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Does offshoring affect industry employment? Evidence from a wide European panel of countries*

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Abstract. This paper contributes to the literature on the possible impact of international outsourcing on domestic labour markets. We focus on offshoring-employment relationship. The analysis is performed for a wide European panel, composed of 27 EU countries and 13 manufacturing sectors, observed in the period 1995-2009. Thanks to the use of input-output tables from the WIOD project, we measure the intensity of offshoring in the sectors, as well as its decomposition into the domestic and foreign components. Theoretical background for our analysis is rooted in recent trade-in-tasks models of international trade. Our empirical results, based on the estimation of panel data model, suggest that indeed domestic employment in EU manufacturing can be pushed down by increased offshoring. More specifically, low skill workers are the ones to be affected the most because of shrinking labour demand at home.

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INTRODUCTION

The pattern of international trade has changed substantially in the recent decades. Many tasks, especially those which are relatively low demanding in terms of skills and rather repetitive (so called 'routine tasks' – see Grossman and Rossi-Hansberg, 2008) have been moved abroad in order to exploit cost advantage of foreign countries and/or cross-country productivity differentials. It is estimated that nowadays more than half of the world's manufacturing imports are intermediate goods (primary goods, parts and components, and semi-

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finished products), and more than 70% of the world's services imports are intermediate services (OECD, 2013) so the effects of cross-border disintegration of production[1] cannot be ignored by the researchers.

At the same time, many labour markets in developed countries have been experiencing rapid changes concerning changing labour demand and/or wage structure (falling demand for less skill workers, a rise in wage inequality – documented by, among others: Feenstra and Hanson, 1999; Feenstra, 2000, Feenstra, 2010, Acemoglu and Autor, 2011).

Given these tendencies, a common fear expressed by employees and policy makers, mainly from the developed countries, was the following: how do trade opening and offshoring to low wage countries affect employment (and wages) in the countries from which the tasks are moved (offshored)? Threats of negative impact of international outsourcing, especially in terms of cross-border labour substitution (and/or lowering wages) of the low skilled workers at home, have become a policy issue and an important theme in applied - policy oriented research debate. (OECD, 2007; WTO&ILO, 2007, 2011; WTO, 2008, 2013). Political worries started to dominate the debate on possibly 'worrying' implications of trade integration with less developed countries (eg. a paper by A. Wood entitled "How trade hurt unskilled workers", JEP, 1995 or Blinder's, 2006 estimates of 30-40% of all U.S. manufacturing jobs being potentially offshorable). Since then offshoring undoubtedly has been one of the leading research themes in international economics underlying its significant role in the global economy (surveyed in: OECD, 2007; Feenstra 2010).

Yet, there are still some research gaps to be fulfilled. New possibilities in empirical analysis have emerged as a result of a new release of world input-output tables (WIOD). It is now possible to go beyond country-level studies (see Crinò, 2009 for a survey on the first wave of related empirical studies). We now dispose of comparable input-output statistics needed for the calculation of precise offshoring measures and obtaining a match between outsourcing and labour market data for many countries.

In this paper we focus on trends observable in European countries. The effects of offshoring can be exhibited on wages, even though its impact might be actually smaller than conventionally perceived (see Parteka and Wolszczak-Derlacz, 2015 for recent EU-focused evidence). Countries differ in labour market institutions, so it can happen that in economies with rigid wages, the impact of offshoring on domestic labour markets might actually pass through the effect on employment rather than on wages. In order to analyse this issue, in this paper we deal with the effects of offshoring on employment in EU27 sample (1995-2009).

Hence, the main objective of this paper is to answer the following research question: does offshoring of tasks from European countries affect their employment levels? Moreover, we are interested to test if effects of offshoring on employment differ across distinct groups of workers (divided according to the skill level). In particular, can offshoring be blamed for shrinking labour demand for only these workers whose activities are offshored (typically performing low/medium skill intensive tasks)?

The rest of the paper is structured as follows. In Section 2 we provide a brief literature review. Section 3 presents the theoretical background for our empirical analysis. It is based on the data described in Section 4. In Section 5 we try to answer the key question: is there any effect of offshoring on employment in EU manufacturing industries? In order to address this issue we estimate an empirical model based on augmented labour demand function. Finally, section 6 concludes.

