

**WHO BENEFITS FROM OUTSOURCING? A STUDY OF ONE ITALIAN REGION'S
SMALL CLOTHING FIRMS**

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Abstract

This paper analyses the production outsourcing of Emilia-Romagna's clothing manufacturers, using a new reach firm-level dataset. This dataset has the considerable advantage of containing interesting information about the outsourcing of certain phases of the production process that no other data source offers. The production process of these firms, which may be of a totally integrated or more fragmented nature, is thus analysed, and the effects of outsourcing are investigated. Since the analysis of the impact of outsourcing at the firm level has focused more on productivity than on profitability (Olsen, 2006), we are going to study the positive impact of outsourcing decisions both on a firm's value added and on its gross earnings, by estimating econometric models. These models allow us to incorporate a firm's outsourcing propensity into the impact evaluation, by adjusting for possible selection bias (Amemija, 1985; Schnedler, 2005).

Keywords: Fragmentation; Tobit IV type model; Productivity; Profitability.

1. Introduction

The phenomenon of geographically-fragmented production processes has increased without precedent in the last two decades, because information and communication technologies (ICT) have made it possible to slice up the value chain and perform activities in any location (Grossman, Helpman; 2005), while the continuous decline of transportation costs has facilitated the worldwide flows of goods (Hummels, 2007). The “globalization of the value chain” consists in the physical fragmentation of production, and is motivated by a number of factors. One is the desire to reduce operating costs by sourcing inputs from more efficient producers, either domestically or internationally, and either within or outside the boundary of the firm. Other reasons include the wish to enter emerging markets and access strategic assets that can help tap into foreign knowledge and the opportunity to exploit fiscal or legal benefits. The fragmentation of production, notwithstanding the obvious benefits it offers, also involves costs and risks for those firms involved. Indeed, it gives rise to considerable restructuring of businesses, including the “outsourcing” and “offshoring” (the very special case of exclusively international outsourcing) of certain functions (OECD; 2007). The phenomenon of offshoring, in particular, dates back to the beginning of the 1970s, when it involved economies characterized by large-scale enterprises and relatively high labour costs, such as that of the USA (Levitt, 1983; Bartlett, Ghoshal, 1989). In recent decades, the increasing level of competition in international markets has also pushed manufacturing firms in countries with salaries below those of the USA, like Italy, to take advantage of lower production costs abroad. This was initially true for the largest firms, but is now also true of small and medium-size firms, representing the majority of manufacturers in a country like Italy, which have proven capable of splitting up the production cycle without incurring any substantial diseconomies (Mariotti, Piscitiello, 1999).

As far as the consequences of outsourcing are concerned, it may have a number of sometimes unexpected effects on the organization of production, trade flows and international specialization,

the distribution of income, as well as labour markets, and these effects may vary across activities, regions and social classes. Detailed descriptions of the reasons for, and the effects of, outsourcing can be found in Munoz and Welsh (2006), Bengtsson and Dabhilkar (2009) and Windrum et al. (2009).

The impact on productivity has been studied by theorists of international production (Kulmala et al., 2002; Helpman et al., 2004). Results show that higher international involvement tends to be associated with higher productivity at any given level of corporate innovativeness. Gains typically arise from the exploitation of the comparative advantages and economies of scale offered by external suppliers (Grossman, Helpman, 2005). Goods and services may be more efficiently produced in another country, and consequently imported at a lower price. This access to better, cheaper and more varied (final and intermediate) inputs helps improve firms' productivity. Besides, by outsourcing, firms may focus on their core skills and thus increase their level of innovation (Mazzanti, Montresor, Pini, 2007). Several studies (Hijzen, 2006, Castellani, Zanfei, 2007) have found a positive connection between productivity, outsourcing, R&D expenditure and hence innovation processes.

Nevertheless, the impact of outsourcing on the performance of companies and, in particular, on their accounting figures, has seldom been studied in a systematic, in-depth manner (Bengtsson and Dabhilkar, 2009; Windrum et al., 2009). One reason for this is that it is generally rather difficult measuring outsourcing since firms are sometimes reluctant to offer details on their outsourcing and offshoring policies (OECD, 2007). A limited number of empirical studies have focused on the effects of outsourcing on productivity (see, for example, Lacity and Willcocks, 1998; Görzig and Stephan, 2002; Bengtsson and von Hartman, 2005), while its effects on profits, although demonstrated by Harrison (2004), have not been analysed in sufficient detail up until now (Olsen, 2006).

For these reasons, the present paper focuses on examining the positive impact of outsourcing decisions on both the value added and the gross earnings of companies, by estimating econometric

models. We use Tobit-type models which enable us to incorporate a firm's propensity towards outsourcing in the impact evaluation, and to adjust for possible selection bias (Amemija, 1985; Schnedler, 2005). In our case, the selection bias may be due to the fact that only certain firms do in fact decide to outsource, and this decision may well be connected to the characteristics of the firms in question, thus making it difficult to establish any causal link. Another advantage of the Tobit models in question is that they enable us to evaluate the effects of outsourcing also using cross-sectional data.

We concentrate on the small business sector, for which a few evidences are available, and which represents a peculiarity of the Italian economy with its prevalence of family-run businesses that are organized in industrial districts, and that do not receive public subsidies (Cassia and Colombelli, 2009). According to the figures published by our National Statistical Institute for 2007 (www.istat.it), Italian firms employing fewer than 10 workers constitute the vast majority of all businesses (95%), they employ about 47% of the entire Italian workforce, and generate 27% of Italy's entire turnover. These percentages increase to 98%, 59% and 38% if we consider firms with fewer than 20 workers. While firms employing at least 20 workers (2% of all firms) are investigated each year by means of a sample survey which, given their limited number, is almost a Census, smaller firms are accounted for by a different sample survey which does not provide any detailed information regarding their activities or performance.

