location and industry-specific effects, we include dummy variables for regions<sup>6</sup> and industries<sup>7</sup> (i.e.  $\vartheta_n$  and  $\delta_j$  respectively). To account for the type of business function that is offshored, we include dummy variables for each business function type (i.e.  $\lambda_s$ ). The explanatory variables are averaged over the analysed period, 2001-2006.

In our analysis, we first pool each of the business function offshoring decisions together and estimate how the enterprise characteristics relate to its decision to offshore a business function to a particular country for the full set of our enterprise observations. We next perform our analysis for the following sub-samples: (i) manufacturing enterprises; (ii) service enterprises; (iii) domestic-owned enterprises; and (iv) foreign-owned enterprises. Finally, we investigate whether the determinants of offshoring differ according to the type of business function that is offshored. To this purpose, we estimate our model for each type of offshorable business function.

#### **4 Data and Summary Statistics**

To conduct our analysis, we merge data from three separate enterprise level surveys collected by the Central Statistics Office of Ireland. The datasets we use are the International Sourcing Survey (ISS), the Annual Services Inquiry (ASI) and the Census of Industrial Production (CIP). The ISS provides information on enterprise domestic outsourcing and offshoring activities and the factors that influence such behaviour over the period 2001 to 2006. The survey was sent to all enterprises within selected economic activities that had a hundred or more employees in 2007.<sup>8</sup> A total of 636 enterprises out of 1292 responded to the survey.

We primarily focus on the international sourcing questions of the survey. International sourcing is defined in the ISS survey as “the total or partial movement of business functions currently performed in-house or currently domestically sourced by the resident enterprise to either non-affiliated or affiliated enterprise located abroad”. This definition of offshoring enables us to construct an accurate and direct measure of whether an enterprise has offshored or not. Further, the survey asked enterprises to distinguish between core and support business functions such as (i) Distribution and logistics; (ii) Marketing, sales and after sales services; (iii) ICT services; (iv) Administrative and management functions; (v) Engineering and related technical services; (vi) Research and Development; and (vii) Other types of service support functions.<sup>9</sup> A subsequent

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<sup>6</sup> Regions classified as NUTS 2

<sup>7</sup> At the two digit level, NACE Rev. 1.1 classification

<sup>8</sup> The CSO used the Business Register to identify enterprises with more than a hundred employees in 2007

<sup>9</sup> Core business functions are definition in the IOS survey as the “production of final goods or services intended for the market/for third parties carried out by the enterprise and yielding income. Core business function equals in most cases the primary activity of the enterprise”. Support business functions as those functions

question asks enterprises to identify the country/region where the business function was offshored to. The nine regions/countries were EU15, EU12<sup>10</sup>, other European countries<sup>11</sup>, China, India, other Asian countries and Oceania, USA and Canada, South and Central America and Africa.

We match the enterprise sourcing data with additional enterprise information taken from the ASI for service enterprises and from the CIP for manufacturing enterprises. The ASI collects service enterprise information annually. It surveys all enterprises with 20+ employees plus a random sample of the smaller units with 2 to 19 persons engaged. The sample is stratified by activity (NACE Rev 1.1. classification), employment size class and NUTS2 region. The CIP is a census of all manufacturing, mining and utilities plants. We use data from the more detailed survey which is completed by enterprises with more than 20 persons engaged. From these datasets, we use information on enterprise ownership, value of sales, share of sales exported, share of exports in total sales, number of employees, regional location and investment in ICT capital. We take the average of the available data for the enterprise variables over the period 2001-2006 before merging them with the ISS data. Descriptions of the variables used in our analysis are presented in Table A1 in the Appendix.

To account for potential selection bias, we estimate weighted regressions. To calculate the weights, we first merge the CIP and ASI datasets and then, for each year we sum the number of enterprises in each two-digit Nace Rev 1.1 industry. For service enterprises, we sum the grossing factor based on the number of enterprises provided in the ASI, to calculate the number of enterprises in each two-digit NACE Rev 1.1 service industry. The maximum value of the sum of enterprises in each industry over the period 2001 to 2006 is taken and divided by the sum of the enterprises in each two-digit NACE Rev 1.1 industry in the regression sample.

Once the files are merged we have an initial sample of 503 enterprises. Table 1 presents the average value of the offshoring measure by type of business function offshored for (i) all enterprises, (ii) manufactures and (iii) service enterprises. The measure is also broken down by five different types of enterprise in our sample, i.e. all enterprises, foreign-owned, exporters, domestic exporters and domestically owned enterprises.

[Table 1 about here]

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which are “carried out in order to permit or facilitate production of goods or services intended for the market/for third parties by the enterprise. The outputs of the support business functions are not themselves intended directly for the market/for third parties”.

<sup>10</sup> Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, Slovenia.

<sup>11</sup> Switzerland, Norway, Turkey, Russia, Belarus, Ukraine and the Balkan states.



