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DOMESTIC EMPLOYMENT EFFECTS
OF OFFSHORING: EMPIRICAL EVIDENCE
FROM FINLAND

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ABSTRACT: This study empirically explores whether the propensity to offshore affects the total domestic employment at the firm level. The analysis is based on a Finnish weighted sample of 652 firms and screens the effect of offshoring different kinds of tasks. Two main channels of offshoring tasks are taken into account: offshore outsourcing and in-house offshoring. The main conclusion is that offshoring can significantly affect the total domestic employment but that the significance and the direction of the effect depend on which kind of offshoring is involved. Our results offer evidence that in both the manufacturing and service sectors offshore outsourcing of services has a positive effect on employment. In addition it was found that the effect of R&D offshoring on the probability to anticipate an increase of total domestic employment depends on the offshoring channel. Offshore outsourcing of R&D has a positive effect on the anticipated domestic employment, whereas in-house offshoring of R&D has a negative effect. Specific for the manufacturing sector is that offshore outsourcing of production also has a negative significant effect. A final conclusion is that only in the service sector does in-house offshoring of services have a negative effect on the probability to anticipate an increase of domestic employment. By dissecting offshoring by tasks and channels the above empirical findings contribute to a better understanding of the aggregate effects of offshoring on domestic employment.

KEYWORDS: Globalization, internationalization, outsourcing, offshoring, job loss, domestic effects, home country effects

JEL-Codes: F16 (Trade and Labor Market Interactions), F23 (Multinational Firms; International Business), L20 (Firm Objectives, Organization, and Behavior)

TIIVISTELMÄ: Tutkimus tarkastelee empiirisen aineiston avulla toimintojen ulkomaille siirtosuunnitelmien yhteyttä kotimaiseen kokonaistyöllisyyteen yrityksen tasolla. Analyysi perustuu painotettuun aineistoon, joka sisältää 652 suomalaista yritystä ja huomioi siirrettävien tehtävien toimialat. Lisäksi on otettu huomioon ulkomaille siirtojen kaksi eri väylää: yrityksen sisäinen toimintojen ulkomaille siirto sekä ulkomaille ulkoistaminen. Keskeinen tulos onkin, että toimintojen ulkomaille siirrot saattavat vaikuttaa merkittävästi kotimaiseen työllisyyteen, vaikutuksen suunnan kuitenkin riippuessa vahvasti siirtoväylästä. Tulosten mukaan palveluiden ulkomaille ulkoistaminen on positiivisesti yhteydessä kotimaan odotettuun työllisyyteen sekä palvelu- että teollisuussektorilla. Myös t&k:n ulkomaille ulkoistaminen on positiivisesti yhteydessä odotettuun kotimaiseen työllisyyteen, kun taas yritysten sisäisten siirtojen odotettiin heikentävän työllisyystilannetta kotimaassa. Teollisuussektorilla tuotannon ulkomaille ulkoistaminen heikensi odotuksia kotimaisesta työllisyystilanteesta. Lopullinen johtopäätös on, että ainoastaan palvelusektorilla yrityksen sisäisillä toimintojen ulkomaille siirroilla on negatiivinen vaikutus olettamukseen tulevaisuuden kotimaisesta työllisyydestä. Analyysissä huomataankin, että sekä siirtokanavien että toimintojen erittelyllä on tärkeä rooli, kun halutaan ymmärtää toimintojen ulkomaille siirtojen vaikutuksia kotimaiseen työllisyyteen.

AVAINSANAT: Globalisaatio, kansainvälistyminen, toimintojen siirrot ulkomaille, ulkomaille ulkoistaminen, työllisyysvaikutukset, vaikutukset kotimaahan

JEL-koodit: F16, F23, L20

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1. Introduction

Globalizing firms have been moving offshoring practices up the value chain thus affecting the location of production, service, and R&D tasks. Quite a few studies have focused on the domestic effects of offshoring in the manufacturing sector and more recently economic research has analyzed those effects for the service sector too. Overall the results obtained are not straightforward but support the view that the domestic effects of offshoring are not necessarily negative. Often different measures and different time frames are looked at, what makes the comparison between studies more difficult. In the long run the effects depend on how flexible the home country adapts to globalization. Even fewer contributions also analyzed the domestic effects of R&D offshoring (see for example Ali-Yrkkö & Deschryvere, 2008). The focus of the current contribution is on the domestic employment effects of offshoring and its aim is twofold: (1) To analyze the effects of offshoring production, service, and R&D tasks on domestic employment (anticipated increase of employment) and (2) to compare the effects of the two channels of offshoring: offshore outsourcing versus in-house offshoring.

The novelty of this contribution is that it assesses the employment effects of various offshore propensities. Offshore propensities are defined as indicator variables that have the value of one if the firm engaged in a certain kind of offshore activity and zero otherwise. Table 1 categorizes these 6 different offshoring propensities. In our analysis firms can offshore three major tasks: production, service and R&D, where the latter are indeed special service tasks. These tasks can be offshored via two main channels: in-house offshoring (via FDI) and offshore outsourcing (via subcontractors). As the terms "offshoring" and "outsourcing" are often confused, we want to make a clear distinction between them: Any task that is no longer produced within the firm (or group of firms) is outsourced. Any task no longer being conducted in the originating country is offshored.

Table 1.   The 6 offshoring propensities of firms considered in this analysis

		offshored TASKS		
		Production	Services	R&D
offshoring	Channel 1: Offshore outsourcing	1	3	5
CHANNEL	Channel 2: In-house offshoring	2	4	6

Source: authors

The main contribution of this study is to investigate separately the employment effects of the above-defined six types of offshoring and examine, if offshoring really is as homogenous as it is often presented.

The analysis is based on a cross-section of firm data collected for the Prime Minister's Office in Finland in 2006. The database contains 652 firms with at least 10 employees (both SMEs and large firms). The employment effects of offshoring will be studied separately for manufacturing and services since both sectors are expected to differ in which types of offshoring they use. In the survey firms were asked if they engaged in the above types of offshoring during the period 2001-2006. The cross-section also contains forward-looking information on the firms' employment plans (decrease, no change, increase) for the coming three years (2006-9).

The structure of the paper is as follows. Section 2 gives a brief overview of the empirical literature on the domestic employment effects of offshoring. Part 3 describes the methodology of the analysis. Section 4 summarizes the sample properties. Part 5 presents the results of our regression analysis and Section 6 concludes.

2. Literature review on the domestic effects of offshoring

In the academic literature the domestic (or "home country") employment effects of offshoring have only recently started to receive attention. The studies of Feenstra and Hanson (1996, 1999) are considered pioneers in estimating the impacts of internationalized trade on employment. In this section the most recent empirical literature examining the connections between offshoring and foreign direct investments (FDI) and domestic employment is reviewed briefly. After an overview of studies including results of general impacts of offshoring and FDI, the employment effects for production, services, and R&D, are studied in more detail.

On an economy wide level, the effects of FDI are in general found to be positive - according to Blomström, Fors and Lipsey (1997) a 1 million dollar increase in the affiliate net sales abroad adds one employee in the Swedish parent company offices. This positive connection is also supported by Klodt and Christensen (2007), whereas in an Italian study (Mariotti, Mutinelli, & Piscitello, 2003) both negative and positive employment effects are found. When internationalization is measured by the offshoring intensity, the results are even more mixed. According to Ekholm and Hakkala (2005) the employment effects depend on the educational level, as workers with basic and higher education benefit from increased internationalization. Hijzen & Swaim (2007) and Faini et al. (1999) find weakly positive interactions, whereas Geishecker (2008) argues that increased offshoring intensity has increased insecurity in the job market.

Most of the empirical results focus on the employment effects in the manufacturing sector, as it has already gone through massive structural changes along with the progress of trade liberalization. According to several results, the employment effects of offshoring are negative in the manufacturing sector (see for example Egger et al. (2007), Görg & Hanley (2005) and Strauss-Kahn (2003)). In several studies the target country has also been identified and it is noted that the destination of offshoring also influences the employment effects. According to Cadarso et al. (2008), Falk & Wolfmayr (2008), Geishecker (2006) and Hill et al. (2008), when tasks are moved to countries with lower labor costs, in particular, such as Eastern Europe or countries outside the OECD, the domestic employment effects are negative. Often the employment effects do not affect all workers equally. For example Munch (2005) and Falk & Wolfmayr note, workers with the lowest education are typically affected the most. This result is supported by Munch, who states that offshoring increases the probability of unemployment of uneducated workers, whereas for workers with higher education, the probability of job-to-job transitions increases. Nevertheless, on average the actual estimated effects are rather modest. In most of the studies it is estimated that increasing the offshoring intensity by 1% decreases the domestic employment in the manufacturing sector from 0.2 to 2% and, for example, Falk & Koebel (2002) find no negative connection at all between the offshoring intensity and domestic employment.

