OUTSOURCING TO CEE COUNTRIES AND INDUSTRIAL EMPLOYMENT: THE CASE OF SPAIN 1993-2003

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ABSTRACT

The aim of this paper is to investigate the effect of foreign outsourcing, particularly to CEE (Central and Eastern European) countries, on the level of employment for Spain. Outsourcing is calculated using domestic and import – use matrices of input-output tables for 93 Spanish manufacturing industries for the period 1993 to 2003, and data on imports from the National Customs Agency. These data are included in a labour demand function estimated using dynamic panel data techniques. We find that the effect of outsourcing differs with industry characteristics, being negative and significant for medium-high-tech industries and not significant for low-tech sectors.

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1. INTRODUCTION

The EU enlargement in 2004 and the forthcoming one are great opportunities for Europe, but at the same time they provoke a chain of effects on FDI, trade, EU funding, etc. This has raised voices in other EU countries on the effects of low-wages-countries competition on employment and production, especially in labour-intensive industries. However this is not a new issue and it is not constrained to CEE (Central and Eastern European) countries: low-wages countries have increasingly become more internationalised, in terms of trade, foreign direct investment, and vertical integration in the last two decades. Theoretical models of international trade conclude nevertheless that international openness can render benefits for all countries involved. A branch of empirical literature has focused in recent years in studying the effects of this process, both in developed and developing countries.

The greater international integration has increased the exchanges of intermediate inputs among countries. This process involves a substitution between domestic and foreign purchases: a) inter-industry domestic input purchases over production have decreased by 24% in 1995-2000, while their foreign counterpart increased by 32%; b) intra-industrial, also referred as narrow, domestic inputs purchases increased by 10% between 1995 and 2000, while intra-industrial imports grew by 41%. This paper focuses on the later phenomenon, which receives different names in the literature: foreign (or international) outsourcing, fragmentation, delocalisation, international vertical integration, etc.
The importance of outsourcing varies among sectors. We distinguish two main groups of sectors: low-technology sectors and medium – high technology sectors (Appendix 1). Narrow outsourcing (imported intermediate purchases from the same sector) has grown by 52% for medium-high-tech sectors while the increase for low-tech sectors is much lower, only 19%. The Spanish specialisation in traditional industries partly explains that result, as these sectors tend to use inputs produced domestically rather than import them. Spanish low-tech sectors are the only ones to keep a trade balance close to equilibrium, and their location advantages justify that they have attracted more FDI between 1993 and 2001 and have suffered to a lesser extent disinvestments processes during that period (Myro y Fernández-Otheo, 2004).

The substitution between domestic and foreign purchases came together with a change in the origin of the goods. Spain is recently moving towards CEE providers: between 1999 and 2003, the weight of Spanish imports from CEE countries rose by 82%. This process mirrors the increase in FDI flows from Europe to Spain in the years around 1986 (date of entry in the EEC).

As explained by Feenstra and Hanson (1996), outsourcing requires two conditions to occur, first, the production process can be separated into self-contained stages, and, secondly, production stages vary considerably in the relative intensity with which they use labour of different skill types. These conditions are especially easy to meet in industrial production, where outsourcing is a natural development of subcontracting, since production stages are, firstly fragmented and, when possible, moved abroad.

Differences in skill requirements together with differences in wage levels are not the only factor behind outsourcing: 1) Some types of skilled labour may be cheaper abroad (e.g. in the software industry in Ireland and India), 2) there might be economies of scale of specialised providers (e.g. automobile parts, transport), and 3) the uncertainty
inherent to some product characteristics (changes in tastes, product innovation, etc) might give value to a greater flexibility in obtaining inputs.

The aim of this paper is to investigate the effect of foreign outsourcing on the level of employment, with a particular focus on outsourcing to CEE countries. We will also distinguish between the effect on employment for different sectors, as to the best of our knowledge there are not previous studies on the effect of outsourcing for different types of sectors. We focus on narrow measures, intra-industrial, since they are closer to the concept of outsourcing as contracting out part of the production.

The original contribution of this empirical analysis is: 1) our data comes directly from the import use matrices of input-output tables, rather than being indirectly estimated through weighting trade data; 2) we estimate a labour demand function at sector level, instead of focusing on skills or wages as most of the literature; 3) we use dynamic panel data techniques (GMM); 4) we differentiate among the effect of outsourcing depending on sectoral characteristics.

We estimate the effects of outsourcing on Spanish employment for 93 manufacturing sectors distinguishing different geographical locations, and focusing on EU-15, new members and candidates. Our results indicate that there is a negative effect of narrow outsourcing on employment for medium-high-tech sectors while there is not clear effect for low-tech sectors. This result comes out for both the whole of the imported inputs and for inputs bought from CEE countries, although it is only significant for the last case.

The remainder of this paper is as follows. In section 2 we review the relevant literature on labour market and outsourcing. In section 3 we outline the basic model used and the

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1 We are only aware of one study by Görg and Hanley (2005) that studies the effect of outsourcing on employment but at firm-level and using survey rather than input-output data.
calculation of outsourcing measures. Section 4 comments on the data and a number of important econometric issues. Section 5 contains the main empirical results and section 6 concludes.

2. OUTSOURCING AND EMPLOYMENT IN RECENT LITERATURE

The literature analysing the impact of outsourcing on the labour market originates mainly in the leading papers by Feenstra and Hanson (1996, 1999), that focused on sector wage inequality by skills. The work of these authors have been followed and redeveloped through time and, in recent applications, it has been enhanced to account for a geographical element by focusing on the effect of outsourcing to specific groups of countries. In this section we will comment on this literature starting by Feenstra and Hanson (1996, 1999), then focusing on later developments and finally on papers considering a geographical element.

Feenstra and Hanson (1996) analyse the way trade affects the relative demand for skilled labour by estimating a relative labour cost equation (see Berman et. al 1994) augmented by an outsourcing measure which was built by combining import data for U.S. manufacturing industries with input purchases. With this information the authors developed industry-by-industry estimates of outsourcing for the period 1972-1994. Outsourcing is then considered as “an index of the extent to which U.S. firms contract non-skill-intensive production activities to foreigners.”2 They work with data for 435 industrial sectors and find out that on the period 1979-1990 the outsourcing has contributed substantially to the increase in relative non-production wage share, as a proxy for high-skilled wages share; however, results are non-significant for the period 1972-1979.

2 Feenstra and Hanson (1996), pp. 244.
In a later paper, Feenstra and Hanson (1999), the authors develop a similar model enhanced by including technological variables, since these two factors, trade and technical change, are expected to alter wage inequality. Another novelty of the paper is the differentiation between three types of outsourcing, depending on whether the purchases come from the same sectors, narrow outsourcing, from other sectors, difference outsourcing; and the sum of the two, broad outsourcing. This distinction allows the authors to show that the effects of intermediate inputs purchases change depending on their origin. Their results show that narrow outsourcing, intra-industrial intermediate inputs purchases, has a larger effect than the difference one, inter-industrial intermediate inputs purchases.

