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THE DECLINING USE OF UNSKILLED LABOUR IN ITALIAN MANUFACTURING: IS TRADE TO BLAME?

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Abstract

As in other industrialised countries, the manufacturing sector in Italy has recently experienced a substantial increase in the use of skilled relative to unskilled workers - skill upgrading. In this paper we estimate a model, based upon the notion of outsourcing, of the relative demand for skilled labour which allows identification of the roles of technological change and trade, the two main culprits, in skill upgrading. Compared to previous studies of Italy the model is applied to highly disaggregated industrial data and in addition the impact of trade is more precisely measured through the separate identification of import flows from low-wage labour abundant countries and those from OECD partners. Furthermore we also introduce a measure of trade variability. Our results show firstly that economic variables played little or no role in determining the relative demand for unskilled workers in the 1970s in Italy, reflecting the nature of Italian labour market institutions in the period. Subsequently, in the 1980s and 1990s, following some labour market reforms, we find that international competition, in terms of import penetration and the variability of trade prices, had a significant effect on the relative demand for blue-collar workers in Italy in skilled intensive sectors. In unskilled intensive sectors, such as textiles and clothing, where the impact of imports from low-wage countries might be expected to be more pronounced, we do not find a significant effect from imports but rather that the most important role has been played by technological change. The result is consistent with previous studies that indicate that Italian textile and clothing firms have remained internationally competitive by increasingly switching to high quality segments of the industry.

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1. Introduction

As in many other industrialised countries, there has been substantial skill upgrading in the Italian manufacturing sector over last two decades. This shift towards greater employment of skilled relative to unskilled labour is common across different types of industrial sectors, in terms of their intensity of use of skilled and unskilled workers. It also appears to be independent of the level of sectoral disaggregation, implying that the observed aggregate changes are mainly the result of within-industry movements. This paper seeks to assess the role played by trade and technological change in shifting demand away from unskilled workers in Italian manufacturing industries.

Recently, a number of studies have tried to quantify the effect of trade on employment in Italy. De Nardis and Malgarino (1996) find a net positive effect of trade on total employment in almost all industries during the period 1982-88. De Nardis and Paternò (1997) report that the positive net exports generated by Italian manufacturing over the period 1980-95 raised the share of employment in manufacturing over total employment compared to the counterfactual cases of trade balance or of a trade balance held at the level of that in 1980. Interestingly, positive net effects were concentrated on the traditional sectors (industrial and agriculture machinery, leather and footwear, textiles and clothing, furniture, other manufacturing) and negative effects in the high-tech industries. In contrast, Bella and Quintieri (1996) find a small negative effect of trade on total employment for the period 1975-89. However, as yet there is no clear evidence on the key determinants of skill upgrading in Italy. Quintieri and Rosati (1996) interpret the dominant role played by *within* industry skill upgrading as evidence that the increase in the relative use of skilled workers in the 1980s was mainly the result of technological change.

In general, studies of other countries, which have applied more direct tests of the contributions of trade and technology to the increasing inequality between skilled and unskilled workers, tend to exonerate trade.[1] It is either skill biased technological change (Machin and Van Reenen, 1998) or sectorally biased technological progress (Haskel and Slaughter, 1999) which has been

[1] For a clear and detailed comment on the methodologies and results from price studies, see Slaughter (1997).

found to be at the heart of movements in the relative price of skilled-labour compared to unskilled-labour intensive goods, and so, following the logic of the standard Stolper-Samuelson model, the main cause of changes in the relative price of skilled relative to unskilled labour. However, the use of aggregate sectoral data in these studies may hide the true impact of trade (Wood,1998).

Alternative approaches based on the notion of outsourcing (*out*ward re*sour*ce us*ing*) do tend to find a more substantial and significant impact of trade on unskilled wages and employment in the US (Feenstra and Hanson, 1995, 1996; Anderton and Brenton, 1998), in the UK (Anderton and Brenton, 1999), and in Sweden (Anderton, Brenton and Oscarsson, 2001). Outsourcing is enabled by the fragmentation of the production chain and the identification of unskilled intensive activities in both unskilled and skilled intensive sectors. Globalisation allows firms to reduce their costs by moving the production of unskilled intensive activities to low-wage countries. In this paper we assess whether such a phenomenon has been prevalent in Italian manufacturing industries and directly test the role of trade and technological change in influencing skill upgrading using a model which allows for the increasing use of skilled labour within industries.

Our analysis is undertaken at a much more disaggregate industry level than in previous studies of Italy and we also separately identify imports from low-wage countries as more accurately capturing the incentive to outsource. Technological change is captured through the inclusion of a measure of R&D expenditures. An additional feature of this paper is that we introduce a measure of the variance of trade prices from different sources to try and capture the idea that comparative advantages have become thinner (Bhagwati and Dehejia, 1994) and production has become internationally more footloose generating increased uncertainty for domestic producers. The paper proceeds by discussing in the next section information on the extent and nature of skill upgrading in Italy. Section 3 briefly discusses the nature of industrial specialisation in Italy, whilst Section 4 presents the econometric model of outsourcing that we apply to detailed data on Italian manufacturing sectors. Section 5 presents results and considers their implications. A final section presents the conclusions of this piece of work.

2. Skill Upgrading in Italian Manufacturing

In this paper we use the distinction between blue-collar and white-collar workers as a proxy for skilled and unskilled workers.[2] Figure 1 shows the evolution of the share of employment (BcESh) and of wages and salaries (BcWSh) of blue-collar workers for the manufacturing sector as a whole between 1973 and 1995. The figure also shows the relative wage (lnGW/lnGS) of blue-collar compared to white-collar workers. There is a clear discontinuity in the calculated shares between 1982 and 1983 revealed by both the wage and employment shares. This reflects that data from 1973 to 1982 were provided by a survey of firms with 50 or more employees, whilst the data from 1983 to 1995 include responses from firms with at least 20 employees.

The figure demonstrates that the share of blue-collar workers in total manufacturing employment has decreased, by 6 percentage points between 1973 and 1983 and by a further 6 percentage points between 1983 and 1995. The decline in the wage share of blue-collar workers has been less pronounced, particularly in the first period up to 1983. All the decrease in the wage share is concentrated between 1983 and 1995 (from 66% to 59%). As we will discuss in more detail below this follows the relaxation of the strong labour market regulations of the 1970s. The relatively large change in the employment share compared to that for the wage bill share highlights that the increase in inequality between skilled and unskilled workers in Italy has materialised primarily in terms of adjustment to the quantity rather than the price of unskilled workers.

This feature is also reflected in the trend in wages per blue-collar employee relative to salaries per white-collar worker. Relative wages increased by 14 percentage points between 1973 and 1984 but fell by 5 points in the following period. Such a picture is consistent with previous evidence suggesting that labour market institutions and regulations compressed the gap between the relative returns to skilled and unskilled labour in Italy, at least until the mid-1980s. During the 1970s trade unions in Italy had as a primary objective the achievement of an egalitarian distribution of income[3] and were able to induce a strong compression of wage differentials. The

[2] In Italy most of the results of collective agreements are differentiated across workers according to a skill ranking system: blue-collar workers, white-collar workers, quadri and managers. Only blue-collar workers are manual workers while the amount of responsibilities differentiates white-collars from the higher categories. In our data the term white-collar workers refers to all non-blue-collar workers. Thus, the Italian data do not suffer from the same problems as the use of production and non-production workers which have characterised studies of the UK and US and have been criticised (see Leamer, 1994) for the inclusion of certain manual workers, such as office cleaners, non-production (and hence skilled) workers.

[3] 'Equal pay for all work' was the slogan of unions' campaign.

collective contracts of the early 1970s granted equal increases in pay to all workers. Furthermore after 1975 high inflation rates in Italy were accompanied by wage agreements stipulating that all wages should increase by an equal absolute amount. However, these strict regulations were relaxed somewhat in the 1980s. Erickson and Ichino (1995) examine data on the metal-manufacturing sector across Italy and find evidence that the return to skilled workers increased proportionately more than that to unskilled workers after 1983. On the other hand, Sestito (1991) and Bella and Quintieri (1995) do not report any increase in wage inequality even in the 1980s.

Tables 1 and 2 offer a more detailed picture of the disaggregate manufacturing sectors included in the analysis of this paper. In terms of employment the 28 sectors that are included accounted for around 46 per cent of total manufacturing employment in Italy both in 1973 and 1995.[4] The sectors are classified either as low skilled A (LSA), low skilled B (LSB) (where LSB sectors are more capital intensive than those in the first group) and high-skilled (HS). Table 1 shows changes in the employment structure in three different sub-periods (1973-82, 1983-91 and 1992-95).[5]

During all three sub-periods total employment has been declining in all except one of the low-skilled sectors (3219, other manufacture of textiles, in the first sub-period) and in more than half of the high-skilled sectors. This is consistent with the contraction of the manufacturing sector as a whole in Italy. The column of (employment) weights indicates that there have been no major changes in the sectoral structure of each of our broad groups of low skill and high skill aggregates. Almost all sectors have a similar weight in the starting and final years of the three sub-periods. The plus and minus signs signify that the change in the weight of the sector between the two years is at least two percentage points. The fact that only a few cases satisfy such a criterion gives an indication that there has not been a substantial reallocation of resources from one sector to another within each of the broad groups for each of the identified sub-periods.[6]

The table also shows that, on average, employment loss has been greater for the unskilled intensive sectors than for the skilled labour intensive group. This is so for both the simple and the weighted average across sectors. In addition it is apparent that there have been substantial

[4] Of the remaining share the transport industry alone accounts for 15% of total employment. The included sectors were chosen principally on the basis of data availability.

[5] As is explained in the data appendix, data for Italy have been recorded using different industrial classifications in the period under study. Therefore we present data separately for the three periods, which in any case allows us to inspect for differences in trends in the three decades.

