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3

The Euro and Firm Restructuring

Matteo Bugamelli, Fabiano Schivardi,
and Roberta Zizza

3.1 Introduction

One of the main drivers of European integration was the idea that a more integrated European economy would promote economic efficiency, allowing countries to fully exploit their competitive advantages, fostering factor mobility and increasing allocational efficiency (European Commission 1993). The euro was a crucial milestone along this path. Ten years after its launch, we can start to assess the effects of such a radical institutional change. In this chapter, we focus on whether the introduction of the euro—narrowly defined as the end of competitive devaluations—has induced significant changes in the productive structure of the euro area (EA) member states.[1]

When the euro was introduced in 1999, the European productive structure was sharply differentiated across member states, with a group of southern countries specialized in traditional, low human capital activities. Firms in these countries took advantage of recurrent devaluations to cope with international competition, especially from the low-wage economies. The

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1. Competitive devaluations are in principle a possible option, even in the posteuro era. Nevertheless, the euro has put an end to the possibility of trade advantages with respect to the rest of the EA, which accounts for a significant fraction of exports for all members. Further, as the euro is a stronger currency, the risk of sharp devaluations is lower.

basic idea underlying our analysis is that the end of competitive devaluations should have had differential effects by country and sector. For one thing, before the introduction of the euro, countries had adopted different strategies in terms of devaluation vis-à-vis the deutschemark (DM; Giavazzi and Giovannini 1989). Second, in some sectors, competition is mainly in prices, so changes in the terms of trade are a fundamental determinant of performance; in other sectors, product differentiation is more pronounced, so prices are just one factor of competitiveness, alongside product quality, brand name, technological content, and so forth. Our initial hypothesis is that the euro should have been a greater shock for the sectors competing mostly in prices and the countries that made a more intense use of competitive devaluations. We therefore expect that restructuring has been more intense in these country-sectors.

We analyze restructuring along two dimensions. First, we consider whether there has been a reallocation of factors away from the sectors that presumably had relied more heavily on devaluations (between-sectoral reallocation process). Second, we consider to what extent the reallocation has occurred within sectors. As the recent body of literature on trade and productivity has shown (Melitz 2003; Bernard, Jensen, and Schott 2006a), most of the productivity gains from trade opening are achieved via the reallocation of production from less to more efficient firms within the same sector.

The between-sectoral analysis is based on standard techniques of convergence/divergence of productive structures. We find very weak support for the proposition that the euro has induced a reallocation of activities between sectors. Specifically, Krugman dissimilarity indices show that intersectoral reallocation in the posteuro era has been almost nil for most of the EA countries and modest for the rest. Although a finer sectoral classification might give a somewhat different picture, we think it is plausible that a substantial process of reallocation should be visible, even using the twenty-two two-digit manufacturing sectors of the Nomenclature générale des Activités économiques dans les Communautés Européennes (NACE) revision 3 classification system.[2]

We then move on to consider whether there is evidence of within-sectoral reallocation. Ideally, one would like to test this hypothesis directly with firm-level data. Unfortunately, such data are not available at the cross-country level. Our analysis is therefore based on sectoral data and on indirect mea-

2. The end of competitive devaluation is not the only channel through which the euro could have stimulated factor reallocation. A trade integration channel within the EA countries must also be acknowledged. The benefits from the use of a common currency—lower transaction costs, no exchange rate risk, better price and cost transparency—are expected to enhance openness to trade and investment, as well as to foster competition. Indeed, since the launch of the euro, bilateral trade among EA members has expanded far more rapidly than trade with other EU countries (European Commission 2008; Baldwin 2006; de Nardis, De Santis, and Vicarelli 2008). Our results suggest that these channels too have had little impact on sectoral reallocation.

sures of restructuring—in particular, productivity growth. We follow the approach introduced by Rajan and Zingales (1998). We rank countries by how heavily they relied on devaluations, considering both nominal and real devaluation vis-à-vis the DM over the 1980 to 1998 period. We classify sectors according to how important devaluations were for competitiveness using a series of indicators of the sectoral skill content, with the idea that low-skill content implies more price competition. An alternative ranking is to look directly at the importance of emerging economies in world trade in each sector. The variable we track is China's export share. The interaction between the country-level devaluation measure and the sectoral skill content measure constitutes the indicator of how much a country-sector should have been affected by the euro.

We find clear support for the hypothesis that the euro has induced relatively strong intrasectoral restructuring. Productivity growth has been fastest in the sectors with low-skill content and in the countries that had relied more on competitive devaluations. This result is robust to a series of checks. In particular, to address potential omitted-variable bias, we not only include country and sector dummies but also a control group of countries that are broadly similar to the EA countries, except for adoption of the euro—namely, Denmark, Sweden, and the United Kingdom. We also show that our results are not driven by some underlying autocorrelated process independent of the euro. Moreover, restructuring seems to have had little negative effect on employment. The exception is when we rank sectors according to the Chinese export share, in which case a clear negative effect on employment emerges. Note that this is only a within-country and sector comparison, so it does not allow us to draw conclusions on aggregate growth differentials between the countries or the sectors. All we can say is that *relative to the country and sector averages,* the productivity growth differential between low- and high-skill sectors was higher in a high-devaluation country than in a low-devaluation one.

To obtain direct evidence on the restructuring process, we then turn to firm-level evidence from Italian manufacturing. We first review a series of forty in-depth interviews with entrepreneurs conducted by researchers at the Bank of Italy in 2007, in the spirit of the National Bureau of Economic Research (NBER)/Sloan "pin factory" project (Borenstein, Farrell, and Jaffe 1998). The interviews offer soft evidence on the restructuring process. They suggest that since the adoption of the euro, firms have shifted their business focus from production to upstream and downstream activities, such as research and development (R&D), product design, marketing, and distribution. These activities in fact can procure a certain degree of market power and enable firms to escape the pure cost competition. Moreover, the shift is more dramatic in traditional low-tech activities, in line with the aggregate evidence. Finally, it emerges that restructuring is an ongoing process, not a single episode with a beginning and an end.

The insights from the interviews are corroborated by the hard, quantitative evidence provided by a database of manufacturing firms representative of the population of firms with at least fifty employees. First, the cross-sectional dispersion in both productivity and profitability has increased steadily since 1999, as one would expect during restructuring episodes. And there is a marked decline in the share of blue-collar workers, consistent with the thesis that firms are shifting the focus away from production. The lower the technological content of the sector, the sharper the decline. Interestingly, in the pre-euro era, the opposite was the case: low-tech firms used devaluations to recoup price competitiveness and intensified their reliance on low-skilled workers. We do not find that job flows intensified after the introduction of the euro; the restructuring process seems to entail a reallocation of workers within rather than between firms.

To close the circle, finally we consider whether the restructuring firms actually perform better than the others, regressing value added and productivity growth on indicators of restructuring at the firm level derived from ad hoc questions on the importance of trademarks and of changes in the mix of goods produced. We also include the share of blue-collar workers. The results confirm that the firms that undertook restructuring recorded higher growth rates, both in value added and in productivity.

A number of papers are considering the effects of the euro on member countries ten years after its inception. Alesina, Ardagna, and Galasso (see chapter 2 in this volume) show that the common currency has contributed to building political consensus for restructuring in the product markets—markedly through liberalization in the energy and communication sectors—but not in the labor market. Bertola (2007) finds an association between the euro adoption and the improvements in terms of employment and equilibrium unemployment. Our work is more broadly related to the growing body of literature that considers the effects of international competition on national productive structure (Chen, Imbs, and Scott 2007). The paper closest to our sectoral analysis is that of Auer and Fischer (2008) on the effects on U.S. industry of import penetration from emerging economies. They also find that the U.S. sectors most exposed to competition from emerging countries recorded higher productivity growth, as well as lower price inflation. The same result on productivity is found by Bugamelli and Rosolia (2006) on Italian data. Using U.S. firm-level data, Bernard, Jensen, and Schott (2006a) find that industries' exposure to imports from low-wage countries is correlated positively with the probability of plant death and negatively with employment growth. In a companion paper, Bernard, Jensen, and Schott (2006b) show that a reduction of inbound trade costs is positively associated with industry productivity (TFP), the probability of plant death, the probability of entry of new exporters, and export growth by incumbent exporters. For Italy, Bugamelli, Fabiani, and Sette (2008) show that greater

exposure to Chinese export penetration has diminished the pace of firms' output price increases.

The rest of this chapter is organized as follows. In section 3.2, we describe the data and perform the between-sector analysis. Section 3.3 explains the econometric approach to test for within-sector reallocation and discusses the results. Section 3.4 deals with the firm-level evidence for Italian manufacturing firms, and section 3.5 concludes.