A number of interesting results emerge from Table 1. First, some business functions are more likely to be offshored than others. In Table 1 column 1, we see that for all enterprises (i.e. top section of Table 1), the average value of the offshoring measure ranges from 0.35 down to 0.03 with Core (Other) business functions having the highest (lowest) values. Second, manufacturing enterprises are more likely to offshore each business function compared with services enterprises (based on comparison of middle and bottom section of column 1). Third, there are differences in the ranking of the offshoring business function measure for manufacturing and services enterprises. The offshoring of distribution and engineering service support functions is more prevalent amongst manufacturing enterprises while the offshoring of marketing, ICT and distribution services are more likely amongst the services enterprises. Finally, offshoring patterns differ according to enterprise ownership characteristics and exporting activity. For the full sample of manufacturing and service enterprise observations (i.e. top section of Table 1), we find that foreign-owned enterprises and domestic exporters are more likely to offshore than domestic enterprises for each business function, with the exception of the “Other” business function category. This pattern holds when we examine service enterprises separately (i.e. middle section). However, for manufacturing enterprises (bottom section), the pattern is not as clear cut with domestic enterprises exhibiting a higher propensity to offshore a number of business functions compared with domestic exporters.

Additional descriptive statistics of the variables used in our analysis are presented in Tables A2 and A3 in the Appendix.

## **5 Empirical Results**

In this section, we present the estimates on how enterprise characteristics relate to offshoring decisions. Table 2 column 1 presents the estimates of the probit model described above where we pool all enterprise observations. Specifically, the dependent variable is a binary variable equal to one if the enterprise offshored a particular business function to a particular destination. The estimates shown in Table 2 are the average marginal effects and robust standard errors are reported in the parenthesis. We present the estimation results in a stepwise fashion; we include the foreign ownership dummy, domestic exporter dummy, location dummy and industry dummies as our initial set of controls and add one explanatory variable at a time. The final column contains the full model specification.

[Table 2 about here]

The results in Table 2 suggest that larger and more productive enterprises are more likely to offshore. This positive link between an enterprise’s productivity and its propensity to trade is well

established in the international trade literature.<sup>12</sup> Furthermore, foreign-owned enterprises and domestic exporters are both 3 percentage points more likely to offshore compared with domestic enterprises and domestic exporters serving the home market respectively. The important role of ICT for offshoring also appears to be confirmed with the ICT intensity variable being positively associated with an enterprise's propensity to offshore. Also, enterprises that have a website are 1.3 percentage points more likely to offshore. We find that enterprises that are solely located in the Border, Midland and Western region have a relatively lower propensity to offshore.

The characteristics of the source region controlled for by the source country dummies are significantly related to enterprise offshoring behaviour, with offshoring to country/regions outside of the EU15 found to be less likely.<sup>13</sup> This result is unsurprising as the fixed entry costs into offshoring to the EU15 group of countries are likely to be lower given their relative proximity and the strong trade and financial linkages. We also see that support business functions had a lower propensity of being offshored when compared with the omitted reference group, i.e. core business functions.

So far, we have estimated the average relationship between enterprises' offshoring decisions and potential determinants. However, the relationships may vary across groups of enterprises. Accordingly, we next examine whether our findings vary for the following sub-samples (i) manufacturing; (ii) services; (iii) domestic-owned; and (iv) foreign-owned enterprises.

[Table 3 about here]

Table 3 shows that there are some differences in the model estimates across enterprise sub-samples. We continue to find that larger enterprises are more likely to offshore in each model specification, but only more productive service enterprises and foreign-owned enterprises had a higher propensity to offshore. ICT investment per employee was positively associated with offshoring in the services and domestic-owned enterprise sub-samples. Surprisingly, the coefficient is negative for manufactures and foreign-owned enterprises. However, it is only marginally so at the ten percent level of significance in these two cases. We find that the domestic exporters dummy is negative in the manufacturing sample. Although this result is not what would be generally expected, it is consistent with the summary statistics discussed earlier. We find that the sign of the industry competition measure differs between model specifications. Theoretically, either sign is valid. On the

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<sup>12</sup> Most of the research in this area has focused on the link between productivity and the exporting of goods. Recent research by Vogel and Wagner (2010) has found a positive link between productivity and importing. Also, Biewen et al (2012) find evidence that more productive firms are more likely to import services from abroad.

<sup>13</sup> Given the important economic ties between Ireland and the UK, it would have been particularly useful if the survey separated the UK from the other EU15 old member states. We could then have examined if the strong ties with Ireland-UK were driving this result.

one hand, lower competition in an industry enables incumbent enterprises to make larger profits which allow them to overcome the entry costs of outsourcing internationally. On the other hand, greater competition forces enterprises to become more productive and in order to maintain competitiveness they may undertake cost saving measures such as offshoring inefficient business functions. Finally, we continue to find that the source country dummies and support business function dummies are significant in each model.

Columns 1-7 in Table 4 show the estimates of determinants of offshoring for each type of business function that was offshored.<sup>14</sup> The dependent variable is a binary variable equal to one if the enterprise offshored each business function to a particular destination and equal to zero if it did not.

[Table 4 about here]

We find that foreign-owned enterprises and domestic-owned exporters had a relatively greater propensity to offshore each type of service support function. Further, our results indicate that larger enterprises were more likely to offshore distribution, marketing, ICT, and administration functions, while more productive enterprises offshored distribution and marketing functions.