[6] None of the changes in the weight of a sector is greater than 3%.

changes in the structure of employment. Common to all sectors has been a smaller contraction of white-collar employment than the fall in the number of blue-collar workers. Indeed, in the majority of cases there has been an increase in the number of white-collar workers and a decrease in the number of blue-collar workers suggesting a process of skill upgrading in all of the sectors under study. This conclusion is consistent with existing evidence for Italy. For example, Quintieri and Rosati (1996) provide detailed information on changes in the skill composition of employment between 1982 and 1990. They report an increase of 9 percentage points in the ratio of white to blue-collar workers between the two years.[7]

Table 2 provides some information at the sectoral level on employment and wage shares and the ratio of wages to salaries per head. The first group of columns offers an exact measure of the reduction in the blue-collar share of employment in each sector. There is some evidence to suggest that skill upgrading has been slightly stronger in high-skilled sectors such as drugs and medicines (ISIC 3522), manufacture of engines and turbines (ISIC 3821), manufacture of metal and woodworking machinery (ISIC 3823), manufacture of special industrial machinery (ISIC 3824), machinery and equipment not elsewhere classified (ISIC 3829) than in the low-skilled sectors. Important exceptions are cement, lime and plaster (ISIC 3692) and manufacture of made-up textile goods, except clothing (ISIC 3212). On the other hand all sectors, with the notable exception of footwear (ISIC 3240), have experienced an increase in relative wage per employee. Increases have been rather high (14 percentage points or more) for manufacture of textiles not elsewhere classified (ISIC 3219), leather and fur dressing (ISIC 3231/32), cement, lime and plaster (ISIC 3692), drugs and medicines (ISIC 3522), petroleum and coal (ISIC 3540).

The last group of columns in Table 2 provides information on the change in the share of blue-collar workers in total employee remuneration- the wage share. Following the reduction in the employment share for the same categories of workers almost all sectors have been characterised by a decline in the blue-collar wage share. The few exceptions correspond exactly to those sectors where the blue-collar share of employment has increased.

As a whole the evidence provided by these data point to adjustments in the Italian labour market following a demand shift biased against the unskilled and to have occurred in terms of quantity rather than price. Our descriptive analysis would suggest inequality in terms of wages to have decreased until the mid-80s and to have increased slightly in the last decade. Such movements point directly to the role of trade unions and regulations in the process of wage determination in

[7] These authors also find evidence of substantial skill upgrading within occupational categories.

Italy. De Nardis and Paternò (1996) have documented an increase in the ratio of non-production to production workers that was not accompanied by an increase in the ratio of the remuneration for the two types of workers.

Obviously the data in Table 2 may not tell the whole story. Supply factors have also to be considered. It has previously been shown that the composition of the labour force changed rather radically in Italy as in other OECD countries. Faini et al. (1998) report a dramatic fall of the share of unskilled workers in the labour force balanced by an increase in the share of workers with a high-school and a university degree. Such a trend has been recorded extensively in all other OECD countries. In the face of these movements in the relative supply of the different types of workers the observed rise in the relative wages of skilled workers in the US and the UK suggest that demand factors are likely to be prevalent. In France, Sweden, and Germany the increase in inequality across the two categories of workers has arisen in terms of employment rather than wages which suggests low price flexibility in the functioning of labour markets and a strong role for institutions and/or regulations. Our analysis suggests that the Italian case has to be interpreted along these latter lines.

Consistent with such an interpretation, data on unemployment for workers of different educational levels suggest that unemployment has grown faster for workers with low education levels (Faini et al., 1998). Clearly, such trends do not reflect shifts in relative supply.[8] De Nardis and Paternò (1997) report data on the factor endowments of the Italian economy relative to other countries. It is clear that the amount of physical capital and land is similar in Italy to that in other EU economies and the US. However, at the beginning of the 1990s Italy's endowment of human capital appears well below that of other industrialised economies. In 1991 only 6% of the population between 25 and 64 had a secondary school certificate, while only 2.6% of the same population owned a degree in any scientific field (comparable figures for the EU are respectively 19% and 7%, for the UK 16% and 7.7% and for the US 36% and 6.5%). Assuming that over the last two decades changes in the work force composition towards the skilled have not been more pronounced in Italy than in other OECD countries, then supply factors are unlikely to be at the heart of skill upgrading in Italy.

[8] If there has been a shift towards the skilled in the supply of labour which has contributed to skill upgrading the higher unemployment rates for low educated workers would suggest the demand relative shift towards the skilled has had a greater effect.

3. The Competitive Position of Italy on International Markets

Compared to other industrialised economies, the standard Heckscher-Ohlin depiction of a 'Northern' country being abundant in capital and skilled labour does not fit very well with the observed features of Italy. Previous analyses have reported that Italy appears to be relatively labour abundant (Faini et al., 1998) and relatively poorly endowed with skilled labour (De Nardis and Paternò, 1997) compared to other OECD countries. Given that the bulk of the international exchanges of Italy are with other industrialised countries, this would imply that unskilled labour in Italy is more likely to gain from international trade.

However, Italy is still strongly specialised in traditional sectors such as footwear, textiles and clothing where significant competition comes from countries where the cost of labour is lower. Of course Italy appears as skilled intensive when compared to the low-wage industrialising countries. Therefore it is important in any investigation of the fortunes of unskilled workers in Italy relative to other categories of workers to distinguish the impact of trade with OECD and non-OECD countries.

In the last three decades the specialisation pattern of Italy has changed relatively little compared to the experience of other European economies. According to De Nardis and Malgarini (1998), France, Germany and the UK have experienced a larger number of cases of change of specialisation. On the contrary in Italy two thirds of the considered sectors confirmed or even reinforced their initial position of comparative advantage (disadvantage). This has occurred in the face of increased competition from countries relatively well endowed with unskilled labour which is intensively used in the traditional sectors in which Italy specialises. De Nardis and Malgarini (1998) suggest that such developments indicate that dynamic scale economies, of a learning by doing type, are at work in the traditional sectors. In this way, the enlarged size of the relevant market following increased openness to trade has strengthened the competitive advantage of Italy.[9] Consistent with this are the results of De Nardis and Paternò (1997), referred to earlier, which show a positive effect on total employment from trade in the traditional sectors and a negative impact from high skilled activities

In Table 3 we report measures of the international position of our 28 disagggregate sectors in terms of import penetration from both OECD and non-OECD countries together with export intensity ratios. The latter are included in order to give an indication of where competition for

[9] Referring to the competitive rather than the comparative advantage of a sector reflects the need to use a different theoretical framework from the static Heckscher-Ohlin model.

Italian manufacturers has increased in overseas markets. The data show clearly that the bulk of exchanges are with other OECD countries. Furthermore import penetration from OECD countries has increased in almost all sectors in the HS and LSB groups, but it has decreased in the textiles, clothing and footwear sectors (LSA), where instead import penetration from non-OECD countries has increased. In tandem with the increasing penetration of imports in most sectors there has also been an increase in the share of exports in total sales. Such an increase in export propensity has been particularly strong in the HS group, where for some sectors more than half of their total sales come from exports. Strangely, the analyses referred to earlier suggest that for these high-skill sectors Italy does not have a clear comparative advantage relative to the traditional sectors.

Clearly then when considering the increasing penetration of the Italian market by imports it is important to differentiate sectors and distinguish imports from different sources. This is what we do in the following part of the paper where we estimate the effect of trade flows from OECD and non-OECD sources on the employment structure within disaggregate sectors of the Italian economy.

4. The Model of Outsourcing

Given the analysis above of the changes in Italian manufacturing sectors the objective of this paper is to explore the role of trade and technological change in explaining the within industry shift towards the increasing use of skilled relative to unskilled labour. A suitable framework is provided by theories of outsourcing. This paper draws on previous analyses of outsourcing by Feenstra and Hanson (1995 and 1996), Anderton and Brenton (1998; 1999) and Anderton, Brenton and Oscarsson (2001). We estimate an equation derived from a translog cost function with two variable factors (skilled (white-collar (wc)) labour and unskilled (blue-collar (bc)) labour) and with capital taken to be a fixed factor of production such that[10]

$$\mathrm{d}SE_{it} = \alpha \mathrm{d}\ln K_{it} + \beta \mathrm{d}\ln Y_{it} + \rho TECH_{it-1} + \lambda \mathrm{d}\ln MS_{it} + \ell \mathrm{d}\ln(W^{hs}/W^{ls})_{it} + \gamma D_t + u_{it} \quad (1)$$

Where for industry, *i*, and for year, *t*,

SE_{it} is the employment share of the skilled (white-collar) workers $\left(\frac{E_{it}^{wc}}{\left(E_{it}^{wc} + E_{it}^{bc} \right)} \right)$

[10] A detailed derivation of the estimating equation is provided in Appendix 1.

W^{wc}/W^{bc} is the relative wage rate of skilled to low-skilled workers.

K_{it} is the capital stock.

Y_{it} is real output.

$TECH_{it}$ is a proxy variable for technological change, in our case R&D as a share of output.

MS_{it} is the share of the value of domestic demand for the output of industry i accounted for by imports from low-wage countries,

D_t is a set of time dummies included to capture changes in demand for white-collar workers common across industries for a given year,

u_{it} is an error term.