A number of authors have followed Feenstra and Hanson work and, in most cases, found a positive effect of outsourcing on skilled labour, pointing to firms contracting out production phases that are intensive in low-skilled labour. Among the papers we focus on are Hijzen et al. (2005), Strauss-Kahn (2003) and Görg and Hanley (2005). A recent redevelopment considers a geographical component of outsourcing by focusing on the effect of outsourcing to specific groups of countries, among them Egger and Egger (2003, 2005), Geishecker (2005), Falk and Wolfmayr (2005) and, related, Marin (2004).

Hijzen et al. (2005) extend Feenstra and Hanson framework by estimating a system of four variable factor demand functions, including relative demand for skilled workers, for 50 U.K. industrial sectors for the period 1982-1996. The relative demand function is augmented to include an inter-industrial outsourcing measure and shows that international outsourcing has had a strong negative effect on the demand for unskilled labour.
A similar result is found by Strauss-Kahn (2003), who works with 50 French industries for the period 1977-1993 but focusing on relative unskilled demand. The author finds that outsourcing has a negative effect on unskilled labour demand, however it is not the only element affecting labour, as skilled-biased technological progress seems more important than outsourcing in explaining the reduction in unskilled labour demand.

Görg and Hanley (2005) propose a microeconomic focus on the topic and analyse the absolute effect on total labour. They estimate labour demand as a dynamic model for 652 plant level data for the Irish electronics sector during the period 1990-1995, and find out that, in the short run, outsourcing is linked to reductions in labour demand, however outsourcing of different kinds will affect employment in different manners, so stronger negative effects appear from outsourcing of materials than from services’ one.

Literature on the effect of geographically restricted outsourcing is limited and very recent. Egger and Egger are among the first authors in considering a geographical element in the outsourcing analysis. They are interested in the labour effect of outsourcing to CEE countries and choose Austrian data for geographical closeness to CEE countries; however their results could apply to economies with similar characteristics within EU-15.

Egger and Egger (2005) use a dataset for 20 Austrian manufacturing industries between 1990 and 1998 to analyse Austrian outsourcing to Central and Eastern European economies. They further develop previous studies by expressly considering the effect of inter-sectoral spillovers in the relationship between outsourcing and labour demand, so that they can take into account not just direct but also indirect effects of outsourcing on labour. They show that inter-sectoral relationships affect notably the effect of outsourcing on labour, so that models ignoring the spillover effect underestimate the role of outsourcing. In our empirical application we follow Egger and Egger in
considering the input-output industrial linkages to better account for outsourcing. Egger and Egger (2005) is not the authors’ first approach to geographical outsourcing. In a previous work, Egger and Egger (2003), both authors find out that outsourcing to Eastern European economies accounts for about one quarter of the change in relative employment in favour of high-skilled labour. Both papers support that an increase in outsourcing to CEE countries induces a shift in relative skilled employment in favour of high-skilled labour and consider that the result is likely to become even more pronounced when the Eastern economies join the European Union.

The analysis of the effect of CEE outsourcing is becoming of increasing interest among European economists, both in terms of skill structure and level of employment. Following Egger and Egger we can also find Geishecker (2005) or Falk and Wolfmayr (2005). Geishecker analysed the effect of outsourcing to CEE countries on Austrian and German labour skill structure. He finds out that outsourcing towards Central and Eastern Europe is an important explanatory factor for the decline in relative demand for manual workers in German manufacturing.

Falk and Wolfmayr (2005) work with sectoral data from 7 EU countries for the period 1995-2000. They estimate a standard labour demand equation augmented by outsourcing, proxied by a same-sector materials import penetration measure, allowing for a differentiated effect on higher and lower-skill sectors. The authors find out that imports from low-wage countries, which include CEE and the NICs and other East Asian countries, have a negative effect on employment, specially in less-skilled industries.

Finally, Marin (2004) gives a different approach to the topic and, analysing through firm level data the effect on Austrian and German employment of Eastern Europe outsourcing, finds out that jobs in Eastern Europe do not compete with jobs in Austria
and Germany. However she points out that also high skilled jobs are being transferred to Eastern Europe in response to human capital scarcity in Austria and Germany, a rather unregarded feature in previous studies.

In all the aforementioned literature, except Görg and Hanley (2005) and Falk and Wolfmayr (2005), the analysis focuses on the effect of outsourcing on relative labour demand, since the effect of outsourcing is different for skilled and unskilled labour. We follow Görg and Hanley and Falk and Wolfmayr in focusing on the total labour demand effect. Another common element in most articles is that the analysis does not account for the time element: all papers, except Görg and Hanley, consider a static relationship between outsourcing and labour. In our empirical application we follow Görg and Hanley since we consider that labour does not react automatically to changes in any of the variables considered, so that a dynamic analysis is more adequate.

3. LABOUR DEMAND EQUATIONS AND CALCULATION OF OUTSOURCING

Our paper differs from the above commented literature as we study the link between outsourcing and employment at sector level. This involves estimating a dynamic labour demand function from a CES production function, in the style of those estimated by on Van Reenen (1997) and Piva and Vivarelli (2003), that use this function to include technical change. We extend this framework to include outsourcing instead.

The starting point is the assumption of firms maximising profits in a perfect competition environment. From there it is possible to obtain the demand function for the labour factor from the first order condition, which states that each factor’s marginal product has to equal its real price (that may or may not be adjusted by some kind of mark-up). Applying
logarithms, a linear relationship between employment, output, real wage and other factors (as we will see) results.

The labour demand equation development starts from a CES function of the form:

\[ Y = A\left[\left(\beta K\right)^\rho + \left(\alpha N\right)^\rho\right]^{\left(\frac{1}{\rho}\right)} \]  

(1)

where \( Y \) is output, \( K \) is capital stock, \( N \) is employment, \( A \) is a potential Hicks-neutral technological change, \( \alpha \) and \( \beta \) are technical parameters and \( 0 < \rho < 1 \). Solving the first order condition commented above (quantity of labour input that maximises profits), taking logarithms and regrouping, it is possible to obtain an expression like:

\[ n = y + \sigma w - (1 - \sigma)\ln\alpha \]  

(2)

where \( \sigma = 1/(1 - \rho) \) is the elasticity of substitution between \( K \) and \( N \), small letters denote logarithms, and \( w \) is the log of (real) labour cost.

This labour demand function can be augmented by including variables of outsourcing and estimated using panel data:

\[ n_{it} = \alpha_0 y_{it} + \alpha_1 w_{it} + \alpha_2 \text{outsourcing}_{it} + (\varepsilon_i + u_{it}) \]  

(3)

for \( i = 1, ..., N \) firms or sectors and \( t = 1, ..., T \) years or periods, and where \( \varepsilon \) are firm–specific (time–invariant) effects and \( u \) are the usual error term.