Moreover, our specific focus is on clothing firms in Italy's Emilia-Romagna region. The decision to focus on the clothing sector is due to the facts that it is one of the most relevant sectors of the Italian economy, also in terms of the number of industrial districts and the degree of internationalization, and that outsourcing is of particular importance within this sector (Graziani, 2001) since production cycles are extremely segmented vertically, and since the considerable independence of each production phase facilitates outsourcing. Within this particular sector, production is carried out mainly by small and medium-size firms that are highly specialized and often work in niche markets. Furthermore, we choose the Emilia-Romagna region due to its high degree of entrepreneurial

activity, its importance in the national economy, and its heavily export-oriented character. Emilia-Romagna is also one of the four most important Italian regions for the clothing sector, accounting as it does for 9.8% of all Italian clothing firms and 13.8% of Italy's clothing exports in 2008 (SMI, 2009).

This paper is organized as follows. The second Section discusses the outsourcing issue in Italy. The third Section describes the data sources in more detail, and in doing so it explains how we selected the firms for analysis using statistical multivariate techniques, and provides some information on those characteristics most closely connected with the phenomenon of outsourcing. The third Section examines the econometric models employed, while the fourth Section offers the empirical results of our analysis. The fifth and final section offers some observations and conclusions, together with opportunities for future study.

2. The phenomenon of outsourcing in Italy

In Italy, the process of outsourcing picked up pace during the 1990s, at first involving medium-sized firms within the textile-clothing and leather-footwear sectors; these firms tried to recoup that competitiveness they had seen eroded by the increasing market foothold of the larger Asian economies. It has become a necessary choice for many firms wishing to compensate for the disadvantage of labour costs and the strengthening of the euro against the dollar. The phenomenon of off-shoring has therefore represented a defensive strategy in the main which while reducing domestic employment, has allowed firms to remain competitive in the market. However, for some medium-sized firms the choice has been dictated by the strategic aim of penetrating emerging markets (Meacci, 2006).

The measurement and analysis of outsourcing in Italy is of particular interest, due to the aforementioned prevalence of small and medium-size firms characterised by a low degree of

internationalization and a tendency to be clustered together in special “industrial districts”. Indeed, the outsourcing phenomenon is having important repercussions on the traditional district-based organization of Italy’s firms (Becchetti, Rossi, 2000, Beccattini, 2004; Mariotti *et al.*, 2008). It is widely acknowledged that one good reason for the vitality shown by Italy’s small and medium-sized firms has been this geographical concentration in industrial districts, which enables them to benefit from economies of agglomeration, and from the know-how and synergies that have developed within such an environment (Baldwin, 1999; Dunning, 2000, Menghinello, 2004). These districts are often characterised by the presence of small firms highly specialized in certain selected phases of a production process of which they constitute only one link in the supply chain. The survival of such firms is now clearly threatened by the possibility of internationally relocating those phases of production characterised by a substantial degree of independence, and the industrial districts in question need to make a greater effort to adapt and reorganize. Nevertheless, the reaction of, and consequences for, those small and medium firms within Italy’s industrial districts may vary considerably. The absence of any strategic project, and of the possibility of controlling the market, has obviously penalized those small firms that are not in a position to address the current contraction in demand and prices, and the escalation of competition. However, there are some Italian small and medium firms which are unable to operate on a global scale in a position of excellence, particularly those operating in the so called “made in Italy” sectors (manufacturers in the traditional leather and footwear, textile, clothing and industrial machinery sectors).

Moreover the outsourcing process, currently being implemented by firms regardless of their size, has facilitated the emergence of new enterprises. Existing firms need to focus their investments on those core activities that are of most importance for the creation of value, and as such have begun to delegate additional tasks to other firms, thus facilitating their creation with the help of specific support. As a result, however, the new firms often have no corporate autonomy as they are completely dependent upon exclusive contracts with a client company.

It goes without saying that the responses to global pressure are not always the same in all business sectors. In the clothing sector, for example, firms initially outsourced selected phases of their production processes, such as cutting, sewing and ironing, to smaller firms and workshops often situated within the same districts, or in any case not very far away. It was only at a later stage (mainly in the 1990s) that firms began to resort to offshoring, as a result among other things of the gradual removal of trade and investment barriers between the industrialized nations (Giannelle and Tattara, 2009). However, up until now offshoring has mainly been the preserve of larger firms with the required organizational capacity, which have been in a position to gradually replace certain Italian subcontractors with foreign ones, and this has created the foreseeable problems for Italy's smaller clothing manufacturers. On the other hand, however (as our results will confirm), small firms are nevertheless used to outsourcing certain phases of production to other (small) firms. As a result: *i*) a significant amount of outsourcing continues to be done "locally" within the country; *ii*) small clothing firms have adopted the dual role of subcontractor and outsourcing firm, within the framework of a chain of firms, the length of which is difficult to ascertain, where each firm works for third parties while at the same time delegating certain phases of their production to other firms.

With regard to the figures we have for company fragmentation, a survey of Italian manufacturers with more than 10 employees, carried out by Capitalia (2005), reveals that 7.3% of Italian firms resorted to outsourcing in 2004, although this particular survey provides no information on which phases of the production process were outsourced, or on the entity of domestic outsourcing.

Detailed information on domestic and overseas subcontracting is provided by an Italian administrative source, the Sectoral Studies (SDS – *studi di settore*) (Di Nicola, 2007), taken into consideration in this work. These SDS have gathered substantial information on firms since 2002, which the Tax Agency then uses to assess the small and medium firms' income-tax returns in order to determine the entity of corporate taxation due. Information is provided each year by almost all those firms with a turnover of less than 5,164,659 euros.