In our particular application we have used total sales of the industry as a measure of output. A more detailed discussion of the data and their construction are provided in Appendix 3. The MS term represents import penetration from low-wage countries (alternatively we also include separately import penetration from OECD countries) and can be interpreted as a proxy for outsourcing.[11] Feenstra and Hanson (1995, 1996) justify the inclusion of the import penetration term, although these authors do not distinguish imports by place of production, by arguing that merely including the factors derived from a traditional translog production function will not capture other factors – such as outsourcing – which may influence a firm's relative demand for skilled labour. Given that outsourcing to low-wage countries is claimed to push the range of activities performed by domestic industry away from low-skill towards high-skill tasks, the import penetration term can be interpreted as representing a reduced-form relationship between outsourcing and a firm's unit input requirement for skilled labour.[12]

In our analysis we also seek to investigate whether increased volatility in international markets, in terms of large fluctuations in the prices of traded goods, has induced a shift away from the employment of unskilled workers within industries. Bhagwati and Dehejia (1994) have argued

[11] Low-wage countries are defined as non-OECD countries, with the OECD taken as those members prior to 1994 (i.e. excluding recent members such as the Czech Republic, Hungary, Poland, South Korea and Mexico).

[12] Ideally we would include intermediate products imported from low-wage countries. However, data on imported intermediate products, available from input-output tables does not distinguish between low-wage and high-wage sources and is often available only at much higher levels of aggregation. Hence, here we prefer to use actual import penetration from low-wage countries at a detailed sectoral level as our

that international markets are now characterised by comparative advantages that at the margin are much thinner. Therefore production is more footloose from one country to another and continual new entries in the international arena generate uncertainty for firms producing import-competing substitutes regarding the nature of competitive conditions. Such considerations are likely to be most pronounced with regard to low-skill intensive activities and may further encourage the outsourcing of this part of the production process whilst the skill intensive elements, which are subject to less volatility in international competition, are retained in the domestic market.

We try to capture the impact of trade volatility by including in our estimating equations the normalised standard deviation of relative import prices. Again, we distinguish between trade from OECD and non-OECD countries. We have used imports from 17 individual countries to construct the OECD indicator. For the non-OECD measure we have distinguished between 5 large regions (Latin and Central America, Asia, Africa, NICs and the rest, which correspond primarily to the Central and Eastern European Countries).[13]

5. Estimation Results

We apply equation 1 to data for the period 1973 to 1995 pooling over the 28 industrial sectors for which we have information on all of the relevant variables (for details of the sectors covered see Appendix 2). We also estimated with our sample of sectors split into the three groups discussed earlier, two low-skill groups, one being relatively more capital intensive (LSB) and a high skill group. We use a weighted least squares estimator, where the weights are the sector's share in the total employment covered by our sample, to address the possible problem of heteroskedasticity arising from the different size of the sectors under study.[14]

We also relaxed the assumption of independence for the within-group residuals. In our model each 4-digit industry may constitute a group. Since we follow each sector for a time span the residuals of the observations referring to the same industry but to different years, may be correlated. For example, if a sector with higher than average labour skill intensity in one year is

proxy for outsourcing. In addition, using input-output data on intermediate inputs ignores that final products can be an important element of outsourcing in certain sector, such as clothing and footwear.

[13] Our measures of variability at a particular observation are based upon changes in import prices over the previous 3 years. This allows for the measure of variability to be based upon a greater number of data points and provides for a lagged effect in the labour market adjustment to trade volatility. For the same reason we have also used 1 period lagged variables for all trade indicators.

[14] In our tables of results we report White-corrected standard errors, which provide for appropriate inferences without actually specifying the nature of heteroskedasticity.

likely to have an higher than average skill intensity the following years and the same for other sector characteristics, then significance tests estimated coefficients may be misleading. One way to control for this intra-group correlation is to estimate a fixed effects model with dummy variables for all industries (possible groups). However, in our results sectoral dummies were never statistically significant, reflecting that the estimating equation is specified in first differences. Here, we have maintained the first difference specification, since it is derived in a consistent way from the underlying cost function, and obtain 'correct' standard errors by modifying the group (sector) scores that enter the calculation of the variance covariance matrix. Group scores in robust-cluster estimation are simply the sums of the individual scores within each group (in our case the sum of scores obtained from the observations referring to the same industry but to different years).

The results from estimating our outsourcing equation on the whole of the sample period found that none of the economic variables were statistically significant. As we shall discuss shortly we summarise that over an important part of our sample period, from 1973 to 1983, employment and wage shares for unskilled workers were primarily determined by institutional factors in Italy. Also, as we discuss in the data appendix (Appendix 3) there was also a major change in the recording of the industrial data in Italy in 1982.[15] For these reasons we decided to split our sample into two periods and re-estimated our model separately for each period.

1973-82

Results for this period were very similar to those for the whole of the sample period. This suggests that during the 1970s relative employment of skilled compared to unskilled workers was not affected in any significant way by the economic variables included in our estimating equation. This may reflect some of the difficulties encountered in deriving consistent data for the sub-period (see the appendix). However, there is strong evidence that institutional forces were at the heart of employment dynamics in Italy during the 1970s. From the 1960s the public administration controlled worker placement. Firms that had a vacancy could only fill it from the list of unemployed people held by the public employment agencies (Uffici di collocamento). Nominal hiring activities such as those involving a selection procedure, were strictly forbidden. Commentators suggest that this law has been particularly restrictive for Italian firms (Russo and Veredas, 2000) and created a disincentive to expand employment, especially that of manual

[15] There was also a (less important) change in the industrial classification in 1991. See the appendix for more details. This was reflected in a large value for the year dummy for 1992.

workers, and a greater reliance on overtime as a means of raising total output. In other words the firm when deciding on whether to hire a new worker, faced relatively high labour costs together with an uncertain level of effort and productivity from a worker it could not select by itself but had to employ from the lists of the public employment agencies.

The use of temporary contracts was also highly constrained and the *Statuto dei lavoratori* further regulated hiring and firing procedures, establishing a reinstatement obligation for workers subject to unfair dismissal. These laws have been defined as 'the most comprehensive attempt to introduce rigidities and regulations in the labour market' (Bertola and Ichino, 1995). The degree of adjustment to cyclical shocks allowed to firms was also controlled by the Cassa Integrazione Guadagni, a device that allowed firms to lay-off workers for a temporary period, without a termination of their contract. This acted as shadow unemployment benefit.

These employment regulations affected all types of employees but it appears that implementation was targeted at what was deemed to be the weakest part of the workforce, the unskilled. Therefore it is likely that employment regulations may have introduced some skill-biased distortion adding to that due to the wage policy followed by the trade unions, mentioned earlier. Firms may have invested more in skilled workers in order to limit the costs from less productive workers. Following an efficiency employment rule, employment regulations appear to have led firms to hire relatively more skilled workers, thought as more productive and less involved in strikes and other union activity.[16]

In addition, Italian firms may have moved towards more capital intensive technologies because of the strong labour regulations. Caballero and Hammour (1998) show that in the short run an institutional push in favour of a particular production factor gives it a rent over its competitive price. In the long run, however, other production factors will react and will try to exclude the favoured factor through technological adaptation. These authors find evidence of this pattern for France but not for the US. These forms of restructuring are likely to have been skill biased and therefore to have contributed to skill upgrading in Italian manufacturing.

It is 1983 which appears to be the key turning point when labour market reforms, and in particular changes to hiring and firing procedures, were introduced in Italy (Bertola and Ichino, 1995; Russo and Veredas, 2000). We now try to assess whether, in the more liberal institutional

[16] In a proper efficiency wages set-up, lower relative wages for the unskilled may not necessarily be seen as an incentive towards greater effort by skilled workers.

framework of the 1980s and 1990s, competition from international markets added to the pressures to restructure employment in Italian manufacturing.[17]

1983-95

The final specifications based on model (6) for the three groups of sectors are presented in Tables 4, 5 and 6.[18] In all cases it was found to be appropriate to include the sales term lagged either one or two years. This indicates some delay in the adjustment of relative employment of skilled and unskilled workers in Italian industries following changes in demand, as measured by the change in total sales. Lagged values of the other standard arguments in the cost function (the change in the capital stock, technological change, as measured by R&D expenditures, and the relative wage) did not prove to be statistically significant.

An important feature of the results across all three groups of sectors is the lack of significance of the relative price of imports, which is included to capture the incentive or propensity to outsource overseas.[19] Thus, overall movements in the price of imports relative to domestic prices do not appear to have significantly affected developments in the skill structure of employment in Italy.[20] On the other hand, we do find more consistent evidence that changes in import penetration have had a significant impact upon the relative amounts of skilled and unskilled labour used in Italian manufacturing industries. We now discuss the results for each of the three groups of sectors in turn.

[17] More generally a detailed analysis is warranted on how such national 'border limited' changes in regulations have interacted with international market forces, such as competition from low-wage countries in the form of either trade or the threat of relocation, and with skill-biased technological change.

[18] A separation of our sectors by groups has followed the rejection of an F-test on a common slope coefficient for our explanatory variables. The same test has instead accepted the hypothesis of a common effect across the sectors in each of the three groups.

[19] The one exception to this general conclusion is the relative price of non-OECD imports in the LSB sectors. However, the sign on this term was apposite to that expected. As we discuss in the text these relative prices where extremely volatile and we have some doubts about the reliability of the data.

[20] This term can be interpreted in two ways. It represents the exclusive channel of influence from trade to wages (or employment in the presence of wage rigidities) in the standard trade model. Entrance into international markets by low wage countries matters only if recorded in movements in the relative prices of goods. If we think of the North and the South as producing different quality varieties of the same good, the difference being expressed in the quantities of skilled and unskilled labour used, then trade can affect the employment structure only through movements in this relative price term. Moving away from the traditional approach, the relative price term can be interpreted as representing price incentives to outsource, since a decline of the price of imports from the South relative to domestic output may encourage outsourcing from the North to the South.

High-skilled sectors

Both the coefficients on the sales and the capital stock terms are negative and significant for the high-skill sectors.[21] The negative sign suggests that a contraction of the capital stock or a reduction in total sales tend to reduce the manual component of the workforce rather more than the non-manual element. Such a conclusion is consistent with previous results and the view that increases in the level of production and in production capabilities are complementary to the relative employment of manual workers and that in cyclical downturns companies tend to shed unskilled-labour at a faster rate than skilled workers.