[1] In order to avoid confusion between various terms describing this phenomenon, throughout the paper we use the following definitions. *Outsourcing* means licensing of activities to an unaffiliated supplier. It can be either domestic (domestic outsourcing) or foreign (international outsourcing). *Offshoring* is defined as: "geographic separation of activities involved in producing a good (or service) across two or more countries" (Feenstra and Hanson, 2001, p.1).

Our empirical results, based on the estimation of panel data model, suggest that indeed domestic employment can be affected by growth in offshoring. More specifically, low skill workers are the ones to be affected the most because of shrinking labour demand at home.

LITERATURE REVIEW

The literature on international outsourcing-labour market interactions started to gain ground in international economic literature in 1980s and 1990s when the researchers noticed the rising importance of international production networks, global disintegration of production process and resulting changes in global structure of trade (an increase of trade in parts and components – its first wave is well documented in Arndt and Kierzkowski, 2001). To give an example, it is documented (Feenstra and Jensen, 2012) that the share of imported inputs in total use of intermediates in the US manufacturing increased from approx.. 6% in 1980 to over 27% in 2009, when intermediate inputs already accounted for two thirds of world trade (Acemoglu et al., 2012, p.1).

Since then many studies and analysis in the field of international economics have dealt with the interaction between the increasing importance of offshoring on employment or earnings (see Acemoglu and Autor, 2011, Crinò, 2009 or Görg, 2011 for a review). Offshoring involves moving parts of production abroad, often from more developed countries (called the "North" or "the West") to less developed ones ("the South" or "the East") which affects skill composition of labour demand and relative wages (see, among others: Katz and Margo, 2014 Consequently, many papers expressed fears on negative labour market effects of such global production sharing, experienced by advanced economies (eg. Feenstra and Hanson, 1996; Deardorff, 2001). Import competition with countries such as China has been perceived as a threat to local labour markets (eg, the US – Autor et al, 2013). Given the focus of our paper, we shall focus here on the evidence concerning the effects of offshoring on employment and/or papers using similar sector level data as we do.

On the empirical ground, there seems to be an agreement among scholars that a rise in employment in favor of the high skilled in some developed countries such as U.S. or the U.K. has been the result of an outward shift in relative skilled labour demand (Bound and Johnson, 1992; Katz and Murphy, 1992; Autor *et al.*, 2008). Among the determinants of such a shift, many studies pointed out the role played by so-called skill biased technological change (SBTS, eg. Acemoglu, 2002; Acemoglu et al., 2012). However, other influential papers argue that it is indeed trade in intermediate inputs and material offshoring that matters for domestic labour markets (among others: Feenstra and Hanson, 1999, 2001).

Studies on negative relationships between trade and domestic employment include (among others): Sachs et al. (1994), Freeman and Katz (1991), Revenga (1992), Bernard, Jensen and Schott (2006) or Federico (2014). Görg (2011) in his summarizing discussion on the effects of globalization and offshoring on jobs in developed countries concludes that offshoring may indeed lead to higher job turnover in the short run. However, he argues that in the long run, there is no sign that trade or offshoring leads to higher unemployment (or lower employment) overall, even though employment of low-skilled workers may be affected.

Sector level data (mainly coming from EU KLEMS – of which WIOD is a substantial extension[2]) has been used by other researchers, but there is still a wide research gap to fulfill. Lo Turco and Parteka (2011), Michaels et al. (2014), Polgár and Wörz (2010), Wolszczak-Derlacz (2013) all focused on trade-labour interactions but without looking explicitly into the outsourcing practices.

[2] EU KLEMS project did not provide input-output data and was much more limited in time, country and sectoral coverage.