The ICT intensity variable is positively associated with an enterprise's propensity to offshore core business functions only. Enterprises with a website had a relatively greater propensity to offshore core, ICT, engineering, and research and development business. We continue to find that the propensity to offshore to destinations outside of the EU15 was lower. Also, enterprises located in the BMW region were less likely to offshore core, distribution, engineering, and research and development functions.

Tables 5 and 6 show estimates of our model specifications for manufacturing and service enterprises separately. We find that our results for the service enterprises sample are very similar to those for the full sample. However, there are a number of differences in the estimates for the manufacturing sample. In particular, we find no significant difference between the propensity of foreign and domestic-owned manufacturing enterprises to offshore any of their business functions. Interestingly, we find that the propensity to offshore ICT and Administration functions to India to be similar to the propensity to offshore to the EU15. India is a world leader in the provision of outsourced ICT and back office business functions. Against this background, our finding suggest it is likely that cost savings and productivity gains to Irish manufacturing enterprises from offshoring such functions there, offset the advantages of offshoring to potential locations in the geographically more proximate EU15.

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<sup>14</sup> The model specification for 'other' business could not be estimated due to issues of collinearity and sample size.

[Table 5 and Table 6 about here]

## 6 Conclusions

In this paper we investigated the factors that are expected to influence an enterprise's decision to offshore business functions. More specifically, we used Irish survey data for the period 2001-2006 for over 500 enterprises to consider how factors, internal and external to the enterprise, relate to its propensity to offshore eight different types of business functions. In line with recent studies, and the need to better understand the offshoring behaviour of service enterprises, we undertook our analysis for both manufacturing and service enterprises.

While the focus of this paper is on identifying the relationship between various factors and offshoring activity, it is important to acknowledge that although our findings may be indicative of a causal relationship they cannot be interpreted as such. In order to be able to make such causal assertions, we would need to move beyond our cross sectional approach and use multi-period enterprise observations and detailed information on the timing of an enterprise's decision to offshore. However, such a panel dataset does not yet exist for Ireland.

Our results can be summarised as follows. We find that for the full sample of enterprises the likelihood of offshoring was positively associated with the size and labour productivity of the enterprise. Furthermore, international linkages through foreign-ownership and exporting increased the likelihood of offshoring. ICT was also found to matter, with ICT investment per employee and website ownership being positively associated with an enterprise's propensity to offshore. Further, we find that core business functions were more likely to be offshored compared with support service functions. The location where functions were offshored to is also important, with the propensity to offshore to destinations outside of the EU15 being lower. Interestingly, further analysis suggests that the relationships between offshoring and potential determinants differ for services and manufacturing enterprises. While our main findings generally hold for services enterprises, some of the findings are not significant for manufacturing. In particular, we find no significant relationship regarding the propensity of more productive or foreign-owned manufacturing enterprises to offshore.

Finally, we find that the strength of the associations between an enterprise's characteristics and its decision to offshore differ according to the type of business function that was offshored. We find that large manufacturing enterprises had a higher propensity to offshore distribution, ICT, and engineering services. Larger service enterprises had a higher propensity to offshore distribution, marketing, and ICT and administration service support functions. Also, labour productivity was positively related to the offshoring of a number of support business functions for service enterprises.

Interestingly, foreign ownership was positively associated with the offshoring of a number of business functions for all service enterprises but not for manufacturing enterprises. There is also some evidence to suggest that enterprises solely located in the less developed Border, Midland and Western region had a lower propensity to offshore.

**Table 1 Offshoring by enterprise type**

<b>Offshored business function</b>	<b>All</b>	<b>Foreign-owned enterprises</b>	<b>Exporters</b>	<b>Domestic-owned exporters</b>	<b>Domestic-owned enterprises</b>
<b>All enterprises</b>					
Core	0.35	0.48	0.45	0.37	0.26
Distribution	0.20	0.31	0.28	0.21	0.12
Marketing	0.16	0.24	0.19	0.14	0.1
ICT	0.15	0.25	0.17	0.08	0.07
Administration	0.11	0.20	0.12	0.05	0.04
Engineering	0.17	0.24	0.23	0.20	0.11
Research and Development	0.09	0.15	0.12	0.05	0.04
Other	0.03	0.03	0.02	0.01	0.03
Observations	503	215	278	118	288
<b>Services</b>					
Core	0.25	0.39	0.33	0.35	0.19
Distribution	0.13	0.25	0.20	0.19	0.07
Marketing	0.14	0.24	0.20	0.22	0.08
ICT	0.13	0.24	0.16	0.14	0.07
Administration	0.10	0.22	0.11	0.08	0.03
Engineering	0.11	0.19	0.15	0.19	0.06
Research and Development	0.04	0.07	0.05	0.08	0.03
Other	0.03	0.02	0.00	0.00	0.03
Observations	303	99	92	37	204
<b>Manufacturing</b>					
Core	0.50	0.55	0.49	0.40	0.43
Distribution	0.31	0.36	0.32	0.24	0.24
Marketing	0.19	0.23	0.19	0.12	0.13
ICT	0.18	0.25	0.16	0.06	0.08
Administration	0.13	0.17	0.11	0.04	0.06
Engineering	0.26	0.28	0.26	0.21	0.23
Research and Development	0.15	0.22	0.14	0.04	0.06
Other	0.04	0.04	0.03	0.01	0.04
Observations	200	116	176	67	84

*Notes:* Own calculations based on ISS survey question. Sample is derived from merging the ASI, CIP and ISS datasets provided by CSO. The summary measure in each cell is the mean value for each of the binary offshoring measures used in the analysis.