The positive sign of the relative price of skilled relative to unskilled labour confirms that an increase in wages relative to salaries leads to a change in the composition to the labour force towards the relatively cheaper factor, skilled labour. It is surprising that the R&D indicators were not significant in the high-skilled sectors. This feature is at odds with previous studies which, for a range of countries, consistently find that technological change leads to a substantial and significant increase in the ratio of skilled to unskilled workers in the production process. However, it is apparent that for a number of the high skill sectors analysed here expenditures on R&D (as a proportion of output) in Italy have been considerably lower that in other countries, such as the US. Nevertheless, it may also be that the use of R&D expenditures as a proxy for technological change is not appropriate for Italy, although in studies of other countries[22] this measure appears to have worked as a proxy of technological change. An alternative measure that could be investigated in the future is the number of patents granted which reflects more the output of innovative activity.

The results in Table 4 suggest that trade played an important role in determining the skill structure of employment in Italian skilled intensive sectors in the 1980s and early 1990s. Increases in the market penetration of imports both from OECD countries (equation 1) and non-OECD sources (equation 4) appear to be significantly linked with the move towards the use of relatively more skilled labour in the production of advanced high-technology goods in Italy. Whilst changes in relative prices themselves are not significant (equations 2 and 8), the variability of prices across sources of imports does appear to be important (see equations 3 and 5).

[21] Capital stock coefficient only at 10% level.

[22] Anderton and Brenton (1998, 1999) for the UK and the US and Feenstra and Hansen (1996) for the US.

The significance of import penetration from non-OECD countries reflects the direct impact of outsourcing to low-wage countries. Although countries such as the NICs and other Asian countries initially emerged into the international economic arena by penetrating unskilled-labour-intensive sectors, recently they have started to be involved in unskilled-labour-intensive activities in the high-skilled technological sectors. The negative impact of imports from OECD countries on the relative employment of unskilled workers could reflect the indirect effects of outsourcing by the OECD countries themselves which has improved their ability to penetrate the Italian market. Further, as discussed above, Italy has exhibited little comparative advantage in the production of high-skilled products, whilst it has strengthened its apparent advantages in the traditional, typically more unskilled intensive, sectors.

Our finding concerning the importance of outsourcing in the skilled-intensive sectors is consistent with evidence from a similar study of Sweden (Anderton, Brenton, and Oscarsson, 2001). However, the expectation in the Swedish case is that comparative advantage is firmly rooted in the high-tech skilled intensive sectors. For Italy it is clear that comparative advantage lies elsewhere in less skilled intensive sectors such as textiles and clothing. It is to the analysis of these sectors that we now turn.

Our estimates crudely suggest that increasing import penetration during the 1980s and early 1990s accounted for around one third of the increase in employment inequality between skilled and unskilled workers in Italian high-skill sectors. Most of the increase was due to increased trade with low-wage countries, which accounted for one quarter of the increase in the use of skilled relative to unskilled labour. The impact of trade on inequality is greater if one also takes into account the impact of uncertainty as reflected in our measure of the variability of import prices.

Low-skilled A sectors

The results from applying our empirical specification to this group of sectors (Table 5) are quite different from the results obtained for the high-skill sectors. In particular, the trade variables do not seem to have significantly influenced the skill composition of employment across the different low-skill activities, such as textiles and clothing, footwear and leather products. Of the other variables entering the cost function, capital and output are never statistically significant while the relative wage term is an important determinant of the skill structure and has the

expected sign. Somewhat counter to expectations, R&D appears to have played in important and strong role in shifting employment in these sectors towards skilled workers.[23]

The continued specialisation of Italy in the textiles, clothing and footwear industries, discussed earlier, has been based upon substantial upgrading of product quality which in turn has been reflected by the increasing use of skilled relative to unskilled workers. Table 1 shows that on average skill upgrading has been more substantial in the low-skill group A than in the high-skill group. Our analysis suggests that the increase in import penetration that we observe for these sectors is not directly linked with the skill upgrading that has occurred. Brenton and Pinna (2001) show that most of the increase in Italian imports of textiles and clothing has been concentrated in products where Italian firms do not export – the expansion of imports and exports has been asymmetric. Given the importance of product differentiation and national marks of origin for these sectors this is suggestive that increasing import penetration has occurred primarily in (low) quality segments of the market in which Italian firms are not directly competing. This pattern of adjustment then entails problems with the relative price variables such that domestic product upgrading which improves the ability of domestic firms to compete with imports will be reflected in a rising relative domestic price.

Navaretti, Falzoni and Turrini (2000) stress how the determinants of outsourcing are firm specific and so will be influenced by the extent of success of product and quality upgrading. Thus our industry level data may not capture some elements of the impact of outsourcing which materialise at the firm level. Our results reflect that the majority of firms in these sectors have been able to shift into higher quality segments of the market. What has been more important for these sectors has been expenditures on research and development that have enabled the successful pursuit of strategies based on high-quality products and limited the need to outsource.

Low-skilled B sectors

The results for this group of industries, which are characterised by a relatively low intensity in the use of skilled labour but by a high intensity in the use of capital, are much less informative (Table 6). The capital stock variable is not significantly linked to changes in the composition of the workforce. This probably reflects the dominance of capital as an input and that in these industries it may be necessary to distinguish between types of machines in terms of their potential complementarity to skilled and unskilled labour. The sales term has (as expected) a

[23] Since R&D as a share of total sales is quite small for these activities the variable has been multiplied by 10^2 in the empirical estimation.

negative sign and which is significant at the 10 per cent level. Surprisingly the relative wage term is never significant and the coefficient on the R&D variable is negative and statistically significant.[24] The latter result implies that innovation in these sectors is associated with increases in the manual component of the workforce, which is difficult to explain.

With respect to import penetration, the OECD variable is not significant whilst import competition from the non-OECD countries is significantly linked to skill upgrading. Table 3 shows that, as for the high-skill industries, the level of import penetration from low-wage countries in these industries is very low although in many cases the proportionate change is substantial. So again, the share of imports from low-wage countries in domestic Italian sales appears to be associated with the rising wage share of skilled workers in these industries but here it is not the magnitude of imports that is important rather the tendency for import penetration to increase reflecting the competitive threat posed by imports. In other words, low values of import penetration do not preclude international competition from significantly affecting domestic labour market outcomes. On the other hand, experimentation with the relative price of imports (not reported here) led to contradictory results with the relative price term for non-OECD countries being of the wrong sign but strongly significant. This result implies that when outsourcing becomes less attractive skill upgrading occurs. However, this may reflect considerable problems with the unit values for these sectors, our proxy for import prices, which were particularly erratic over our sample period.

Conclusions

Our detailed sectoral analysis of skill upgrading in the Italian manufacturing industry indicates that trade, through outsourcing, influenced the employment possibilities of unskilled workers in Italy in the 1980s and 1990s. Our results suggest that economic variables had little impact on labour market outcomes in the 1970s when institutional factors dominated. We find important differences in the impact of trade between different groups of sectors. In particular we find that it is blue-collar workers in the skilled intensive sectors who have been most vulnerable to the effect of increasing international competition in terms of a decline in their use relative to that of skilled labour. For these sectors we find that competition from both OECD and non-OECD countries matters for unskilled workers. On the other hand in the low-skill sectors the impact of trade is weak and not significant. Further, technological change has played an important role in

[24] The R&D variable has been re-scaled because of the very small numbers in the data. This must be borne in mind when interpreting the estimated coefficient.

developments affecting unskilled workers in the low-skill sectors but not in the high-skill sectors.

We also find some evidence to support the notion that not only do changes in import penetration matter but also that an increase in trade variability is important in influencing domestic labour market outcomes. Uncertainty regarding trade, thinner margins of comparative advantage and more footloose production appear to encourage firms to adjust by upgrading production to more skilled labour intensive techniques and to outsource the less skill activities. Our conclusions are consistent with previous evidence that in Italy the most technology intensive industries have been the least successful on international markets and that these industries are suffering more from foreign competition in the domestic market (Quintieri and Rosati, 1996).

Although this study has been undertaken at a much more detailed level than previous studies of Italy, which may, in part, explain why these studies did not clearly identify a significant impact from trade, there is still a need for even more detailed studies to provide for a broad understanding of adjustment to international trade and technological change. In the Italian case an important aspect of the apparent success of sectors such as footwear, textiles and clothing in the face of increasing international competition, has been the way that the industry has become organised and in particular the adoption of flexible production methods and the emergence of locational concentration of firms in industrial districts.[25]

Flexibility in production often results in rapid increases or decreases in labour input and has led firms to increase the number of temporary or part-time workers, who enjoy lower levels of employment security. This results in income variation for workers over time due to their changing access to employment. Finally, workers with lower levels of employment security are likely to have less bargaining power than more secure, skilled workers. Thus, production and labour flexibility may have played an important role in widening wage differentials between skilled and unskilled workers. If the impact of flexibility is absorbed by small companies (less than 20 employers) then the effect of adjustment to trade will not be picked up in the aggregate industrial statistics that we utilise here.

Nevertheless, whilst there is still considerable need for further analysis, we are still able to draw some conclusions and implications for policy makers. Firstly, globalisation can affect low-skilled workers in all sectors, not just those in traditional unskilled intensive industries. Policies, which concentrate adjustment assistance towards workers displaced in traditional unskilled

[25] For a discussion related to the footwear sector see Brenton, Pinna and Vancauteren (2000).

sectors, could miss an important element of the adjustment to globalisation. Secondly, policies towards innovation should not be focussed solely upon high technology industries. In Italy innovation appears to have constituted an important aspect of the adjustment of traditional industries such as textiles and clothing.