Among the recent analysis performed with the use of WIOD data, few papers deal explicitly with offshoring - labour market nexus[3]. Schwörer (2013) analyse (mainly in a descriptive manner) offshoring and domestic outsourcing practise only in nine European countries between 1995 and 2008. Additionally he concludes that estimated establishment's productivity gains are driven in particular by gains of multinational firms. Foster-McGregor et al. (2013) adopt a fairly standard approach and estimate translog cost function to check the impact of offshoring on the cost shares of workers with different skills. They found that the largest impacts have been observed for medium-skilled workers. Timmer et al. (2013) use WIOD's data to calculate a new concept based on the value added that countries contribute to the production of final manufacturing goods, called 'global value chain (GVC) income. Finally, in the recent study, Parteka and Wolszczak-Derlacz (2015) analyse the impact of offshoring on wages (specifically on the wage growth and wage convergence) in manufacturing sectors from the EU27 sample of countries. Interestingly, it is found that even though offshoring is associated with the decline in the growth of wages of less skilled workers, the magnitude of this effect is small and economically negligible. The set of countries and sectors employed in this paper is the same as in Parteka and Wolszczak-Derlacz (2015) study on offshoring-wage nexus, so the two studies can be treated as complements.

THEORETICAL BACKGROUND

Recent theoretical literature which explains how international fragmentation of production may affect labour markets, and the structure of employment in particular, is built upon the so-called 'new-new trade theory' and the Melitz model (see the extensive review on heterogeneous firms and trade in: Melitz and Redding, 2014).

As the theoretical background for our analysis we shall use the model of production fragmentation (conceptualized in terms of tradable tasks) proposed within this stream by Grossman and Rossi-Hansberg (2008, from now on GRH, 2008). Before their work, theoretical models dealing with offshoring - labour markets nexus emphasized mainly the effects of changing labour demand on wages. Consequently, low skilled labour from developed countries had been seen to be a loser from trade integration process, mainly because of the effect on trade-induced demand shift and changes in the relative wages of the low skilled and rising wage inequality (Wood, 1995; Autor et al, 2008; Feenstra, 2000; Feenstra and Hanson, 1996).

GRH (2008) propose less conventional approach and decompose the impact of offshoring into three effects: productivity effect, relative price effect, and labor supply effect. The interplay between these effects creates the net result which is not necessarily negative for the domestic market (from which some of the tasks are offshored elsewhere in the world).

GRH (2008) approach can be summarized as follows. They deal with domestic (home) and foreign (abroad) labour force composed of workers with different skills. Production process is conceptualized in terms of tradable tasks that can be undertaken at home or abroad – mainly in order to take advantage of lower foreign wages. Different tasks can be performed by low skilled workers ("ls tasks") and by high skilled workers ("hs tasks"). Offshoring usually involves performing low-skill tasks abroad, as they can be moved abroad easily. However, it is connected with some additional costs. The cost of offshoring varies with the nature of tasks (tasks easily offshorable versus tasks which are difficult to be offshored), and the marginal task performed at home has to balance the offshoring costs.

[3] Most of the papers prepared within WIOD project (www.wiod.org) present a selected theme (eg. supply chain trade, price of services, value added content of trade, energy intensities).

Originally GRH (2008) focus on the effect of offshoring on wages. When the technology of offshoring improves, the cost of performing the set of low-skill tasks abroad declines. Consequently, domestic low-skill labour focuses now on tasks characterised by greater productivity (because less demanding low-skill tasks with lower productivity have been offshored). It means that on average the productivity of tasks performed at home increases. What is the effect on wages at home? Wages are tied to average productivity, so its rise results in increasing wages of low skilled workers at home. In other words, the model highlights the case where offshoring increases the wage of workers whose jobs are offshored. GRH (2008) demonstrate that such an effect is plausible, even though it is contrary to the common view that offshoring necessarily pushes down domestic low skilled wages.

Hence, the productivity effect can be summarized as follows: productivity rising due to offshoring puts an upward pressure on wages of the low-skilled. However, in GRH (2008) framework there is also another parallel effect: because of the drop in the costs of production due to offshoring, the relative price of low-skilled labour intensive good should drop, harming the wages of domestic low-skilled workers (relative price effect). On top of that, as the domestic demand for some low-skilled workers falls because of more intense offshoring activity, their wages also fall (labor supply effect).