When estimating either of those functions (2 and 3), we would calculate a static or long-term equilibrium relationship between the studied variables. We would however neglect the potential dynamic links between these variables. In terms of time series or static panel data estimations, this involves considering equation (1) as a long-term relation and including it in an error correction model as:

\[ \Delta n_i = \alpha + \beta_1 \Delta y_i + \beta_2 \Delta w_i + \beta_3 \left(n_{i-1}^* - n_{i-1}^*\right) + \varepsilon_i \]  

(4)
where only dynamic elements in output and wages, and not in the outsourcing variable, are included.

In the case of panel data, the equation can be transformed in a dynamic specification as:

\[ n_{it} = \alpha_0 n_{i,t-1} + \alpha_1 y_{it} + \alpha_2 w_{it} + \alpha_3 \text{outsourcing}_{it} + (\epsilon_{it} + u_{it}) \]  

(5)

for \( i = 1, \ldots, N \) sectors or firms and \( t = 1, \ldots, T \) years or periods. It is possible to find the value of the long-term coefficient for all the variables in expression (5) from the short-term estimated coefficients. For the outsourcing case, the long-term coefficient can be calculated as follows:

\[ \alpha_{3L} = \frac{\alpha_3}{1 - \alpha_0} \]  

(6)

And similarly for any other coefficient. However, equation (5) must be understood as a first investigation into the dynamic structure of the relation, deeper investigation will be performed by including further lags of all these variables into the specification.

**Calculation of outsourcing measures**

In our case, to calculate different measures of outsourcing we employ the use matrices of the Spanish input-output tables (commodity by sector), instead of the inter-industry symmetrical (commodity by commodity) matrices. The use matrix shows in columns the input structure for the different sectors (including secondary production), as it includes intermediate consumption and remuneration to primary inputs, adding up to the output value. While rows at the use matrix show distribution of commodities between intermediate demand and final demand\(^3\).

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\(^3\) The main difference with respect to the symmetrical matrix is that the latter includes intersectoral flows, both by columns and by rows, in terms of “pure industries” or “commodities”. In this fashion, secondary
Our decision is justified by data availability for the period 1993-2002, as we have at our disposal six use tables (1995-2000)\(^4\) for one symmetrical table. Using those six tables allows us to take into account changes in the use table coefficients for both domestic and imported inputs. In measuring international outsourcing directly from the use matrices we follow the same line of research as Hijzen et al. (2005). This is considered superior to other measures, like those of Feenstra and Hanson (1996, 1999), Egger and Egger (2003, 2005) and Strauss-Kahn (2003) that need to combine input-output tables and trade data to proxy imported inputs by sector.

Two different outsourcing measures are introduced in the empirical application. One refers to global outsourcing for the Spanish economy and the second one focuses on outsourcing to different country groups. The global outsourcing measure is calculated from the **use matrices of coefficients** by dividing each element of the use table by the effective output (\(q\)) for each column\(^5\). The typical element of the imported matrix, \(m_{ij}\), indicates the amount of imported input \(i\) (\(M_{ij}\)) required per euro of output in sector \(j\).

Following Feenstra and Hanson (1999) we identify different measures of outsourcing: narrow outsourcing, difference and broad outsourcing. The **narrow** outsourcing is obtained by restricting to inputs purchased from same type of commodity (in terms of input-output tables this is measured by the coefficient in the diagonal of the use matrix of coefficients):

\[
global \text{ narrow outsourcing}_{ij} = m_{ij} = \frac{\text{Imported Inputs}^\text{World}_{ij}}{\text{Production}_{j}}, \forall i = j
\]

production for each sector is relocated in its corresponding “pure industry”. Nevertheless, 90% of total production is main production.

\(^4\) It is possible to observe a very important change in the coefficients from 1995 to 2000. This is why to fill the gaps we estimate the data for 1993 and 1994 by extrapolating the growth rates of 1995-1998, and for 2001 and 2002 we apply the growth rates of 1998-2000.

\(^5\) We divide by effective production, as in Egger and Egger (2003) and Strauss-Kahn (2003), while Hijzen et al. (2004) divide by added value, Görg and Hanely divide by total wages, and Feenstra and Hanson (1996) divide by total non-energy purchases.
The measure of difference\(^6\) outsourcing for each industry relates to imports of intermediate inputs from all types of commodities but the one linked to the sector (in terms of input-output tables this is measured by the sum of the column of the use matrix of coefficients minus the diagonal element):

\[
global \ difference \ outsourcing_{ij} = \sum_{j=1}^{N} m_{ij}, \forall i \neq j
\]

The narrow measure seems more appropriate, as it reflects intra-industrial links. This is closer to the definition of outsourcing as "contracting out of activities that were previously performed within a production unit" (Hijzen et al., 2005). Nevertheless, it would not include some activities that, when contracted outside the firm, are classified in a different industry (transport, accountancy, computing services, etc).

Outsourcing measures have been also calculated for inputs bought to different groups of countries; as an example, the CEE narrow outsourcing measure restricts the previously defined narrow outsourcing measure\(^7\) to imports from CEE countries, as:

\[
CEE \ narrow \ outsourcing_{ij} = \left( \frac{Imported \ Inputs_{ij}^{World}}{Production_{ij}} \right) \cdot \left( \frac{Total \ Imports_{ij}^{CEE}}{Total \ Imports_{ij}^{World}} \right), \forall i = j
\]

To calculate this measure we weight our previous global narrow outsourcing measure by a new term. This term is the ratio of imports from CEE countries of commodity \(i\) relative to total imports of commodity \(i\)\(^8\). An equivalent measure has been calculated for other groups of countries, as EU-15, new members and candidates.

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\(^6\) The broad measure is calculated as the sum of the narrow and the difference.

\(^7\) The CEE difference measure is calculated in a similar fashion from the global difference outsourcing measure.

\(^8\) This measure includes intermediate and final goods imports. Ideally we should only include intermediate inputs.
4. DATA AND ESTIMATION ISSUES

In this section we present some of the data used in this paper. Employment is measured by thousands of worked hours yearly for each sector. Production is added value (net sales minus buying of intermediate goods) in € thousands. Labour cost is measured by labour related expenditure per worked hour in euros. These data are provided by the Encuesta Industrial (INE) and they are deflated for each sector by its industrial price index. As commented above, the use input – output tables allow us to include information on how much of the inputs required by one sector are originated domestically or imported from the rest of the world. As the calculated measure for narrow outsourcing is directly obtained for 26 manufacturing sectors from the input – output tables, we multiply that figure for different groups of sectors by an estimation of intermediate inputs for our 93 sectors, obtained from data of Encuesta Industrial and percentages on imported over total inputs from the use matrix. Data for imported commodities for each country have been obtained from Camara de Comercio and INE databases. All variables are deflated in base 2000.