Finally, here we have looked at only one aspect of labour market adjustment to globalisation and technological change; the skill upgrading observed within industries. Equally important is an understanding of what happened to the low-skill workers displaced from both the high-skill and low-skill sectors and the dynamics of labour adjustment, such as duration of unemployment and the propensity for re-employment.

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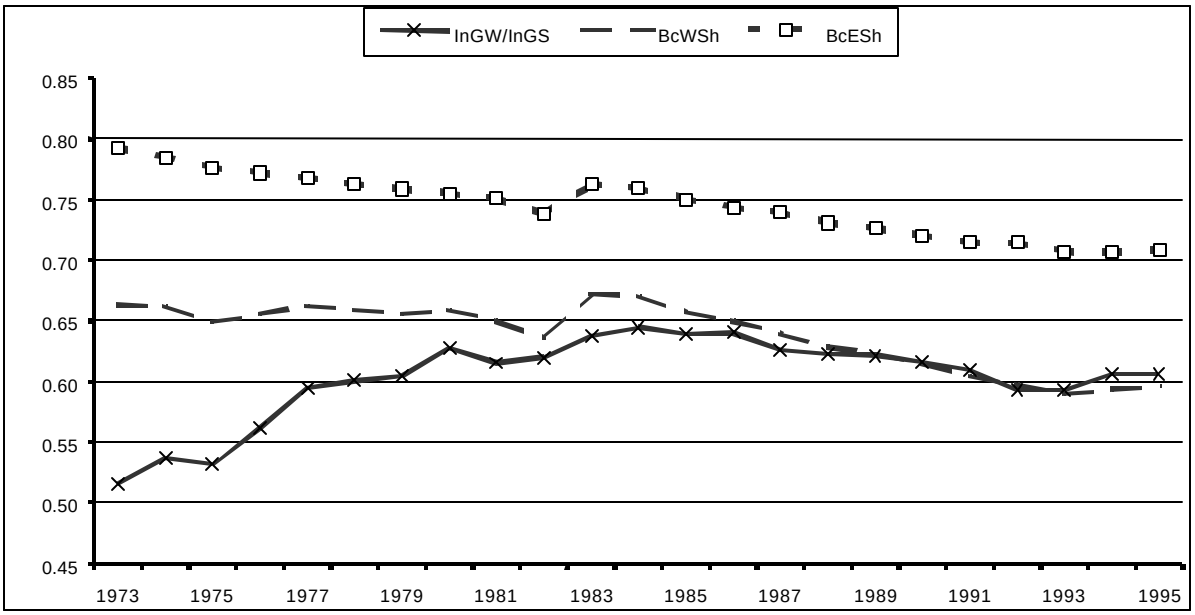
Figure 1: Italian total Manufacturing. Blue collar wage and employment shares. Blue collar average relative



lnGW / lnGS = Blue collar average wage relative to white collar average salary
BcWSh = Blue-collar wage share
BcESh = Blue-collar employment share

Table 1 Changes in the structure of employment in 28 disaggregated Manufacturing sectors

	Change between 1973-82				Change between 1983-91				Change between 1992-95			
	Total Employment	**White Collar Employment**	**Blue Collar Employment**	**Employment Sector Weight**	**Total Employment**	**White Collar Employment**	**Blue Collar Employment**	**Employment Sector Weight**	**Total Employment**	**White Collar Employment**	**Blue Collar Employment**	**Employment Sector Weight**
LSA												
3211	-0.33	-0.10	-0.37	0.36	-0.13	0.01	-0.15	0.29	-0.04	0.05	-0.06	0.26
3212	0.06	0.38	0.02	0.01	-0.02	0.10	-0.05	0.02	-0.11	-0.04	-0.13	0.02
3213	-0.40	-0.19	-0.42	0.13 -	-0.14	0.13	-0.17	0.12	-0.08	0.09	-0.11	0.10
3214	-0.28	0.05	-0.33	0.01	-0.26	-0.02	-0.30	0.01	-0.15	-0.24	-0.12	0.00
3215	.	.	.	.	-0.23	-0.04	-0.27	0.00	-0.20	-0.10	-0.22	0.00
3219	-0.30	0.02	-0.35	0.02	0.27	0.58	0.21	0.02	0.04	0.12	0.02	0.03
3220	-0.31	-0.11	-0.34	0.28	-0.10	0.08	-0.13	0.33	-0.13	-0.02	-0.15	0.34 -
3231/32	-0.20	-0.35	-0.17	0.02	-0.15	0.13	-0.19	0.02	-0.04	-0.03	-0.04	0.03
3233	-0.18	-0.33	-0.15	0.14	-0.08	0.31	-0.13	0.16	-0.37	-0.22	-0.41	0.17
3240	-0.21	0.05	-0.23	0.03 +	-0.14	0.15	-0.16	0.03	-0.05	0.13	-0.07	0.03
Average	**-0.24**	**-0.06**	**-0.26**		**-0.10**	**0.14**	**-0.13**		**-0.11**	**-0.03**	**-0.13**	
Weighted Average *	**-0.30**	**-0.14**	**-0.32**		**-0.11**	**0.11**	**-0.14**		**-0.13**	**-0.02**	**-0.15**	
LSB												
3610/99	-0.07	0.24	-0.12	0.12 +	-0.14	0.06	-0.18	0.12	-0.08	-0.01	-0.10	0.11
3620	-0.19	0.08	-0.23	0.10	-0.12	-0.02	-0.14	0.06	-0.12	-0.14	-0.11	0.05
3691	-0.26	-0.01	-0.30	0.06	-0.31	-0.11	-0.34	0.06	-0.10	0.00	-0.12	0.05
3692	-0.11	0.18	-0.16	0.13	-0.30	-0.09	-0.37	0.14	-0.21	-0.21	-0.21	0.11
3811	-0.18	0.14	-0.24	0.06	-0.05	0.08	-0.09	0.06	-0.15	-0.19	-0.14	0.11
3812	-0.08	0.20	-0.15	0.16	-0.02	0.12	-0.06	0.16	-0.22	-0.24	-0.20	0.18
3819	-0.25	0.00	-0.32	0.37 -	-0.11	-0.05	-0.13	0.40	-0.02	-0.09	0.00	0.38 +
Average	**-0.16**	**0.12**	**-0.22**		**-0.15**	**0.00**	**-0.19**		**-0.13**	**-0.13**	**-0.13**	
Weighted Average *	**-0.17**	**0.10**	**-0.23**		**-0.14**	**-0.01**	**-0.17**		**-0.11**	**-0.13**	**-0.10**	
HS												
3521	-0.01	0.11	-0.08	0.03	-0.11	0.00	-0.20	0.02	-0.03	-0.05	-0.02	0.03
3522	0.06	0.21	-0.09	0.10	0.17	0.39	-0.15	0.11 +	-0.12	-0.10	-0.16	0.12
3530	0.04	-0.01	0.10	0.03	-0.10	-0.02	-0.17	0.03	-0.02	0.07	-0.11	0.04
3540	0.01	0.12	-0.07	0.01	0.12	0.41	-0.02	0.00	.	.	.	.
3551/59	-0.19	0.01	-0.24	0.04 -	-0.26	-0.17	-0.28	0.03 -	-0.05	-0.07	-0.04	0.02
3821	-0.06	0.06	-0.11	0.05	-0.21	-0.08	-0.27	0.05	-0.18	-0.20	-0.17	0.04
3822	0.06	0.26	-0.01	0.09	-0.28	-0.18	-0.32	0.11 -	-0.18	-0.20	-0.17	0.10
3823	-0.11	0.19	-0.20	0.20	-0.02	0.22	-0.11	0.19	-0.11	-0.11	-0.11	0.20
3824	-0.12	0.12	-0.20	0.23	0.02	0.19	-0.06	0.25	-0.05	-0.01	-0.07	0.27
3829	0.01	0.20	-0.05	0.11 +	0.12	0.28	0.05	0.09 +	0.08	0.08	0.09	0.10 +
3833	-0.13	0.15	-0.22	0.12	-0.26	-0.29	-0.25	0.10 -	0.13	-0.03	0.17	0.08
Average	**-0.04**	**0.13**	**-0.11**		**-0.07**	**0.07**	**-0.16**		**-0.05**	**-0.06**	**-0.06**	
Weighted Average *	**-0.06**	**0.15**	**-0.14**		**-0.06**	**0.06**	**-0.11**		**-0.06**	**-0.06**	**-0.07**	

* Weights have been calculated as the share of each sector employment in total employment of the group

Table 2 Manufacturing Blue Collars' Employment share, Relative wage and Wage share (1973-95)