3.2 Cross-Sectoral Reallocation

In this section, we analyze the productive structure of the EU member countries and its evolution over time; given the need for a sufficiently long period after the introduction of the euro and data availability, we focus on the EU15 countries—that is, the eleven that adopted the euro on its inception (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain) plus Greece (entered the EA in 2002), in addition to Denmark, Sweden, and the United Kingdom, which have not adopted the euro. Following Bertola (2007), the three non-EA countries constitute the control group.[3] Despite its evident shortcomings, this is the best control group available.[4] We assess whether the introduction of the euro has induced a reallocation of production between sectors, and if so, whether the intersectoral change has been more dramatic in the countries that had previously made greater use of competitive devaluations. The main data source we rely on in this and the next section is the March 2008 release of the European Union Level analysis of Capital, Labor, Energy, Materials, and Service Inputs (EU KLEMS) database (Timmer, O'Mahony, and Van Ark 2007). The manufacturing sector's share of value added in 2005 stood at around 20 percent for most countries, with lower values in France, Denmark, Greece, and Luxembourg. Following the secular decline in manufacturing, the share decreased somewhat between 1998 and 2005 in most countries;

3. Bertola (2007) uses a diff-in-diff approach to test the effects of the euro on income dispersion.

4. Ideally, the control group should have more than three countries in order to avoid idiosyncratic country patterns affecting the results. However, what is really crucial is that the control group (non-EA members) is comparable with the treatment group (EA members). As EU membership involves many factors not available to the econometrician (laws, regulation, etc.), a control group with only EU countries should provide the best guarantees in terms of similarity (Baldwin 2006), whereas including non-EU countries seems more problematic. One could also object that the treatment is not fully exogenous, as in principle, the three noneuro members could have deliberately opted out in order to not preclude future competitive devaluations. This does not seem to be the case, however. For example, in the context of the assessment made by HM Treasury on the case for the United Kingdom to join the euro zone, Buiter and Grafe (2003) conclude that monetary independence has not been instrumental to maintain (or regain) competitiveness; indeed, "the UK exchange rate during the 1990s and until well into 2002 has been a source of competitive misalignment" (35).

Ireland and the United Kingdom experienced the most pronounced downsizing of the sector.

From now on, we concentrate on manufacturing, as the effects we are considering work through the terms of trade and so are important mostly for tradeable goods. Data on value added, employment, and capital stock for the manufacturing sector are available for all EU15 countries, with a breakdown into twenty-two industries corresponding as a rule to the two-digit NACE classification. Southern countries such as Italy, Greece, and Portugal still have a large share of their value added in traditional sectors, such as textiles, apparel, leather goods, and footwear. The other countries concentrate their production in more technologically advanced sectors: machinery in Germany (but in Italy, too), chemicals in a host of countries (Belgium, France, Germany, the Netherlands, Ireland, and the United Kingdom), and radio, television, and communication equipment in the Nordic countries (Finland and Sweden, in particular).

In order to facilitate the comparison of productive structures among countries and over time, we first characterize sectors by their skill, R&D, and information and communication technology (ICT) intensity, and then we group them into intensity classes. Figures are computed from U.S. data, which we use in the regression analysis to avoid problems of endogeneity. Skill intensity is proxied by hours worked by high-skilled persons—defined as those with at least a college degree—as a share in total hours; R&D intensity is R&D expenditure over value added; ICT intensity is the ratio of ICT capital stock to the total capital stock, both in real terms.[5]

As table 3.1 shows, the machinery and the electrical and optical equipment sectors exhibit the highest ICT content; together with "other transport equipment," they spend a relatively higher fraction of their value added on R&D and employ relatively more-skilled persons. As a rule, traditional sectors (producing food, textiles, leather, and wood products) are characterized by low values of the three indicators. Intensity classes (low, medium low, medium high, high) are then defined according to quartiles in the distribution of each indicator (see table 3A.1 in the appendix for the matching of sectors into skill, ICT, and R&D categories). A glance at the value added shares broken down by skill content in 1998 and 2005 (figure 3.1) suggests that sectoral modifications were modest in the period. Only in Finland and Sweden has reallocation toward high-skill activities been substantial; Ireland stands out as the country where high-skill activities are prominent; if anything, Italy and Spain have increased their share in low-intensity activities.

To address sectoral modification in a more synthetic way, we apply standard techniques of convergence/divergence of productive structures. In

5. The ICT and skill intensity have been derived from EU KLEMS; R&D intensity comes from the OECD STAN database.

Table 3.1 **ICT, R&D, and skill intensities in the U.S. and China's world market share by sector of economic activity**

Sector (NACE code in parentheses)	ICT intensity	R&D intensity	Skill intensity	Chinese share
Food products and beverages (15)	0.06	0.01	0.16	0.03
Tobacco products (16)	0.06	0.01	0.27	0.02
Textiles (17)	0.05	0.01	0.10	0.09
Wearing apparel, dressing (18)	0.05	0.01	0.14	0.16
Leather, leather products, and footwear (19)	0.05	0.01	0.09	0.20
Wood and products of wood and cork (20)	0.04	0.01	0.08	0.03
Pulp, paper, and paper products (21)	0.10	0.02	0.17	0.01
Printing, publishing, and reproduction (22)	0.10	0.02	0.34	0.01
Coke, refined petroleum products, and nuclear fuel (23)	0.05	0.06	0.31	0.05
Chemicals and chemical products (24)	0.12	0.14	0.41	0.02
Rubber and plastics products (25)	0.04	0.03	0.15	0.06
Other nonmetallic mineral products (26)	0.07	0.02	0.14	0.05
Basic metals (27)	0.06	0.02	0.14	0.03
Fabricated metal products (28)	0.06	0.02	0.12	0.05
Machinery, n.e.c. (29)	0.18	0.06	0.16	0.02
Office, accounting, and computing machinery (30)	0.16	0.42	0.49	0.03
Electrical machinery (31)	0.16	0.12	0.21	0.04
Radio, television, and communication equipment (32)	0.16	0.22	0.36	0.05
Medical, precision, and optical instruments (33)	0.16	0.36	0.38	0.03
Motor vehicles, trailers, and semitrailers (34)	0.14	0.13	0.20	0.00
Other transport equipment (35)	0.14	0.24	0.33	0.12
Manufacturing, n.e.c.; recycling (36, 37)	0.09		0.16	0.09
Correlation matrix				
ICT intensity	1.0	0.7	0.6	–0.3
R&D intensity		1.0	0.8	–0.1
Skill intensity			1.0	–0.3
Chinese share				1.0

Source: Based on EU KLEMS, OECD STAN, and United Nations data. Year: 1998.
Note: "n.e.c." = not elsewhere classified.

particular, we calculate bilateral dissimilarity indices based on value added shares, broken down by industry and by skill, R&D, and ICT intensity according to the classification in table 3A.1. Dissimilarity between country A and country B is captured by the following index, á la Krugman:

$$\text{Dis}_{AB} = \left(\frac{1}{2} \sum_i \left| a_i - b_i \right| \right), \tag{1}$$

where a and b are the corresponding shares. The index ranges from 0 (perfect similarity) to 1 (perfect dissimilarity). The productive structure of each country is compared with that of the EA, net of the country's own economy for EA members only; indices are calculated for 1998 and 2005. Table 3.2 shows that within the EA, the most highly dissimilar countries—apart from

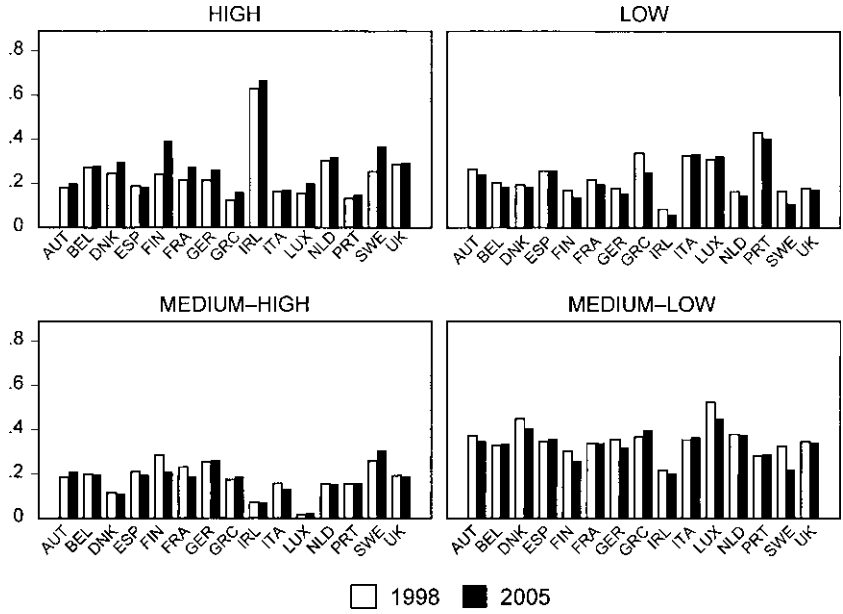

Fig. 3.1 Share of value added by skill content
Source: Our elaborations on EU KLEMS data.