3. The dataset

3.1. The chosen units

SDS data allow for the analysis and evaluation of firms' activities, and of the economic environment in which they operate, as these data provide information about: the economic sector, the productive processes, the composition of the labour force, balance sheets, specific goods and services produced, reference markets, the localization of production, and a number of other important features of each specific economic sector. The information regarding the localization of production enables us to understand whether the various phases of the production process are carried out by the firm itself (internally) or by domestic or foreign subcontractors (externally). Moreover, the SDS for the clothing sector offers another important item of information, namely: "the expenses incurred for outsourced production and/or processing". We have used this specific information, which is rarely available, in the model described in the following section. Furthermore, we have added the information regarding those industrial districts that firms may belong to. As we shall see later, there are three districts within the Emilia-Romagna region where clothing manufacturing is of particular importance.

We examined figures for those ongoing businesses located in Emilia-Romagna in 2005 (tax year 2004), with the exception of those firms producing "mesh dropped" goods (the production of which differs substantially from the "manufacture of garments"). The remaining firms (2,142) nevertheless produce a considerable variety of different products. Indeed, the raw materials used represent the one element that unites a sector which is actually extremely varied with regard to the process technologies employed (and thus, with regard to the incidence of capital-labour inputs). Therefore, in order to avoid the risk of fitting models to a set of individual firms that employ excessively

different production processes, we searched for clusters of firms that were homogeneous in terms of the products obtained and/or processed.

To this end, we carried out a Principal Component Analysis (PCA) and a Cluster Analysis, which enabled us to identify twelve different groups. We used the information on the percentage of revenue deriving from various types of product (finished products or parts thereof) as starting variables for the PCA. There were 32 possible types of garment. One reason for this was the somewhat high correlation between the percentages for certain specific products (ranging, in absolute values, from 0.001 to 0.515). The PCA, carried out using a Varimax rotation in order to facilitate interpretation of results, revealed the presence of highly-correlated productions, as can be seen from the 15 principal components (shown in Table 1), which account for 61% of total variability.

Results show that, for example, firms producing jackets also tend to produce trousers, while those producing skirts tend to produce dresses and shirts as well.

Table 1: Description of the first 15 principal components

| Principal component | Connected mainly to the production of: |
|---------------------|--|
| F1 | Jackets and trousers |
| F2 | Skirts, dresses and shirts |
| F3 | Gloves, scarves and hats |
| F4 | Sweatshirts and t-shirts |
| F5 | Briefs, tank tops and pyjamas |
| F6 | Lingerie and beach wear |
| F7 | Ties and scarves |
| F8 | Padded jackets and jackets |
| F9 | Belts and other accessories |
| F10 | Baby clothes and maternity wear |
| F11 | Stockings and tights |
| F12 | Leather hats, belts and jackets |
| F13 | Wedding dresses and tights |
| F14 | Work clothes |
| F15 | Gym suits and other sportswear |

In order to segment the firms according to products or processes, we have adopted hierarchical (Ward) and non-hierarchical (K-means) clustering techniques. The hierarchical cluster reveals three

values for the possible number of groups - 12, 14 and 17 - on the basis of indicators R^2 and Pseudo F. The non-hierarchical analysis carried out for these three numbers of groups gives very similar results. A group of firms, much larger than the others, tends not to divide as the number of groups increases. The smaller groups consist of firms that are highly specialized in very specific products. Therefore segmentation in the lowest number of groups (12) was chosen (with an R^2 value of 0.60, indicating an acceptable degree of separation between the groups), the description of which, based on the declared products, is given in Table 2.

Table 2: Description of clusters of firms

| Cluster | n | Firms producing and/or processing: |
|---------|-------|--|
| 1 | 1,747 | Jackets, trousers, skirts, dresses, shirts, pullovers (mesh cut), t-shirts |
| 2 | 114 | Belts and ties |
| 3 | 48 | Work clothes |
| 4 | 42 | Padded jackets and jackets |
| 5 | 42 | Sweatshirts and t-shirts |
| 6 | 27 | Gloves, scarves |
| 7 | 11 | Gym suits and other sportswear, jeans |
| 8 | 7 | Baby clothes, maternity wear, pyjamas and underwear |
| 9 | 7 | Stockings and tights |
| 10 | 5 | Baby clothes, maternity wear |
| 11 | 3 | Ties and scarves |
| 12 | 2 | Leather hats and caps, belts |

In order to consider a group of firms that was as homogeneous as possible, for the purposes of the following impact analysis, we chose to focus on the largest group only (cluster 1) which, in essence, manufacturers “outdoor wear”. It has to be pointed out here that even though firms in the SDS archive were already classified according to their sector activity (ATECO 5 digits) with modalities similar to those shown in Table 2, this ATECO classification was neither reliable nor up to date.

3.2. The variables

The target variables are “per capita value added” and “gross earning before taxation” (EBITDA), which represent, respectively, labour productivity and the profitability of operations before depreciation charges and provisions are deducted. These variables were calculated as indicated by the Inland Revenue Agency. Per capita value added is calculated as the ratio between operational value added and the average number of people employed. Operational value added is calculated as the difference between sales revenue net of changes in inventories of finished products, and the cost of raw materials, semifinished goods and services. EBITDA is the difference between value added and labour costs. A few firms in the dataset (30) displayed negative values for EBITDA, and were thus omitted from our analysis as they represent highly specific cases which the Inland Revenue reserves the right to investigate further. Moreover, 825 of the remaining firms do not have any employees as such, whereby thus their value added is equal to their EBITDA, and so they were analysed separately from the others.

Both target variables are expressed as logarithms in the models described in the next section, with the result that they give changes in variables in percentage terms.