	Blue Collar Employment Share				Mean Wage / Mean Salary				Blue Collar Wage Share			
	1973	**1983**	**1995**	**D 73-95**	**1973**	**1983**	**1995**	**D 73-95**	**1973**	**1983**	**1995**	**D 73-95**
LSA												
3211	0.88	0.83	0.79	-0.09	0.49	0.64	0.61	0.13	0.78	0.76	0.70	-0.08
3212	0.89	0.81	0.76	-0.13	0.49	0.57	0.60	0.11	0.79	0.70	0.65	-0.14
3213	0.90	0.87	0.82	-0.09	0.51	0.64	0.59	0.08	0.82	0.81	0.72	-0.10
3214	0.87	0.85	0.82	-0.04	0.49	0.56	0.55	0.06	0.76	0.76	0.72	-0.04
3215	.	0.84	0.80	-0.04	.	0.64	0.72	0.08	.	0.76	0.74	-0.02
3219	0.87	0.84	0.78	-0.09	0.49	0.63	0.63	0.14	0.76	0.76	0.69	-0.07
3220	0.89	0.87	0.83	-0.06	0.49	0.58	0.51	0.03	0.79	0.80	0.71	-0.08
3231/32	0.83	0.87	0.84	0.02	0.53	0.78	0.76	0.23	0.72	0.84	0.80	0.08
3233	0.83	0.88	0.76	-0.07	0.53	0.67	0.60	0.07	0.72	0.83	0.66	-0.06
3240	0.93	0.92	0.88	-0.05	0.60	0.64	0.57	-0.03	0.89	0.88	0.81	-0.08
Weighted Average				**-0.06**				**0.09**				**-0.06**
LSB												
3610/99	0.86	0.83	0.77	-0.09	0.54	0.65	0.66	0.13	0.77	0.76	0.69	-0.08
3620	0.86	0.81	0.80	-0.06	0.54	0.65	0.65	0.11	0.77	0.74	0.72	-0.05
3691	0.86	0.87	0.81	-0.05	0.54	0.67	0.66	0.13	0.77	0.81	0.74	-0.03
3692	0.86	0.75	0.67	-0.19	0.54	0.74	0.75	0.22	0.77	0.69	0.60	-0.17
3811	0.85	0.80	0.76	-0.09	0.55	0.71	0.71	0.16	0.76	0.74	0.69	-0.06
3812	0.80	0.80	0.83	0.02	0.58	0.71	0.60	0.02	0.70	0.74	0.70	-0.01
3819	0.76	0.81	0.80	0.04	0.55	0.72	0.66	0.11	0.64	0.76	0.73	0.09
Weighted Average				**-0.06**				**0.13**				**-0.04**
HS												
3521	0.60	0.57	0.53	-0.07	0.53	0.66	0.66	0.13	0.44	0.47	0.42	-0.02
3522	0.48	0.40	0.28	-0.20	0.48	0.66	0.64	0.15	0.31	0.30	0.20	-0.11
3530	0.49	0.50	0.44	-0.05	0.63	0.71	0.69	0.06	0.38	0.41	0.35	-0.03
3540	0.60	0.66	0.57	-0.02	0.53	0.71	0.68	0.15	0.44	0.58	0.48	0.04
3551/59	0.83	0.80	0.81	-0.02	0.53	0.62	0.59	0.06	0.72	0.71	0.71	0.00
3821	0.75	0.70	0.61	-0.14	0.58	0.69	0.67	0.09	0.63	0.62	0.51	-0.12
3822	0.74	0.76	0.73	-0.01	0.60	0.68	0.63	0.03	0.63	0.68	0.63	0.00
3823	0.77	0.72	0.65	-0.11	0.64	0.69	0.67	0.04	0.68	0.64	0.56	-0.12
3824	0.74	0.68	0.62	-0.12	0.60	0.70	0.67	0.07	0.63	0.60	0.52	-0.11
3829	0.77	0.72	0.66	-0.11	0.58	0.64	0.67	0.09	0.66	0.62	0.56	-0.10
3833	0.76	0.78	0.82	0.06	0.50	0.59	0.53	0.02	0.61	0.68	0.70	0.09
Weighted Average				**-0.07**				**0.08**				**-0.04**

Table 3 Export intensity and Import penetration from OECD and non-OECD countries by sectors.

	Import Penetration from OECD [1]			Import Penetration from non-OECD [1]			Export intensity ratios [2]		
	1975	**1985**	**1995**	**1975**	**1985**	**1995**	**1975**	**1985**	**1995**
LSA									
3211	0.13	0.20	0.21	0.05	0.07	0.09	0.21	0.26	0.33
3212	0.31	0.19	0.13	0.03	0.04	0.07	0.10	0.18	0.22
3213	0.04	0.03	0.05	0.01	0.00	0.02	0.38	0.32	0.42
3214	0.36	0.24	0.27	0.11	0.14	0.31	0.26	0.21	0.38
3215	.	0.30	0.13	.	0.07	0.05	.	0.14	0.33
3219	0.28	0.33	0.17	0.01	0.01	0.01	0.33	0.33	0.34
3220	0.05	0.08	0.09	0.03	0.05	0.16	0.13	0.24	0.33
3233	0.06	0.07	0.07	0.02	0.07	0.14	0.45	0.41	0.43
3240	0.03	0.06	0.05	0.01	0.05	0.17	0.67	0.58	0.52
3231/32	0.11	0.19	0.14	0.14	0.18	0.24	0.19	0.33	0.38
Weighted Average	**0.09**	**0.12**	**0.12**	**0.03**	**0.05**	**0.12**	**0.27**	**0.32**	**0.37**
LSB									
3620	0.15	0.18	0.23	0.02	0.02	0.04	0.22	0.23	0.25
3691	0.10	0.11	0.15	0.00	0.01	0.01	0.01	0.03	0.04
3692	0.00	0.00	0.03	0.00	0.01	0.01	0.01	0.03	0.02
3811	0.18	0.21	0.26	0.01	0.02	0.05	0.25	0.34	0.40
3812	0.05	0.06	0.04	0.00	0.00	0.01	0.16	0.26	0.39
3819	0.19	0.20	0.18	0.01	0.02	0.04	0.16	0.22	0.26
3610/99	0.06	0.07	0.08	0.01	0.01	0.01	0.21	0.26	0.32
Weighted Average	**0.11**	**0.10**	**0.13**	**0.01**	**0.01**	**0.02**	**0.17**	**0.20**	**0.29**
HS									
3521	0.05	0.08	0.11	0.00	0.00	0.00	0.06	0.13	0.17
3522	0.13	0.17	0.21	0.00	0.00	0.01	0.15	0.21	0.25
3530	0.06	0.05	0.01	0.08	0.23	0.00	0.02	0.06	0.06
3540	0.19	0.43	0.33*	0.02	0.05	0.01*	0.12	0.04	0.06*
3821	0.12	0.15	0.29	0.01	0.03	0.01	0.25	0.46	0.41
3822	0.13	0.10	0.17	0.01	0.00	0.02	0.44	0.50	0.61
3823	0.30	0.19	0.27	0.02	0.02	0.03	0.38	0.45	0.43
3824	0.25	0.30	0.29	0.00	0.01	0.01	0.41	0.48	0.48
3829	0.25	0.27	0.30	0.01	0.02	0.03	0.26	0.41	0.45
3833	0.04	0.06	0.07	0.00	0.00	0.02	0.32	0.40	0.61
3551/59	0.10	0.18	0.23	0.00	0.02	0.05	0.09	0.34	0.44
Weighted Average	**0.18**	**0.20**	**0.23**	**0.01**	**0.02**	**0.02**	**0.27**	**0.39**	**0.43**

1. Import penetration is measured as imports (OECD or non-OECD) divided by domestic consumption (domestic sales plus total imports).
2. Export intensity is meausured as exports over total sales.

* 1991 data.

Table 4 ılts for High-skilled sectors

Sample Period 1983-1995
Weighted least squares Weights are total employment in sector divided by total employment by group
Dep. VAR: Change in white-collar employment share

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Const	-0.004	-0.006	-0.009	-0.004	-0.010	-0.009	-0.010	-0.006
	0.006	0.007	0.008	0.006	0.007	0.007	0.007	0.007
Δ LK	-0.016	-0.018	-0.016	-0.018	-0.018	-0.018	-0.016	-0.019
	0.01	0.010*	0.01	0.010*	0.009*	0.009*	0.01	0.010*
Δ LY (-2)	-0.026	-0.024	-0.028	-0.026	-0.019	-0.021	-0.019	-0.022
	0.012*	0.013*	0.011*	0.012*	0.010*	0.009**	0.009**	0.01
R&D	0.012	0.023	0.004	0.015	-0.018	-0.027	-0.035	0.020
	0.10	0.10	0.07	0.09	0.07	0.06	0.06	0.09
Δ LWratio	0.067	0.065	0.059	0.071	0.055	0.065	0.061	0.060
	0.031*	0.04	0.03	0.029**	0.04	0.027**	0.024**	0.04
Δ LOEImp(-1)	0.019917							
	0.001*							
Δ LOERel Pr		-0.01						
		0.021						
nsdoe			0.00					
			0.002*					
Δ LNOEImp							0.01	
							0.003	
Δ LNOEImp(-1)				0.01		0.01	0.01	
				0.005**		0.005**	0.005**	
D LNOERel Pr								0.01
								0.005
nsdnoe3					0.01	0.01	0.01	
					0.004**	0.004**	0.004**	
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.26	0.24	0.25	0.26	0.28	0.31	0.32	0.24
N obs	139	139	139	139	139	139	139	139
N clusters	11	11	11	11	11	11	11	11

Notes:
(i) standard errors reported. * 10% significant coefficient ** 5% *** 1%
(ii) explicatives: ınst = intercept;
Δ WcEmS = change in the White-collar employment share
Δ LK = change in the log of capital stock
Δ LY (-1) = change in the log of total sales at t -1
R&D = R&D expenditure as a share of total sales
Δ Lwratio = change in the log of blue collars' relative wage
Δ LOEImp = change in the log of OECD import penetration ratio
Δ LOERel Pr = change in the log of OECD import prices relative to domestic prices
Δ LNOEImp = change in the log of non-OECD import penetration ratio
Δ LNOERel Pr = change in the log of non-OECD import prices relative to domestic prices
nsdoe = normalised standard deviation of import prices from 17 OECD countries
nsdnoe = normalised standard deviation of import prices from 5 non-OECD regions
nsdnoe3 = normalised standard deviation of import prices from 5 non-OECD regions in the previous 3 years

Table 5 Estimation Results for Textiles, Clothing and Footwear

Sample Period 1983-1995
Weighted least squares Weights are total employment in sector divided by total employment by group
Dep. VAR: Change in white-collar employment share