In this section we will also briefly comment on the behaviour of the main variables included in our regressions. The time period considered (1993-2003) shows the end of a recession (1993-1994), a recovery (1995-2001) and the beginning of a soft slowdown (2002) in Spain. Figure 1 shows how sales and employment reflect that cyclical evolution of the Spanish economy for the manufacturing sectors. It is also interesting to note that both variables have a similar behaviour as we expect employment to be crucially determined by production. Especially in the case of Spain, where the easy terms for dismissal in the case of temporary jobs favours that close link\(^9\).

\(^9\) According to Segura (2001), this high share of temporary jobs in Spain (33%, three times higher than EU average), is due to its relative lower cost relative to permanent jobs. This can be explained by. 1) the
This behaviour of sales and employment has been similar to that of international trade in Spain. The rate of openness was 28% at the beginning of nineties and 43% in 2003. This growth is shared by exports and imports and both have shown higher nominal growth rates than GDP. Nevertheless, Spanish imports have grown above exports and the propensity to import has risen by nearly 50% in the last ten years.

The main products imported by the Spanish economy are motor vehicles and chemical products, and both show some of the highest growth rates. The imports of extractive products, machinery and equipment or food and beverages are also notable, but their growth rates in the period are much more modest or even negative. A wide range of countries provide Spain with commodities but, as expected, the European Union (EU-15) is the first supplier: more than 60% of Spanish imports comes from the EU-15.

For the period 1995-2003 a group of countries have increased its market share in Spain, showing the highest rates of cumulative growth. These are EU-15, all the new members of the EU-25, the new candidates and the Asian group of India, Thailand, China and lower relative wages of temporary workers; 2) the wide range of dismissals legally considered as wrongful; and 3) the higher cost of dismissal compensation for permanent jobs.
South Korea. On the other hand the rest of Asia, Africa, Oceania and America have reduced its position as Spanish providers in global terms. However, this behaviour hides a different performance at commodity level, mainly with the EU-15\textsuperscript{10}, as we can observe in Figure 2.

Figure 2: Market share variation for EU-15 and CEE countries (1995-2003).

Alongside the increase in the market shares of EU new members and candidates, there has been an important change in the pattern of Spanish imports from these groups of countries: the weight of capital and intermediate goods is increasing, whereas the weight of consumption goods is decreasing (Figure 3).

\textsuperscript{10} It is notable that the market share of America has decreased for all types of commodities analysed, except one.
From our constructed measures of outsourcing, it is possible to observe that global foreign outsourcing, both in narrow and broad terms, has greatly increased in the period considered: manufacturing intra-industrial imported inputs have escalated from 6% to around 14% of total production. Nevertheless, the Spanish manufacturing industry is simultaneously generating employment in this period, and therefore we can regard outsourcing as an additional factor for competitiveness: it allows firms to reduce costs and increase flexibility, so that they keep and even increase their production and employment.

Source: Own elaboration. Data from the Cámara de Comercio and INE databases.

Figure 4: Narrow outsourcing measures

Source: Data from the Use matrices in the Input –Output Tables (INE), calculated as explained in this section.
On the contrary, narrow domestic outsourcing, defined as the bought of same-sector domestic inputs, has been roughly stable, while broad domestic outsourcing has decreased, especially since 1996. As explained by López (2002), total purchases of intermediate consumptions and services have become roughly stable since 1993.

The greater globalisation, both in terms of trade and multinational activities, especially in the case of the Spanish economy in recent years, can also explain that different behaviour: there seems to be some degree of substitution between domestic and imported inputs, particularly in broad measures, as can be seen in Figure 5.

**Figure 5: Difference outsourcing measures**

![Difference outsourcing measures](image)

Source: Data from the *Use matrices in the Input–Output Tables* (INE), calculated as explained in this section.

The patterns for EU-15 and CEE and candidates outsourcing are quite different for the analysed period, for total manufacturing outsourcing grew by 37% for EU-15 and 310% for new members and candidates. Most of the substitution is then between domestic and imported inputs from CEE countries, so that the impact on domestic labour demand is expected to be stronger for imports from CEE countries than for inputs imported from other countries.
Figure 6: Narrow Medium-high-tech Sectors Outsourcing to CEE and EU-15.

Source: Data from the *Use matrices in the Input–Output Tables* (INE) and *Bilateral Trade Database* (OECD), calculated as explained in this section.
Note: Base year 1993=100.

Outsourcing to EU new members and candidates has not been equally distributed among sectors, being more important for medium-high-tech ones. The different patterns of imports growth per country are shown in Figure 6 for medium-high-tech sectors: while EU-15 outsourcing hardly grew for 1993-2003 for these sectors, outsourcing to new members and candidates grew by more than 360%. The increase in low-tech sectors outsourcing to new members and candidates is smaller, although still higher than to EU-15, 209% compared to 28% respectively. Attending to the different rates of growth, impact on labour demand is therefore expected to be stronger for medium-high-tech sectors.

Figure 6 also shows that, while the outsourcing to new members and candidates has grown for the whole of the period, it intensifies acutely in 1997-1998, dates when accession negotiations with Cyprus, Hungary, Poland, Estonia, the Czech Republic and Slovenia (the so-called "Luxembourg Group") started. A new impulse in the outsourcing to EU new members and candidates takes place in 1999, when the decision
to open negotiations with Romania, Slovakia, Latvia, Lithuania, Bulgaria and Malta ("Helsinki Group") was taken. The prospectus of an open market reduced uncertainty for new investors and stimulated FDI in these countries what resulted in the observed increase in outsourcing.

Once we have constructed our variables, we need to consider the most appropriate method of estimation. We have panel data for 93 sectors and 11 years. It is a short panel in terms of observations and it also has an important dynamic component.

The existence of a lagged dependent variable among the regressors generates problems in OLS estimations. Furthermore our model contains endogenous and predetermined variables what points to the use of differences GMM technique (DIF-GMM) as the most suitable one (see, for example, Arellano and Bond, 1991). This is an instrumental variable method that estimates the equation in differences and includes lagged values of the variables as instruments. The order and number of lags included for each variable depends on whether they are considered endogenous, predetermined or exogenous.

Since we work with a short panel and strong autocorrelation is likely in most variables, the difference GMM technique could be affected from a weak instruments problem, leading to biased regressors. For that reason, GMM system technique (SYS-GMM) is expected to be preferred (see Blundell and Bond, 1998). The system GMM estimator combines the standard set of equation in first-differences that uses suitably lagged levels as instruments, with an additional set of equations in levels with suitably lagged first-differences as instruments. The validity of these additional instruments can be tested using standard Sargan test of over-identifying restrictions.

This technique improves the difference GMM by estimating the regression in differences and levels, and using lagged levels as instruments for the differenced
equation and lagged differences for the levels equations. The chosen instruments are included in each table.