The explanatory variables used in the models were selected either on the basis of existing studies on the topic which, as we have already said, have mainly focused on the effects of outsourcing on productivity (Helg, Tajoli; 2005; Antonietti, Antonioli, 2007), or following suggestions offered by certain experts within the clothing sector. Some of the most important such variables are: the costs that firms incur in order to carry out their businesses, such as the cost of goods and services (excluding outsourcing), advertising expenditure, wages and, of course, “the expenses incurred for the outsourced production and/or processing”, all expressed as logarithms; capital stock (net of depreciation) in logarithmic terms; the number of years the firm has been in business; office or factory floor space in square meters; the number of phases constituting the entire production process carried out by the firm (max. 19); the number of factory workers; the number of employees.

The following qualitative company characteristics have been introduced into models, in order to better control inter-firm heterogeneity, as dummies variables: the district (a particularly important role is played by the textile district of Carpi, while the motorsport district of Bologna and the biomedical district at Mirandola are also of importance even though they do not come within the textile sector; the market area where the manufactured goods are sold (this may be the municipality, the province, up to three regions, Italy, other UE or non-UE countries); the fact of whether business activities are conducted exclusively for itself or exclusively for third parties. Moreover, we have also created two dummy variables representing groupings of those phases of production that the firms can carry out. One of these dummies (head) represents the initial phases during which styles, models, prototypes, sizes and technical specifications are established, while the other dummy variable (body) includes the later phases, from cutting to packaging. Finally, we have also created a variable representing the composition of the labour force in terms of skills, computed as the percentage of white-collar workers.

3.3. Descriptive statistics

Table 3 shows some figures (mean and coefficient of variation or percentage) for the most important characteristics of those firms with employees, with a distinction made between outsourcing and non-outsourcing firms. It should be pointed out that, given the limited size of the firms in the dataset, the outsourcing in question is exclusively of a national character. Table 4 gives the equivalent figures for those firms without employees.

Table 3: Characteristics of firms with employees.

| Characteristics | Outsourcing firms (61%) | Non-outsourcing firms (39%) |
|---|-------------------------|-----------------------------|
| | Mean (CV*100) | Mean (CV*100) |
| EBITDA | 127,703 (135) | 71,310 (174) |
| Value Added | 261,857 (147) | 152,636 (144) |
| Per capita value added | 120,584 (926) | 214,486 (787) |
| Capital stock | 135,680 (249) | 84,506 (231) |
| Costs of goods and services | 156,202 (222) | 76,489 (382) |
| Outsourcing costs | 180,063 (160) | - |
| Labour costs | 50,138 (1,401) | 56,173 (883) |
| Number of workers | 8.9 (143) | 6.5 (94) |
| Number of white-collar employees | 6.8 (181) | 4.5 (129) |
| Age of company | 13.2 (79) | 16.0 (62) |
| Number of phases (max. 19) | 6.7 (89) | 3.3 (112) |
| Floor area (m ²) for production | 221.5 (146) | 153.8 (124) |
| Percentage of white collar workers | 0.07 (232) | 0.03 (413) |
| | % | % |
| District of Bologna | 16 | 7 |
| District of Carpi | 23 | 27 |
| District of Mirandola | 18 | 9 |
| Exclusively for itself | 19 | 7 |
| Exclusively for third parties | 67 | 84 |
| Head phases | 46 | 32 |
| Municipal market area | 6 | 18 |
| Provincial market area | 26 | 35 |
| 3 regions market area | 37 | 38 |
| National market area | 30 | 9 |
| UE market area | 20 | 5 |
| Non-UE market area | 18 | 5 |

Starting with those firms employing workers (Table 3), what we notice is that those firms outsourcing work are, on average, newer and larger than their non-outsourcing equivalents, and have higher average EBITDA, value added, costs for goods and services and numbers of workers than the latter, although they spend less on labour since some of their labour is outsourced. Furthermore, outsourcing firms have fewer employees on average, and thus their per capita value added tends to be higher than that of non-outsourcing firms. Even if we were to limit our analysis to just one of the groups arising from the cluster analysis, the variability of certain characteristics such as per capita value added and labour costs, as shown by their CVs, appears almost as high.

Moreover, the outsourcing firms tend to be particularly concentrated within the districts of Bologna and Mirandola (despite the fact that the Carpi industrial district is the most important of the three concerned, containing as it does a quarter of all the firms in the group). As was previously mentioned in Section 2, many outsourcing firms work exclusively for third parties (67%), thus creating a system of firms organized in “pyramid” fashion, where each firm focuses on few phases of production, and saves money by outsourcing the other ones. The available information does not enable us to understand whether the subcontractors in question are located in the same area or not. Those figures we have obtained for firms without employees (Table 4) are obviously lower than the previous ones, in terms of both the mean and the coefficient of variation. Furthermore, these employee-less firms appear to be specialized in fewer phases of the chain. In fact, the same difference between outsourcing and non-outsourcing firms that emerged with regard to those firms with employees, also emerges here, albeit to a lesser extent.

Table 4: Characteristics of firms with no employees.

| Characteristics | Outsourcing firms (19%) | Non-outsourcing firms (81%) |
|---|-------------------------|-----------------------------|
| | Mean (CV*100) | Mean (CV*100) |
| EBITDA | 37,270 (83) | 28,168 (101) |
| Value Added | 38,132 (81) | 50,963 (124) |
| Capital stock | 29,706 (160) | 16,539 (242) |
| Costs of goods and services | 29,118 (378) | 4,901 (829) |
| Outsourcing costs | 53,811 (249) | - |
| Number of workers | 1.7 (49) | 1.6 (80) |
| Age of company | 10.6 (90) | 11.4 (84) |
| Number of phases (max. 19) | 4.4 (107) | 1.8 (117) |
| Floor area (m ²) for production | 60.2 (102) | 63.9 (75) |
| | % | % |
| District of Bologna | 13 | 7 |
| District of Carpi | 31 | 23 |
| District of Mirandola | 14 | 10 |
| Exclusively for itself | 17 | 7 |
| Exclusively for third parties | 71 | 90 |
| Head phases | 41 | 17 |
| Municipal market area | 13 | 17 |
| Provincial market area | 39 | 31 |
| 3 regions market area | 37 | 50 |
| National market area | 11 | 1 |
| UE market area | 6 | 1 |
| Non-UE market area | 6 | 1 |

The differences in the EBITDA or per capita value added between outsourcing and non-outsourcing firms cannot be seen as due to outsourcing as such, because as we have just said, outsourcing firms are on average larger than non-outsourcing firms. Therefore, we have to “purify” our evaluation of the effect outsourcing has on such indicators, of those company characteristics affecting the choice to outsource production.