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Const	-0.008	-0.007	-0.008	-0.007	-0.007	-0.007	-0.008
	-0.004*	-0.004*	-0.004*	-0.004*	-0.004*	0.00	0.00
Δ LK	0.005	0.004	0.003	0.003	0.003	0.003	0.003
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Δ LY (-1)	0.014	0.015	0.015	0.015	0.015	0.015	0.015
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
R&D*1000	0.042	0.039	0.029	0.039	0.039	0.041	0.038
	0.015**	0.015**	0.014*	0.015**	0.013**	0.016**	0.013**
Δ LWratio	0.056	0.055	0.055	0.053	0.055	0.054	0.055
	0.028*	0.026*	0.027*	0.030*	0.027*	0.028*	0.027*
Δ LOEImp	0.005461						
	0.011						
Δ LOERel Pr		0.00					
		0.010					
nsdoe			0.00				
			0.002				
Δ LNOEImp				0.00			
				0.008			
Δ LNOERel Pr					0.00		
					0.004		
nsdnoe						0.00	
						0.005	
nsdnoe3							0.00
							0.005
Year Dummies	YES	YES	YES	YES	YES	YES	YES
R^2	0.31	0.31	0.31	0.31	0.31	0.31	0.31
N obs	128	128	128	128	128	128	128
N clusters	10	10	10	10	10	10	10

Notes:
(i) standard errors reported. * 10% significant coefficient ** 5% *** 1%
(ii) explicatives: Const = intercept;
Δ WcEmS = change in the White-collar employment share
Δ LK = change in the log of capital stock
Δ LY (-1) = change in the log of total sales at t -1
R&D*1000 = R&D expenditure as a share of total sales * 1000
Δ Lwratio = change in the log of blue collars' relative wage
Δ LOEImp = change in the log of OECD import penetration ratio
Δ LOERel Pr = change in the log of OECD import prices relative to domestic prices
Δ LNOEImp = change in the log of non-OECD import penetration ratio
Δ LNOERel Pr = change in the log of non-OECD import prices relative to domestic prices
nsdoe = normalised standard deviation of import prices from 17 OECD countries
nsdnoe = normalised standard deviation of import prices from 5 non-OECD regions
nsdnoe3 = normalised standard deviation of import prices from 5 non-OECD regions in the previous 3 years

Table 6 Estimation Results for Low-skilled / Capital intensive sectors (LSB)

Sample Period 1983-1995
Weighted least squares Weights are total employment in sector divided by total employment by group
Dep. VAR: Change in white-collar employment share

	(1)	(2)	(3)	(4)	(5)
Const	-0.008	-0.008	-0.010	-0.008	-0.004
	0.01	0.01	0.01	0.01	0.00
Δ LK	0.001	-0.006	-0.005	0.000	-0.001
	0.01	0.01	0.01	0.01	0.01
Δ LY (-2)	-0.076	-0.078	-0.077	-0.076	-0.074
	0.043*	0.042*	0.043*	0.040*	0.041*
R&D	-1.507	-1.706	-1.730	-2.045	-2.098
	0.61**	0.72**	0.70**	0.93**	0.67**
Δ LWratio	0.026	0.041	0.030	0.062	0.070
	0.21	0.23	0.22	0.20	0.20
Δ LOEImp	0.033691				
	0.027				
Δ LOERel Pr		0.02			
		0.023			
nsdoe			0.00		
			0.003		
Δ LNOEImp				0.04	0.04
				0.015**	0.015**
nsdnoe					-0.01
					0.004*
Year Dummies	YES	YES	YES	YES	YES
R^2	0.29	0.27	0.27	0.33	0.34
N obs	91	91	91	91	91
N clusters	7	7	7	7	7

Notes:
(i) standard errors reported. * 10% significant coefficient ** 5% *** 1%
(ii) Explicatives: Const = intercept;
Δ WcEmS = change in the White-collar employment share
Δ LK = change in the log of capital stock
Δ LY (-1) = change in the log of total sales at t -1
R&D= R&D expenditure as a share of total sales
Δ Lwratio = change in the log of blue collars' relative wage
Δ LOEImp = change in the log of OECD import penetration ratio
Δ LOERel Pr = change in the log of OECD import prices relative to domestic prices
Δ LNOEImp = change in the log of non-OECD import penetration ratio
Δ LNOERel Pr = change in the log of non-OECD import prices relative to domestic prices
nsdoe = normalised standard deviation of import prices from 17 OECD countries
nsdnoe = normalised standard deviation of import prices from 5 non-OECD regions
nsdnoe3 = normalised standard deviation of import prices from 5 non-OECD regions in the previous 3 years

List of Variables

Const = intercept;

ΔWcEmS = change in the White-collar employment share

Δ LK = change in the log of capital stock for sector i

Δ LY (-1) = change in the log of real sales at t-1 for sector i

R&D*1000 = R&D expenditure as a share of total sales * 1000

ΔLwratio = change in the log of blue-collar wage relative to white-collar salaries

ΔLOEImp = change in the log of imports from OECD countries as a share total domestic sales minus exports plus total imports

ΔLOERel Pr = change in the log of the relative price imports from OECD countries relative to the domestic one

nsdoe = normalized standard deviation of import prices from 17 OECD countries

ΔLNOEImp = change in the log of imports from non-OECD countries as a share total domestic sales minus exports plus total imports

ΔLNOERel Pr = change in the log of the relative price imports from non-OECD countries relative to the domestic one

nsdnoe = normalized standard deviation of import prices from 5 nonOECD regions (Latin and Central America, Asia, Africa, NICs, and Rest of the World which correspond to the CEEEs)

nsdnoe3 = normalized standard deviation of import prices from 5 nonOECD regions in the previous 3 periods(Latin and Central America, Asia, Africa, NICs, and Rest of the World which correspond to the CEEEs)

Appendix 1 – Derivation of the Estimating Equation

The starting point for empirical studies of outsourcing are the papers by Berman *et al.* (1994) who start from translog cost function:

$$\ln C_i = a_0 + a_y \ln Y_i + \frac{1}{2} a_{YY} \ln (Y_i)^2 + b_K \ln K_i + \frac{1}{2} b_{KK} \ln (K_i)^2 +$$

$$+ \sum_j g_j \ln W_{ij} + \frac{1}{2} \sum_j \sum_k g_{jk} \ln W_{ij} \ln W_{ik} + \sum_j d_{YJ} \ln Y_i \ln W_{ij} + \sum_j \delta_{KJ} \ln K_i \ln W_{ij} + \rho \ln Y_i \ln K_i +$$

$$l_T T_i + \frac{1}{2} l_{TT} T_i + l_{YT} T_i \ln Y_i + l_{KT} T_i \ln K_i + \sum_j \varnothing_{iw_j} T_i \ln W_{ij} \qquad (1)$$

where C_i is variable costs in industry i,

Y_i is output in industry i,

K_i is the capital stock in industry i,

W_{ij} is the price of variable factor j and

T represents technology in industry i.

Cost minimisation generates the factor share equations (S):

$$S_{ij} = \alpha_j + \delta_{Yj} \ln Y_i + \delta_{Kj} \ln K_i + \sum_K \gamma_{jk} \ln W_{ik} + \varnothing_{iw_j} T_i \qquad (2)$$

whilst differencing (denoted by d) generates

$$dS_{ij} = \varnothing_{iw_j} dT_i + \delta_{Yj} d \ln Y_i + \delta_{Kj} d \ln K_i + \sum_k \gamma_{jk} d \ln W_{ik} \qquad (3)$$

assuming homogeneity of degree one in prices imposes

$$\sum_K \gamma_{iK} = \sum_j \gamma_{iK} = \sum_j \delta_{iK} = \sum_j \delta_{Yj} = 0 \qquad (4)$$

which generates with two variable factors, j and k

$$ds_{ij} = \varnothing_{ij} d T_i + \delta_{Kj} d \ln K_i + \delta_{Yj} d \ln Y_i + \gamma d \ln\left(\frac{W_j}{W_k}\right) \quad (5)$$

In our empirical application of the above model we have two variable factors of production, low-skilled (production) workers and higher-skilled (non-production) workers, and adopt a similar approach to Machin *et al.* (1996), to Anderton and Brenton (1998, 1999) and Anderton, Brenton and Oscarsson (2001) and estimate the Italian employment share equation, equation 1 in the text.*Industries included in the regression analysis*

Appendix 2 – Description of the Sample Industries

Low-skilled Group A (LSA)

3211 Spinning, weaving and finishing of textiles

3212 Manufacture of made-up textile goods other than clothing

3213 Knitted goods

3214 Manufacture of carpets and rugs

3215 Cordage, rope and twine industries

3219 Manufacture of textiles not elsewhere specified

3220 Manufacture of wearing apparel except footwear

3231/32 Tanneries and leather finishing. Fur dressing and dyeing industries

3233 Manufacture of leather products except footwear and apparel

3240 Manufacture of footwear except rubber or plastic footwear

Low-skilled Group B (LSB)

3610/99 Manufacture of pottery, china and earthenware. Manufacture of non-metallic mineral products, not elsewhere specified

3620 Manufacture of glass and glass products

3691 Manufacture of structural clay products

3692 Manufacture of cement, lime and plaster

3811 Manufacture of cutlery, hand-tools and general hardware

3812 Manufacture of furniture and fixtures primarily of metal

3819 Manufacture of fabricated metal products except machinery and equipment, not elsewhere classified

High-skilled (HS)

3521 Paints, varnishes and lacquers

3522 Manufacture of drugs and medicines

3530 Petroleum refineries

3540 Miscellaneous products of petroleum and coal

3551/59 Tyre and tube industries. Manufacture of rubber products

3821 Manufacture of engines and turbines

3822 Manufacture of agricultural machinery and equipment

3823 Manufacture of metal and woodworking machinery

3824 Manufacture of special industrial machinery and equipment except metal and wood working machinery

3829 Machinery and equipment except electrical not elsewhere classified

3833 Manufacture of electrical appliances and housewares

Appendix 3 – Description of the Data

Research and Development

The source of data is OECD ANBERD database. The R&D indicator is research and development expenditure expressed as a share of total sales. These data are only available at the 3 digit level of the ISIC , whilst we estimate using industry data at the 4-digit level. This could create a bias in the estimate of the standard error of the R&D coefficient stemming from the correlation among the observations belonging to the same 3-digit sector. Therefore we have also considered a technology indicator defined at the 4-digit level: research and development expenditure per employee where the expenditure on R&D at the 4-digit level is crudely obtained by using the share of total sales for the 4-digit sector. Nevertheless, there are reasons to favour the more aggregate indicator, which implies a common value across all textiles sectors, for example. Spillovers from R&D among similar sectors may be important, for example, the knowledge and the technologies resulting from the production and processing of wool can be applied to cotton or other textiles. The approach we adopt is to present results using the 3-digit indicator provided that a check with the 4-digit indicator reassures us that the standard errors of the coefficient are not biased.