Validity for this estimation technique depends on the existence of negative first order autocorrelation and the absence of second order autocorrelation. This requisite is tested using $m_1$ and $m_2$ Arellano and Bond tests, as showed in Arellano and Bond (1991). Instrument validity is tested by Sargan tests, reported for each case. We must be cautious about our results: these techniques are optimal for large samples, while in sectoral studies like this one we only have at our disposal a limited number of observations.

To apply this econometric technique (and to compare it with other alternative panel data methods), we will use the econometric software PcGive version 10.0, that includes the specific package DPD (dynamic panel data). To control for alterations in the general macroeconomic environment time dummies are included in all regressions.

5. EMPIRICAL ANALYSIS

In this section we first analyse the differences in the outsourcing effects depending on sectoral characteristics and we do a first approach to the origin of outsourcing. Then we explore in more detail the effect of outsourcing to CEE countries and also distinguish differences among countries within the CEE group. Then we investigate a bit further on the robustness of our results.

Table 1 summarizes the results from our empirical application considering the effect of outsourcing on labour and focusing on different effects depending on the characteristics of the sectors. At a first step we analyse the effect of outsourcing on all industrial sectors, and, since we would expect sectors with different characteristics (international competitiveness, technological intensity, requirements of raw materials or capital goods,
etc) to show a distinct behaviour, at a second step we have calculated our regressions for two types of sectors: low-tech and medium-high-tech. Table 1 contains 6 columns, the two first analyse the global effect of outsourcing, since both consider all possible sectors out of 92 (NACE 151-366, excluding 160)\(^\text{11}\). Columns 3 and 4 reduce the sample to low-tech sectors, which are small in number since they include only 34 sectors, so that some problems of small dataset appear. Columns 5 and 6 only consider medium-high-tech sectors, a total of 58. The effect of outsourcing for each of these groups of sectors has been investigated for the whole of imported intermediate inputs and for those coming from CEE countries, and our results show that the effect of outsourcing is different depending on the origin of the goods.

The assumptions for the variables made by the model, and the implications in terms of instruments are explained below. About the results, for the variables in the standard labour demand equation results in all columns show consistent coefficients for added value, wages and the lag of labour, and they are even more similar in the long-term coefficients shown in table 1b. All three coefficients are always statistically significant and keep approximately constant in all regressions, with values close to those found by previous empirical studies and according to theory\(^\text{12}\). Although the values of regressions in columns 3 and 4 differ compared to other regressions, these columns show the results for regressions performed on small datasets, so that the results are less robust.

A few general comments on the outsourcing variable are now in order. Outsourcing can be considered as a strategic variable for firms. In most cases, firms can change with short notice the origin of their imported intermediate inputs as a response to production, intermediate or final goods market conditions, so that firms’ decisions are reflected in

\(^{11}\) Petroleum, energy and water sectors have been excluded as well as the tobacco industry.

\(^{12}\) According to the CES function, the coefficient for wage measures the elasticity of substitution between labour and capital and the coefficient for added value should approach 1 if there are constant returns to scale or if the elasticity of substitution between labour and capital is 1 (Hubert and Pain, 2001, p. 71).
changes in the value of outsourcing to different countries\textsuperscript{13}. This is true for geographical outsourcing, that is, outsourcing measures related to chosen groups of countries, say CEE countries (new EU members and candidates) in columns 2, 4 and 6 in table 1, but changes in outsourcing origin cannot be collected by a general measure of outsourcing such as Global outsourcing, in columns 1, 3 and 5, since changes in outsourcing compensate. When a firm changes the country of origin of its imported intermediate inputs, increasing and decreasing flows converge in our outsourcing measure.

Another source of mixed effects is the choice of outsourcing measure. As we have seen before, broad and difference measures can be the result of opposing trends. In the regressions that follow we will focus on the narrow measure of outsourcing, as it better describes the type of subcontracting that can affect labour demand for the sector.

For the narrow outsourcing measures we can observe that for all manufacturing sectors, column 1, none of them are significant\textsuperscript{14}. Then we split the sample into low-tech and medium-high-tech sectors. Low-tech sectors include those in which Spain has been historically specialised: textile, shoes, food industries, etc. Outsourcing does not appear to have a significant effect on Spanish employment in those industries either when we consider outsourcing to CEE countries or to the whole of the world economy.

\textit{<Table 1 around here>}

When we turn on medium-high-tech sectors, like machinery, equipment, chemical, metallic products, etc, we find a negative effect from narrow outsourcing to CEE countries on total worked hours in these Spanish industries. Outsourcing is much higher

\textsuperscript{13} Grossman & Helpman (2002, 2005) are good examples of theoretical models for these strategic decisions within a firm.

\textsuperscript{14} Estimations for broad outsourcing were calculated but found non-significant.
in these sectors than in low-tech sectors (as the weight of these sectors in the Spanish economy is still too low) so their expected effect on labour demand should be greater.

This can be explained, firstly, as Spain has a deficit in medium-high technology so demand for this type of intermediate inputs can not be provided by the domestic industry but imported. Secondly, these sectors favour the outsourcing process by focusing on product differentiation, introducing information and communication technologies to a greater extent and allowing a greater vertical fragmentation.

Our measure of global outsourcing is not significant for medium-high-tech sectors, but this is probably because it catches opposite effects as explained above. In the case of outsourcing to CEE countries for medium-high-tech sectors, this is not only much higher but it has also increased spectacularly in 1993-2003 (by more than 300%), and we find a significant effect on sectoral employment.

For the CEE outsourcing similar results were found in previous literature, for example in Görg and Hanley (2005) or in the global estimation in Falk and Wolfmayr (2005). Other papers’ results are not comparable since they focus on relative labour demand, while our results are for absolute labour demand. Although it may seem striking at the first sight that for Falk and Wolfmayr split sample results show different behaviour to ours it can be explained by the dissimilar country specialization. While for their “Machinery, Electrical, Optical & Transport equip.” regression none of the different measures of international outsourcing are statistically significant, our medium-high-tech is significant and has a negative sign. Also, while Falk and Wolfmayr “less skill intensive manufacturing industries” regressions show a negative effect on employment, low-tech is non-significant. The differences in the results are explained by the differences in the production specialisation for Spain and the countries in Falk and Wolfmayr sample. While Spain is more competitive in low-tech sectors, the countries in
Falk and Wolfmayr sample are more competitive in medium-high-tech ones (Austria, Denmark, Finland, Germany, Italy, the Netherlands and Sweden). Also Egger et al. (2003) finds that outsourcing and imports negatively affect employment (probability of workers staying in or changing into the manufacturing industry) in sectors with a comparative disadvantage, as medium-high-tech sectors in Spain.