The net result of offshoring depends on the interplay between these three aforementioned forces. GRH (2008) show that domestic low skilled workers can either loose or gain as a result of offshoring – the net effect is ambiguous. Analogous reasoning can be performed for high-skilled workers or any other type of labour. The novelty of GRH (2008) approach lies in stressing the importance of the productivity effect that paradoxically benefits these workers whose tasks are easily offshored. Consequently, offshoring of tasks can generate shared gains for all domestic factors, in contrast to the traditional view of the mechanism linked strictly to labour supply effect.

Recently, Wright (2014) has extended the GRH (2008) wage-focused model to conceptualise the impact of offshoring on employment. He decomposes the demand for labor into three channels. A negative displacement effect leads to a direct decline in the demand for employment at home (firms move tasks overseas). However, there is also an output effect which can affect the domestic employment positively – it is connected with productivity gains from offshoring and higher aggregate production. Finally, Wright (2014) describes a substitution effect of offshoring: potential substitution between high-skill factor and low-skill factor and/or between domestic and foreign tasks can have ambiguous effects on domestic employment.

In order to test this model, Wright (2014) estimates the labour demand function for the set of the US manufacturing industries in the period 2001-2007 and checks explicitly the impact of increasing offshoring to China. He finds that as a result of offshoring, the employment of US low-skill workers dropped but at the same time it was compensated by the increase in high-skill workers' employment.

THE DATA AND THE MEASUREMENT OF OFFSHORING

In our work we use sector level data on flows of intermediate goods coming from input-output tables, complied within the World Input Output Database project (WIOD – see Timmer et al. 2012 for the details). We match them with socioeconomic accounts data on employment, wages and capital - also from WIOD. Our panel is composed of 13 manufacturing sectors (listed in Table 1) in EU27 countries[4] Due to data availability our analysis covers the years 1995-2009.

[4] AUT , BEL, BGR , CYP , CZE , DEU , DNK , ESP , EST , FIN , FRA , GBR , GRC , HUN, IRL, ITA , LTU, LUX , LVA, MLT , NLD , POL, PRT, ROU, SVK , SVN , SWE.

Offshoring index (*OFF*) employed in our research is in the first instance calculated in a traditional way (Feenstra and Hanson, 1999; Hijzen and Swaim, 2007) as the ratio of the value of imported inputs to the size of the industry:

$$OFF_{ij,t} = \frac{\sum_{k=1}^{K} mi_{ik \neq j,t}}{VA_{ij,t}} \quad (1)$$

where *i* denotes country from which the tasks are offshored (called also home or domestic country), *j* and *k* refer to sectors and *t* is the time period; *mi* denotes imported intermediates and *VA* is the value added. Such an index reflects so-called 'broad' offshoring (see also Parteka and Wolszczak-Derlacz, 2015 for the application): it relates the sum of inputs imported by industry *j* from all industries different than *j* to the added value of industry *j*. As far as the sources of *mi* are concerned, we consider imported intermediates from the whole world (so-called global offshoring).

Table 1

Offshoring indices – manufacturing industries, EU27 countries, 1995 and 2009

Industry		1995			2009		
code	description	*OFF*	*IntOUT*	*DomOUT*	*OFF*	*IntOUT*	*DomOUT*
15t16	Food, Beverages and Tobacco	0.357	0.140	2.626	0.467	0.203	2.511
17t18	Textiles and Textile Products	0.498	0.409	1.333	0.536	0.556	1.246
19	Leather, Leather and Footwear Products	0.475	0.294	1.808	0.510	0.438	1.468
20	Wood and Products of Wood and Cork	0.302	0.197	1.585	0.410	0.254	1.730
21t22	Pulp, Paper, Paper , Printing and Publishing	0.361	0.297	1.251	0.423	0.333	1.348
24	Chemicals and Chemical Products	0.548	0.445	1.352	0.836	0.634	1.529
25	Rubber and Plastics	0.545	0.445	1.261	0.718	0.598	1.331
26	Other Non-Metallic Mineral Products	0.278	0.236	1.214	0.360	0.274	1.423
27t28	Basic Metals and Fabricated Metal Products	0.534	0.400	1.465	0.744	0.495	1.613
29	Machinery, Nec	0.393	0.323	1.286	0.548	0.451	1.335
30t33	Electrical and Optical Equipment	0.600	0.507	1.257	1.130	0.843	1.344
34t35	Transport Equipment	0.765	0.443	1.882	1.210	0.612	2.168
36t37	Manufacturing, Nec; Recycling	0.386	0.314	1.385	0.493	0.379	1.464

Notes: *OFF*, *IntOUT* and *DomOUT* explained in the main text. Weighted averages across the EU27 countries, weighted according to the sector size (total hours worked by persons engaged).