Baldwin (2006) argues that the global market and competition for jobs is no longer at the nationwide or industry level, but at the individual level. Offshoring in the services sector has only recently started, because the mobility of labor has increased and more importantly, communication systems have become faster, cheaper, and their availability has also improved significantly in developing countries. The results are somewhat mixed, as some of the studies focus on the employment effects of the increase of imported intermediate inputs in the services sector and fewer concentrate on the offshoring of services. According to Amiti & Wei (2005a, 2005b) there is no significant negative correlation between the offshoring of

services and the domestic employment. However, when using a more disaggregated level of industry classification, a slight negative connection is found. A very moderate negative connection is confirmed by the results of Falk & Wolfmayr (2008) and Görg & Hanley (2005). Yet several other studies connect service offshoring with positive employment effects. According to Crinò (2007), highly educated white-collar workers in the service sector, in particular, have benefitted from offshoring - according to the results, 11 out of 15 high-skill occupations have gained in terms of employment. Bachmann and Braun (2008) find that offshoring increases the stability in the service sector, as it reduces the number of job-to-job transitions. In the study of Hill et al. (2008) no employment effects are found, but offshoring of services increases the labor productivity significantly.

The empirical literature examining the employment effects of R&D offshoring is still fairly scarce. Based on a Finnish sample of 428 firm with R&D activities, Ali-Yrkkö and Deschryvere (2008) find that roughly 9.5% of the firms had R&D activities abroad in 2001-6. About 7.5% of the firms located R&D from Finland in the same period. Less than 2% internationalized R&D through in-house offshoring while almost 6% engaged in offshore outsourcing. It was found that manufacturing firms with in-house offshoring of R&D, in particular, had a lower probability to increase domestic R&D employment. But in the service sector they mainly found a significant negative effect of offshore outsourcing of R&D. Thursby & Thursby (2006) analyze the anticipated employment effects of offshoring R&D by using the results of a questionnaire answered by over 200 multinational companies. According to the results, about 85% of the respondents performed at least some of their R&D activities abroad. The companies were also asked if they anticipate a substantial change in the employment in the near future. More than 60% of the respondents expect no significant changes. The largest increases are assumed to take place in China and India, whereas in Western Europe and the USA the respondents expect to see a substantial decline in R&D employment. Also according to Huggins et al. (2007), the main destinations of R&D offshoring are in Asia - almost 75 % of the new R&D jobs were created in Asia-Pacific, whereas the main sources of R&D FDI are in North America and EU-15. The results of the study carried out by LTT-tutkimus (2007) support the figures of Thursby & Thursby. Almost 70 % of the respondent companies have increased their R&D offshoring during the past five years and even more are about to do so in the following 5 years. However, almost 80 % of the respondent companies estimate that the offshoring of R&D has not replaced domestic R&D significantly in the past five years. Over 60 % also assume that domestic R&D will not be replaced by offshoring in the near future, because only a few percent of the respondent companies expect the R&D offshoring to completely replace domestic R&D. According to Hanson et al. (2003), the domestic R&D employment is positively affected by the increase of low skilled employment in the foreign affiliates, whereas high skilled workers in the foreign affiliates are substitutes for the domestic R&D personnel.

All in all, the results are very ambiguous. Since the studies use different time frames, measures of internationalization, and levels of aggregation (country, industry, firm, plant, individual) the direct comparison of the results is difficult. However, studies using information on FDI rather than offshoring in general get generally more positive results. It is also shown that the results tend to "disappear" as the level of aggregation rises. Both of these findings strongly support the setup of this study, because we differentiate between six types of offshoring and the analysis is carried out on the firm level.

3. Methodology

The relation between labor demand and offshoring is not determined *a priori*. On the one hand, productivity may go up and, on the other, lower unit prize may fuel output (Hill et al., 2008). In order to investigate the hypothesis H1 that offshoring has a negative impact on domestic employment, we formulate a simple observable model:

$$y_{i\ 2006-2009} = \begin{cases} 1 & if \ \ y_i^* > 0 \\ 0 & if \ \ y_i^* \leq 0 \end{cases}$$

, with the measure of domestic employment $y_{i\ 2006-2009}$ equaling 1, if firm *i* anticipates an **increase** in total domestic employment in the period 2006 to 2009 or 0 if this is not the case. In studying the labor market effects of offshoring, previous econometric analyses typically chose the dependent variable to be based on real employment rather than on anticipated employment. The most frequently used dependent variables have been aggregate employment (on industry or regional level), plant level employment, or the individual job hazard rate (probability of getting unemployed). There are studies that did use the anticipated employment to screen the employment effects of offshoring but they are of a more descriptive nature (Thursby & Thursby, 2006; Statistics Denmark, 2008). The choice of our dependent variable is determined by the data availability, but it would be of interest to revise the robustness of our results by verifying the overall effect of offshoring on the real firm level employment change in the period 2006 to 2009 once the latter data are available. The advantages of using the anticipated employment change as a dependent variable are twofold. The results obtained are based on the most recent available employment data and our forward-looking dependent variable potentially reduces endogeneity problems in our cross-sectional setup. As employment protection plays a role in determining the speed at which companies react to offshoring, looking at the anticipated increase does help to minimize that concern.

The empirical latent model with latent metric $y_{i\ 2006-2009}^*$ (probability of an anticipated increase in total domestic employment in the period 2006 to 2009) becomes:

$$y_{i\ 2006-2009}^* = \beta_1 \left(offshoring\ propensity\right)_{i\ 2001-2006} + \beta_2 X_{i\ 2006} + \varepsilon_{i\ 2006} \tag{1}$$

with $\varepsilon_{i\ 2006}$ following an extreme value distribution.

The unit of analysis in the logit model described above is the firm. The right hand side of the equation contains various offshoring propensities (see figure 1) that refer to the period 2001 to 2006 and a vector X with a number of control variables that refer to the year 2006 and that have been identified in the literature as affecting employment. Before describing which explanatory variables will be included in the model it is necessary to briefly interpret the time dimensions in equation (1). The model above enables us to analyze the effects of having offshored during the period 2001 to 2006 on an anticipated increase in employment in the period 2006 to 2009. As such the lags between having offshored and planning to increase employment can vary between 1 to 8 years. Therefore, our employment effects of offshoring have to be interpreted as average effects along different firms and lags. As such the cross-sectional data are able to take into account the lagging effects of offshoring and our results should be interpreted as short to medium term effects of offshoring on employment.

Offshoring propensities can influence employment directly or indirectly and it is therefore necessary to control for some extra variables.

The most general variable that belongs to the category of offshoring propensities is the propensity to have relocated tasks (production, service, or R&D tasks) in the period 2001-2006. On a more detailed level a difference is made between the two channels by which those tasks can be offshored since offshore outsourcing propensity and in-house offshoring propensity of production, services, or R&D are taken into account. The last set of introduced variables is the in-house expansion abroad propensities (of production and R&D). The specifications will combine different offshore propensities in order to determine the robustness of their effects and the interaction effects between them.

The vector X contains a number of (available) control variables that have been identified in the literature as affecting employment. As a proxy for firm age two dummies are used to tell if a firm is either infant or old, and where the reference category is mid-age. As a proxy for firm size two dummies are used that tell if the firm is either large or small, and where the reference category is the medium sized firm. To capture information from the plant level, a dummy is used that tells if a firm has more than one establishment or not. Based on previous literature it can also be expected that offshoring influences the employment variable both directly and indirectly (via profitability and R&D intensity). Görg & Hanley (2008) found that offshoring can have a direct impact on R&D intensity and an indirect (lagged) impact on R&D intensity via profitability. Entering these three variables in our specification may possibly lead to multicollinearity and asks for a careful interpretation of those explanatory variables. Profitability is defined as return on investment and is supposed to have a positive impact on employment. R&D intensity is defined as R&D expenses as percentage of turnover and its impact is ambiguous. Nationality of the ownership has been found to be of relevance for offshoring and employment (see for example Görg et al., 2004) and therefore a foreign ownership dummy will be introduced in the specification. Since export active firms may also be more likely to offshore, a variable is used that represents the export intensity. The latter being defined as Finnish exports as percentages of turnover. Also the shares of total firm employment per educational level (high education and low education) are taken into account with the mid-education level being the reference category. A final group of variables that is included in all econometric specifications is a range of regional dummies and industry dummies, which are aimed to control for any regional and sector specific effects.

Domestic outsourcing propensities of production, services, and R&D can give information on the differences in effects between domestic and international outsourcing on the domestic employment. *A priori* it is unclear to what extent the effects will be different. To evaluate this, domestic outsourcing propensities will be introduced when testing for the robustness of the effects of the offshoring propensities in section 5.3.

Offshoring in the period 2001-6 may also affect employment sooner or later than 2006-9. Ideally one would allow for more detailed lags but this is not possible as it would require panel data. Another reason why panel data would improve our results is the possibility of isolating other firm specific effects.

Equation (1) will be run for manufacturing sector and service sector separately, because the industries are expected to behave differently (see introduction).

4. Data description and sample properties

Data description

The survey was set up as part of a project of the Prime Minister's Office in Finland[1]. The target population consists of firms with at least 10 employees in manufacturing and private services. The stratified random sample and associated weights were determined in association with the Statistic Finland's Register of Enterprises and Establishments, which has the statutory duty to maintain a complete and continuous record of all businesses in the country. The questionnaire, strata, and other details can be found in the appendix. The computer-aided telephone interviews were carried out in summer 2006 (with some retrospective and forward-looking questions) and it yielded 652 usable observations; the response rate was 40%. Unless otherwise mentioned, all results reported in this paper employ the sampling weights. As with any general firm population, the sample also includes foreign-owned companies and subsidiaries with parent companies abroad.