**Table 2**                    **Determinants of offshoring, average marginal effects**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign owner dummy	0.033*** (0.004)	0.032*** (0.004)	0.032*** (0.004)	0.034*** (0.004)	0.031*** (0.004)	0.031*** (0.004)	0.029*** (0.004)	0.030*** (0.004)
Domestic exporter	0.033*** (0.007)	0.029*** (0.007)	0.030*** (0.007)	0.030*** (0.007)	0.026*** (0.007)	0.026*** (0.007)	0.026*** (0.007)	0.027*** (0.006)
BMW location dummy	-0.014*** (0.002)	-0.013*** (0.002)	-0.014*** (0.002)	-0.013*** (0.002)	-0.012*** (0.002)	-0.012*** (0.002)	-0.012*** (0.002)	-0.011*** (0.002)
Size	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003** (0.001)	0.003** (0.001)
Labour productivity		0.005*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
Wage per employee			-0.002 (0.004)	-0.004 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)
ICT investment per employee				0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Website dummy					0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.003)	0.013*** (0.004)
Herfindahl index						-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)
EU12							-0.109*** (0.019)	-0.110*** (0.017)
ROE							-0.122*** (0.019)	-0.123*** (0.017)
China							-0.120*** (0.019)	-0.122*** (0.017)
India							-0.123*** (0.019)	-0.124*** (0.017)
Other Asia & Oceania							-0.124*** (0.019)	-0.126*** (0.017)
USA & Canada							-0.121*** (0.019)	-0.121*** (0.017)
South and Central America							-0.134*** (0.019)	-0.134*** (0.017)
Africa							-0.132*** (0.019)	-0.133*** (0.017)
Distribution								-0.055*** (0.008)
Marketing								-0.065*** (0.008)
ICT								-0.065*** (0.008)
Administration								-0.060*** (0.010)
Engineering								-0.052*** (0.010)
R&D								-0.064*** (0.010)
Other								-0.080*** (0.008)
Pseudo R <sup>2</sup>	0.085	0.087	0.087	0.096	0.098	0.098	0.265	0.344
N	35784	35784	35784	33840	33840	33840	33840	33840

*Notes:* The estimates were obtained with a probit estimator. Robust standard errors are shown in parentheses. \*, \*\*, \*\*\*, significant at the 10%, 5% and 1% level respectively. Dependent variable is a binary variable equal to 1 if enterprise offshores a business function to a host country and zero otherwise. 2 digit Industry dummies are included. Weights are calculated for each 2-digit NACE Rev 1.1 sector.

**Table 3 Determinants of offshoring by firm type, average marginal effects**

	All enterprises	Manufacturing	Services	Domestic-owned enterprises	Foreign-owned enterprises
	(1)	(2)	(3)	(4)	(5)
Size	0.003** (0.001)	0.015*** (0.004)	0.002* (0.001)	0.004*** (0.001)	0.006** (0.003)
Labour productivity	0.006*** (0.002)	0.001 (0.004)	0.007*** (0.002)	0.000 (0.002)	0.010*** (0.004)
Wage per employee	-0.005 (0.004)	-0.001 (0.010)	-0.005 (0.004)	-0.003 (0.004)	0.001 (0.009)
ICT investment per employee	0.001*** (0.000)	0.002 (0.001)	0.001*** (0.000)	0.001*** (0.000)	0.004*** (0.001)
Website	0.013*** (0.004)	-0.037* (0.022)	0.012*** (0.003)	0.012*** (0.005)	-0.028* (0.014)
Herfindahl index	-0.002 (0.003)	-0.014*** (0.004)	0.011* (0.007)	0.640*** (0.179)	-0.002 (0.006)
Foreign owner dummy	0.030*** (0.004)	0.000 (0.012)	0.028*** (0.004)	- -	- -
Domestic exporter dummy	0.027*** (0.006)	-0.023** (0.010)	0.025*** (0.007)	0.009*** (0.003)	- -
BMW location dummy	-0.011*** (0.002)	0.009 (0.007)	-0.014*** (0.003)	-0.014*** (0.003)	0.005 (0.007)
EU12	-0.110*** (0.017)	-0.093*** (0.033)	-0.111*** (0.018)	-0.022*** (0.003)	-0.076*** (0.011)
ROE	-0.123*** (0.017)	-0.193*** (0.023)	-0.116*** (0.018)	-0.024*** (0.003)	-0.108*** (0.012)
China	-0.122*** (0.017)	-0.150*** (0.027)	-0.119*** (0.018)	-0.028*** (0.004)	-0.100*** (0.011)
India	-0.124*** (0.017)	-0.174*** (0.029)	-0.119*** (0.018)	-0.032*** (0.004)	-0.100*** (0.011)
Other Asia & Oceania	-0.126*** (0.017)	-0.165*** (0.028)	-0.122*** (0.018)	-0.030*** (0.004)	-0.111*** (0.012)
USA & Canada	-0.121*** (0.017)	-0.164*** (0.025)	-0.117*** (0.018)	-0.028*** (0.004)	-0.087*** (0.011)
South and Central America	-0.134*** (0.017)	-0.203*** (0.023)	-0.128*** (0.019)	-0.045*** (0.007)	-0.154*** (0.015)
Africa	-0.133*** (0.017)	-0.205*** (0.023)	-0.126*** (0.018)	-0.039*** (0.005)	-0.168*** (0.018)
Distribution	-0.055*** (0.008)	-0.091*** (0.029)	-0.052*** (0.008)	-0.024*** (0.003)	-0.041*** (0.009)
Marketing	-0.065*** (0.008)	-0.148*** (0.025)	-0.058*** (0.008)	-0.027*** (0.003)	-0.044*** (0.012)
ICT	-0.065*** (0.008)	-0.150*** (0.027)	-0.057*** (0.008)	-0.026*** (0.004)	-0.053*** (0.011)
Administration	-0.060*** (0.010)	-0.159*** (0.025)	-0.051*** (0.010)	-0.032*** (0.004)	-0.052*** (0.012)
Engineering	-0.052*** (0.010)	-0.153*** (0.023)	-0.043*** (0.010)	-0.019*** (0.003)	-0.047*** (0.010)
R&D	-0.064*** (0.010)	-0.168*** (0.022)	-0.054*** (0.010)	-0.032*** (0.004)	-0.064*** (0.013)
Other	-0.080*** (0.008)	-0.185*** (0.021)	-0.070*** (0.008)	-0.048*** (0.006)	-0.165*** (0.019)
Pseudo R <sup>2</sup>	0.344	0.365	0.345	0.307	0.3574
N	33840	14040	19800	19224	14328