Table 3.2 Krugman dissimilarity indices vis-à-vis the euro area

	Skill intensity		ICT intensity		R&D intensity		NACE	
	1998	2005	1998	2005	1998	2005	1998	2005
Euro area								
Austria	0.06	0.06	0.07	0.04	0.06	0.07	0.15	0.11
Belgium	0.06	0.03	0.10	0.13	0.07	0.06	0.20	0.19
Finland	0.10	0.15	0.11	0.20	0.16	0.19	0.31	0.39
France	0.02	0.03	0.05	0.03	0.06	0.05	0.11	0.11
Germany	0.08	0.10	0.14	0.14	0.16	0.17	0.20	0.19
Greece	0.13	0.11	0.26	0.21	0.27	0.24	0.36	0.37
Ireland	0.42	0.42	0.21	0.18	0.35	0.34	0.47	0.47
Italy	0.13	0.19	0.11	0.12	0.09	0.13	0.16	0.21
Luxembourg	0.26	0.23	0.30	0.27	0.18	0.17	0.34	0.34
The Netherlands	0.13	0.11	0.12	0.14	0.12	0.11	0.21	0.24
Portugal	0.21	0.20	0.18	0.19	0.24	0.26	0.28	0.29
Spain	0.03	0.09	0.09	0.13	0.08	0.14	0.12	0.15
Noneuro area								
Denmark	0.13	0.11	0.07	0.03	0.06	0.06	0.18	0.19
Sweden	0.09	0.21	0.10	0.18	0.09	0.15	0.15	0.28
United Kingdom	0.07	0.05	0.05	0.07	0.06	0.06	0.14	0.15

Source: Based on EU KLEMS and STAN OECD data.
Note: Dissimilarity indices are calculated for each country with respect to the EA, net of the country itself for EA members.

Ireland and Luxembourg, which are exceptionally small—are the southern countries still specialized in low-skill activities. There is no sign of a uniform tendency toward either convergence or divergence: some countries increased and others decreased their similarity with the rest of the area. This is clear from figure 3.2, where we take an average of the indicators and plot the value for 2005 against that for 1998. Countries above (below) the 45degree line are those diverging from (converging to) the EA average sectoral structure. In line with previous evidence of very limited sectoral modification for almost all countries, we find little convergence/divergence; if anything, there is a slight tendency toward heterogeneity.

We also evaluate for each country the dissimilarity index between 1998 and 2005 to assess the extent of intersectoral change over the period. Irrespective of the sectoral breakdown, the extent of sectoral reallocation proves to be fairly modest (table 3.3). The dissimilarity index never goes beyond the first half of its range. The countries that changed their structure most are Sweden and Finland, followed by Greece.

It is interesting to see whether the degree of intersectoral reallocation, though mild, is related to competitive devaluations. We construct two mea-

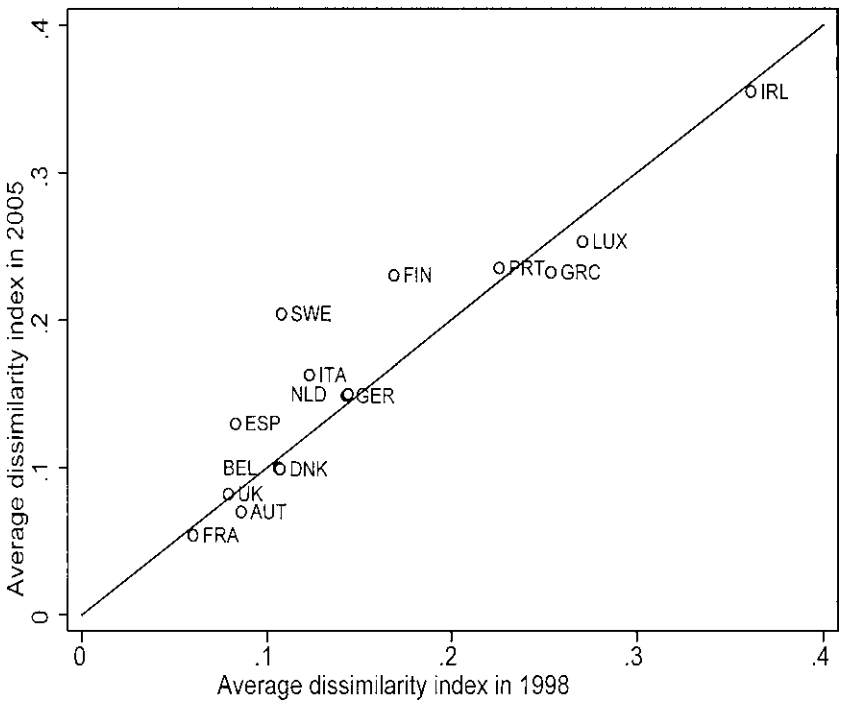

Fig. 3.2 Dissimilarity index with respect to euro area average: 1998 and 2005

Table 3.3 **Krugman dissimilarity indices, 1998 to 2005**

	Skill intensity	ICT intensity	R&D intensity	NACE
United Kingdom	0.01	0.02	0.02	0.06
The Netherlands	0.02	0.02	0.04	0.06
Belgium	0.02	0.02	0.02	0.04
Spain	0.02	0.03	0.05	0.07
Italy	0.03	0.05	0.04	0.07
Portugal	0.03	0.04	0.03	0.06
Ireland	0.04	0.09	0.04	0.11
Austria	0.05	0.04	0.04	0.07
Denmark	0.06	0.04	0.04	0.09
Germany	0.06	0.03	0.07	0.07
France	0.06	0.06	0.06	0.10
Luxembourg	0.07	0.06	0.05	0.10
Greece	0.08	0.09	0.13	0.14
Finland	0.15	0.16	0.16	0.20
Sweden	0.16	0.19	0.18	0.27

Source: Based on EU KLEMS and STAN OECD data.

Note: Countries are ordered according to the indices based on skill intensity.

sures of devaluation, nominal and real (DEVNOM and DEVREAL, respectively), calculated as the cumulated difference between January 1980 and December 1998 of the logarithm of each country's nominal/real effective exchange rate as a deviation from that of Germany. In principle, a negative sign indicates a depreciation relative to the DM; the absolute number refers to the intensity of the cumulative depreciation or appreciation. But for ease of interpretation, we invert the signs so that a higher value of the indicator reflects more intensive resort to competitive devaluations. Table 3.4 reports the values for DEVNOM and DEVREAL. The difference between the two (ΔP) is the cumulated change in relative producer prices. Both the nominal and the real indicators have been computed with respect to sixty-two countries, including the main emerging and developing economies. Both their exchange rates and their producer prices have entered the indicator, with a weight computed on the basis of trade flows (see Finicelli, Liccardi, and Sbracia (2005) for the methodology).

We find that when devaluation is measured in nominal terms (figure 3.3), the countries relying most heavily on devaluations are those most specialized in low-skill activities. This positive relationship vanishes when we consider devaluation in real terms. We also find some weak evidence that countries relying more heavily on devaluations exhibit relatively more pronounced signs of intersectoral reallocation, as shown by figure 3.4, where we plot the dissimilarity index between 1998 and 2005 (reported in the first column of table 3.3) against real devaluation; this evidence does not depend

Table 3.4 **Nominal and real measures of devaluation and price changes**

	DEVNOM	DEVREAL	ΔP
Austria	0.227	0.079	0.148
Belgium	0.408	0.187	0.222
Denmark	0.408	–0.042	0.450
Finland	0.432	0.109	0.323
France	0.479	0.068	0.411
Germany	0.000	0.000	0.000
Greece	1.945	0.086	1.859
Ireland	0.660	0.071	0.589
Italy	0.768	0.067	0.701
Luxembourg	0.408	0.187	0.222
The Netherlands	0.185	0.167	0.018
Portugal	1.366	–0.196	1.562
Spain	0.864	0.150	0.715
Sweden	0.893	0.099	0.794
United Kingdom	0.490	–0.230	0.720

Source: Bank of Italy's calculations. (See Finicelli, Liccardi, and Sbracia [2005].)