Sample properties

Unless mentioned differently, all results in the remaining analysis take into account the weights of the stratified sample. Table 2 tabulates the means of selected sample variables by main industry (manufacturing versus services). The last column reports the statistical significance of the difference between the means (a two-sided t-test without assuming equal variances across the two groups). The first block in the table lists variables that describe the anticipated change of firm employment. As described in the previous section '*planning to increase the firm's total employment in Finland*' will be used as the main dependent variable in the multivariate analysis. The second group of variables in the table lists all explanatory variables of the analysis that give information on offshoring practices of the firms. Next to the offshoring intensity, different offshore propensities are listed. Offshore intensity[2] is defined as the level of engagement in offshoring whereas the propensities are defined as indicator variables that have the value of one if the firm is engaged in offshoring and zero otherwise. Average offshore propensities give information on what share of the firms' offshored at least some tasks abroad. The survey enables us to know which firms offshored which tasks (production, services, or R&D) in the period 2001-6. In addition the analyzed database contains information on which channels firms used to offshore those tasks: offshore outsourcing and/or in-house offshoring (see figure 1). The third and last block in Table 2 lists the control variables of our multivariate analysis and offers information on characteristics of the firm, region, and industry.

In 2006 roughly half of the firms (49.2%) anticipated an increase in employment in Finland in the period 2006-9. The share of firms that anticipated a decrease in employment is clearly lower (12.3 %). These strong figures must be interpreted in the context of robust economic growth (Statistics Finland reports the real GDP growth at market prices to be 4.9% in 2006). The share of manufacturing firms (16%) that anticipated a decrease in employment is higher than that of the service sector (10.6%). However, the differences in anticipated employment changes between the manufacturing and service sectors turn out to be statistically insignificant.

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[1] Some properties of the data, as well as some basic results, are reported in Secretariat of the Economic Council, 2006.

[2] Off-shoring intensity is the ratio of the 2001-6 off-shored man-years to the 2003 employment in Finland.

Table 2. Descriptive statistics

	All sectors Mean	S.D.	Manufacturing Mean	Services Mean	Signif.
Planning to increase the firm's total employment in Finland	49.2 %	3.9 %	47.6 %	49.9 %	
Planning to decrease the firm's total employment in Finland	12.3 %	2.6 %	16.0 %	10.6 %	
Planning not to change the firm's total employment in Finland	38.6 %	3.9 %	36.5 %	39.5 %	
Firm: Offshoring propensity	6.7 %	2.0 %	4.8 %	7.6 %	
Firm: Offshoring intensity	0.8 %	0.4 %	2.1 %	0.2 %	'
Firm: Offshoring intensity (conditional on offshore intensity > 0)	14.4 %	n.a.	37.7 %	3.5 %	n.a.
Firm: Domestic outsourcing of production	10.9 %	1.8 %	29.8 %	2.2% (a)	***
Firm: Relocated production from Finland	5.3 %	1.1 %	15.6 %	0.6% (a)	***
(1) Offshore outsourcing of production	4.2 %	1.0 %	12.5 %	0.5% (a)	***
(2) In-house offshoring of production	1.6 %	0.5 %	5.0 %	0.1% (a)	***
Firm: In-house expansion of production abroad	2.1 %	0.5 %	6.1 %	0.3% (a)	***
Firm: Domestic outsourcing of services	59.9 %	3.8 %	52.0 %	63.5 %	+
Firm: Relocated services from Finland	6.0 %	1.9 %	2.1 %	7.8 %	**
(3) Offshore outsourcing of services	2.3 %	0.8 %	1.2 %	2.7 %	'
(4) In-house offshoring of services	4.6 %	1.8 %	1.2 %	6.2 %	*
Firm: Domestic outsourcing of R&D (b)	8.8 %	1.7 %	16.5 %	5.2 %	***
Firm: Relocated R&D from Finland (b)	2.9 %	0.8 %	6.3 %	1.4 %	**
(5) Offshore outsourcing of R&D (b)	2.3 %	0.6 %	4.5 %	1.3 %	*
(6) In-house offshoring of R&D (b)	0.8 %	0.5 %	2.0 %	0.2 %	
Firm: In-house expansion of R&D abroad (b)	1.2 %	0.5 %	3.4 %	0.3 %	**
Firm: Age (years)	16.6	0.9	19.0	15.5	*
Firm: Infant	31.4 %	3.6 %	28.0 %	32.9 %	
Firm: Mid-Age (Reference)	35.9 %	3.8 %	31.2 %	38.0 %	
Firm: Old	32.7 %	3.7 %	40.8 %	29.0 %	*
Firm: Size (Finnish empl.)	121.5	13.7	125.2	119.7	
Firm: Small	72.2 %	2.5 %	68.1 %	74.0 %	'
Firm: Mid-size (Reference)	20.0 %	2.3 %	23.6 %	18.4 %	'
Firm: Large	7.8 %	1.3 %	8.3 %	7.6 %	
Firm: Multi-establishment	34.8 %	3.6 %	27.7 %	38.0 %	+
Firm: Profitability (ROI)	10.6 %	2.4 %	9.1 %	11.3 %	
Firm: Foreign owner	11.8 %	2.4 %	7.8 %	13.5 %	+
Firm: Export intensity	9.4 %	1.0 %	18.2 %	5.4 %	***
Firm: Employment abroad intensity	1.8 %	0.3 %	3.8 %	0.8 %	***
Firm: R&D propensity	40.6 %	3.3 %	65.2 %	29.4 %	***
Firm: R&D intensity	1.8 %	0.3 %	2.1 %	1.7 %	
Firm: High educ. empl. sh.	14.4 %	2.0 %	5.2 %	18.8 %	***
Firm: Med. educ. empl. sh., (Reference) (c)	24.6 %	2.4 %	13.4 %	30.0 %	***
Firm: Low educ. empl. sh.	61.0 %	2.8 %	81.4 %	51.2 %	***
Firm: Missing educ. sh.	6.9 %	2.0 %	3.6 %	8.5 %	+
Region: Metropolitan area (Reference) (d)	23.2 %	3.1 %	8.6 %	29.8 %	***
Region: North	7.8 %	2.3 %	6.2 %	8.6 %	
Region: South	19.6 %	3.3 %	24.5 %	17.4 %	
Region: East	11.6 %	2.8 %	10.7 %	12.0 %	
Region: West	37.7 %	3.7 %	50.0 %	32.2 %	**
Industry: Foods, textiles, apparel (15-19)	6.4 %	1.4 %	20.5 %	.	***
Industry: Wood, pulp, paper (20-21)	3.5 %	1.0 %	11.0 %	.	***
Industry: Chemicals (23-25)	2.4 %	0.8 %	7.6 %	.	***
Industry: Metals (27-28)	7.9 %	1.5 %	25.3 %	.	***
Industry: Machinery, equip. (29, 34-35)	4.9 %	1.1 %	15.7 %	.	***
Industry: Electronics, electr. eq. (30-33)	2.0 %	0.6 %	6.2 %	.	***
Industry Other manuf.(22, 26, 36-37) (e)	4.3 %	1.1 %	13.6 %	.	***
Industry: Trade (50-52)	26.4 %	3.4 %	.	38.4 %	***
Industry: Transportation (60-64, ex. 642)	10.1 %	2.7 %	.	14.6 %	***
Industry: Knowledge intensive business services (KIBS)	15.7 %	1.5 %	.	22.8 %	***
Industry: Other services (55, 65-74, ex. KIBS) (f)	16.6 %	3.2 %	.	24.1 %	***
Number of sample observations	652		349	303	

(a) Service firms can have production activities as the industry categorization of firms is based on their main activity; (b) Not all firms in the sample have R&D expenses and table A.2. lists the propensities to outsource and off-shore R&D conditional on having R&D expenses. (c) Mid-education level is the reference level of education. (d) Greater Helsinki Metropolitan area is the reference area, it includes Helsinki, Espoo, and Vantaa; (e) Other manufacturing is the reference category for the manufacturing sample; (f) Other services is the reference category for the non-manufacturing; The Numbers (1) to (6) correspond to the 6 kinds of off-shore propensities in figure 1. Statistical significance: *** p<0.01, ** p<0.05, * p<0.10, + p<0.15, ' p<0.20.

Looking at the means of the offshore variables reveals that relatively few firms have offshored tasks during the years 2001-6 (6.7% of the firms). The mean of the offshored employment is limited and represents less than 1% of the total employment in Finland. However, conditional on having offshored tasks, this mean becomes 14.4 %. Service firms do offshore relatively more often (7.6%) than manufacturing firms (4.8%) but the difference is not statistically significant. The offshore intensity of manufacturing firms is significantly higher than that of service firms. Conditional on having an offshore intensity greater than zero, the average offshore intensity of manufacturing reaches a whopping share of 36.5% compared to the 3.5% for service firms.