The different effect found in our results for low-tech and medium-high-tech sectors could then be explained by considering three factors. Firstly, Spain is more competitive internationally in low-tech sectors and therefore outsourcing and its potential negative impact on employment are both lower. Gandoy and González (2004) show that for the period 1986-2001, and especially between 1995 and 2001, Spanish low-tech industry added value and labour grow well over the EU-11 rate. Between 1995 and 2001, value added grows at an annual average rate of 3.4%, more than four times the EU rate. Spanish low-tech sectors exports have also been growing, although not enough to compensate the rise in imports. Although low-tech sectors’ growth has been labour intensive, with a negative effect on unit labour cost, there are other factors behind this growth: a) Firms have moved to quality production, avoiding standard goods and introducing a wide range of new goods; b) Spanish industry has tend to increase differentiation, as shown by the rise in intra-sectoral trade.; c) R&D expenditure grows faster in low-tech sectors; d) Between 1997 and 2001 direct investment is higher for low-tech sectors than for medium-high-tech\(^\text{15}\). All these reasons lead us to the conclusion that location advantages compensate the increase in labour cost, with a positive effect on foreign investment.

\(^\text{15}\) Myro and Fernández-Otheo (2004) find that the percentage of non-residents’ social capital is substantially reduced in high technological intensity sectors for 1997-2002. However, a similar disinvestment does not take place in medium and low technological intensity sectors.
Secondly, the presence of foreign multinational enterprises in medium-high-tech sectors is far higher, and it is this type of firms that leads the outsourcing process in search of cost reductions. Torrent and Gual (2005) show that the share of multinationals sales in low-tech sectors producing consumption goods is lower than the average of the whole of the industry. For example, multinationals’ share of total sales in Foods and beverages, Textile, leather and shoes and Manufacturing industries are 35,1%, 17,8% and 14,7% respectively compared to 50,3% for the whole of the industry. Also multinationals’ propensity to import is lower for these sectors, 7,4%, 27,5% and 18%, respectively compared to 38,1% for the whole of the industry. The authors conclude that the chances of investment delocalisation due to the European enlargement are low for Spanish low-tech sectors, while it is substantially higher for Transport equipment, Electronic products or Rubber and plastic.

Lastly, imports from low-tech sectors are basically allocated to final consumption (55%), rather than to intermediate inputs or capital goods, in contrast to imports from medium-high-tech sectors, mainly directed to these two last categories (60% are intermediate inputs and 24% are capital goods). The negative effect of final imports on labour demand should be controlled by a final imports measure better than narrow outsourcing.

About the validity of the instruments for table 1, it is not rejected according to the Sargan test of overidentifying restrictions for all columns, however the p-value is too high in columns 2 and 3, what could be pointing at a problem of short sample. The result of the second order serial correlation tests, negative correlation in $m_1$ and no correlation in $m_2$, are marginally consistent with the assumption of no serial correlation in the residuals.
We have further studied the impact of outsourcing for medium-high-tech sectors distinguishing different country groups, as can be seen in Table 2. This table contains five regressions: column 1 analyses the effect of outsourcing to EU-15 countries, column 2 to Hungary, Poland and Czech Rep., column 3 considers other new EU members, column 4 EU candidates (Turkey, Romania, Bulgaria) and finally column 5 includes outsourcing to any country but the previous ones.

<Table 2 around here>

The coefficients for added value, wages and lagged labour show once again consistent coefficients with very similar values which are always significant. The validity of the instruments is not rejected, according to the Sargan test of overidentifying restrictions. Absence of first order negative correlation is clearly rejected by $m_1$; however the hypothesis of no second order serial correlation tested by $m_2$ is only marginally accepted.

The coefficient for outsourcing is not significant for wide definitions of outsourcing, EU-15 and Rest of World in columns 1 and 5. However it becomes significant for some geographically defined outsourcing. A non-significant effect is always rejected, with increasing significance for other new EU members, the group of Hungary, Poland and Czech Rep., and finally the EU candidates, in columns 3, 2 and 4 respectively. According to our estimations, it is outsourcing to this last group of countries that causes the bigger impact on Spanish employment. This is consistent with our previous description of the fast growing narrow outsourcing to CEE countries in the last years, and particularly to candidate countries, with lower wages and increasing exchanges with the rest of Europe.
The negative effect of outsourcing to these countries on Spanish industrial employment could be compensated indirectly if outsourcing had a positive effect on production and such production required labour. This could be true if outsourcing helped firms to have lower prices or increase competitiveness through any other channel. A first approach to addressing this aspect has been carried out by estimating an equation where value added was explained on terms of outsourcing (and labour). Results did not show evidence of a positive effect of outsourcing on production, however further investigation on this point should be considered.

Table 3 investigates the consistency of our regressors and analyses the advantages of our estimation technique, system GMM estimator. Within group and OLS are the usual references for consistency of GMM estimators. Relative to GMM, OLS biases \( \hat{\alpha}_0 \) (the estimated coefficient for the lagged employment) upwards while within group biases \( \hat{\alpha}_0 \) downwards\(^{16}\). Column (1) and (2) reports the OLS and within group estimations for our base model and expected results are confirmed, with a very high coefficient for lagged labour in the OLS regression, 1,01, and a low coefficient in the within regression, 0,8.

 Column (3) presents the first-differenced GMM, that estimates an equation in differences using instruments in levels, while column (4) shows the system GMM, that improves the first-differenced GMM by estimating the equation both in differences and levels, using instruments in both levels and differences. First-differenced GMM estimators have proved to perform poorly when the instruments available for the first-

\(^{16}\) See Arellano and Bond, 1998.
differenced equation are weak\textsuperscript{17}, what could be our case since we are working with a short panel. Weak instruments result in a first-differenced GMM regressor that is biased towards the within group one, in our case the first-differenced GMM is even below the within one, so that system-GMM, in column (4) is advisable since it deals with the weak instruments problem. By comparing first-differenced and system GMM estimators we can determine the validity of the extra information provided by the levels equation in the system GMM. In this case the validity of the instruments is not rejected by the Sargan test in any of the two columns. Results for the second order serial correlation tests are consistent with the assumption of no serial correlation in the residuals for column 4 but this is not the case for column 3, so we prefer results in column 4.

The choice of instruments in this regression is according to the assumptions on the variables made by the model, which are based in economic theory and supported by estimation results. The model assumptions are the endogeneity of the added value and labour variables, the predetermination of the wages variable and the exogeneity of the outsourcing variable. Different assumptions on the variables were tried but not supported by results.

Column (5) lags the instrument set for system-GMM one period, both for levels and differences, what is expected to improve the estimation if $\nu_\mu \sim \text{MA}(1)$, instead of the assumed MA(0), as a result the estimation period is reduced by one year. Results are very similar for columns (4) and (5) so we prefer instruments at column (4) in order to keep more years in the sample. Finally column (6) replicates the preferred estimation technique in column (4) but removing the outsourcing variable as a regressor and as an instrument. Results show that the remaining variables absorb the effect of the excluded outsourcing measure, the long term positive coefficient for value added is slightly

\textsuperscript{17} Arellano and Bover, 1995; Blundell and Bond, 1998.
reduced, while the long term negative coefficient for wages is slightly increased (in absolute value), so we consider that both coefficients have caught the outsourcing effect, even more when all three variables, value added, wages and outsourcing, are increasing during the period. Also Sargan test gets worse, again we prefer regression in column (4).