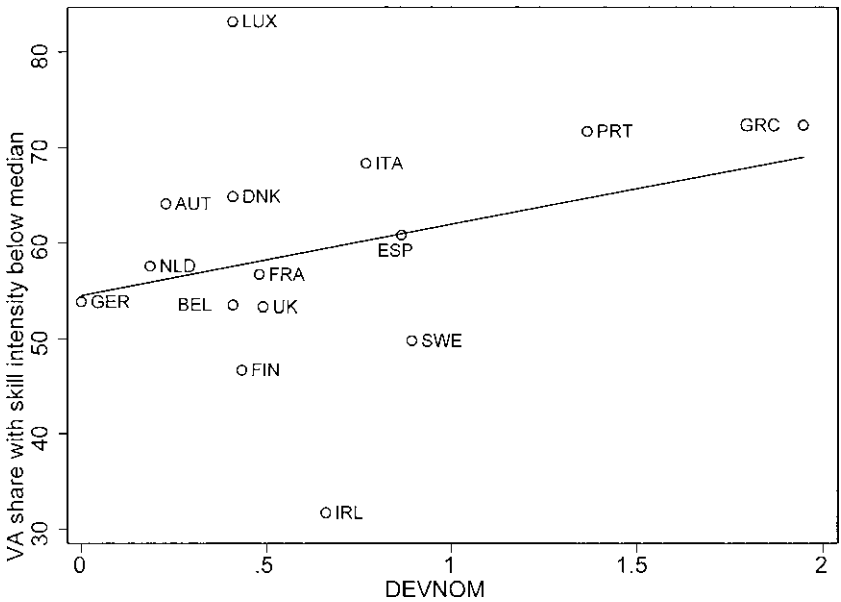

Fig. 3.3 **Size of low-skill activities and devaluation in nominal terms**

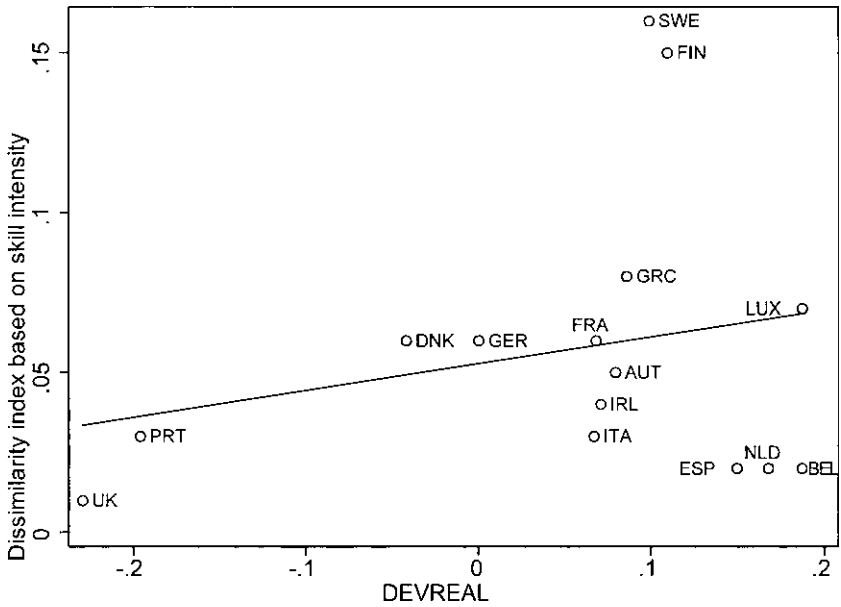

Fig. 3.4 Dissimilarity index (by skill intensity) and real devaluation

on the choice of the indicator (nominal versus real and different sectoral breakdowns).

On the whole, we can conclude that the euro has not induced a structural break in member countries' specialization patterns. Let us now move on to assess whether a process of within-sectoral restructuring characterized EA firms in the first part of this decade, and in particular, whether this process was driven by the introduction of the euro, which eliminated competitive devaluations.

3.3 Within-Sectoral Reallocation

In this section, we use sectoral data to test the hypothesis that the end of competitive devaluations has induced a restructuring process in the EA firms. We begin by describing the empirical approach and the data and then move on to the results. Finally, we perform a series of extensions and robustness checks.

3.3.1 The Empirical Approach and the Data

We test the effects of the euro on within-sectoral restructuring using sectoral data from different countries. Ideally, one would like to use direct measures of reallocation, such as job creation and destruction, entry, exit, and so

forth. Unfortunately, such measures can only be constructed from firm-level data and so are not available for a cross-section of countries.[6] Accordingly, we use an outcome variable that should be closely related to reallocation (i.e., productivity growth). In fact, if reallocation and restructuring bring about productivity increases,[7] then the country-sectors that restructured more should have recorded a higher growth rate of productivity. We measure productivity as real value added per hour worked. We also consider growth in employment (more precisely, the number of hours worked) growth: in fact, productivity increases might have been due simply to a reduction in the employment level, connected with the exit of the less-productive plants and workers, the reorganization of production, and offshoring. Descriptive statistics by country for the outcome variables are provided in table 3A.2 in the appendix.

We follow the approach introduced by Rajan and Zingales (1998) in their paper on the effects of financial development on growth. The idea is to exploit both cross-country and cross-sectoral variability to test the effects of the euro on productivity growth. First, we determine how heavily the various countries had relied on devaluations (DEV_i): we expect that the greater this reliance, the stronger the effects of the euro. Second, we propose a measure S_j of how important devaluations were for sectoral competitiveness before the euro: in some sectors, competition is mainly price competition, so movements in the terms of trade are a fundamental determinant of performance; for others, product differentiation may be more pronounced, so prices could be just one in a series of other factors in competitiveness, such as product quality, brand name, and technological content. If the euro has had any effect in terms of restructuring, we expect it to be strongest in the country-sectors that relied more intensively on competitive devaluations, as measured by the interaction between the country and the sectoral indicators, $DEVi * S_j$. We can test our argument through the following regression:

$$(2) \qquad \Delta \ln y_{ij9805} = \alpha_0 + \alpha_1 DEV_i * S_j + \alpha_2' \mathbf{X}_{ij} + DC_i + DS_j + u_{ij},$$

where $\Delta \ln y_{ij9805}$ is average yearly productivity growth in country i and sector j between 1998 and 2005, X_{ij} are additional controls, and DC_i and DS_j are country and sector dummies, respectively. Our prediction concerns the coefficient α_1: if $\alpha_1 > 0$, then the higher the country-sector reliance on devaluations, the stronger the effects of the euro on productivity; $\alpha_1 = \delta^2 \Delta \ln y_{ij} / \delta DEV_i \delta S_j$.

6. See Davis, Haltiwanger, and Schu (1996) for an overview of a large body of literature developed in the 1990s regarding sectoral reallocation. Bartelsmann, Scarpetta, and Schivardi (2005) compute sectoral statistics of reallocation for nine OECD countries, but their time span stops at the end of the 1990s at best.

7. The literature on productivity growth decomposition has identified various sources of productivity increases related to reallocation and restructuring; see Foster, Haltiwanger, and Krizan (2001) for a survey.

One important feature of this approach is the inclusion of both country and sector dummies. Country dummies ensure that the results are not driven by specific country characteristics that might potentially be related to the devaluation measure: rather, we use within-country differences in sectoral growth rates to identify the parameters of interest. The same applies to sectors: we do not compare different growth rates of productivity across sectors, as these might be dictated by sectoral characteristics potentially related to the variables we use to classify them. As such, this approach is robust to the main criticisms of the cross-country regressions with aggregate data, such as omitted-variable bias and reverse causality.[8]

Although the inclusion of country and sector dummies controls for the most likely omitted-variable problems, one could still argue that we might just be capturing an underlying process that would have occurred even without the euro. For example, the intensifying competition from emerging countries might have forced restructuring regardless. Such a process might have been more pronounced precisely in those countries and sectors that relied more on competitive devaluations, potentially more vulnerable to such competition. This is indeed a very serious concern. To address it, we take the three countries that did not adopt the euro as a control group and compute the effect of the interaction for the EA in deviation from non-EA countries. Formally, our regression framework is represented by:

$$\Delta \ln y_{ij9805} = \beta_0 + \beta_1 \mathrm{DEV}_i * S_j + \beta_2 \mathrm{EA}_i * \mathrm{DEV}_i * S_j + \beta_3' \mathbf{X}_{ij} + \mathrm{DC}_i + \mathrm{DS}_j + u_{ij}, \tag{3}$$

where EA_i is a dummy equal to 1 for the EA countries. In this specification, the coefficient β_2 measures the deviation of the EA effect from that of the non-EA countries, β_1. The idea is that the latter countries did not give up the possibility of devaluing but are similar to the EA countries from an economic point of view, because as members of the EU, they are subject to identical foreign trade rules, with the exception of the exchange rate. Differences in the degree of restructuring according to the interaction term can therefore be attributed to the euro. As discussed previously (see note 4), this control group is probably the best available, although it can be criticized both for its small size and its not necessarily random selection. To make sure that our results are not totally dependent on the control group, we also estimate equation (2) on EA members only—that is, considering the absolute effect rather than the deviation from the control group. In this case, we are not controlling for potential confounding factors. However, we still control for fixed country and sectoral attributes so that these estimates allow us to assess the extent to which our results depend on the control group.

8. Reverse causality could occur if productivity growth were persistent and if sectors with low productivity growth were determining the devaluation pattern before the euro. In this case, the correlation would actually be because productivity growth causes DEV. However, if anything, this should bias our estimates downward, inducing a negative correlation between DEV and productivity growth.

In terms of the country-level indicator, we want to capture the reliance on competitive devaluations. From the theoretical standpoint, it is unclear whether real or nominal devaluation is the relevant variable. Consider a country that kept a fixed nominal exchange rate with the DM but gained competitiveness by curbing price rises. For it, the euro should not represent much of a change, as the exchange rate was already stable, and using real devaluation might overstate its reliance on devaluations. On the other side, consider a country with relatively rapid price inflation that used devaluations to limit the effects on competitiveness. For such a country, appreciation was already under way before the euro, and using the nominal exchange rate would overstate the reliance on devaluations. These examples suggest that the ideal indicator should consider real devaluations that were due to changes in the nominal exchange rate. To capture this, in our basic specification, we introduce both the nominal exchange rate and the degree of relative producer price inflation in order to allow for potentially different dynamics of the two components of the real exchange rate. We test whether the coefficients of the two variables are opposite in sign and equal in absolute value, in which case the real exchange rate can be used directly.