Of the manufacturing firms 15.6% offshored production, 6.3% R&D, and 2.1% services (other than R&D). Of the service firms 7.8% offshored services, while 1.4% offshored R&D. The observation that service firms also offshored some production tasks is explained by the fact that the categorization of sectors is based on the main activity of the firms. Table 2 also numbers and lists the averages of the six types of offshoring described previously in Table 1. The means in the manufacturing sectors show that not only offshore outsourcing of production but also of R&D is two to three times more common than in-house offshoring (12.5% versus 5% for production and 4.5% versus 2% for R&D). Due to the strategic character of R&D tasks one would expect in-house offshoring of R&D to be more important than offshore outsourcing of R&D (cf. Deschryvere and Ali-Yrkkö, 2008). However, our data seems to suggest that most of the offshored R&D tasks do not have a strategic position as they are channeled abroad via offshore outsourcing. The importance of offshoring modes of service tasks in manufacturing sector is evenly divided (1.2%) but contrary to what is seen in the manufacturing sector, in the service sector the in-house offshoring channel is three times more important than the offshore outsourcing channel (6.2% versus 2.7%). Relocating R&D in the service sector happens mainly via offshore outsourcing (1.3%) and very rarely uses in-house offshoring (0.2%). Along with the information on relocating activities, the survey results contain information on the in-house expansion of production and R&D abroad. In the manufacturing sector in-house expansion abroad in the period 2001-6 has been undertaken by 6.1% of the firms for production tasks and by 3.4% for R&D tasks. The in-house expansion abroad of R&D in the service sector has been very limited since only 0.3% of the firms were involved. It is worth checking both the employment effects of relocating tasks and the employment effects of the expansion of tasks abroad. Domestic employment is not only affected by relocation of employment but also increasingly by the growth of those firms' employment abroad. This is also true in the case of start-ups that plan to go global in the very first stages of their existence. In the latter case the transition in the firm's organization by relocation is skipped and expansion abroad occurs right away.

When screening outsourcing and offshoring propensities of the period 2001-6 it is found that the average offshoring propensities are much lower than domestic outsource propensities of tasks. Looking at the gap between these propensities can provide extra information about domestic outsource-ability and offshore-ability of tasks. The size of that gap varies by the task involved:

- Production tasks: In the manufacturing sector the offshore propensity (15.6%) is roughly half of the domestic outsourcing propensity (29.8%).
- Service tasks (except R&D tasks): 6% of the firms have offshored services but ten times that share (59.9%) have domestically outsourced services. Domestic outsourcing of services is very common, but as a significant share of services requires closeness to the client, the gap with the offshore propensity is huge.

o <u>R&D tasks</u>: Almost 3% of firms have offshored R&D while three time more firms (9%) had (a part of) their R&D domestically outsourced. A similar ratio of one-to- three shows up when only the firms with R&D expenses are retained (7.4% versus 22.6%; see table A.2.).

The third block of table 2 lists other characteristics of the weighted sample and underlines the fact that on average the manufacturing and service sectors differ significantly in age, export intensity, employment abroad intensity, R&D propensity, and in their employment shares per education level. Compared to manufacturing firms, service firms are on average younger, they have lower export intensity, employment abroad intensity, and R&D propensity, but they also have a higher share of employees with a university or a college degree.

Table A.4 shows the propensities to combine the offshoring of different tasks like production, services, and R&D. The table reveals that the only combination that is relatively well spread is the offshoring of production and R&D tasks. Roughly 5% of the manufacturing firms have offshored both production and R&D tasks in the 2001-6 period. The used channel for that was mostly offshore outsourcing (2.85%) and to a lesser extent in-house offshoring (1.84%).

Having described the sample characteristics, the next section will tackle the domestic employment effects of offshoring tasks in a multivariate context.

5. Econometric results

In order to investigate the relation between offshoring and the domestic employment we now turn to the estimation of equation (1). The results of various specifications are reported per industry. We first discuss the results for the manufacturing sector and then for the service sector. The reasons to interpret the results with care are threefold: (1) The amount of firms that offshore tasks is fairly limited what makes our results being based on a limited amount of observations; (2) The setup of our model with a forward looking employment variable and lagging explanatory offshoring propensities may reduce but not eliminate endogeneity problems; and (3) Estimated effects of certain variables may be prone to multicollinearity.

5.1. Manufacturing sector

The specifications of equation (1) for the manufacturing sector are listed in Table 3. The different specifications focus on different kinds of offshoring (see figure 1) and always include a list of control variables described in section 3. All tables with the estimation results of our logit model list the marginal effects (ME's) in order to facilitate interpretation.

The baseline regression in column (a) takes into account the propensity of having relocated production from Finland during the period 2001-6. Results show that - on a firm level - having relocated production does have a negative significant effect (ME -0.33) on the probability to anticipate an increase in total employment in Finland (at 1% level). The marginal effect of our explanatory dummy variable has to be interpreted as the difference between the probabilities to anticipate an increase in domestic employment of a "typical" firm that relocated production and of the "typical" firm who didn't relocate production[3]. Column (b) shows that the latter negative effect significantly (at 5% level) operates via the offshore outsourcing channel (ME -0.31). The effect of in-house offshoring is negative but not significant. Next to the relocation of production via offshore outsourcing, also the in-house expansion of production abroad has a significant negative effect (ME -0.23) on our employment variable (at 5% significance level). This result underlines that pressure on the domestic labor market can not only be influenced by the relocation of tasks as such, but also by pure employment growth in foreign affiliates (see also Kenney & Dossani, 2005).

We now take a closer look at the employment effects of offshoring R&D tasks. Column (c) shows that having relocated R&D tasks does not have a significant effect on the probability to anticipate an increase in total domestic employment. However, when separate channels of offshoring are taken into account it is found that offshore outsourcing of R&D has a positive significant (at 10% level) effect (ME 0.21) and in-house offshoring of R&D has a negative significant (at 1% level) effect (ME -0.40) on the employment variable. A further result suggests that the propensity of in-house expansion of R&D abroad does not have a significant effect on the total employment.

A third group of tasks that can be offshored by the manufacturing sector are service tasks. Column (e) points out that having relocated service tasks does not have a significant impact on the anticipated increase in domestic employment. Taking into account the channels of offshoring reveals that offshore outsourcing of services does have a significant (at 5% level) positive effect (ME +0.28) on the probability to anticipate an increase in employment in Finland.

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[3] Typical firm refers to the fact that to calculate the marginal effect of the relocated production dummy all other variables in the regression are set to some fixed values, either mean values (continues variables) or modal values (dummy variables).

Table 3. Estimation results for the manufacturing sector: the effects of offshoring on (the anticipated INCREASE of) employment in the home country

Dependent variable in logit model: Planning to INCREASE total employment in Finland in the next three years;
Sample of manufacturing sector; Table lists the marginal effects

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
Relocated production from Finland (d)	-0.333 ***						-0.379 ***	-0.344 ***	-0.389 ***					
Offshore outsourcing of production (d)		-0.308 **									-0.363 ***	-0.308 **	-0.363 ***	
In-house offshoring of production (d)		-0.003									0.075	-0.036	0.045	
In-house expansion of production abroad (d)		-0.23 **									-0.186 +	-0.224 **	-0.177 +	
Relocated R&D from Finland (d)			0.016				0.233 *		0.233 *	0.014				
Offshore outsourcing of R&D (d)				0.208 *							0.337 ***		0.338 ***	0.209 *
In-house offshoring of R&D (d)				-0.396 ***							-0.39 ***		-0.389 ***	-0.394 ***
In-house expansion of R&D abroad (d)				-0.017							0.035		0.016	-0.042
Relocated services from Finland (d)					0.062			0.215 +	0.22 *	0.061				
Offshore outsourcing of services (d)						0.282 **						0.32 **	0.319 **	0.305 **
In-house offshoring of services (d)						-0.134						-0.035	-0.048	-0.066
Infant (d)	-0.237 *	-0.251 **	-0.218 *	-0.195 +	-0.218 *	-0.221 *	-0.242 **	-0.239 *	-0.244 **	-0.218 *	-0.234 *	-0.253 **	-0.237 *	-0.197 *
Old (d)	-0.285 **	-0.298 **	-0.296 **	-0.284 **	-0.297 **	-0.294 **	-0.278 **	-0.288 **	-0.281 **	-0.297 **	-0.277 **	-0.296 **	-0.276 **	-0.282 **
Small (d)	-0.008	-0.011	-0.043	-0.015	-0.04	-0.041	-0.007	0.001	0.001	-0.04	0.023	-0.006	0.028	-0.012
Large (d)	-0.028	0.02	-0.091	-0.087	-0.092	-0.104	-0.042	-0.039	-0.054	-0.093	-0.006	0.006	-0.02	-0.101
Multi-establishment (d)	-0.111	-0.112	-0.148 +	-0.143 +	-0.151 +	-0.151 +	-0.099	-0.116	-0.105	-0.15 +	-0.097	-0.117	-0.102	-0.148 +
Profitability (ROI)	0.422	0.43	0.472	0.396	0.468	0.456	0.388	0.406	0.373	0.467	0.341	0.398	0.312	0.373
Foreign owner (d)	0.169 +	0.167 +	0.161 +	0.148 '	0.159 +	0.158 +	0.157 '	0.164 +	0.152 '	0.158 '	0.136	0.161 '	0.127	0.14
Export intensity	0.062	0.077	-0.017	-0.03	-0.018	-0.022	0.066	0.057	0.062	-0.019	0.076	0.067	0.066	-0.038
R&D intensity	2.07	2.011	1.231	0.976	1.253	1.201	2.075	2.146	2.144 '	1.247	1.781	2.008	1.786	0.967
High educ. empl. sh.	0.71	0.738	0.688	0.671	0.684	0.7	0.721	0.706	0.716	0.684	0.723	0.74 '	0.732	0.684
Low educ. empl. sh.	0.897 **	0.889 **	0.779 *	0.79 *	0.778 *	0.787 *	0.906 **	0.904 **	0.914 **	0.777 *	0.898 **	0.896 **	0.905 **	0.794 *
Firm: Missing educ. sh. (d)	0.318	0.303	0.273	0.268	0.274	0.282	0.317	0.326	0.325	0.274	0.286	0.314	0.299	0.277
North (d)	0.102	0.084	0.125	0.107	0.124	0.122	0.105	0.098	0.101	0.125	0.063	0.081	0.06	0.102
South (d)	-0.106	-0.11	-0.1	-0.115	-0.101	-0.107	-0.096	-0.107	-0.096	-0.101	-0.119	-0.115	-0.125	-0.123
East (d)	-0.148	-0.16	-0.118	-0.132	-0.119	-0.126	-0.139	-0.149	-0.14	-0.118	-0.163	-0.166	-0.17	-0.14
West (d)	0.027	0.015	-0.001	-0.006	-0.002	-0.013	0.029	0.025	0.027	-0.002	0.005	0.003	-0.008	-0.02
Foods, textiles, apparel (d)	0.025	0.036	0.068	0.067	0.07	0.081	0.038	0.031	0.045	0.071	0.05	0.052	0.067	0.085
Wood, pulp, paper (d)	0.107	0.116	0.119	0.138	0.12	0.126	0.121	0.112	0.127	0.12	0.15	0.125	0.16	0.149
Chemicals (d)	0.263	0.263	0.25	0.264	0.25	0.267	0.281 '	0.267	0.284 '	0.25	0.291 '	0.281 '	0.309 +	0.283 '
Metals (d)	0.346 **	0.349 **	0.351 **	0.36 **	0.352 **	0.361 **	0.362 **	0.352 **	0.368 **	0.353 **	0.375 **	0.361 **	0.388 **	0.374 **
Machinery, equip. (d)	0.188	0.178	0.088	0.105	0.092	0.106	0.196	0.201	0.207	0.092	0.203	0.199	0.225	0.126
Electronics, electr. eq. (d)	0.032	0.015	-0.073	0.066	-0.066	-0.052	0.018	0.048	0.032	-0.069	0.127	0.043	0.156	0.091
Observations	349	349	349	349	349	349	349	349	349	349	349	349	349	349
Adjusted Wald test (Model)	2.629 ***	2.311 ***	2.048 ***	2.168 ***	2.007 ***	1.996 ***	2.604 ***	2.509 ***	2.487 ***	1.961 ***	2.37 ***	2.196 ***	2.271 ***	2.099 ***
Goodness-of-fit (F-adjusted test statistic of A&L)	0.802	1.417	0.888	5.042	1.251	3.395	1.355	0.762	1.602	0.917	2.015	2.136	1.460	5.686