*Notes:* The estimates were obtained with a probit estimator. Robust standard errors are shown in parentheses. \*, \*\*, \*\*\*, significant at the 10%, 5% and 1% level respectively. Dependent variable is a binary variable equal to 1 if enterprise offshores a business function to a host country and zero otherwise. 2 digit industry dummies are included. Weights are calculated for each 2-digit NACE Rev 1.1 sector. The sample that the model is estimated for is denoted at the top of the column.



**Table 4 Determinants of offshoring, average marginal effects**

	Core	Distribution	Marketing	ICT	Administration	Engineering	R & D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Size	0.006 (0.005)	0.006** (0.003)	0.007*** (0.002)	0.007** (0.003)	0.008** (0.003)	-0.001 (0.003)	0.001 (0.003)
Labour productivity	0.010 (0.007)	0.022*** (0.004)	0.006* (0.003)	0.006 (0.004)	0.008 (0.005)	-0.002 (0.005)	0.006 (0.005)
Wage per employee	-0.009 (0.015)	-0.017* (0.010)	-0.010 (0.008)	-0.013 (0.011)	-0.014 (0.013)	0.011 (0.012)	-0.001 (0.013)
ICT investment per employee	0.008*** (0.002)	-0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.002* (0.001)	0.001 (0.001)	-0.000 (0.001)
Website	0.066*** (0.012)	-0.020 (0.019)	-0.008 (0.011)	0.014* (0.008)	0.012 (0.009)	0.021** (0.009)	0.016** (0.006)
Herfindahl index	-0.006 (0.017)	-0.006 (0.008)	-0.003 (0.004)	-0.003 (0.008)	-0.005 (0.007)	0.001 (0.008)	0.004 (0.006)
Foreign owner dummy	0.051*** (0.016)	0.068*** (0.015)	0.035*** (0.010)	0.041*** (0.012)	0.040*** (0.011)	0.037*** (0.011)	0.032*** (0.011)
Domestic exporter dummy	0.029 (0.020)	0.095*** (0.029)	0.026* (0.014)	0.028* (0.017)	0.047** (0.023)	0.059** (0.024)	0.039* (0.023)
BMW location dummy	-0.053*** (0.010)	-0.013** (0.006)	-0.001 (0.005)	0.007 (0.010)	0.005 (0.009)	-0.015** (0.006)	-0.013** (0.005)
EU12	-0.195*** (0.062)	-0.118*** (0.020)	-0.067*** (0.021)	-0.106*** (0.019)	-0.124*** (0.040)	-0.184*** (0.052)	-0.147*** (0.045)
ROE	-0.231*** (0.062)	-0.143*** (0.018)	-0.091*** (0.018)	-0.100*** (0.020)	-0.138*** (0.038)	-0.200*** (0.052)	-0.152*** (0.045)
China	-0.203*** (0.062)	-0.130*** (0.019)	-0.100*** (0.017)	-0.110*** (0.019)	-0.142*** (0.038)	-0.205*** (0.052)	-0.147*** (0.045)
India	-0.251*** (0.061)	-0.149*** (0.018)	-0.097*** (0.017)	-0.082*** (0.023)	-0.139*** (0.038)	-0.198*** (0.052)	-0.142*** (0.044)
Other Asia & Oceania	-0.228*** (0.062)	-0.133*** (0.019)	-0.100*** (0.017)	-	-0.146*** (0.039)	-0.210*** (0.052)	-0.147*** (0.045)
USA & Canada	-0.240*** (0.061)	-0.135*** (0.019)	-0.088*** (0.018)	-0.099*** (0.020)	-0.136*** (0.038)	-0.200*** (0.052)	-0.136*** (0.044)
South and Central America	-0.284*** (0.061)	-0.149*** (0.018)	-0.099*** (0.017)	-0.110*** (0.019)	-	-0.210*** (0.052)	-
Africa	-0.277*** (0.061)	-0.146*** (0.018)	-0.101*** (0.017)	-	-	-0.209*** (0.052)	-0.148*** (0.045)
Pseudo R <sup>2</sup>	0.298	0.471	0.342	0.296	0.441	0.431	0.504
N	4212	3996	4041	3108	3094	4077	3024