For the sectoral indicators, we assume that price competition is more relevant in activities with a low human capital content (i.e., in which low-skilled workers are prevalent). The products of low-skill activities are likely to compete more in price than in quality relative to high-skill products. For a sector with low human capital content, the end of devaluations should have represented a stronger incentive to restructure; other things being equal, these sectors should have recorded higher productivity increases. Our main indicator is thus the skill content at the sectoral level. Following Rajan and Zingales (1998), in order to avoid endogeneity problems, we use the U.S. measure on the assumption that skill content is largely a technological characteristic, so the measure computed for the United States also applies to other countries. This assumption is particularly suitable for the EA countries, whose level of development is comparable to the United States. In accordance with our interpretation, we use sectoral low-skill intensity—that is, (1-skill intensity). This makes it easier to read the regression results.

We also experiment with other measures of sectoral dependence on devaluation. Following the same reasoning as before, high-R&D activities should also compete less on price and more on quality and technological content, reducing the price sensitivity of demand and hence the effects of exchange rate movements. Low-R&D activities should be characterized by greater price elasticity of demand, intensifying the response to terms of trade movements. We also use ICT intensity on the assumption that this is related to technological content. As before, we define sectors in terms of low-R&D and ICT intensity: (1-R&D content) and (1-ICT intensity), again computed for U.S. sectors.

Underlying our approach is the idea that in low human capital activities, the end to competitive devaluations has deprived EA countries of an instru-

ment for meeting the competition from low-wage emerging economies. An alternative way to rank sectors, then, is to look directly at the importance of those economies in world trade. We take the most important of them, China, and compute its share of world exports in 1998. In this case, we are testing whether restructuring has been more intensive in countries that had relied on devaluations more heavily and in sectors where China's export share was larger.

The bottom part of table 3.1 reports the correlation coefficients between the sectoral indicators. As expected, the correlation between the first three indicators is high, ranging from 0.6 to 0.8. That between China's world market share and the others is negative. That is, the Chinese share is inversely related to the human capital content of production, but correlation is low in absolute terms: –0.3 with ICT and skill intensity and –0.1 with R&D intensity, suggesting that to see China simply as a low human capital good exporter might be to miss some important features of its economy.

We also run the same regression for EA countries in the period before the introduction of the euro. The assumption is that at that time, the competitive pressures were mitigated by competitive devaluations. In this case, we expect no particular difference between the study and the control group. In the language of the policy evaluation literature, we make sure that we are not simply capturing preexisting trends and that the euro did indeed induce a structural break.

3.3.2 Results

Our main regression is based on equation (3), where the outcome is average annual productivity growth for the period from 1998 to 2005. In addition to sectoral and country dummies, we include the log of the initial value of the dependent variable, and to control for any country-sector trend, its growth rate in the period from 1995 to 1998. Moreover, unless otherwise stated, to avoid endogeneity problems, we weight observations according to sectoral employment in 1998. We run weighted regressions for two reasons. First, accounting for the importance of the sector gives an estimated coefficient representative of the population effect. Second, sectoral data could suffer from measurement error, which is likely to be negatively correlated with the size of the sector itself. In particular, mismeasurement of employment or value added in some small sectors might have a powerful impact on the estimates.[9] Finally, all standard errors are computed using the White robust correction.

Table 3.5 reports the results of estimating equation (3) when the sectoral dependence on devaluations is gauged by low-skill intensity. Panel A shows

9. For example, in 1998, the "office, accounting and computing machinery" sector only had 1,500 employees in Austria, 800 in Belgium, and 300 in Greece; the "leather, leather products and footwear" sector only had 1,300 employees in Ireland.

Table 3.5 **Low-skill intensity and devaluations**

	(1)	(2)	(3)	(4)	(5)
			A. Productivity growth		
DEV * SK * EA	1.17**	1.01**	0.71	1.50***	0.55**
	(0.56)	(0.40)	(0.50)	(0.53)	(0.26)
DEV * SK	–0.64	–0.41*	–0.23	–0.66**	
	(0.50)	(0.23)	(0.37)	(0.31)	
ΔP * SK * EA	–1.05**				
	(0.45)				
ΔP * SK	0.58				
	(0.37)				
$\ln(\text{prod}_{98})$	–0.05***	–0.05***	–0.05***	–0.05***	–0.05***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Δprod_{9598}	0.16**	0.16**	0.07	0.09	0.11*
	(0.07)	(0.08)	(0.08)	(0.11)	(0.06)
Observations	321	321	321	321	256
R^2	0.54	0.53	0.37	0.43	0.51
			B. Employment growth		
DEV * SK * EA	–0.19	–0.06	–0.06	–0.11	0.07
	(0.23)	(0.24)	(0.27)	(0.31)	(0.13)
DEV * SK	0.24	0.07	0.10	–0.03	
	(0.19)	(0.19)	(0.21)	(0.25)	
ΔP * SK * EA	0.12				
	(0.23)				
ΔP * SK	–0.16				
	(0.19)				
$\ln(\text{emp}_{98})$	0.01***	0.01***	–0.01**	0.01*	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Δemp_{9598}	0.21***	0.20***	0.29***	0.16*	0.17**
	(0.07)	(0.07)	(0.10)	(0.08)	(0.07)
Observations	323	323	323	323	258
R^2	0.71	0.71	0.50	0.63	0.65

Note: DEV is the indicator of nominal devaluation (DEVNOM) in column (1) and of real devaluation (DEVREAL) in all other columns, computed over the period from 1980 to 1998; SK is low-skill intensity; EA is a dummy equal to 1 for the euro area countries; ΔP is the relative growth rate in producer prices (see the main text for details); $\ln(\text{prod}_{98})$ ($\ln(\text{emp}_{98})$) is initial productivity (employment), and Δprod_{9598} (Δemp_{9598}) is productivity (employment) growth in the 1995 to 1998 period. Outcome growth rates are computed for 1998 to 2005 in all columns except column (4), where it is computed for 2002 to 2005. All regressions are weighted with the sectoral employment, apart from that in column (3), which is unweighted. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

the estimates for productivity growth. The first column includes the interaction of skill intensity both with nominal devaluation (DEVNOM) and with relative producer price inflation (ΔP). The estimates for the control group are not significantly different from 0, in line with the idea that for these countries, the euro has not brought a structural break. Relative to the control group, the EA countries that had devalued more before the euro show relatively sharper productivity growth in low-skill-intensive sectors, while the reverse holds for the interaction with producer price inflation. The two coefficients are opposite in sign and very similar in absolute value (1.17 versus –1.05), and we fail to reject the hypothesis that one is equal to the negative of the other. We interpret this as an indication that while our earlier questions concerning the best measure of devaluation may be important in principle, in practice, real devaluation is a sufficient statistic for our purposes. We therefore concentrate on it in the other columns.

In column (2), we give the basic specification, with the interaction term constructed with the real exchange rate (DEVREAL). For the three non-EA countries, we find a negative coefficient, significant at 10 percent. This implies that productivity in sectors with less skill intensity grew relatively less when the real devaluation vis-à-vis the DM in the 1980 to 1998 period was greater. The interaction with the EA dummy gives a positive coefficient (1.01), significant at 5 percent (standard error equal to 0.40): compared to the control group, among the EA countries, productivity growth has been stronger when the real devaluation in the 1980 to 1998 period was greater and the sectoral skill intensity was lower. The other controls have the expected sign; in particular, productivity growth is positively serially correlated and displays mean reversion.

To evaluate the magnitude of the effects, we use the growth differential, defined as:

$$GD \equiv \beta_2(DEV_{75} - DEV_{25}) * (S_{75} - S_{25}),$$

where DEV_{75} is the value of DEV for the country at the seventy-fifth percentile of the distribution (Spain), and DEV_{25} is the value at the twenty-fifth percentile (France); S_{75} is the sector at the seventy-fifth percentile of the skill distribution (other nonmetallic mineral products), and S_{25} is the sector at the twenty-fifth percentile (other transport equipment). The variable GD measures how much more productivity grew in a low-skill sector (namely, at the seventy-fifth percentile of the skill distribution) compared to a high-skill one (at the twenty-fifth percentile) in a country that relied heavily on devaluations (at the seventy-fifth percentile) compared to one that did not (at the twenty-fifth percentile). For $\beta_2 = 1.01$, the growth differential is 1.7 percent—a sizeable effect—equal to the median yearly productivity growth and just below the mean (2.1 percent). It is important to note that this is only a within-country and sector comparison, so it does not allow us to draw conclusions on growth differential between the countries or the sectors. For example, it might well be that average productivity growth in Spain has

been lower than in France: this would be captured by the country dummy. Similarly, average productivity growth in low-skill-intensity sectors might have been lower than in high-intensity ones. All we can say is that *relative to the country and sector averages,* the productivity growth differential between low- and high-skill sectors was higher in Spain than in France.