6. **CONCLUDING REMARKS**

In this paper we have estimated the effects of outsourcing on Spanish employment for 93 manufacturing sectors distinguishing different geographical locations, and focusing on EU-15, new members and candidates. Our results indicate that there is not clear effect for low-tech sectors while there is a negative effect of narrow outsourcing on employment for medium-high-tech sectors. This result comes out for both inputs imported from CEE countries and new members and total imported inputs, although it is only significant for the former case.

Most of the recent literature focuses on foreign (or international) outsourcing, as they consider that the major reason for contracting out some activities is to benefit from lower wages in other countries. In particular, some of those papers point to the substitution of low–skilled labour for imported inputs from abroad. We directly estimate the impact from outsourcing on the level of manufacturing employment. Outsourcing can decrease not only low-skilled labour but also some types of skilled labour that are cheaper abroad.

Our results show a significant negative impact of narrow outsourcing to CEE countries on employment in medium-high-tech sectors, what can be explained attending to the characteristics of the Spanish manufacturing sector. Firstly, Spain has a comparative
disadvantage in medium-high-tech sectors so this type of intermediate goods can not be
provided by the domestic industry but imported. A second factor is the dominance of
foreign capital, mainly through multinationals location, in high technology firms due to
their location strategies in the past. These multinationals locate in Spain only part of the
production process and therefore they must import a great amount of intermediate
inputs. Thirdly, these sectors favour the outsourcing process by focusing on product
differentiation, introducing information and communication technologies to a greater
extent and allowing a greater vertical fragmentation.

Some of the above mentioned arguments can also explain the lack of significance in the
low-tech outsourcing measure. Spain is comparatively more competitive in these sectors
while multinationals have a lower degree of internationalization, leading to a lower
effect of outsourcing on employment.

This reduction of employment is a short-run direct effect and it depends on the type of
labour considered (high and low-skilled), types of activities subcontracted, sector
specific characteristics, price and elasticity effects, short or long term, localisation, etc.
However, the final impact may be different as it could favour competitiveness in these
Spanish sector, allowing firms to reduce costs and consequently to keep and even
increase their production and employment, with an indirect positive effect on
employment.

We have considered different measures of outsourcing and we conclude that narrow
outsourcing seems to have a negative impact on the level of employment. This is
especially the case when we focus on CEE countries (compared to EU-15 and the rest of
the world), and when considering medium-high-tech sectors. Among CEE countries, the
effect from outsourcing to candidate countries is even bigger than for new members.
6. BIBLIOGRAPHY


Table 1: Main results for different country groups and types of sectors, 1993-2003

<table>
<thead>
<tr>
<th>Variable</th>
<th>World</th>
<th>CEE countries</th>
<th>World</th>
<th>CEE countries</th>
<th>World</th>
<th>CEE countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_{t-1}$</td>
<td>0.72577</td>
<td>0.72957</td>
<td>0.56824</td>
<td>0.52734</td>
<td>0.83320</td>
<td>0.83209</td>
</tr>
<tr>
<td></td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.004)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
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<tr>
<td>$(Q-CI)_{t}$</td>
<td>0.27200</td>
<td>0.27010</td>
<td>0.46531</td>
<td>0.51246</td>
<td>0.18461</td>
<td>0.20077</td>
</tr>
<tr>
<td></td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.012)**</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>$W_{t}$</td>
<td>-0.34758</td>
<td>-0.33093</td>
<td>-0.42116</td>
<td>-0.45224</td>
<td>-0.15205</td>
<td>-0.16294</td>
</tr>
<tr>
<td></td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.012)**</td>
<td>(0.171)</td>
<td>(0.067)*</td>
<td></td>
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<tr>
<td>$Outsourcing_{t}$</td>
<td>0.00184</td>
<td>-0.00599</td>
<td>-0.00520</td>
<td>0.00656</td>
<td>-0.01964</td>
<td>-0.05846</td>
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<tr>
<td></td>
<td>(0.901)</td>
<td>(0.639)</td>
<td>(0.856)</td>
<td>(0.804)</td>
<td>(0.152)</td>
<td>(0.066)***</td>
</tr>
</tbody>
</table>

Sargan test

<table>
<thead>
<tr>
<th></th>
<th>World</th>
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<th>World</th>
<th>CEE countries</th>
<th>World</th>
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</tr>
</thead>
<tbody>
<tr>
<td>m (1)</td>
<td>67.63</td>
<td>65.85</td>
<td>20.99</td>
<td>20.89</td>
<td>51.46</td>
<td>46.96</td>
</tr>
<tr>
<td></td>
<td>[0.206]</td>
<td>[0.252]</td>
<td>[1.000]</td>
<td>[1.000]</td>
<td>[0.747]</td>
<td>[0.871]</td>
</tr>
<tr>
<td>m (2)</td>
<td>-4.0430</td>
<td>-4.027</td>
<td>-1.812</td>
<td>-1.750</td>
<td>-4.833</td>
<td>-4.865</td>
</tr>
<tr>
<td></td>
<td>[0.000]***</td>
<td>[0.000]***</td>
<td>[0.070]*</td>
<td>[0.080]*</td>
<td>[0.000]***</td>
<td>[0.000]***</td>
</tr>
</tbody>
</table>

1. CEE countries include new EU members and candidates.
2. All variables are in logs.
3. Test shown are: $p$ values for significance of coefficients and for the null hypothesis of joint validity of the instruments for Sargan test of overidentified restrictions, and autocorrelation tests $m$ (1) and $m$ (2) (they are tests - with distribution N (0,1) - on the serial correlation of residuals; $p$ values in parentheses). The Sargan-test has a $\chi^2$ distribution under the null hypothesis of validity of the instruments. * indicates significance at 10% level, ** at 5% level and *** at 1% level.
4. Estimations are run using DPD for PcGive.
5. GMM-SYS estimation combining a system of equations in first differences with a system of equations in levels using as instruments respectively the variables in levels and in first differences.
6. The table shows 2-step estimators, using finite sample corrected standard errors.
7. Estimation includes 34 sectors (NACE 151-223, excluding 160) for low-tech sectors, 58 sectors (NACE 241-366) for medium-high-tech sectors.

Instruments:
- Transformed equation: $L_{i,j-2}, (Q-CI)_{i,j-2}, W_{i,j-1}, W_{i,j}, Outsourcing_{it}$
- Level equation: time dummies, $\Delta L_{i,j-1}$ and $\Delta (Q-CI)_{i,j-1}$.