*Notes:* The estimates were obtained with a probit estimator. Robust standard errors are shown in parentheses. \*, \*\*, \*\*\*, significant at the 10%, 5% and 1% level respectively. Dependent variable is a binary variable equal to 1 if an enterprise offshores a business function (denoted at the top of the column) to a particular destination and zero otherwise. 2-digit industry dummies are included. Weights are calculated for each 2-digit NACE Rev 1.1 sector. Regressions where host country estimates are missing are due to no observations of offshoring to that destination. Due to small number of enterprises and limited variation we were unable to accurately estimate the offshoring equation for “other” business functions.

**Table 5 Determinants of offshoring in manufacturing enterprises, average marginal effects**

	Core	Distribution	Marketing	ICT	Administration	Engineering	R & D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Size	0.027 (0.018)	0.034** (0.013)	-0.005 (0.010)	0.037** (0.015)	0.013 (0.011)	0.034*** (0.013)	-0.001 (0.011)
Labour productivity	0.035** (0.015)	0.006 (0.011)	0.001 (0.010)	-0.013 (0.015)	-0.001 (0.012)	-0.035** (0.016)	-0.008 (0.010)
Wage per employee	0.053 (0.047)	0.019 (0.031)	-0.028 (0.023)	-0.027 (0.038)	-0.022 (0.027)	0.040 (0.040)	-0.032 (0.025)
ICT investment per employee	0.002 (0.004)	0.004 (0.003)	0.005 (0.003)	-0.001 (0.003)	-0.001 (0.003)	0.001 (0.003)	0.005 (0.003)
Website	-0.117 (0.090)	-0.134* (0.079)	0.002 (0.036)	- (-)	0.004 (0.034)	- (-)	-0.149 (0.102)
Herfindahl index	-0.048*** (0.015)	-0.038*** (0.012)	-0.011 (0.010)	-0.023 (0.018)	-0.012 (0.013)	-0.006 (0.012)	0.014 (0.013)
Foreign owner dummy	-0.021 (0.050)	-0.053 (0.041)	-0.032 (0.039)	0.019 (0.045)	-0.009 (0.037)	0.033 (0.030)	0.051 (0.034)
Domestic exporter dummy	-0.041 (0.047)	-0.042 (0.031)	-0.065*** (0.024)	-0.037 (0.039)	-0.027 (0.028)	0.019 (0.032)	-0.026 (0.027)
BMW location dummy	-0.016 (0.029)	0.020 (0.023)	0.027 (0.021)	0.033 (0.028)	0.036 (0.028)	0.010 (0.020)	0.007 (0.023)
EU12	-0.171*** (0.058)	-0.175*** (0.052)	-0.010 (0.129)	-0.145* (0.083)	0.083 (0.124)	-0.150** (0.061)	-0.189*** (0.039)
ROE	-0.389*** (0.073)	-0.406*** (0.042)	-0.200** (0.082)	-0.154* (0.084)	-0.124* (0.075)	-0.221*** (0.047)	-0.191*** (0.039)
China	-0.174*** (0.064)	-0.217*** (0.048)	-0.201** (0.082)	-0.158* (0.084)	-0.127* (0.075)	-0.218*** (0.047)	-0.193*** (0.039)
India	-0.433*** (0.056)	-0.408*** (0.042)	-0.189** (0.082)	0.087 (0.145)	-0.118 (0.075)	-0.226*** (0.047)	-0.184*** (0.039)
Other Asia & Oceania	-0.277*** (0.070)	-0.218*** (0.049)	-0.202** (0.082)	- (-)	-0.127* (0.076)	- (-)	-0.196*** (0.039)
USA & Canada	-0.253*** (0.066)	-0.391*** (0.048)	-0.194** (0.082)	-0.150* (0.083)	-0.124* (0.075)	-0.197*** (0.048)	-0.113** (0.048)
South and Central America	-0.441*** (0.054)	-0.411*** (0.041)	-0.203** (0.082)	-0.158* (0.084)	- (-)	- (-)	- (-)
Africa	-0.456*** (0.048)	- (-)	-0.203** (0.082)	- (-)	- (-)	-0.227*** (0.047)	- (-)
Pseudo R <sup>2</sup>	0.4008	0.6341	0.4154	0.3842	0.4161	0.3478	0.3885
N	1755	1480	1620	1190	1225	1323	938

*Notes:* The estimates were obtained with a probit estimator. Robust standard are shown in parentheses. \*, \*\*, \*\*\*, significant at the 10%, 5% and 1% level respectively. Dependent variable is a binary variable equal to 1 if a manufacturing enterprise offshores a business function (denoted at the top of the column) to particular destination and zero otherwise. 2-digit industry dummies are included. Weights are calculated for each 2-digit NACE Rev 1.1 sector. Regressions where host country estimates are missing are due to no observations of offshoring to that destination. In column (4) and (6) the website variable is not estimated as all enterprises in the respective sample have a website. Due to small number of enterprises and limited variation we were unable to accurately estimate the offshoring equation for “other” business functions.