We then perform a series of robustness checks of this basic result. In column (3), we repeat the exercise without weights. The estimate of the coefficient drops to 0.7, and the standard error increases slightly so that the *p*-value is equal to 0.16. This indicates that the weighting scheme is important to obtain a significant coefficient, suggesting that the results have to be taken with due caution. Still, the value is positive and the *p*-stat reasonably low.

One could argue that firms require some time to adjust to the change of regime brought about by the euro. Moreover, even if restructuring started early on, such processes might take some time to result in productivity gains. According to this interpretation, one should find that the effects of restructuring are more visible in the latter part of the posteuro period, so we repeat the exercise and calculate productivity growth for the 2002 to 2005 period.[10] The coefficient does increase substantially—to 1.5—and is significant at 1 percent, lending support to the view that the effects of the euro on European firms did take some time to become appreciable. In fact, if we run the exercise for the 1998 to 2002 period (unreported), we get a substantially lower coefficient (0.36) that is not significantly different from 0 (standard error equal to 0.26).

As argued previously, a possible criticism relates to the control group, only made up of three countries. In column (5), we run regression (2) only for the EA countries. In this case, we are not controlling for potential confounding factors; still, given that both sector and country dummies are included, we are controlling for fixed attributes on both levels. We find a positive and significant coefficient, although smaller, in accordance with the fact that the effect was negative for the control group. According to this estimate, the growth differential is 0.96 percent. This allows us to exclude the possibility that our results are simply driven by some idiosyncratic characteristics of the control group: within the EA countries, productivity grew faster in exactly those country-sectors that are most likely to be hit by the introduction of the fixed-exchange rate regime.

As observed earlier, one might expect that productivity growth has been achieved through downsizing and offshoring, in which case it should go hand in hand with a reduction in employment. In panel B, we repeat the exercise and use employment growth as the dependent variable. Contrary to this proposition, we find no clear relation between our interaction mea-

10. To maximize comparability with the other regressions, we use the same initial value and pre-euro growth rate as we do for the other columns. Results are unchanged if we use the log of productivity in 2002 and the growth rate in the 1998 to 2002 period.

Table 3.6 **Low-R&D intensity and devaluation**

	(1)	(2)	(3)	(4)
	A. Productivity growth			
DEV * RD * EA	1.51**	0.62	1.63**	1.01***
	(0.59)	(0.52)	(0.73)	(0.36)
DEV * RD	–0.43	–0.08	–0.52	
	(0.34)	(0.39)	(0.37)	
$\ln(prod_{98})$	–0.06***	–0.06***	–0.06***	–0.05***
	(0.01)	(0.01)	(0.02)	(0.01)
$\Delta prod_{9598}$	0.16**	0.07	0.10	0.11*
	(0.08)	(0.08)	(0.11)	(0.06)
Observations	306	306	306	244
R^2	0.56	0.38	0.46	0.54
	B. Employment growth			
DEV * RD * EA	0.36	0.05	0.48	0.18
	(0.30)	(0.24)	(0.43)	(0.19)
DEV * RD	–0.27	–0.09	–0.43	
	(0.20)	(0.17)	(0.31)	
$\ln(emp_{98})$	0.01***	–0.01**	0.01**	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Δemp_{9598}	0.22***	0.29***	0.19**	0.17**
	(0.07)	(0.10)	(0.09)	(0.07)
Observations	308	308	308	246
R^2	0.71	0.50	0.64	0.65

Note: DEV is the indicator of real devaluation (DEVREAL), computed over the period from 1980 to 1998; RD is low R&D intensity; EA is a dummy equal to 1 for the EA countries; $\ln(prod_{98})$ ($\ln(emp_{98})$) is initial productivity (employment), and $\Delta prod_{9598}$ (Δemp_{9598}) is productivity (employment) growth in the 1995 to 1998 period. Outcome growth rates are computed for 1998 to 2005 in all columns except column (3), where it is computed for 2002 to 2005. All regressions are weighted with the sectoral employment, apart from that in column (2), which is unweighted. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

sure and employment growth. The coefficient of the interaction is generally negative but is small in absolute value and not significantly different from 0. According to this finding, restructuring does not seem to have had a downside in terms of job losses.

These basic patterns are confirmed when using R&D and ICT intensity as sectoral indicators of the importance of devaluations.[11] In table 3.6, we report the results for the R&D indicator. As before, the coefficient of the interaction is positive and significant, again with the exception of the

11. As for skill intensity, the specification with DEVNOM and ΔP confirms that DEVREAL is a sufficient statistic for our purposes. Accordingly, that specification is not reported.

unweighted regression. The effect increases in the second subperiod and still holds when computed on the EA countries only. The growth differential implied by the estimate in column (1) is similar in magnitude to that using skill intensity (1.6 percent productivity growth increase per year). Again, no clear effect on employment emerges—if anything, there is some evidence of a positive impact.

Similar results hold for ICT intensity, although the estimates tend to be less precise. The growth differential is 1.2 percent per year (table 3.7). With this indicator, we get a significant coefficient also in the unweighted case, while no evidence of a stronger effect in the second subperiod emerges. The employment regressions again suggest no effect of the interaction term.

Table 3.7 **Low-ICT intensity and devaluation**

	(1)	(2)	(3)	(4)
	A. Productivity growth			
DEV * ICT * EA	1.64*	2.78**	1.35	0.83
	(0.91)	(1.34)	(1.37)	(0.51)
DEV * ICT	–0.66	–1.24	–0.68	
	(0.58)	(0.99)	(0.95)	
$\ln(prod_{98})$	–0.06***	–0.05***	–0.06***	–0.05***
	(0.01)	(0.01)	(0.02)	(0.01)
$\Delta prod_{9598}$	0.16*	0.07	0.09	0.10*
	(0.08)	(0.07)	(0.12)	(0.06)
Observations	321	321	321	256
R^2	0.53	0.37	0.42	0.50
	B. Employment growth			
DEV * ICT * EA	0.29	–0.38	0.49	0.06
	(0.57)	(0.64)	(0.65)	(0.35)
DEV * ICT	–0.32	0.01	–0.56	
	(0.39)	(0.46)	(0.48)	
$\ln(emp_{98})$	0.01***	–0.01**	0.01*	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Δemp_{9598}	0.21***	0.30***	0.16**	0.17**
	(0.06)	(0.10)	(0.08)	(0.07)
Observations	323	323	323	258
R^2	0.71	0.50	0.63	0.65

Note: DEV is the indicator of real devaluation (DEVREAL), computed over the period from 1980 to 1998; ICT is low ICT intensity; EA is a dummy equal to 1 for the EA countries; $\ln(prod_{98})$ ($\ln(emp_{98})$) is initial productivity (employment), and $\Delta prod_{9598}$ (Δemp_{9598}) is productivity (employment) growth in the 1995 to 1998 period. Outcome growth rates are computed for 1998 to 2005 in all columns except column (3), where it is computed for 2002 to 2005. All regressions are weighted with the sectoral employment, apart from that in column (2), which is unweighted. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Findings are somewhat different when the sectoral indicator is the export share of China (table 3.8). In this case, the productivity estimates tend to be less clear-cut. First, they are only significant for the baseline specification and for the unweighted one. The effect disappears when we exclude the control group, suggesting that these results are to be treated with even more caution than the others. In any case, according to the baseline specification, the growth differential is 0.5 percent, where the sectors at the twenty-fifth and seventy-fifth percentiles are chemicals and chemical products and rubber and plastic products, respectively. More interestingly, a negative effect on employment emerges. In the basic specification, we get a coefficient

Table 3.8 **Chinese export share and devaluation**

	(1)	(2)	(3)	(4)
	A. Productivity growth			
DEV * CH * EA	1.34**	1.52**	0.98	0.27
	(0.67)	(0.70)	(1.19)	(0.38)
DEV * CH	–1.06**	–0.82	–0.97	
	(0.48)	(0.52)	(1.10)	
$\ln(prod_{98})$	–0.06***	–0.05***	–0.06***	–0.05***
	(0.01)	(0.01)	(0.02)	(0.01)
$\Delta prod_{9598}$	0.16*	0.07	0.09	0.11*
	(0.09)	(0.08)	(0.12)	(0.06)
Observations	321	321	321	256
R^2	0.53	0.36	0.42	0.49
	B. Employment growth			
DEV * CH * EA	–1.77**	–1.01	–1.75**	–0.39*
	(0.69)	(0.67)	(0.77)	(0.23)
DEV * CH	1.38**	1.11***	1.22*	
	(0.64)	(0.41)	(0.71)	
$\ln(emp_{98})$	0.01***	–0.01**	0.01*	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Δemp_{9598}	0.21***	0.29***	0.16**	0.19***
	(0.06)	(0.10)	(0.08)	(0.07)
Observations	323	323	323	258
R^2	0.73	0.51	0.64	0.65

Note: DEV is the indicator of real devaluation (DEVREAL), computed for the period from 1980 to 1998; CH is China's world export share; EA is a dummy equal to 1 for the EA countries; $\ln(prod_{98})$ ($\ln(emp_{98})$) is initial productivity (employment), and $\Delta prod_{9598}$ (Δemp_{9598}) is productivity (employment) growth in the 1995 to 1998 period. Outcome growth rates are computed for 1998 to 2005 in all columns except column (3), where it is computed for 2002 to 2005. All regressions are weighted with the sectoral employment, apart from that in column (2), which is unweighted. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

of –1.77, significant at 5 percent. The implied growth differential is –0.6 percent.