Notes: Mid-age is the reference category of age; Mid-size is the reference category of size; Mid-education level is the reference level of education; Greater Helsinki Metropolitan area is the reference area, it includes Helsinki, Espoo, and Vantaa; other manufacturing is the reference industry. Statistical significance: *** p<0.01, ** p<0.05, * p<0.10, + p<0.15, ' p<0.20. (d) dy/dx is for discrete change of dummy variable from 0 to 1.
A&L: for more information on this test see Archer & Lemeshow (2006).

Although the magnitude of the effects described can vary if the specification takes in to account the offshoring propensities of more than one of the above task categories (production, R&D, services), the direction and significance of the effects stay in line with the above findings. Columns (g) to (j) list the results of different combinations of relocation propensities whereas columns (k) to (n) list the regression results for the combinations of the propensities to use different offshore channels.

Summarizing the significant effects in the manufacturing sector we find that both offshore outsourcing of production and in-house offshoring of R&D have a negative impact on the probability to anticipate an increase in the total domestic firm employment. On the contrary, both offshore outsourcing of R&D and services turned out to have a positive impact. Next to relocation of tasks, in-house expansion of production also has a significant negative impact. Based on our manufacturing sample it can be concluded that on a firm level the offshore-propensities of production, R&D, and service tasks have different impacts on employment. In addition to which task is concerned, the offshore channel also seems to influence the effects on domestic employment.

5.2. Service sector

Turning to the service sector means looking at the effects of two groups of tasks (services and R&D) instead of three, as production tasks do not apply here. As expected, the effects studied in the service sector do (partly) vary from those in the manufacturing sector. The effects of the service and manufacturing sector are in line when the offshore outsourcing channel is concerned, but do vary considerably when looking at the in-house offshoring channel.

Column (a) in Table 4 shows that the significant negative impact of relocating services captures two opposite offshoring channel effects. In-house offshoring of services has a significant (1% level) negative effect (ME -0.5) whereas in-house offshoring of services has a significant (10% level) positive effect (ME +0.34). Column (c) reveals that the R&D relocation effect is not statistically significant. However, looking at the different offshoring channels in column (d) does show a significant positive effect (ME 0.5) for the offshore outsourcing propensity of R&D and a significant negative effect (ME -0.41) for the in-house offshoring propensity of R&D (both at a 1% level). In addition, a significant negative effect of '*in-house expansion of R&D abroad*' is found (ME -0.42). Column (f) shows that the negative effect of in-house offshoring of R&D becomes insignificant and very small if in-house offshoring of services is included in the specification. This can be explained by the fact that most firms that in-house offshored R&D also in-house offshored other services.

Altogether, the significant effects of the internationalization of services and R&D in the service sector are found to differ from those in the manufacturing sector in three ways: (1) In-house offshoring of services does have a significant negative impact in the service sector; (2) In-house offshoring of R&D does not have a robust significant impact in the service sector, and (3) In-house expansion of R&D abroad does have a significant negative impact. Comparing the magnitude of the effects shows that the effects in the service sector are higher than those in the manufacturing sector. In addition to testing the impact of offshore propensities by listing different specifications in Tables 3 and 4, the next section will test the robustness of the results above by taking into account some additional information.

Table 4.   Estimation results for the service sector: the effects of offshoring on (the anticipated INCREASE of) domestic employment

Dependent variable in logit model: Planning to INCREASE total employment in Finland in the next three years;
Sample of service sector; Table lists the marginal effects

	(a)	(b)	(c)	(d)	(e)	(f)
Relocated services from Finland (d)	-0.404 ***				-0.404 ***	
Offshore outsourcing of services (d)		0.344 *				0.342 *
In-house offshoring of services (d)		-0.5 ***				-0.5 ***
Relocated R&D from Finland (d)			0.163		0.152	
Offshore outsourcing of R&D (d)				0.346 ***		0.347 ***
In-house offshoring of R&D (d)				-0.411 ***		-0.098
In-house expansion of R&D abroad (d)				-0.421 ***		-0.413 ***
Infant (d)	-0.183	-0.164	-0.071	-0.07	-0.185	-0.163
Old (d)	-0.043	-0.042	0.021	0.021	-0.043	-0.04
Small (d)	-0.392 ***	-0.42 ***	-0.372 ***	-0.376 ***	-0.391 ***	-0.423 ***
Large (d)	0.207 +	0.157	0.193 '	0.19 '	0.202 '	0.153
Multi-establishment (d)	-0.05	-0.063	-0.053	-0.052	-0.053	-0.066
Profitability (ROI)	-0.077	-0.067	-0.071	-0.07	-0.077	-0.065
Foreign owner (d)	-0.051	-0.059	-0.184	-0.184	-0.05	-0.058
Export intensity	-0.016	0.001	-0.078	-0.055	-0.018	0.014
R&D intensity	0.904	0.283	0.453	0.803	0.837	0.327
High educ. empl. sh.	1.114 ***	1.071 ***	0.972 ***	0.968 ***	1.115 ***	1.072 ***
Low educ. empl. sh.	0.271	0.27	0.206	0.222	0.273	0.282
Firm: Missing educ. sh. (d)	0.153	0.19	-0.017	-0.001	0.157	0.199
North (d)	-0.118	-0.112	-0.11	-0.101	-0.118	-0.109
South (d)	-0.462 ***	-0.462 ***	-0.446 ***	-0.452 ***	-0.463 ***	-0.467 ***
East (d)	-0.141	-0.144	-0.133	-0.129	-0.142	-0.142
West (d)	0.025	0.035	-0.002	-0.006	0.026	0.034
Trade (d)	0.393 ***	0.398 ***	0.341 **	0.343 **	0.393 ***	0.4 ***
Transportation (d)	0.109	0.116	0.057	0.054	0.108	0.114
KIBS (d)	0.381 ***	0.345 **	0.331 **	0.332 **	0.38 ***	0.344 **
Observations	303	303	303	303	303	303
Adjusted Wald test (Model)	3.512 ***	3.773 ***	3.389 ***	3.185 ***	3.366 ***	3.368 ***
Goodness-of-fit (F-adjusted test statistic of A&L)	53.175	25.573	10.903	10.639	52.774	24.366

Notes: Mid-age is the reference category of age; Mid-size is the reference category of size; Mid-education level is the reference level of education; Greater Helsinki Metropolitan are is the reference area, it includes Helsinki, Espoo, and Vantaa; other services is the reference industry. Statistical significance: *** $p<0.01$, ** $p<0.05$, * $p<0.10$, + $p<0.15$, ' $p<0.20$. (d) dy/dx isfor discrete change of dummy variable from 0 to 1. A&L: for more information on this test see Archer & Lemeshow (2006).

5.3. Robustness tests

- Test 1: Take into account domestic outsourcing of production, services and R&D.