Table 1b: Long-term coefficients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>World</th>
<th>CEE countries</th>
<th>World</th>
<th>CEE countries</th>
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<th>CEE countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(Q-CI)_{t}$</td>
<td>0.99187</td>
<td>0.99877</td>
<td>1.07771</td>
<td>1.08422</td>
<td>1.10678</td>
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<tr>
<td>$W_{t}$</td>
<td>-1.26748</td>
<td>-1.22371</td>
<td>-0.97545</td>
<td>-0.95680</td>
<td>-0.91160</td>
<td>-0.97041</td>
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<td>Outsourcing</td>
<td>0.00671</td>
<td>-0.02216</td>
<td>-0.01204</td>
<td>0.01388</td>
<td>-0.11772</td>
<td>-0.34815</td>
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</table>
### Table 2: Main results for different country groups, medium-high-tech sectors, 1993-2003

<table>
<thead>
<tr>
<th>Variable</th>
<th>EU-15</th>
<th>Hungary, Poland, Czech Republic</th>
<th>Other New EU members</th>
<th>EU candidates</th>
<th>Rest of the World</th>
</tr>
</thead>
<tbody>
<tr>
<td>( L_{t-1} )</td>
<td>0.82835 (0.000)***</td>
<td>0.83871 (0.000)***</td>
<td>0.83535 (0.000)***</td>
<td>0.71920 (0.000)***</td>
<td>0.82944 (0.000)***</td>
</tr>
<tr>
<td>((Q-CI)_t)</td>
<td>0.19004 (0.000)***</td>
<td>0.19051 (0.000)***</td>
<td>0.19191 (0.000)***</td>
<td>0.32616 (0.000)***</td>
<td>0.18163 (0.001)**</td>
</tr>
<tr>
<td>( W_t )</td>
<td>-0.16617 (0.096) *</td>
<td>-0.17582 (0.034) **</td>
<td>-0.17567 (0.045) **</td>
<td>-0.25585 (0.069) ***</td>
<td>-0.16581 (0.186)</td>
</tr>
<tr>
<td>Outsourcing, ( t )</td>
<td>-0.02006 (0.140)</td>
<td>-0.02079 (0.021) **</td>
<td>-0.01970 (0.056) *</td>
<td>-0.04416 (0.000) ***</td>
<td>-0.01348 (0.278)</td>
</tr>
</tbody>
</table>

Sargan test | [0.757] | [0.207] | [0.213] | [0.935] | [0.624] |
| m (1) | [0.000] ** | [0.000] *** | [0.000] ** | [0.000] ** | [0.000] ** |
| m (2) | [0.045] ** | [0.043] *** | [0.052] * | [0.159] | [0.046] ** |

See notes 2 to 6 table 1.

Instruments:
- Transformed equation: \( L_{t-j-2} \), \((Q-CI)_{i,j-2}\), \( W_{t-1} \), Outsourcing, \( t \)
- Level equation: time dummies, \( \Delta L_{t-j-1} \) and \( \Delta (Q-CI)_{i,j-1} \).

### Table 2b: Long-term Coefficients.

<table>
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<th>Variable</th>
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<th>EU candidates</th>
<th>Rest of the World</th>
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<tr>
<td>((Q-CI)_t)</td>
<td>1.10714</td>
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<td>( W_t )</td>
<td>-0.96809</td>
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<td>Outsourcing, ( t )</td>
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<td>-0.12887</td>
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<td>-0.15725</td>
<td>-0.07905</td>
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Table 3: Different estimation techniques.

<table>
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<tr>
<th>CEE- Medium-high-tech sectors</th>
<th>OLS</th>
<th>Within</th>
<th>Diff-GMM</th>
<th>Sys-GMM 2nd</th>
<th>Sys-GMM 3rd</th>
<th>Sys-GMM 2nd No outs</th>
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<tr>
<td>L_{t-1}</td>
<td>1.00519</td>
<td>0.79606</td>
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<td></td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
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<tr>
<td>(Q-CI)_t</td>
<td>0.02422</td>
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<td>0.16744</td>
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<td></td>
<td>(0.267)</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
<td>(0.002)***</td>
<td>(0.000)***</td>
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<tr>
<td>W_t</td>
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<td></td>
<td>(0.870)</td>
<td>(0.000)***</td>
<td>(0.027)*</td>
<td>(0.067)*</td>
<td>(0.007)***</td>
<td>(0.012)**</td>
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<tr>
<td>Outsourcing_t</td>
<td>-0.01089</td>
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<td>-0.01844</td>
<td></td>
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<tr>
<td></td>
<td>(0.236)</td>
<td>(0.029)*</td>
<td>(0.524)</td>
<td>(0.006)***</td>
<td>(0.490)</td>
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</table>

Sargan test: 46.29, 46.96, 46.46, 50.74

m (1): -4.530, -4.865, -4.629, -4.872

m (2): 0.7254, 1.988, 1.809, 2.036

Outsourcing: -4.66724, 1.01213, 0.72037, 1.19570, 1.18173, 1.04285

See notes 2 to 4 in table 1.
1. Instruments in column 3:
   - Transformed equation: \( L_{t-2} \), \((Q-CI)_{t-2} \), \( W_{t-1} \), \( W_t \), \( \text{Outsourcing}_{it} \)
2. Instruments in column 4:
   - Transformed equation: \( L_{t-2} \), \((Q-CI)_{t-2} \), \( W_{t-1} \), \( W_t \), \( \text{Outsourcing}_{it} \)
   - Level equation: time dummies, \( \Delta L_{t-1} \) and \( \Delta (Q-CI)_{t-1} \).
3. Instruments in column 5:
   - Transformed equation: \( L_{t-3} \), \((Q-CI)_{t-3} \), \( W_{t-1} \), \( W_t \), \( \text{Outsourcing}_{it} \)
   - Level equation: time dummies, \( \Delta L_{t-2} \) and \( \Delta (Q-CI)_{t-2} \).
4. Instruments in column 6 are similar to those in column 4 but deleting outsourcing.
5. Columns 3, 4, 5 and 6 show 2-step estimators, using finite sample corrected standard errors.

Table 3b: Long-term Coefficients.

<table>
<thead>
<tr>
<th>Dependent variable: employment ( L_t ), CEE- Medium-high-tech sectors</th>
<th>OLS</th>
<th>Within</th>
<th>Diff-GMM</th>
<th>Sys-GMM 2nd</th>
<th>Sys-GMM 3rd</th>
<th>Sys-GMM 2nd No outs</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Q-CI)_t</td>
<td>-4.66724</td>
<td>1.01213</td>
<td>0.72037</td>
<td>1.19570</td>
<td>1.18173</td>
<td>1.04285</td>
</tr>
<tr>
<td>GPH_t</td>
<td>-1.47275</td>
<td>-1.19212</td>
<td>-0.42572</td>
<td>-0.97041</td>
<td>-1.77045</td>
<td>-1.29042</td>
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<tr>
<td>Outsourcing_t</td>
<td>2.09854</td>
<td>-0.18924</td>
<td>-0.03132</td>
<td>-0.34815</td>
<td>-0.09887</td>
<td></td>
</tr>
</tbody>
</table>