**Table 6 Determinants of offshoring in services enterprises, average marginal effects**

	Core	Distribution	Marketing	ICT	Administration	Engineering	R & D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Size	0.003 (0.005)	0.004* (0.002)	0.010*** (0.003)	0.007* (0.004)	0.009** (0.004)	-0.003 (0.004)	0.001 (0.002)
Labour productivity	0.010 (0.008)	0.020*** (0.004)	0.010** (0.005)	0.007 (0.006)	0.011* (0.006)	0.000 (0.005)	0.005 (0.004)
Wage per employee	-0.011 (0.015)	-0.014 (0.010)	-0.011 (0.013)	-0.011 (0.014)	-0.012 (0.015)	0.009 (0.013)	0.005 (0.009)
ICT investment per employee	0.009*** (0.002)	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.003* (0.001)	0.001 (0.001)	-0.001 (0.001)
Website	0.061*** (0.012)	-0.019 (0.018)	-0.013 (0.016)	0.016 (0.011)	0.010 (0.012)	0.020** (0.009)	- -
Herfindahl index	0.065* (0.033)	0.011 (0.019)	-0.013 (0.013)	0.012 (0.022)	-0.034* (0.019)	0.020 (0.014)	-0.237 (0.432)
Foreign owner dummy	0.048*** (0.015)	0.060*** (0.014)	0.049*** (0.016)	0.060*** (0.019)	0.043*** (0.015)	0.036*** (0.011)	0.029** (0.012)
Domestic exporter dummy	0.027 (0.021)	0.084*** (0.030)	0.038* (0.021)	0.058** (0.029)	0.056* (0.031)	0.061** (0.026)	0.035 (0.022)
BMW location dummy	-0.056*** (0.011)	-0.019*** (0.004)	-0.004 (0.008)	0.011 (0.017)	-0.002 (0.012)	-0.025*** (0.007)	-0.011*** (0.003)
EU12	-0.198*** (0.067)	-0.108*** (0.020)	-0.068*** (0.018)	-0.104*** (0.018)	-0.127*** (0.036)	-0.188*** (0.056)	-0.049*** (0.016)
ROE	-0.216*** (0.067)	-0.114*** (0.019)	-0.075*** (0.017)	-0.097*** (0.019)	-0.126*** (0.036)	-0.201*** (0.055)	- -
China	-0.205*** (0.067)	-0.117*** (0.019)	- -	- -	-0.131*** (0.036)	-0.207*** (0.056)	-0.049*** (0.016)
India	-0.235*** (0.067)	-0.120*** (0.019)	-0.083*** (0.016)	-0.097*** (0.019)	-0.128*** (0.036)	-0.198*** (0.055)	-0.044*** (0.017)
Other Asia & Oceania	-0.223*** (0.067)	-0.120*** (0.019)	- -	- -	- -	-0.211*** (0.056)	-0.049*** (0.016)
USA & Canada	-0.237*** (0.066)	-0.108*** (0.020)	-0.073*** (0.017)	-0.095*** (0.019)	-0.124*** (0.036)	-0.205*** (0.056)	-0.043*** (0.017)
South and Central America	-0.269*** (0.066)	-0.120*** (0.019)	-0.085*** (0.016)	- -	- -	-0.211*** (0.056)	- -
Africa	-0.261*** (0.066)	-0.116*** (0.019)	- -	- -	- -	-0.211*** (0.056)	-0.049*** (0.016)
Pseudo R <sup>2</sup>	0.2766	0.4476	0.2876	0.3165	0.4248	0.4499	0.2452
N	2457	2331	1614	1345	1620	2340	1435

*Notes:* The estimates were obtained with a probit estimator. Robust standard are shown in parentheses. \*, \*\*, \*\*\*, significant at the 10%, 5% and 1% level respectively. Dependent variable is a binary variable equal to 1 if a service enterprise offshores a business function (denoted at the top of the column) to particular destination and zero otherwise. 2-digit industry dummies are included. Weights are calculated for each 2-digit NACE Rev 1.1 sector. Regressions where host country estimates are missing are due to no observations of offshoring to that destination. In column (7) the website variable is not estimated as all enterprises in the respective sample have a website. Due to small number of enterprises and limited variation we were unable to accurately estimate the offshoring equation for “other” business functions.