4. Econometric models for the evaluation of outsourcing effects

We propose to use a Tobit IV type model (Amemija, 1986) to evaluate the effects of outsourcing on per capita value added and gross earning before taxation (both expressed as logarithms). This kind of model has been originally proposed in “impact analysis”, as it enables the effect of a treatment on a target phenomenon in a non-experimental context to be evaluated, taking account of the self-selection of those units being treated. Nevertheless, this kind of model is not often used since it requires information that is seldom available.

The model suggested was estimated for each of our target variables. It consists of two regression equations, one for the group of the outsourcing firms, and one for the group of the non-outsourcing firms: this would be sufficient if the allocation of each company to the groups were conducted at random.

$$\begin{aligned}
 1. y_{O_i} &= \mathbf{x}'_{O_i} \boldsymbol{\beta}_O + u_{O_i} && \text{outsourcing firms} \\
 2. y_{NO_i} &= \mathbf{x}'_{NO_i} \boldsymbol{\beta}_{NO} + u_{NO_i} && \text{non outsourcing firms}
 \end{aligned} \quad [1]$$

However, this is not the case since the choice of resorting to outsourcing leads to a process of self-selection and the effect of outsourcing may interact with the firm’s characteristics. Therefore, a

third equation determining allocation to the two groups is required, and this represents the selection of units subjected to a treatment.

Moreover, as we have already said, the source considered includes the important information on “the expenses incurred for the outsourced production and/or processing”, and this may be used as a dependent variable in the third equation. In terms of impact analysis, we also know the entity of the treatment. In particular, we consider the logarithm of such expenses as a linear function of certain firm characteristics. This dependent variable is observed for the outsourcing firms, otherwise it is equal to 0 (censored regression model).

$$\begin{aligned}
3. T_i^* &= \mathbf{x}'_{Ti} \boldsymbol{\beta}_T + u_{Ti} \\
T_i &= T_i^* \quad \text{if } T_i^* > 0 \text{ (outsourcing firms)} \\
&= 0 \quad \text{if } T_i^* \leq 0 \text{ (non outsourcing firms)}
\end{aligned} \quad [2]$$

Residuals of these three models relating to the same firms may be correlated. This three equation model is known as the IV type Tobit model (Amemija, 1986).

$$\begin{pmatrix} u_O \\ u_{NO} \\ u_T \end{pmatrix} \sim N_3 \left(\mathbf{0}, \begin{bmatrix} \sigma_O^2 & 0 & \sigma_{O,T} \\ 0 & \sigma_{NO}^2 & \sigma_{NO,T} \\ \sigma_{O,T} & \sigma_{NO,T} & \sigma_T^2 \end{bmatrix} \right) \quad [3]$$

In our case, we have also introduced “the expenses incurred for the outsourced production and/or processing” among the explanatory variables of the model for the outsourcing firms (equation 1), so as to introduce a small degree of simultaneity in the system of equations (Lee, 1993).

As identification problems may arise for the variance-covariance matrix in [3], parameters of this kind of more complex Tobit models are estimated using the two-step Heckman method (Heckman 1974; 1976).

The following explanation of such a method aims to facilitate interpretation of the results. In rewriting the model in the form of a conditional expectation, the self-selection problem is represented by a missing significant explicative variable, given by the inverse of the Mills' ratio, the λ function, which has to be added to the explicative variables in all the equations:

$$\begin{aligned}
1. E(T_i | T_i^* > 0) &= \mathbf{x}'_{Ti} \boldsymbol{\beta}_T + \sigma_T \lambda(\mathbf{x}'_{Ti} \boldsymbol{\beta}_T \sigma_T^{-1}) \\
\text{where } \lambda(\mathbf{x}'_{Ti} \boldsymbol{\beta}_T \sigma_T^{-1}) &= \frac{\phi(\mathbf{x}'_{Ti} \boldsymbol{\beta}_T \sigma_T^{-1})}{\Phi(\mathbf{x}'_{Ti} \boldsymbol{\beta}_T \sigma_T^{-1})} \quad [4] \\
2. E(Y_{Oi} | T_i^* > 0) &= \mathbf{x}'_{Oi} \boldsymbol{\beta}_O + \sigma_{O,T} \sigma_T^{-1} \lambda(\mathbf{x}'_{Ti} \boldsymbol{\beta}_T \sigma_T^{-1}) \\
3. E(Y_{Noi} | T_i^* \leq 0) &= \mathbf{x}'_{Noi} \boldsymbol{\beta}_{NO} - \sigma_{NO,T} \sigma_T^{-1} \lambda(-\mathbf{x}'_{Ti} \boldsymbol{\beta}_T \sigma_T^{-1})
\end{aligned}$$

The first step of the Heckman method consists in estimating the ratio $\boldsymbol{\beta}_T/\sigma_T$ by applying the maximum likelihood to the Probit model corresponding to the equation determining the allocation to the two groups (first equation in [4]). The second step consists in estimating the parameters of the three regression models (including the λ function as an explicative variable) using the least squares method. However, the regression coefficients of the λ function in the target variable equations (equation 2 and 3 in [4]) contain the covariances between residuals. Therefore, a significance test for the correlation between residuals coincides with a test for the significance of the λ function.