If the model does not take into account domestic outsourcing it may be misspecified. Table A.3 indeed shows that the domestic outsourcing variables and offshore outsourcing variables can correlate substantially (up to 0.62). Not taking into account domestic outsourcing would lead to a biased coefficient of the offshore outsourcing variables. Tables A.5-6 repeat the specifications of tables 3-4, but they do take into account the available domestic outsourcing propensities. The main results turn out to be robust for the manufacturing sector. In addition, it is found that 'the domestic outsourcing of services propensity' has a significant (5% level) positive effect (ME: +0.22 in column (e) of table A.5) on domestic outsourcing where as the domestic outsourcing propensities of production and R&D turn out to be insignificant. The main results are also robust for the service sector. However, adding domestic outsourcing dummies does cause a reduction in the significance level of the offshore outsourcing propensity of R&D (from 1% to a 10% level). In the service sector, the domestic outsourcing propensities of both R&D and services are found to be negative but statistically insignificant. Overall, the results turn out to be robust but the magnitude of the effects must be interpreted with care because of the multicollinearity described above.

- Test 2: Anticipated decrease of employment

Equation (1) can capture the effect of different offshore propensities on the probability to increase total employment in Finland. The equation allows for finding what we call weak evidence for our hypothesis H_1. In the short to medium term relocating tasks abroad may naturally not lead to increasing employment and, therefore, finding statistically significant negative effects of offshoring on the probability to anticipate an increase in domestic employment should be interpreted with care. In addition to running equation number (1) it, therefore, seems optimal to run a second equation with the same characteristics, except that it has a different dependent variable $z^*_{i\,2006-2009}$ representing the probability of an anticipated decrease in total domestic employment.

$$z^*_{i\,2006-2009} = \beta_1 \left(offshoring\ propensity \right)_{i\,2001-2006} + \beta_2 X_{i\,2006} + \varepsilon_{i\,2006} \qquad (2)$$

Finding the positive significant effects of the offshore propensities on the probability of an anticipated decrease in domestic employment, would deliver strong evidence for our hypothesis H_1. Looking at the results (not reported) of running equation (2) shows that only two effects turn out to be significant and in line with those of equation (1). For the manufacturing sector '*offshore-outsourcing of services*' has a negative effect on the probability to decrease employment and for the service sector it is the in-house offshoring of services that has a negative effect. As a limited number of firms were planning to decrease employment, results should be interpreted with care.

6. Conclusions

The offshoring practices of multinational firms have an impact on the domestic labor market. However, in the literature the effects of offshoring on domestic employment are ambiguous. The results can often not be directly compared since studies typically use different time frames, measures of internationalization and levels of aggregation. Still two main conclusions can be drawn: (1) studies that employ information on FDI rather than offshoring in general get more positive results, and (2) results tend to become weaker as the level of aggregation rises. Both conclusions support the set up of this study as we analyze the domestic employment effects of offshoring at the firm level and differentiate between 6 types of offshoring. In this setup a firm can offshore three types of tasks (production, services, R&D) and use two offshoring channels (offshore outsourcing via subcontractors or in-house offshoring via FDI).

Based on a Finnish sample of 652 firms in year 2006 with at least 10 employees, it was found that roughly half of the firms anticipated an increase in employment in Finland in 2006-2009 while about 12% expected a decrease. When looking at the occurrence of the six types of offshoring, it was found that in the manufacturing sector offshore outsourcing of production and R&D tasks is two to three times more common than in-house offshoring. Both offshoring channels have the same importance for service tasks. The opposite effects were found for the service sector, because the in-house offshoring channel is three times more important than the offshore outsourcing channel. Relocating R&D in the service sector happens mainly via offshore outsourcing and very rarely uses in-house offshoring.

Table 5. Summary of the effects of offshoring on domestic employment

	Manufacturing sector			Service sector	
TASKS:	Production	Services	R&D	Services	R&D
Offshore outsourcing channel	(-)	(+)	(+)	(+)	(+)
In-house offshoring channel	not sign.	not sign.	(-)	(-)	not sign.
In-house expansion abroad	(-)	n.a.	not sign.	n.a.	(-)

Notes: (-): Negative significant effect of the offshore propensity on the probability to anticipate an increase in employment.
 (+): Positive significant effect of the offshore propensity on the probability to anticipate an increase in employment.
Not sign. stands for statistically non-significant effect, n.a. stands for not available.

The results of a logit-model explaining the probability of an anticipated increase in domestic employment with different offshore propensities and a list of control variables show that on a firm level the offshore propensities of production, R&D, and service tasks have different impacts on employment (see Table 5). In addition to which task is concerned the offshoring channel also seems to influence the effects on domestic employment. A final finding is that the results do partly differ between the manufacturing and service sectors. Both offshore outsourcing of production and in-house offshoring of R&D have a significant negative impact on employment for the manufacturing sector. Whereas both offshore outsourcing of R&D and services do have a significant positive impact. Looking at the significant effects of the internationalization of services and R&D in the service sector reveals three differences with those in the manufacturing sector. Firstly, in-house offshoring of services does have a significant negative impact in the service sector. Secondly, in-house offshoring of R&D does not have a robust significant impact and thirdly, in-house expansion of R&D does have a significant negative impact. Comparing the magnitude of the effects reveals slightly higher effects for the service sector. The estimation results were found to be robust when domestic

outsourcing variables were taken into account. Looking at the effects of offshoring on an anticipated decrease of employment leaves us with two significant effects in line with the findings above. For the manufacturing sector '*offshore outsourcing of services*' has a negative effect while for the service sector it is '*in-house offshoring of services*' that has a negative effect. The most important reason why the results should be interpreted with care is the limited number of observations.

The main contribution of this empirical analysis is that it differentiates between the offshored tasks and the offshoring channel. In sum, it seems that only certain types of offshoring lead to increased employment while others do not. Our understanding of aggregated domestic employment effects of offshoring can be improved when this heterogeneity of offshoring is better taken into account.

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Appendix: Description of the survey

The field evidence for the study comes from a Finnish cross-sectional survey carried out by ETLA, the Research Institute of the Finnish Economy. The survey was nationwide and the target population consisted of firms with at least 10 employees in manufacturing and private services[4]. The stratified random sampling without replacement or clustering was used as a sampling technique (see Cochran, 1977, Chapter 5). There were nine strata in the sample, determined by the industry and size of firms. It was decided to include all large firms (with at least 250 employees) in all focused sectors in the sample, and in other strata comprehensive random samples were drawn. The stratified random sample and associated weights were determined in association with Statistic Finland's Register of Enterprises and Establishments, which has the statutory duty to maintain a complete and continuous record of all businesses in the country. Table A.1 describes the strata and the execution of the survey in more detail.

The questionnaire was initially designed and data collected as part of the project conducted for the Prime Minister's Office in Finland to study the challenges of globalization (some properties of the data, as well as some basic results are also reported in Secretariat of the Economic Council, 2006). The respondents of the survey represented the companies' top management. The core questions in the survey asked respondents about their firms' international activities and views on Finland as their host country.

The survey focused, in particular, on domestic and offshore outsourcing and in-house offshoring conducted by companies in the new millennium, and on their motivating factors. The survey was conducted by computer assisted telephone interviews. The interviews were completed between 9 June and 24 August 2006, and were carried out by Tietoykkönen Oy, which specializes in research and marketing information services, fieldwork, and statistical data analysis and has over 15 years experience in the field. Its specifically trained staff regularly carries out similar surveys for the Bank of Finland, various ministries, and other clients. The number of completed interviews was 653, with a response rate of 40%.

The (un-weighted) number of global staff in the respondent companies at the end of 2005 was 625,000. In Finland, these companies had 375,000 employees (un-weighted), which accounted for a quarter of the staff in the Finnish business sector, and 44% of the domestic employment in the target population firms in 2005.

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[4] NACE Rev. 1.1 codes 15–37, 50–74. "Private services" is a short name for industries not dominated by public provision.

Table A.1. How the survey was carried out.

A. Number of firms in the target population in June 2006

| | Firm size category (# of employees) | | | |
	Small 10-49 empl.	Medium 50-249 empl.	Large at least 250 empl.	Total
Manufacturing (15-37)	2,832	870	244	3,946
Services 1 (50-71)	5,369	726	213	6,308
Services 2 (72-74)	1,784	364	70	2,218
Total	9,985	1,960	527	12,472

B. Number of firms in the random sample to be interviewed

| | Firm size category (# of employees) | | | |
	Small 10-49 empl.	Medium 50-249 empl.	Large at least 250 empl.	Total
Manufacturing (15-37)	200	400	244	844
Services 1 (50-71)	150	200	213	563
Services 2 (72-74)	150	200	70	420
Total	500	800	527	1,827

C. Number of contacts reached during the interviewed period

| | Firm size category (# of employees) | | | |
	Small 10-49 empl.	Medium 50-249 empl.	Large at least 250 empl.	Total
Manufacturing (15-37)	192	364	213	769
Services 1 (50-71)	139	185	184	508
Services 2 (72-74)	134	180	59	373
Total	465	729	456	1,650

D. Number of completed interviews

| | Firm size category (# of employees) | | | |
	Small 10-49 empl.	Medium 50-249 empl.	Large at least 250 empl.	Total
Manufacturing (15-37)	51	162	137	350
Services 1 (50-71)	41	53	86	180
Services 2 (72-74)	33	64	26	123
Total	125	279	249	653

Notes: NACE Rev. 1.1 Industry codes are in parentheses. Data for determining the strata were acquired from the Statistics Finland's register of Enterprises and Establishments

Table A.2. Propensities to outsource and offshore R&D, conditional on having R&D expenses

	All sectors Mean	S.D.	Manufacturing Mean	Services Mean	Signif.
Domestic outsourcing of R&D	22.6 %	4.3 %	26.2 %	18.9 %	
Relocated R&D from Finland	7.4 %	2.0 %	9.9 %	4.9 %	
Offshore outsourcing of R&D	5.8 %	1.7 %	7.0 %	4.5 %	
In-house offshoring of R&D	2.0 %	1.2 %	3.2 %	0.7 %	
In-house expansion of R&D abroad	3.1 %	1.2 %	5.3 %	0.8 %	*
Number of sample observations	428		284	144	

(a) Statistical significance: *** p<0.01, ** p<0.05, * p<0.10, + p<0.15, ' p<0.20.