## Appendix

**Table A1: Variable Descriptions**

Variable	Description	Notes
Offshore	Dummy Variable equal to 1 if enterprise offshores a particular function to a particular country and zero otherwise	
Size	Natural log of average total employees in the enterprise	We scale the variable by dividing it by 1000 before calculating its natural log.
Labour productivity	Natural log of average turnover per employee	We scale the variable by dividing it by 100,000 before calculating its natural log.
Wage per employee	Natural log of average wage per employee	We scale the variable by dividing it by 1000 before calculating its natural log.
ICT investment per employee	Natural log of average ICT capital investment per employee. ICT is averaged over the period 2005-2006, the period for which data is only available for both service and manufacturing enterprises	We scale the variable by dividing it by 10,000 and replace zeros with 0.00001 before calculating its natural log.
HHI	Natural log of Herfindahl Index constructed at the NACE 2-digit level.	
NUTS2: BMW	Dummy variable equal to 1 if enterprise has a plant located in Border, Midland and Western NUTS2 Region and zero otherwise	
Website	Dummy variable equal to 1 if enterprise has a website in any year over the period, zero otherwise	
Foreign	Dummy variable equal to 1 if enterprise is owned by a foreign entity in any year over the period, zero otherwise	
Domestic-owned Exporter	Dummy variable equal to 1 if a domestically owned enterprise exported in any year over the period, zero otherwise	

*Notes:* Unless otherwise stated variables are based on data taken from ASI, CIP and ISS provided by CSO. Data is averaged over available observations over the period 2001-2006.

**Table A1**      **Descriptive Statistics**

	<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>Min</b>	<b>Max</b>
All enterprises	Turnover (Euro, '000)	503	115000.00	314000.00	374.42	2960000.00
	Total employees ('000)	503	0.36	0.68	0.00	9.99
	Labour Productivity ('00000)	503	3.53	8.25	0.11	91.42
	Wage per employee, ('000)	503	30.76	18.59	2.55	309.16
	ICT capital investment per employee ('0000)	479	0.07	0.14	0.00	1.15
	Exports per turnover	502	0.30	0.41	0.00	1.00
	Website dummy variable	499	0.91	0.29	0.00	1.00
	Herfindahl Index	503	0.07	0.11	0.00	0.97
	Foreign ownership dummy	503	0.43	0.49	0.00	1.00
	Domestic-owned exporter dummy	503	0.23	0.42	0.00	1.00
	NUTS2 BMW location dummy	503	0.18	0.39	0.00	1.00
Services	Turnover (Euro, '000)	303	82200.00	239000.00	374.42	2300000.00
	Total employees ('000)	303	0.38	0.82	0.00	9.99
	Labour Productivity ('00000)	303	2.94	7.10	0.11	78.73
	Wage per employee, ('000)	303	29.22	22.15	5.19	309.16
	ICT capital investment per employee ('0000)	303	0.06	0.12	0.00	0.99
	Exports per turnover	303	0.09	0.24	0.00	1.00
	Website dummy variable	303	0.86	0.34	0.00	1.00
	Herfindahl Index	303	0.03	0.08	0.00	0.57
	Foreign ownership dummy	303	0.33	0.47	0.00	1.00
	Domestic-owned exporter dummy	303	0.16	0.36	0.00	1.00
	NUTS2 BMW location dummy	303	0.12	0.33	0.00	1.00
Manufacturing	Turnover (Euro, '000)	200	164000.00	396000.00	952.00	2960000.00
	Total employees ('000)	200	0.32	0.40	0.01	3.77
	Labour Productivity ('00000)	200	4.43	9.66	0.19	91.42
	Wage per employee, ('000)	200	33.09	10.81	2.55	68.72
	ICT capital investment per employee ('0000)	200	0.08	0.16	0.00	1.15
	Exports per turnover	200	0.63	0.41	0.00	1.00
	Website dummy variable	200	0.98	0.14	0.00	1.00
	Herfindahl Index	200	0.13	0.12	0.01	0.97
	Foreign ownership dummy	200	0.58	0.49	0.00	1.00
	Domestic-owned exporter dummy	200	0.36	0.48	0.00	1.00
	NUTS2 BMW location dummy	200	0.28	0.45	0.00	1.00

*Notes:* Own calculations based on data taken from the ASI, CIP and ISS surveys provided by CSO. Data is averaged over available observations over the period 2001-2006.

**Table A2 Pairwise correlations of variables included in regressions**

	Offshore dummy variable	Total employees (‘000)	Labour Productivity (‘00000)	Wage per employee, (‘000)	ICT capital investment per employee (‘0000)	Website dummy variable	Herfindahl Index	Foreign ownership dummy	Domestic- owned exporter dummy	NUTS2 BMW location dummy
Offshore dummy variable	1									
Total employees (‘000)	0.03	1								
Labour Productivity (‘00000)	0.05	0.02	1							
Wage per employee, (‘000)	0.05	0.05	0.61	1						
ICT capital investment per employee (‘0000)	0.05	0.11	0.22	0.34	1					
Website dummy variable	0.03	0.22	0.08	0.24	0.29	1				
Herfindahl Index	0.07	0.15	0.42	0.39	0.27	0.12	1			
Foreign ownership dummy	0.08	0.27	0.24	0.26	0.15	0.20	0.40	1		
Domestic-owned exporter dummy	0.00	-0.08	0.15	0.13	0.10	0.11	0.14	-0.48	1	
NUTS2 BMW location dummy	0.01	-0.13	-0.07	-0.23	-0.01	-0.07	0.04	-0.09	0.15	1

Note: Pairwise correlations of the variables included in the regressions. In our regression analysis, we include the natural logarithm of the continuous variables.

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