Finally, although the models proposed in this present work are applied to cross-sectional data, and thus they do not take account of the dynamics of the target phenomena, they allow us to highlight the differences between firms by modelling their heterogeneity.

5. Estimation results

The estimated models show quite a good fit, evaluated by \bar{R}^2 , above all for EBITDA. The graphical analysis of residuals enables us to exclude problems due to the heteroschedasticity of residuals, and the symmetry of their distribution appears acceptable. The logarithmic transformation of the dependent variables certainly attenuates such problems to a certain extent.

The following subsections 5.1 and 5.2, show the results obtained for firms with employees, and firms without employees, respectively.

5.1. Firms with employees

Tables 5 and 6 show the econometric estimates obtained using the IV type Tobit model estimated for the EBITDA and the Per Capita Value Added of the firms with employees. Each table presents estimates of the parameters of the model's three equations in three separate columns. Due to the considerable number of possible auxiliary variables, only those resulting significant according to a process of backward elimination, were kept in the model and presented in the Tables.

Starting with the model for EBITDA estimated for those firms with employees, the test for the significance of correlations between residuals shows that the correlation coefficient for the outsourcing firms is significant, at $p_value < 0.05$, and negative, whereas it is not for the non-outsourcing firms. Therefore, the regression model for the logarithm of the EBITDA of non-outsourcing firms may also be estimated separately from the model for outsourcing costs. The estimation of this individual model gives estimates of coefficients that are almost identical to the ones given in the table (which is why these results are not reported). If, on the other hand, we did not model the self-selection of the outsourcing firms, we would overestimate the effect of outsourcing on EBITDA.

The first two columns in the table show those factors determining the choice to outsource, and the entity of outsourcing. The coefficients of the auxiliary variable introduced as a logarithmic transformation (log-log model) may be interpreted as elasticities. Thus, for example, if the costs of goods and services increases by 1%, the outsourcing costs decrease on average by 0.23%, all other conditions being equal. Capital stock has a similar effect, albeit positive. Besides if the age of the firm increases by one year, outsourcing costs fall by 17%, while if the floor space used for production increases by one square meter, outsourcing costs increase by 0.3%. Certain dummy explanatory variables were found to be significant when describing outsourcing expenditures, such as two districts, the one in Bologna and the one in Mirandola, where firms tend to resort more to outsourcing than firms situated in other areas do, whereas for those firms conducting the initial phases of the production process, the contrary is true.

As regards the effects on EBITDA in the case of the outsourcing firms, we can see that it increases with the cost of goods and services, labour costs and outsourcing costs, together with a series of other company characteristics. In particular, a 1% increase in outsourcing costs causes an average increase in EBITDA of 0.10%. Elasticity is lower for the other goods and services costs, whereas it is higher for labour costs. If we compare these results with those obtained for non-outsourcing firms, which of course do not incur outsourcing costs, we see that labour costs do not constitute a significant variable in the model for non-outsourcing firms. This result, while it may appear surprising at first, is further explained by the graphs in Figure 1, where firms are plotted according to the logarithm of EBITDA and the logarithm of labour costs.

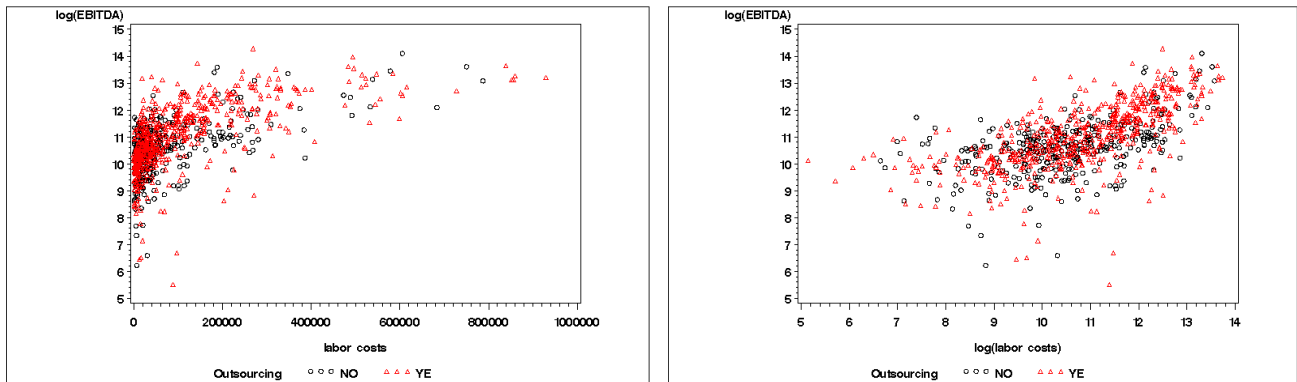
Table 5: Results for firms with employees: effects on EBITDA