Trade Indicators

Italian import data were obtained from the OECD on an SITC basis (5-digit level) and converted to the ISIC Rev2 classification. Import value and quantity were obtiend by country of origin. L OEImp and L NOEImp are the logs of the shares of total domestic demand for industry *i* accounted by imports respectively from OECD and non-OECD countries. L OERelPr and L NOERelPr have been added as an alternative to import penetration measures and are relative price terms defined as the price (unit value) of Italian imports respectively from OECD and non-OECD countries relative to the Italian producer prices for each ISIC sector.

Converting ISTAT data to the ISIC classification

The complete data set covers the period 1973 – 1995. The source of data on wages, employment, capital and sales is ISTAT survey on firms with 20 or more employees.

Wages and Employment

The survey contains information on payments and employment separately for blue-collars and white-collars only since 1983. For the period 1973 – 82 data from the survey on firms with 50 or more employees has also been used in order to calculate shares of total payments and employment for the two types of workers. We will comment on this point later in this section.

We have converted data from the Italian industrial classification to the ISIC classification and we have pooled them across 28 sectors, which have been grouped as low-skilled A (LSA), low-skilled B (LSB) and high-skilled.

The original ISTAT data are classified according to different revisions of the Italian industrial classification ATECO. ATECO71 classifies economic activities in the years 1973-82, ATECO81 in the period 1983-91 and ATECO91 (correspondent to the NACE) since 1992. Therefore different concordances information provided by ISTAT have been used in order to retrieve data for each of the ISIC sectors entering our sample, for which we have data on trade volumes and prices and R&D intensity. The table of concordances follow this section.

Wages and employment data for the ATECO71 categories above are available only as a total, without any distinction based on the occupation of the workers. Such a distinction for the period 1973-82 is available at a more aggregated level from a different survey, based on firms with 50 employees or more. We have applied calculated shares of blue-collar (and therefore white-collar) employment and wages from these data to the employment and wages totals of the ATECO71 categories belonging to the same aggregated sector. Such procedure brings along two important assumptions, one of which particularly important:

1. that the shares of wages and salaries and the composition of employment in firms with 50 employees or more is the same as in firms with 20 or more employees. Such assumption will not be so crucial for our results if firms with a number of employees between 20 and 50 do not differ significantly from the ones with more than 50 employees. Intuitively, firms with less than 20 employees are likely to differ from medium and large firms along this line;
2. that the composition of total wages and employment between white and blue-collars is the same across all the disaggregated activities belonging to the same aggregate sector. In other words we are denying some heterogeneity across disaggregated activities in the adjustment to trade and technology shocks. This assumption is likely to be crucial in the case two different ISIC sectors correspond to disaggregated ATECO71 activities belonging to the same aggregate sector.

From 1983 to 1991 economic activities have been classified by ISTAT according a revised classification (ATECO81). Still the information on concordances that has been used is the one provided by ISTAT. We have listed it in the Appendix to the paper.

Since 1983 the survey on firms with 20 employees or more contains the information on wages and employment disaggregated by type of worker. Still the information is available at the 3-digit level (ATECO81). The ATECO81 sectors correspondent to each 4-digit ISIC can be either 3-or 4-digit codes. Therefore also for 1983-91 data shares calculated from the 3-digit sectors have been applied to the 4-digit ones to obtain wages and employment numbers for white and blue-collar workers. In this case, since data are all from the same survey, point 1 above discussed does not have any relevance.

Since 1992 a third classification has been adopted (based on the NACE 92). Concordances have been found at the level of disaggregation for which data distinguishing between wages and employment figures by type of worker were available.

Capital and Total Sales

The same survey (firms with 20 employees or more) contains information on capital (which includes land and machinery whether new or used) and total sales. A breakdown of sales between domestic and exports is also available since 1975. The concordances used to convert data from the Italian industrial classification to ISIC are the ones discussed in the Appendix.

The capital variable, K in the tables, indicates capital stock that includes land, machinery (both new and old) and buildings.

Data matching from the Italian to the International Standard classification

Concordances between ISIC and ATECO71

ISIC	ATECO71		ISIC	ATECO71		ISIC	ATECO71		ISIC	ATECO71	
3211	3.03.01		3220	3.04.01		3699	3.12.02	m	3824	3.10.19	
	3.03.02			3.04.02			3.12.03			3.10.20	
	3.03.03			3.04.03			3.12.04			3.10.34	
	3.03.04			3.04.04			3.12.10				
	3.03.05			3.04.06			3.12.11		3829	3.10.05	
	3.03.07			3.04.07			3.12.12	m		3.10.08	
	3.03.08			3.04.08	m		3.12.13	m		3.10.10	
	3.03.09			3.04.09	m					3.10.11	
	3.03.10			3.04.10	m	3811	3.10.22			3.10.21	
	3.03.11						3.10.25			3.10.27	
	3.03.12		3231/32	3.06.01			3.10.26			3.10.54	
	3.03.19			3.06.02						3.10.56	m
	3.03.23					3812	3.10.04			3.10.61	
			3233	3.06.03							
3212	3.04.05					3819	3.10.07		3521	3.13.07	m
	3.04.13		3240	3.05.01			3.10.23			3.13.16	
				3.05.02	m		3.10.24				
3213	3.03.13						3.10.47		3522	3.13.20	
	3.03.14		3610	3.12.09						3.13.21	
				3.12.17	m	3821	3.10.09			3.13.22	m
3214	3.03.17										
			3620	3.12.14		3822	3.10.16		3530	3.13.29	
3215	3.03.16	m		3.12.15			3.10.53	m		3.13.30	
	3.03.22	m									
			3691	3.12.08		3823	3.10.12		3540	3.13.05	
3219	3.03.20						3.10.13			3.13.31	
	3.03.21		3692	3.12.05							
	3.03.24			3.12.06		3824	3.10.14		3551/59	3.14.01	
	3.03.15	m		3.12.07	m		3.10.15			3.14.02	
	3.03.18	m					3.10.17			3.14.03	m
			3699	3.12.01	m		3.10.18				
									3833	3.10.41	

The m in the table indicates that data on the correspondent industry category are missing. For the period 1973-82 no data are available for the textile sector 3815. A correction has been made to the ISTAT table of concordances with reference to the ISIC sectors 3823 – 3824. In the original table there is not distinction of which categories belongs to ISIC 3823 and those correspondent to ISIC 3824, i.e. all categories in the table above listed near 3823 and 3824 correspond to both. Our data on wages, employment, capital and domestic sales for sector 3823 (activities 3.10.12 and 3.10.13) include machinery used in the leather and footwear processing (which according to the ISIC classification are

included sector 3829) as long as machinery for metal and woodprocessing (which are included in sector 3823)[26].

Concordances between ISIC and ATECO81

ISIC	ATECO81	ISIC	ATECO81	ISIC	ATECO81	ISIC	ATECO81
3211	431	3220	453.6	3691	241	3829	328.9
	432		453.7				
	433		454.1	3692	242.1	3811	316.1
	434		454.2		242.2		316.2
	435		456		242.3		316.6
	437						316.8
	439.3	3231/3232	441	3821	328.1		
	439.8				328.2	3812	316.5
	439.9	3233	442.1	3822	319.2		
					321	3819	313.1
3212	455	3240	451.1				313.2
			451.2	3823	322		313.4
3213	436		452		327.1		313.5
3214	438.1						316.3
		3610/3699	243.1	3824	323		316.4
3215	439.5		243.2		324		
	439.7		243.3		325.1	3521	251.9
			243.4		325.2		255
3219	439.1		244		327.2		
	439.2		245.1		327.3	3522	257
	439.4		245.2				
	439.6		245.3	3829	313.6	3530	140.1
	438.2		246		316.7		140.2
			248.1		325.3		
3220	442.2		248.2		326	3540	120
	453.1		248.3		327.4		251.5
			248.4		328.3		
3220	453.2	3620	247.1		328.4	3551/3559	481.1
	453.3		247.2		328.5		481.2
	453.4		247.3		328.6		482
	453.5		247.4		328.8		
			247.5			3833	346

The only difference with respect to ISTAT concordances table refers to sector 3211 to which corresponds all activities in 431 and 434 (431.1 and 434.4 are not included by ISTAT).

[26] Some typos have been spotted for the 1973-82 period. They all refer to 1980 and to the employment figures. A correction has been imposed for sectors 3.03.03, 3.03.13, 3.10.13. In the first two cases the total employment figure for 1980 has been obtained by imposing the change rate of the other activities in the aggregated sector. In the last case, it is evident the last digit has been missed out, therefore a 0 has been added to the figure published.

Since 1992 a third classification has been adopted (based on the NACE 92). Concordances have been found at the level of disaggregation for which data distinguishing between wages and employment figures by type of worker were available. Whenever the information on the correspondence between NACE92 (or ATECO91) and ISIC was not precise we have used the concordance between ATECO81 and ATECO91 to individuate the exact NACE92 codes correspondent to each ISIC sector.

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