As a final check, we run the same regressions as before for the period over which we computed the devaluation indicators: 1980 to 1998. This is to make sure that we are not just capturing some underlying autocorrelated process that was already operating before the euro.[12] To save on space, we report only the main specification with DEVREAL. There is no support for this hypothesis (table 3.9). Neither the effect for the control group nor the deviation for the EA countries is significant for productivity or for employment for any of the sectoral indicators. This further substantiates the argument that our results really are capturing a specific effect of the euro, not some other concomitant factor.

All in all, these regressions suggest that the end of competitive devaluations has had a positive impact on productivity growth in those countries and sectors that had presumably relied more on them. Moreover, there does not appear to be any downside in terms of jobs: reallocation does not seem to have come at the expense of employment growth. A clear exception to this is the regression using the Chinese export share. This analysis begs the question of how productivity growth was achieved—that is, how restructuring occurred. We tackle this issue in the next section.

3.4 Firm-Level Evidence of Restructuring: The Case of Italian Manufacturing

In this section, we turn to firm-level evidence on the response to the euro, drawn mostly from a survey of Italian manufacturing firms run by the Bank of Italy (INVIND). Restricting attention to Italy clearly limits the generality of the results, but Italy is an interesting case, as it had relied heavily on competitive devaluations and is specialized in traditional, low-tech activities, which according to the evidence set out previously should have been most severely affected by the introduction of the common currency. We first review some insights from a series of case studies and then consider the time series evolution of various measures of reallocation activities. Finally, we study the correlation between restructuring and performance at the level of the firm.

3.4.1 Case Studies

In the spring of 2007, the Bank of Italy conducted in-depth interviews with entrepreneurs and chief executive officers of some forty Italian firms, mostly in the manufacturing sector. Like the NBER/Sloan "pin factory" project (Borenstein, Farrell, and Jaffe 1998), the survey involved long inter-

12. The inclusion of lagged growth in the regressions should already account for this.

Table 3.9 **Preregressions**

	SKILLS		R&D		ICT		CHINA	
	PROD. (1)	EMP. (2)	PROD. (3)	EMP. (4)	PROD. (5)	EMP. (6)	PROD. (7)	EMP. (8)
DEV * SECT * EA	–0.11	–0.13	0.05	0.00	0.29	0.09	0.20	0.08
	(0.09)	(0.10)	(0.10)	(0.12)	(0.19)	(0.19)	(0.19)	(0.42)
DEV * SECT	0.07	0.08	–0.01	0.02	–0.10	–0.04	–0.11	–0.12
	(0.05)	(0.06)	(0.05)	(0.07)	(0.10)	(0.10)	(0.11)	(0.18)
$\ln(prod_{80})$	–0.03***		–0.03***		–0.03***		–0.03***	
	(0.00)		(0.00)		(0.00)		(0.00)	
$\Delta prod_{7080}$	0.40***		0.40***		0.40***		0.40***	
	(0.02)		(0.03)		(0.02)		(0.02)	
$\ln(emp_{80})$		–0.00***		–0.00***		–0.00***		–0.00***
		(0.00)		(0.00)		(0.00)		(0.00)
Δemp_{7080}		0.69***		0.69***		0.69***		0.69***
		(0.06)		(0.06)		(0.06)		(0.05)
Observations	293	302	278	287	293	302	293	302
R^2	0.96	0.85	0.96	0.85	0.96	0.85	0.96	0.85

Note: DEV is the indicator of real devaluation (DEVREAL), computed for the period from 1980 to 1998; SECT is the sectoral indicator, indicating low-skill intensity in columns (1) and (2), low-R&D intensity in columns (3) and (4), low-ICT intensity in columns (5) and (6), and China's world export share in columns (7) and (8); EA is a dummy equal to 1 for the EA countries; $\ln(prod_{80})$ ($\ln(emp_{80})$) is initial productivity (employment), and $\Delta prod_{7080}$ (Δemp_{7080}) is productivity (employment) growth in the 1970 to 1980 period. Outcome growth rates are computed for 1980 to 1998. All regressions are weighted with sectoral employment. Robust standard errors in parentheses.

***Significant at the 1 percent level.

views (between two and four hours). The interviewers, always researchers at the Bank of Italy, followed a set schema, but most of the interview was left for the entrepreneurs to elaborate freely. The main goal was to assess whether the firms were restructuring, and if so, in what forms. Of course, forty interviews cannot be statistically representative. The aim was to understand what forces were driving the process and how firms were responding, in order to guide subsequent quantitative analysis, among other things. The main findings were summarized in an internal report by Omiccioli and Schivardi (2007) on which this section is based; the report has not yet been made public for confidentiality reasons.

One clear insight from the interviews is that success stories are invariably based on some degree of market power. Entrepreneurs are generally very clear that given the growing role of low-wage countries in the world trade, competition based on production costs is rapidly becoming unsustainable, so the production of homogeneous, undifferentiated goods is less and less viable. All the firms that were surviving or even prospering in the globalized economy offered products that had a certain degree of differentiation and thus escaped pure cost competition. The challenge is to build up and maintain such market power.

The experiences reviewed were highly differentiated in a number of dimensions—by product, firm size, and the entrepreneur's personal history. But all the cases of successful restructuring had one feature in common: the firms had invested in activities not directly involving production. These activities may be classed as:

- Upstream: product creation (R&D, design) and brand establishment (advertising, marketing).
- Auxiliary: organization of production, often partly or wholly outside the firm (through outsourcing and offshoring); generally based on intensive use of ICT.
- Downstream: sales network, postsales assistance.

These activities are not important only for high-tech products. Rather, the importance of each component varies with the particular business considered. For final goods producers, the crucial needs are the establishment of a brand, the organization of production, and the creation of a sales network. For high-tech activities, the creation of the product, particularly through R&D, remains the main route to competitive advantage. For producers of intermediate goods, customers require constant assistance, particularly for firms producing industrial machineries.

We interviewed some firms operating in the traditional sectors of clothing and shoes. The success stories entailed a shift of the business focus away from production toward brand creation and product design while maintaining a coordinating role in production, which was mostly outsourced, often

abroad.[13] Out of 800 workers of a firm producing machines for tile making, only 70 were employed in the plant, the rest divided between product design (200) and marketing and administration. The prototypes of successful firms suggest that competitive strength is built outside the factory by workers not directly involved in the production process. We will use this insight in our subsequent empirical analysis: restructuring means a greater reliance on nonproduction workers and consequently entails a reduction of the share of blue-collar workers in the workforce.

In terms of cross-sectoral differences, the process seems to be most intensive for low-tech activities. Most of the high-tech firms did not perceive either the euro or the globalization as a discontinuity in the competitive landscape. For them, in fact, competition focuses mostly on innovation and R&D. For example, an entrepreneur producing electrical machinery said that his firm had a three-year lead over its Chinese competitors in technology and contended that this was the key competitive edge to be maintained, rather than lowering production costs. Another firm in the medical and precision instrument field saw its main competitors as located in Germany and Japan; the strong euro had created the opportunity for an important acquisition in the United States.

For low-tech firms—particularly those operating in the traditional sectors, such as clothing and leather—the change was much more profound. All the entrepreneurs in these sectors stressed that a dramatic change in the competitive environment had occurred with the introduction of the euro. Some had changed their business model radically (see note 13); those who had not were clearly struggling. This anecdotical evidence squares with the results of the previous section: the euro was a greater shock for activities of low-skill content. It also suggests that the lower the technological content of the activity, the sharper the shift away from production is likely to be.

Further, the entrepreneurs do not think that the restructuring process is over. They all believed that the international landscape will keep changing fast in the coming years. Also, changes in the business model depend crucially on the individual histories of the firms. In particular, for family firms (almost all those interviewed could be classified as such), radical change tends to coincide with generational succession. Finally, restructuring itself is an ongoing sequential activity, not a 0/1 event. For example, many firms had been introducing business software—particularly some form of enterprise resource planning (ERP)—but this was mostly done in steps: first by digitalizing accounting, then business-to-business transactions, then production, and so on. In fact, we interviewed firms with very different degrees of penetration of business software. All in all, therefore, we expect

13. An entrepreneur in the shoe sector defined his firm as "a services firm that collects information from the market, elaborates it, designs products and dictates instructions to the other firms on how to produce them." Until 1999, this firm, which now employs 260 workers and only produces the models internally, was a traditional shoemaker that produced for other brands.

restructuring to be a smooth ongoing process rather than concentrated in a short period of time.

3.4.2 Quantitative Evidence from Manufacturing Firms

The increasing availability of data sets with firm-level information has spurred a vast literature on restructuring (Davis, Haltiwanger, and Schu 1996).[14] The basic idea, following the seminal work of Lilien (1982), is that periods of restructuring are characterized by intense factor reallocation and increased dispersion of firms' performance. In fact, when a shock hits the economy, some firms adapt and some do not, so their performance diverges, and factors are reallocated to successful restructurers. In this section, we use the insights from this literature and the case studies reviewed previously to assess the degree of restructuring of the Italian manufacturing sector following the introduction of the euro.