Table A.3.1. Correlation between relocation variables

Manufacturing (sample of 349 firms)	Temp	Tempd	OP	OI	RProduction	RServices	RR&D
Planning to increase the firm's total employment in Finland (Temp)	100 %						
Planning to decrease the firm's total employment in Finland (Tempd)	-45.70 %	100.00 %					
Offshoring propensity (OP)	-6.27 %	13.46 %	100 %				
Offshoring intensity (OI)	-8.56 %	5.58 %	47.10 %	100 %			
Relocated production from Finland (RProduction)	-8.09 %	7.97 %	42.22 %	39.01 %	100 %		
Relocated services from Finland (Rservices)	-1.67 %	15.15 %	46.29 %	22.65 %	27.04 %	100 %	
Relocated R&D from Finland (RR&D)	-0.51 %	2.87 %	11.62 %	12.43 %	36.67 %	18.96 %	100 %

Services (sample of 303 firms)	Temp	Tempd	OP	OI	RProduction	RServices	RR&D
Planning to increase the firm's total employment in Finland (Temp)	100 %						
Planning to decrease the firm's total employment in Finland (Tempd)	-45.14 %	100.00 %					
Offshoring propensity (OP)	-5.24 %	-1.47 %	100 %				
Offshoring intensity (OI)	6.33 %	-2.20 %	33.27 %	100 %			
Relocated production from Finland (RProduction)	-10.22 %	6.10 %	10.53 %	28.53 %	100 %		
Relocated services from Finland (Rservices)	-4.56 %	1.19 %	88.23 %	38.41 %	16.46 %	100 %	
Relocated R&D from Finland (RR&D)	7.40 %	-4.12 %	4.64 %	14.00 %	12.63 %	19.40 %	100 %

Table A.3.2. Correlation between detailed outsourcing and offshoring variables

Manufacturing (sample of 349 firms)	Temp	Oproduction	Iproduction	Eproduction	DOP	Oservices	Iservices	DOS	OR&D	IR&D	ER&D	DOR&D
Planning to increase the firm's total employment in Finland (Temp)	100.00 %											
Offshore outsourcing of production (Oproduction)	-2.10 %	100.00 %										
In-house offshoring of production (Iproduction)	-9.99 %	37.20 %	100.00 %									
In-house expansion of production abroad (Eproduction)	-15.59 %	24.82 %	48.29 %	100.00 %								
Domestic outsourcing of production (DOP)	12.30 %	43.57 %	6.04 %	12.85 %	100.00 %							
Offshore outsourcing of services (Oservices)	2.76 %	14.45 %	23.74 %	16.19 %	10.07 %	100.00 %						
In-house offshoring of services (Iservices)	-2.93 %	13.20 %	26.23 %	18.55 %	1.17 %	25.86 %	100.00 %					
Domestic outsourcing of services (DOS)	4.15 %	21.15 %	7.69 %	11.26 %	23.60 %	9.02 %	4.46 %	100.00 %				
Offshore outsourcing of R&D (OR&D)	1.45 %	32.63 %	21.84 %	14.66 %	6.42 %	16.40 %	22.66 %	3.86 %	100.00 %			
In-house offshoring of R&D (IR&D)	-6.12 %	15.75 %	30.07 %	22.50 %	0.53 %	18.04 %	35.25 %	1.79 %	14.42 %	100.00 %		
In-house expansion of R&D abroad (ER&D)	-6.24 %	21.62 %	38.02 %	43.81 %	7.94 %	24.02 %	21.52 %	10.49 %	17.09 %	45.41 %	100.00 %	
Domestic outsourcing of R&D (DOR&D)	2.47 %	28.49 %	21.71 %	15.43 %	14.65 %	17.63 %	7.24 %	12.13 %	53.28 %	-2.26 %	8.15 %	100.00 %

Services (sample of 303 firms)	Temp	Oproduction	Iproduction	Eproduction	DOP	Oservices	Iservices	DOS	OR&D	IR&D	ER&D	DOR&D
Planning to increase the firm's total employment in Finland (Temp)	100.00 %											
Offshore outsourcing of production (Oproduction)	-8.30 %	100.00 %										
In-house offshoring of production (Iproduction)	-5.84 %	-1.42 %	100.00 %									
In-house expansion of production abroad (Eproduction)	-8.74 %	19.11 %	57.25 %	100.00 %								
Domestic outsourcing of production (DOP)	-8.25 %	76.94 %	16.81 %	46.42 %	100.00 %							
Offshore outsourcing of services (Oservices)	-4.89 %	-2.89 %	15.06 %	27.30 %	15.19 %	100.00 %						
In-house offshoring of services (Iservices)	-4.83 %	6.09 %	24.91 %	20.86 %	18.08 %	43.61 %	100.00 %					
Domestic outsourcing of services (DOS)	-8.01 %	4.76 %	-0.21 %	1.82 %	4.87 %	10.42 %	12.06 %	100.00 %				
Offshore outsourcing of R&D (OR&D)	8.58 %	7.68 %	13.08 %	10.69 %	12.82 %	3.17 %	12.92 %	6.02 %	100.00 %			
In-house offshoring of R&D (IR&D)	-2.79 %	-1.64 %	-1.16 %	-1.34 %	-2.14 %	12.48 %	32.79 %	8.00 %	24.02 %	100.00 %		
In-house expansion of R&D abroad (ER&D)	-3.43 %	14.98 %	22.50 %	39.87 %	23.89 %	9.26 %	25.64 %	4.76 %	29.52 %	39.87 %	100.00 %	
Domestic outsourcing of R&D (DOR&D)	3.74 %	9.42 %	6.63 %	4.69 %	10.35 %	8.23 %	11.54 %	10.13 %	62.15 %	22.56 %	16.74 %	100.00 %

Table A.4. Descriptive statistics: shares of firms that combine offshoring of production, services and R&D

	Manufacturing Mean	Services Mean
Production and R&D		
Relocated production and R&D from Finland	4.83 %	n.a.
Offshore outsourcing of production and R&D	2.85 %	n.a.
In-house offshoring of production and R&D	1.84 %	n.a.
Production and services		
Relocated production and services from Finland	1.33 %	n.a.
Offshore outsourcing of production and services	0.37 %	n.a.
In-house offshoring of production and services	0.78 %	n.a.
Services and R&D		
Relocated services and R&D from Finland	0.46 %	0.19 %
Offshore outsourcing of services and R&D	0.27 %	0.03 %
In-house offshoring of services and R&D	0.23 %	0.13 %
Production, services and R&D		
Relocated production, services and R&D from Finland	0.37 %	n.a.
Offshore outsourcing of production, services and R&D	0.23 %	n.a.
In-house offshoring of production, services and R&D	0.14 %	n.a.

Table A.5   Estimation results for the manufacturing sector; Specification with domestic outsourcing dummies; The effects of offshoring on (the anticipated INCREASE of) employment in the home-country

Dependent variable in logit model: Planning to INCREASE total employment in Finland in the next three years;
Sample of manufacturing sector; Specification with domestic outsourcing dummies; Table lists the marginal effects