Source: own calculation.

Furthermore, following Castellani et al. (2013) we decompose the offshoring index into its international and domestic component:

$$OFF_{ij,t} = \frac{\sum_{k=1}^{K} mi_{ik \neq j,t}}{VA_{ij,t}} = \underbrace{\left[\frac{\sum_{k=1}^{K} mi_{ik \neq j,t}}{\sum_{k=1}^{K} di_{ik \neq j,t}}\right]}_{IntOUT} \times \underbrace{\left[\frac{\sum_{k=1}^{K} di_{ik \neq j,t}}{VA_{ij,t}}\right]}_{DomOUT} \quad (2)$$

where *di* is the value of inputs coming from domestic sectors. The first expression is the ratio of imported inputs to the domestic ones (*IntOUT* - international outsourcing) while the second reflects the intensity of domestic outsourcing (*DomOUT*). As argued by Castellani et al. (2013), offshoring indices calculated broadly (as in eq. 1) can overestimate the role of imported parts and components, ignoring the role played by structural changes within the domestic economy, reflected in *DomOUT* component.

The values of offshoring indices for different industries in the analysed EU27 sample (weighted averages) in the first (1995) and last (2009) year of our analysis are reported in Table 1. Offshoring (whether measured by general offshoring index, *OFF* or by more precise international outsourcing index, *IntOUT*) rose substantially over the 1995-2009 period in all the analysed industries. The highest growth was noted in 'Electrical and optical equipment' (the rise of *OFF* from 0.6 to 1.13). In case of domestic outsourcing the situation is different: the change in *DomOUT* is much smaller and three sectors even experienced a drop in domestic outsourcing activity (namely: 'Food, beverages and tobacco', 'Textiles and textile products', 'Leather, leather and footwear products'; note that a drop in *DomOUT* in these sectors went in line with a growth in *IntOUT*). Still, in general the intensity of domestic outsourcing is much higher than that characterising international outsourcing activity.

EMPIRICAL ANALYSIS

The model

Our empirical specification is derived from the theoretical framework described briefly in Section 3 (for the exact mathematical notations of the theoretical model please refer to GRH, 2008 and Wright, 2014). Specifically, the model to be estimated with our data is based on augmented labour demand function which can be expressed in logs as[5]:

$$lnEmp_{ij,t} = \alpha_{ij} + \beta_1 lnw_{ij,t} + \beta_2 lnk_{ij,t} + \beta_3 OFF_{ij,t} + \gamma_t + \varepsilon_{ij,t} \quad (3)$$

or, when offshoring index decomposition (eq. 2) is taken into account:

$$lnEmp_{ij,t} = \alpha_{ij} + \beta_1 lnw_{ij,t} + \beta_2 lnk_{ij,t} + \beta_3 IntOUT_{ij,t} + \beta_4 DomOUT_{ij,t} + \gamma_t + \varepsilon_{ij,t} \quad (4)$$

[5] The first step in our empirical analysis is to check for unit roots in the panel. We employ Fisher's panel unit root test which does not require a balanced panel. We run the test for the variables and their differences and the null hypothesis of unit root is rejected in most of the cases at standard levels of confidence. Detail results are available from authors upon request. We thank an anonymous referee for pointing this out.

where, as before, *i* refers to country, *j* to sector and *t* to time period. Employment in domestic sector (*Emp*, measured in terms of total hours worked by persons engaged in the sector) is our dependent variable. It is a function of: *w* - real wage (labour compensation per hour in 2005 USD), *k* – capital per labour ratio and outsourcing (offshoring), measured by: *OFF*, *IntOUT* and *DomOUT* (as defined in eq. 1 and eq.2).