| L(outsourcing costs) All firms | | L(EBITDA) Outsourcing firms | | L(EBITDA) Non-outsourcing firms | |
|-----------------------------------|----------------------|---------------------------------|----------------------|------------------------------------|----------------------|
| Covariate | Estimate | Covariate | Estimate | Covariate | Estimate |
| L (capital stock) | 0.205*** (3.42) | Constant | 7.366*** (19.07) | Constant | 9.814*** (29.51) |
| L (costs for good and services) | -0.226*** (-3.26) | L (costs for good and services) | 0.032*** (3.07) | L (costs for good and services) | 0.036*** (2.67) |
| Age of company | -0.173*** (-6.56) | L(labour costs) | 0.261*** (7.50) | L (capital stock) | 0.038*** (2.60) |
| No. of phases | 0.618*** (6.58) | L (outsourcing costs) | 0.101*** (5.24) | No. of workers | 0.072*** (8.83) |
| Head phases | -1.772** (-2.17) | No. of workers | 0.011*** (2.97) | Share of white collar workers | 0.862** (1.98) |
| Assembly phase | 2.003*** (3.48) | Share of white collar workers | 0.651*** (2.74) | Age of company | 0.011** (2.19) |
| Packaging phase | 2.592*** (3.48) | District of Carpi | 0.282*** (3.23) | District of Mirandola | -0.389** (-2.54) |
| District of Bologna | 3.229*** (4.41) | Exclusively for itself | -0.279** (-2.49) | Exclusively for third parties | 0.340** (2.24) |
| District of Mirandola | 4.090*** (5.84) | Office space | 0.002*** (2.77) | Assembly phase | -0.462*** (-4.56) |
| Factory space | 0.003*** (3.49) | Cutting phase | 0.352*** (3.76) | Ironing phase | -0.163* (-1.69) |
| | | Assembly phase | -0.443*** (-3.98) | Municipal market area | -0.872*** (-4.34) |
| | | Ironing phase | -0.234*** (-2.71) | Provincial market area | -0.558*** (-2.88) |
| | | Municipal market area | -0.313* (-1.87) | Market area: 3 regions | -0.534*** (-2.87) |
| | | Provincial market area | -0.458*** (-3.59) | | |
| | | Market area: 3 regions | -0.277** (-2.52) | | |
| σ_T | 6.934*** (30.01) | σ_O | 0.907*** (26.75) | σ_{NO} | 0.674*** (22.61) |
| | | $\rho_{O,T}$ | -0.233** (-2.35) | $\rho_{NO,T}$ | -0.180 (-1.00) |
| | | $\bar{R}^2=0,71$ | | $\bar{R}^2=0,57$ | |

Notes: 892 firms. The t-value is shown in brackets. Asterisks denote the significance of coefficient estimates: *** 1% significance, ** 5% significance, * 10% significance.

Fig. 1a: Firms with employees by log(EBITDA) and labour costs

Fig. 1b: Firms with employees by log(EBITDA) and log(labour costs)



Notes: red triangle outsourcing firms; black circle non-outsourcing firms.

The outsourcing firms (red triangle) and the non-outsourcing firms (black circle) display relationships characterised by different slopes. The non-outsourcing firms' slope is not steep. As we have said, these firms' labour costs are generally higher than those of other firms. So if they employ more labour, their value added will increase, whereas their EBITDA will not.

Moreover, the results in Table 5 show that EBITDA is positively effected by the number of employees, and the proportion of white-collar workers, while it is lower for firms with a restricted market area (up to three regions), for those firms working exclusively on their own (if they do not outsource), for firms in the Mirandola district (if they do not outsource), and it is higher for the firms in the Carpi district (if they outsource) and for firms working exclusively for on behalf of third parties (if they do not outsource).

Table 6 below enables us to compare the results obtained, for firms with employees, regarding EBITDA, with the corresponding figures obtained for Per Capita Value Added. In particular we are interested in comparing the effects of outsourcing on each of our two target variables.

We may observe that also in this model, the correlation between the residuals of the equation for outsourcing costs, and the residuals of the model for per capita Value Added of the outsourcing firms, is both significant and negative, while the corresponding correlation for non-outsourcing firms is not. Therefore, if we were once again to ignore self-selection, we would overestimate the

effect of outsourcing on the per capita Value Added of the outsourcing firms. The coefficient of outsourcing costs is again significant in this model, although it is lower than before. If outsourcing costs increase by 1%, then per capita Value Added increases on average, all other things being equal, by 0.04%. Hence outsourcing effects productivity, although the benefits to the enterprise are greater. These findings are consistent with those obtained by Giannelle and Tattara (2009), who evaluated the impact of delocalization on the same indicators considered in this present study, albeit for a sample of large clothing manufacturers in another Italian region (the Veneto) and using a different methodology. They evaluated the said impact as being higher, since they took very large firms into consideration; however, they also discovered a greater benefit to the enterprise than to workers deriving from outsourcing.

The other factors affecting the decision to outsource work, and the entity of outsourcing, are similar to those already examined in the case of the EBITDA model, while per capita Value Added is influenced by a more limited number of auxiliary variables. The per capita Value Added decreases as the number of employees and the cost of intermediate inputs decrease (this is only significant for outsourcing firms), whereas it increases as office space increases (for outsourcing firms only), and is higher for those firms within Carpi's industrial district and for those selling their products to UE countries (in the case of non-outsourcing firms).

Table 6: Results for firms with employees: effects on Per Capita Value Added

| L(expenses for outsourcing) All firms | | L(Per Capita Value Added) Outsourcing firms | | L(Per Capita Value Added) Non outsourcing firms | |
|--|----------------------|--|----------------------|--|----------------------|
| Covariate | Estimate | Covariate | Estimate | Covariate | Estimate |
| Age of company | -0.186*** (-7.34) | Constant | 10.561*** (58.12) | Constant | 10.855*** (90.05) |
| No. of phases | 1.725*** (7.01) | L (costs for good and services) | -0.018** (-2.23) | No. of workers | -0.050*** (-5.96) |
| (No. of phases) ² | -0.052*** (-4.55) | L (outsourcing costs) | 0.044*** (2.79) | No. of phases | 0.036** (2.10) |
| Factory space | 0.003*** (3.04) | No. of workers | -0.018*** (-6.39) | District of Carpi | 0.312*** (2.95) |
| District of Bologna | 3.771*** (4.96) | District of Carpi | 0.359*** (4.60) | UE market area | 1.006*** (3.78) |
| District of Carpi | 1.263*** (1.99) | Office space | 0.003*** (4.06) | | |
| District of Mirandola | 5.150*** (6.97) | Provincial market area | -0.143* (-1.79) | | |
| Head phases | -4.607*** (-5.01) | | | | |
| Body phases | -2.365*** (-3.52) | | | | |
| Provincial market area | 2.588*** (2.93) | | | | |
| Market area: 3 regions | 3.582*** (4.33) | | | | |
| National market area | 4.977*** (4.84) | | | | |
| σ_T | 6,901*** (29.85) | σ_O | 0.755*** (28.77) | σ_{NO} | 0.863*** (24.35) |
| | | $\rho_{O,T}$ | -0.220** (-2.57) | $\rho_{NO,T}$ | 0.186 (1.52) |
| | | $\bar{R}^2=0,71$ | | $\bar{R}^2=0,57$ | |

Notes: 892 firms. The t-value is shown in brackets. Asterisks denote the significance of coefficient estimates: *** 1% significance, ** 5% significance, * 10% significance.