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
Domestic outsourcing of production (d)	0.06	0.075					0.098	-0.049	-0.016		0.1	-0.023	0.003	
Relocated production from Finland (d)	-0.353 ***						-0.414 ***	-0.445 ***	-0.507 ***					
Offshore outsourcing of production (d)		-0.344 ***									-0.403 ***	-0.444 ***	-0.494 ***	
In-house offshoring of production (d)		0.016									0.103	0.055	0.119	
In-house expansion of production abroad (d)		-0.235 **									-0.172 +	-0.247 **	-0.194	
Domestic outsourcing of R&D (d)			-0.09	-0.199 +			-0.122		-0.216 *	-0.157	-0.203 *		-0.279 **	-0.255 *
Relocated R&D from Finland (d)			0.053				0.303 **		0.424 ***	0.11				
Offshore outsourcing of R&D (d)				0.334 ***							0.443 ***		0.507 ***	0.373 ***
In-house offshoring of R&D (d)				-0.415 ***							-0.408 ***		-0.379 ***	-0.393 ***
In-house expansion of R&D abroad (d)				-0.047							-0.006		-0.028	-0.095
Domestic outsourcing of services (d)					0.226 **	0.228 **		0.34 ***	0.377 ***	0.245 **		0.349 ***	0.376 ***	0.241 **
Relocated services from Finland (d)					0.058			0.269 **	0.299 **	0.061				
Offshore outsourcing of services (d)						0.295 **						0.331 ***	0.378 ***	0.346 ***
In-house offshoring of services (d)						-0.172						-0.08	-0.149	-0.14
Infant (d)	-0.24 **	-0.258 **	-0.225 *	-0.201 *	-0.234 **	-0.237 **	-0.256 **	-0.278 **	-0.308 ***	-0.249 **	-0.25 **	-0.3 ***	-0.309 ***	-0.232 **
Old (d)	-0.28 **	-0.293 **	-0.289 **	-0.264 **	-0.324 ***	-0.321 ***	-0.261 **	-0.331 ***	-0.312 ***	-0.314 ***	-0.25 *	-0.343 ***	-0.3 **	-0.287 **
Small (d)	-0.011	-0.014	-0.047	-0.014	-0.016	-0.018	-0.017	0.06	0.059	-0.022	0.02	0.061	0.096	0.009
Large (d)	-0.029	0.02	-0.089	-0.081	-0.112	-0.127 '	-0.045	-0.052	-0.091	-0.117	-0.007	0.002	-0.04	-0.125
Multi-establishment (d)	-0.114	-0.116	-0.13 '	-0.101	-0.154 +	-0.155 +	-0.081	-0.096	-0.039	-0.119	-0.064	-0.098	-0.022	-0.092
Profitability (ROI)	0.413	0.422	0.51	0.454	0.561	0.551	0.423	0.515	0.594	0.643 '	0.385	0.522	0.564	0.589
Foreign owner (d)	0.177 +	0.174 +	0.152 '	0.125	0.193 *	0.193 *	0.158 '	0.216 *	0.187 +	0.176 +	0.126	0.224 *	0.155	0.144
Export intensity	0.048	0.065	-0.014	-0.028	-0.03	-0.035	0.051	0.108	0.118	-0.03	0.06	0.126	0.129	-0.049
R&D intensity	1.949	1.914	1.431	1.411	1.363	1.293	2.128 '	2.736 +	3.243 *	1.742	2.051	2.738 '	3.308 *	1.724
High educ. empl. sh.	0.768 '	0.812 '	0.66	0.586	0.755	0.778	0.778 '	0.833 '	0.812 '	0.713	0.733	0.91 '	0.818	0.679
Low educ. empl. sh.	0.939 **	0.944 **	0.764 *	0.759 *	0.901 **	0.915 **	0.955 **	1.125 ***	1.169 ***	0.89 *	0.929 **	1.152 ***	1.161 **	0.896 *
Firm: Missing educ. sh. (d)	0.351 '	0.342	0.255	0.223	0.337	0.347 '	0.35	0.396 *	0.393 +	0.317	0.297	0.408 *	0.381 '	0.306
North (d)	0.089	0.065	0.128	0.106	0.152	0.15	0.094	0.157	0.185	0.164	0.049	0.133	0.145	0.142
South (d)	-0.108	-0.113	-0.096	-0.114	-0.119	-0.126	-0.093	-0.125	-0.114	-0.112	-0.12	-0.139	-0.149	-0.138
East (d)	-0.15	-0.164	-0.107	-0.114	-0.142	-0.151	-0.128	-0.183	-0.162	-0.124	-0.145	-0.204	-0.189	-0.141
West (d)	0.014	-0.002	0.008	0.011	-0.031	-0.043	0.022	0.011	0.031	-0.015	0.002	-0.022	-0.006	-0.021
Foods, textiles, apparel (d)	0.01	0.019	0.071	0.073	0.159	0.172	0.022	0.172	0.203	0.174	0.041	0.195	0.228	0.188
Wood, pulp, paper (d)	0.1	0.108	0.126	0.16	0.124	0.131	0.113	0.131	0.142	0.14	0.153	0.138	0.172	0.179
Chemicals (d)	0.243	0.239	0.248	0.266	0.307 *	0.325 *	0.248	0.382 ***	0.399 ***	0.31 *	0.264	0.389 ***	0.417 ***	0.341 **
Metals (d)	0.344 **	0.347 **	0.353 **	0.367 **	0.404 ***	0.414 ***	0.363 **	0.445 ***	0.478 ***	0.414 ***	0.382 **	0.459 ***	0.502 ***	0.438 ***
Machinery, equip. (d)	0.178	0.17	0.095	0.123	0.142	0.156	0.19	0.337 **	0.365 **	0.155	0.21	0.343 **	0.394 **	0.202
Electronics, electr. eq. (d)	0.035	0.01	-0.052	0.168	-0.025	-0.01	0.054	0.135	0.199	0.012	0.216	0.111	0.334 +	0.23
Observations	349	349	349	349	349	349	349	349	349	349	349	349	349	349
Adjusted Wald test (Model)	2.538 ***	2.201 ***	1.999 ***	2.176 ***	2.057 ***	2.029 ***	2.571 ***	3.376 ***	3.543 ***	1.855 ***	2.39 ***	2.948 ***	3.315 ***	1.9 ***
Goodness-of-fit (F-adjusted test statistic of A&L)	0.463	1.390	3.862	1.999	0.490	0.529	1.615	4.974	4.815	2.567	1.883	12.903	4.325	1.175

Notes: Mid-age is the reference category of age; Mid-size is the reference category of size; Mid-education level is the reference level of education; Greater Helsinki Metropolitan area is the reference area, it includes Helsinki, Espoo, and Vantaa; other manufacturing is the reference industry. Statistical significance: *** p<0.01, ** p<0.05, * p<0.10, + p<0.15, ' p<0.20. (d) dy/dx is for discrete change of dummy variable from 0 to 1.
A&L: for more information on this test see Archer & Lemeshow (2006).

Table A.6.   Estimation results for the service sector; Specification with domestic outsourcing dummies; The effects of offshoring on (the anticipated INCREASE of) domestic employment

Dependent variable in logit model: Planning to INCREASE total employment in Finland in the next three years;
Sample of service sector; Specification with domestic outsourcing dummies; Table lists the marginal effects

	(a)	(b)	(c)	(d)	(e)	(f)
Domestic outsourcing of services (d)	-0.09	-0.103			-0.091	-0.108
Relocated services from Finland (d)	-0.394 ***				-0.395 ***	
Offshore outsourcing of services (d)		0.356 **				0.356 **
In-house offshoring of services (d)		-0.499 ***				-0.499 ***
Domestic outsourcing of R&D (d)			-0.023	-0.039	0.006	-0.01
Relocated R&D from Finland (d)			0.182		0.167	
Offshore outsourcing of R&D (d)				0.364 *		0.365 *
In-house offshoring of R&D (d)				-0.41 ***		-0.079
In-house expansion of R&D abroad (d)				-0.424 ***		-0.425 ***
Infant (d)	-0.192	-0.173	-0.07	-0.067	-0.194	-0.171
Old (d)	-0.046	-0.046	0.021	0.021	-0.045	-0.044
Small (d)	-0.38 ***	-0.409 ***	-0.375 ***	-0.381 ***	-0.378 ***	-0.413 ***
Large (d)	0.233 +	0.186	0.191 '	0.187 '	0.228 +	0.183
Multi-establishment (d)	-0.045	-0.055	-0.055	-0.055	-0.047	-0.06
Profitability (ROI)	-0.084	-0.074	-0.071	-0.069	-0.083	-0.073
Foreign owner (d)	-0.05	-0.061	-0.185	-0.186	-0.048	-0.061
Export intensity	-0.029	-0.008	-0.078	-0.055	-0.032	0.005
R&D intensity	1.047	0.368	0.462	0.825	0.965	0.402
High educ. empl. sh.	1.13 ***	1.087 ***	0.976 ***	0.975 ***	1.13 ***	1.09 ***
Low educ. empl. sh.	0.288	0.287	0.208	0.225	0.29	0.3 '
Firm: Missing educ. sh. (d)	0.161	0.198	-0.017	-0.001	0.165	0.208
North (d)	-0.086	-0.075	-0.109	-0.1	-0.085	-0.07
South (d)	-0.449 ***	-0.447 ***	-0.444 ***	-0.449 ***	-0.45 ***	-0.451 ***
East (d)	-0.128	-0.129	-0.132	-0.128	-0.129	-0.126
West (d)	0.018	0.026	0	-0.003	0.017	0.025
Trade (d)	0.394 ***	0.401 ***	0.341 **	0.342 **	0.395 ***	0.403 ***
Transportation (d)	0.08	0.085	0.055	0.051	0.079	0.081
KIBS (d)	0.38 ***	0.344 **	0.329 **	0.329 **	0.38 ***	0.343 ***
Observations	303	303	303	303	303	303
Adjusted Wald test (Model)	3.292 ***	3.497 ***	3.275 ***	3.101 ***	3.018 ***	3.018 ***
Goodness-of-fit (F-adjusted test statistic of A&L)	82.830	17.746	10.977	10.278	122.258	16.024

Notes: Mid-age is the reference category of age; Mid-size is the reference category of size; Mid-education level is the reference level of education; Greater Helsinki Metropolitan are is the reference area, it includes Helsinki, Espoo, and Vantaa; other services is the reference industry. Statistical significance: *** p<0.01, ** p<0.05, * p<0.10, + p<0.15, ' p<0.20. (d) dy/dx isfor discrete change of dummy variable from 0 to 1. A&L: for more information on this test see Archer & Lemeshow (2006).

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