We use fixed-effects (within) model with robust standard errors (adjusted for clusters in groups relating to country-sector specific effects). The choice of within estimator is confirmed by the Hausman test. Additionally, the regression is run using the first-difference specification which eliminates invariant country-sector specific features (Wright, 2014) while year dummies (γ_t) absorb common shocks. The final regression to be estimated takes on the following form:

$$\Delta lnEmp_{ij,t} = \alpha_{ij} + \beta_1 \Delta lnw_{ij,t} + \beta_2 \Delta lnk_{ij,t} + \beta_3 \Delta IntOUT_{ij,t} + \beta_4 \Delta DomOUT_{ij,t} + \gamma_t + \varepsilon_{ij,t} \quad (5)$$

Results

Firstly, the regression (5) is run for overall employment in the sector, without distinguishing between different types of labour force (the results are reported in Table 2). Then, we repeat the estimations separately for three different types of workers: high, low and medium-skill (the results are presented in Table 3)[6]. This gives us the possibility to distinguish between heterogeneous (across various skill groups of workers) responses of employment to offshoring (outsourcing) activity.

In all specifications we obtain negative and statistically significant parameter associated with wages (*w*): *ceteris paribus,* the higher the change in wage, the lower the change in labour demand. Additionally, sectors with higher growth of capital/labour ratio (*k*) are on average characterised by lower employment growth (note negative and statistically significant parameter on *k*) which may suggest the replacement of workers by the technology (so called skill-biased technological change – Acemoglu, 2002).

We are especially interested in the relationship between offshoring indices and employment. In the general case (Table 2), all parameters connected with production fragmentation, either measured by general offshoring index (column 1 in Table 2) or by international (*IntOUT*) and domesting outsourcing (*DomOUT*) (column 2 in Table 2), are negatively associated with overall employment in the sector. This might suggest that, indeed, outsourcing of tasks from a given sector, either domestically or abroad, can reduce industry employment. Such an outcome would be in line with the results of (for instance) Federico (2014).

However, when the estimations are performed separately for the subgroups of workers divided by skills (Table 3), there are some noteworthy changes. Offshoring (*OFF*) affects negatively only employment of medium and low skill workers (columns 3 and 5 in Table 3). The negative and statistically significant effect of international outsourcing (*IntOUT*) on employment is sustained only in case of low-skill labour (column 6 in Table 3). Such a result is in line with the common view that the low skilled are the ones to loose from global production sharing. In case of high-skill workers, we are not able to detect statistically significant correlation between offshoring measures and employment.

[6] The division into skill groups comes from WIOD and is based on the education level of workers according to the International Standard Classification of Education (ISCED). Low skilled workers are those with: primary education, first stage of basic education or lower secondary or second stage of basic education; medium-skilled: (upper) secondary or post-secondary education; high-skilled: first or second level of tertiary education.

Table 2

Estimation results: the impact of offshoring on overall industry employment

Dep. variable: $\Delta lnEmp_{ij,t}$		
	(1)	(2)
$\Delta lnw_{ij,t}$	-0.117***	-0.121***
	[0.028]	[0.028]
$\Delta lnk_{ij,t}$	-0.774***	-0.772***
	[0.041]	[0.041]
$\Delta OFF_{ij,t}$	-0.042***	
	[0.013]	
$\Delta IntOUT_{ij,t}$		-0.032***
		[0.011]
$\Delta DomOUT_{ij,t}$		-0.057***
		[0.018]
R2	0.816	0.816
No of groups	350	350
No of observations	4510	4510

Notes: * p<0.10, ** p<0.05, *** p<0.01. Constant not reported. Time dummies included in all specifications. Fixed-effects (within) estimations with robust standard errors (adjusted for clusters in groups relating to country-sector specific effects).

Source: own calculation.