5.2. Firms without employees

Firms without employees are a group of very small firms which are, nevertheless, an important feature of the overall Italian economy. Furthermore, regardless of their limited size, a non-negligible percentage of these firms (19%) outsource part of their production, and this is why we decided not to exclude them from our analysis.

The results obtained for the EBITDA model are given in Table 7. The first thing we notice is that the results for the coefficients of correlation are once again the same, that is, only the coefficient

regarding outsourcing firms is significant. Moreover, many of the auxiliary variables included were also present in the corresponding model estimated for those firms with employees. One very interesting thing concerns the elasticity of EBITDA compared to outsourcing costs, which at 0.095 is almost equal to that estimated for those firms with employees (0.101). This result appears to be very robust in relation to variations in the set of auxiliary variables. Furthermore, the propensity to outsource is greater among newer firms, firms characterised by higher capital stock (a proxy of the size of the firm), by greater advertising expenditure, and by carrying out more phases of the production process. Among outsourcing firms, the elasticity of EBITDA in relation to outsourcing costs is greater than that in relation to spending on other intermediate inputs, which is 0.058, as was also the case for firms with employees. Other important characteristics include the number of workers (in this case workers who are not employees, as family members and associates who work in the firm), the fact of working exclusively for third parties, which has a positive effect on EBITDA, and the fact of carrying out the assembly phase, which is the core function of the production process and has, among all the phases, the greatest impact on the target variables in question (in this case it has a negative effect on EBITDA). If we examine non-outsourcing firms, EBITDA is found once again to be positively effected by the cost for goods and services (albeit subject to a lower degree of elasticity than that seen in the case of outsourcing firms), by capital stock, by factory space and by the size of the workforce. Moreover, EBITDA increases as the market area in question goes from municipal to national level, whereas it is lower for those firms working exclusively for themselves. Thus if we consider all the firms within this group, regardless of whether they outsource or not, third-party working, exclusively or otherwise, has a positive impact on EBITDA.

Table 7: Results for firms without employees: effects on EBITDA

| L (outsourcing costs) All firms | | L (EBITDA) Outsourcing firms | | L (EBITDA) Non outsourcing firms | |
|------------------------------------|-----------------------|---------------------------------|----------------------|-------------------------------------|---------------------|
| Covariate | Estimate | Covariate | Estimate | Covariate | Estimate |
| Constant | -18.837*** (-9.25) | Constant | 8.701*** (24.80) | Constant | 6.248*** (9.36) |
| L (capital stock) | 1.458*** (7.26) | L (costs for good and services) | 0.058*** (3.08) | L (costs for good and services) | 0.028*** (3.25) |
| Age of company | -0.262*** (-3.94) | L (expenses for outsourcing) | 0.095*** (3.65) | L (capital stock) | 0.033*** (3.88) |
| (No. of phases) ² | 0.052*** (5.01) | No. of workers | 0.371*** (4.84) | No. of workers | 0.138*** (5.97) |
| L (advertising costs) | 0.951 (3.81) | Exclusively for third parties | 0.621*** (3.59) | Factory space | 0.005** (8.11) |
| | | Assembly phase | -0.447*** (-3.43) | Exclusively for itself | -0.530** (-4.65) |
| | | | | Municipal or provincial market area | 2.703*** (4.05) |
| | | | | Market area: 3 regions | 2.975*** (4.45) |
| | | | | National market area | 3.215*** (4.59) |
| σ_T | 10.989*** (14.55) | σ_O | 0.807*** (12.03) | σ_{NO} | 0.676*** (30.00) |
| | | $\rho_{O,T}$ | -0.467*** (-3.86) | $\rho_{NO,T}$ | -0.289 (-1.55) |
| | | $\bar{R}^2=0,71$ | | $\bar{R}^2=0,57$ | |

Notes: 825 firms. The t-value is shown in brackets. Asterisks denote the significance of the coefficients estimates: *** 1% significance, ** 5% significance, * 10% significance.

6. Conclusions

This work aims to estimate the effect of outsourcing on the productivity and profitability of small firms within the clothing sector of one Italian region, Emilia-Romagna, which is characterized by a high degree of entrepreneurial activity and a particularly high propensity towards exporting products in that particular sector. The data source we utilise contains detailed information on firms' outsourcing costs which is not provided by any other archive or survey, and which allows us to quantify the financial benefits of outsourcing parts of the production process. To this end, we use IV Type Tobit models which allow us to take account of the self-selection of outsourcing firms in

the estimation process. Our findings reveal that outsourcing has a positive effect on both productivity and, in particular, on profitability. This would seem to indicate that small businesses place immediate profit before productivity and growth, and is in keeping with the findings of another study (Giannelle and Tattara, 2009) that focused on larger firms within another Italian region.

At this point it would be interesting to conduct a longitudinal analysis - feasible only if data for different years were available - in order to discover whether outsourcing produces a “one-off effect” when begun, or whether it also implies increasing productivity/profitability during subsequent periods thereafter.

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