Table 3

Estimation results: the impact of offshoring on industry employment of high, medium and low-skill workers

Dep. variable: $\Delta lnEmp_{ij,t}$						
	High-skill		Medium -skill		Low-skill	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta lnw_{ij,t}$	-0.211***	-0.213***	-0.039*	-0.039*	-0.071***	-0.073***
	[0.022]	[0.022]	[0.021]	[0.021]	[0.023]	[0.023]
$\Delta lnk_{ij,t}$	-0.749***	-0.747***	-0.817***	-0.817***	-0.777***	-0.775***
	[0.039]	[0.039]	[0.038]	[0.038]	[0.040]	[0.040]
$\Delta OFF_{ij,t}$	-0.022		-0.024*		-0.037**	
	[0.026]		[0.014]		[0.015]	
$\Delta IntOUT_{ij,t}$		-0.012		-0.021		-0.029**
		[0.022]		[0.013]		[0.014]
$\Delta DomOUT_{ij,t}$		-0.038		-0.029		-0.052**
		[0.036]		[0.020]		[0.021]
R2	0.508	0.509	0.709	0.709	0.661	0.662
No of groups	350	350	350	350	350	350
No of observations	4510	4510	4510	4510	4510	4510

Notes: * p<0.10, ** p<0.05, *** p<0.01. Constant not reported. Time dummies included in all specifications. Fixed-effects (within) estimations with robust standard errors (adjusted for clusters in groups relating to country-sector specific effects)

Source: own calculation.

As a robustness check, we repeat the estimation now taking into account the possibility of endogeneity in the model (e.g. domestic sector-specific technological shocks may affect not only the employment level but also the distribution of tasks performed domestically and abroad - offshoring). Table 4 reports the results of estimation (eq. 5) when the variables related to foreign sourcing are treated as endogenous and instrumented by their first lag. Despite this change in the estimation, our main conclusions hold (the negative relationship of offshoring with low-skilled workers' employment and the lack of the statistically significant results concerning the employment of high and medium – skilled workers).

Table 4

Robustness check of the estimation results: IV estimation

	High-skill		Medium -skill		Low-skill	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta lnw_{ij,t}$	-0.203***	-0.217***	-0.026*	-0.023	-0.066***	-0.068***
	[0.023]	[0.020]	[0.015]	[0.015]	[0.017]	[0.016]
$\Delta lnk_{ij,t}$	-0.792***	-0.768	-0.855***	-0.861***	-0.806***	-0.796***
	[0.034]	[0.028]	[0.022]	[0.023]	[0.025]	[0.023]
$\Delta OFF_{ij,t}$	0.064		-0.017		-0.034	
	[0.088]		[0.041]		[0.044]	
$\Delta IntOUT_{ij,t}$		-0.091		0.042		-0.134**
		[0.071]		[0.047]		[0.053]
$\Delta DomOUT_{ij,t}$		-0.077		0.019		-0.105***
		[0.048]		[0.034]		[0.035]
R2	0.525	0.526	0.735	0.73	0.683	0.671
groups	350	350	350	350	350	350
No of observations	4160	4160	4160	4160	4160	4160

Notes: * p<0.10, ** p<0.05, *** p<0.01. Time dummies included in all specifications. IV estimation of the fixed effects model, $\Delta OFF_{ij,t}$ and $\Delta IntOUT_{ij,t}$ treated as endogenous variables and instrumented by their lags.

Source: own calculation

CONCLUSIONS

Given the observed changes in the composition of international trade and increasing importance of the disintegration of production across borders, the main aim of this paper was to answer the following question: does offshoring of tasks from European countries affect their employment levels? If yes, which groups of domestic workers are most likely to loose from global production sharing?

In order to analyse this offshoring-employment relationship, we have performed our analysis for a wide European panel, composed of 27 EU countries and 13 manufacturing sectors, observed in the period 1995-2009. Thanks to the use of input-output tables from the WIOD project, we have measured the intensity of offshoring in the sectors, as well as its decomposition into the domestic and foreign components.

Theoretical background for our analysis is rooted in recent trade-in-tasks models of international trade. Our empirical results, based on the estimation of panel data model, suggest that indeed domestic employment can be affected by growth in offshoring. More specifically, low skill workers are the ones to be affected the most because of shrinking labour demand at home.

We are aware of the fact that some limits of our study still have to be addressed. For instance, it has to be noted that offshoring indices (even after the adopted decomposition) are aggregated at the sectoral level so they can overestimate the true offshoring/outsourcing activity (at the level of firms). Additionally, micro level studies would allow us to quantify more precisely the effects of offshoring on labour market outcomes of individual workers.

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