The data come from the Bank of Italy's annual survey of manufacturing firms (INVIND), which is an open panel of around 1,200 firms per year that are representative of manufacturing firms with at least fifty employees. It contains detailed information on firms' characteristics, including industrial sector, nationality, year of creation, number of employees, value of shipments, value of exports, and investment. The questionnaire contains a fixed part and a rotating part used to investigate topics of special interest in the year. The resulting database has been used extensively. (For a description of the database, see, among others, Fabiani, Schivardi, and Trento [2005]; Guiso and Parigi [1999]; and Iranzo, Schivardi, and Tosetti [2008]).

If not all firms are equally successful at restructuring, performance should become more highly dispersed. Following up on the aggregate analysis, we consider productivity, measured as log of sales per worker,[15] and check whether its dispersion increased after the introduction of the euro. Figure 3.5 shows that in fact it did: the cross-firm dispersion of sales per worker goes from around 0.64 in the first part of the 1990s to around 0.70 in the euro period.[16] Moreover, the dispersion increases almost monotonically up to the last available year (2007), suggesting that the process is still very much under way: in fact, if the restructuring wave was over, we would expect dispersion to revert to business-as-usual levels. We have also computed the dispersion of gross operating profits (EBITDA: earnings before interest, taxes, depreciation, and amortization) over value added, drawn from the Cerved data

14. This subsection draws on the Master's dissertation of Daniela Puggioni (2008) at the University of Cagliari.

15. Usually, productivity is measured as value added per worker, but this is not available for a sufficiently long time span. However, given that part of the restructuring activity might entail the offshoring of some part of the production process, sales per worker might capture such reorganization of the production chain better.

16. To make sure that results are not driven by outliers, we have also computed various interquartile ranges, finding exactly the same pattern.

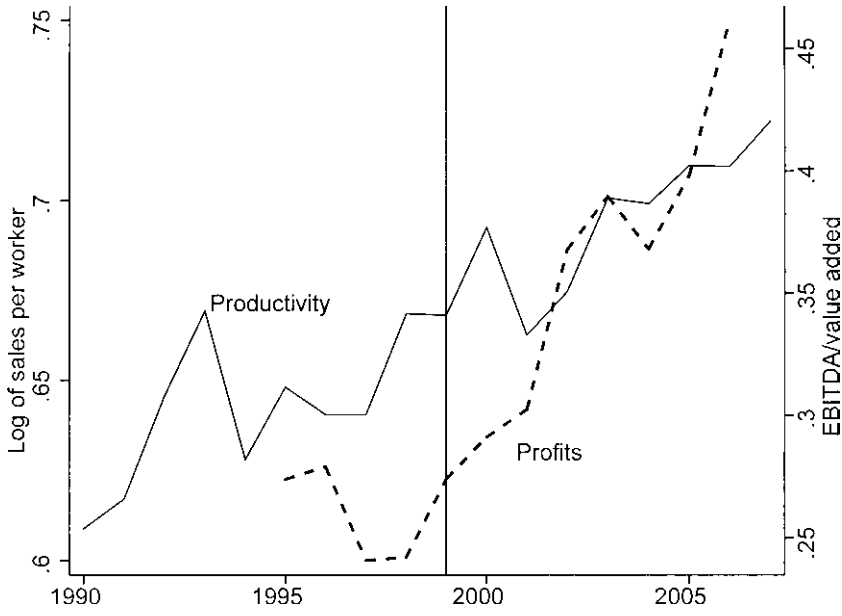

Fig. 3.5 Standard deviation of productivity and profits

Note: Productivity is measured as log of sales per workers (left scale) in the INVIND database. Profitability is EBITDA/value added (right scale) in the Cerved database. In this and the following graphs, a vertical bar is drawn corresponding to 1999, the year of the euro introduction.

set.[17] In fact, Foster, Haltiwanger, and Syverson (2008) show that selection and reallocation are due more to differences in profitability than in productivity. In figure 3.5, we therefore also plot the standard deviation of profits, finding that they follow a similar pattern to productivity.

We next consider reallocation measures based on job flows.[18] The job creation rate (JC) is defined as

$$\mathrm{JC}_t = \frac{\Sigma_{f \in E^+} \Delta E_{ft}}{(1/2)(E_t + E_{t-1})},$$

where ΔE_{ft} is the change in employment for firm f at time t, E^+ is the set of firms that expand employment, and E_t is aggregate employment.[19] The job destruction rate (JD) is defined similarly:

17. The INVIND survey does not allow computation of profitability measures. We have therefore used Cerved, a database with balance-sheet information for almost all Italian limited liability companies, available since 1996. Cerved has no information on employment and therefore cannot be used for the other analysis in this section.

18. See Davis, Haltiwanger, and Schu (1996) for a detailed explanation of job flow measures.

19. The normalization by $(1/2)(E_t + E_{t-1})$ rather than E_{t-1} constrains JC between –2 and 2 rather than –1 and ∞. The distribution is symmetric around 0 and easier to interpret graphically.

$$JD_t = \frac{\Sigma_{f \in E^-} |\Delta E_{ft}|}{(1/2)(E_t + E_{t-1})},$$

where E^- is the set of firms that reduce employment; net employment growth is $EG_t = JC_t - JD_t$; and job reallocation is the sum of job creation and destruction, $JR_t = JC_t + JD_t$. Finally, we also construct a measure of excess job reallocation, $ER_t = JR_t - |EG_t|$, which measures the job reallocation in excess of that required to reach a given change in net employment; for example, a sector might be constantly expanding employment and at the same time reallocating production among existing units: ER measures the job flow rate net of that due to sectoral employment expansion.

In figure 3.6, we report JC, JD, and EG. Job destruction peaks in 1993, when employment in the sample contracted by more than 5 percent. After that, both JC and JD remain fairly stable at values between 2 percent and 4 percent. Consistent with the downward trend in manufacturing employment, EG is negative in most years. Job reallocation also peaks in 1993, then reverts to a fairly stable level of around 6 percent. The ER variable shows a modest upward trend since 1998, with a peak in 2000, but again with fairly modest variations. Thus, the traditional measures of restructuring offer little support to the hypothesis of an increase in restructuring after the euro. All the indicators of job reallocation (with the exception of ER) peak in the recession of the early 1990s and then level off. This occurs at

Fig. 3.6 Job creation, job destruction, and net employment growth
Source: Based on INVIND database.

the same time as the increase in productivity and profitability dispersion, which suggests two things. First, the reallocation process induced by the euro has a smooth, ongoing character, especially when compared to that related to the deep recession of 1993; in particular, it seems to have little effect on the reallocation of factors across firms, possibly because of the degree of flexibility of the factor markets. Second, and strictly related, the posteuro restructuring might be of a different type from that of the early 1990s and might require different indicators: in particular, rather than showing up in job flows across firms, it might have induced more within-firm changes in workforce composition.[20]

The case studies suggest that the firms that did well tended to shift from production to upstream and downstream activities, such as R&D, design, marketing, and distribution chains. In terms of workforce composition, this implies that we should see a decrease in the share of blue-collar workers. Their average share decreased from 0.69 in 1990 to 0.62 in 2007 (figure 3.7). This pattern reflects a secular trend, common to all developed economies, but with a clear break around the 1992 devaluation: from 1992 to 1998, the share stays roughly constant at around 0.67. It starts declining rapidly in 1999, falling to 0.62 in 2007. This evidence is consistent with the thesis that the devaluation of 1992 allowed firms to gain cost competitiveness, boosting the relative importance of production. With the euro, this possibility was ruled out, and firms had to adapt their strategy, shifting away from production and therefore reducing the share of blue-collar workers. This interpretation is further corroborated by the analysis of the cross-firm variance in the share of blue-collar workers. Up to 1998, there is no clear trend in the cross-sectional dispersion of this share.[21] Consistent with the hypothesis that the euro has forced a shift away from low-skill activities and that the process has not been uniform across firms, starting in 1999, the standard deviation of the share of blue-collar workers increases steadily, from around 0.18 to 0.21.

According to the insights of the cross-country analysis of the previous section, the shift away from low-skill workers should have been stronger in low-tech activities, which had relied more on competitive devaluations. To check whether this is indeed the case, we have grouped firms according to the Organization for Economic Cooperation and Development (OECD) classification system (OECD 2003), dividing them into four classes: low, medium-low, medium-high, and high tech. Figure 3.8 reports the time series

20. Unfortunately, due to the lack of information on entry and exit, we cannot compute the decomposition of productivity growth into the within-firm, between-firm, and net entry components.

21. This graphical evidence is supported by the more formal analysis of Iranzo, Schivardi, and Tosetti (2008), who study the within- and between-firm skill dispersion using the same sample for the period from 1980 to 1997, finding a very stable time series pattern for the cross-firm component of skill dispersion (i.e., no evidence of an increase in dispersion).

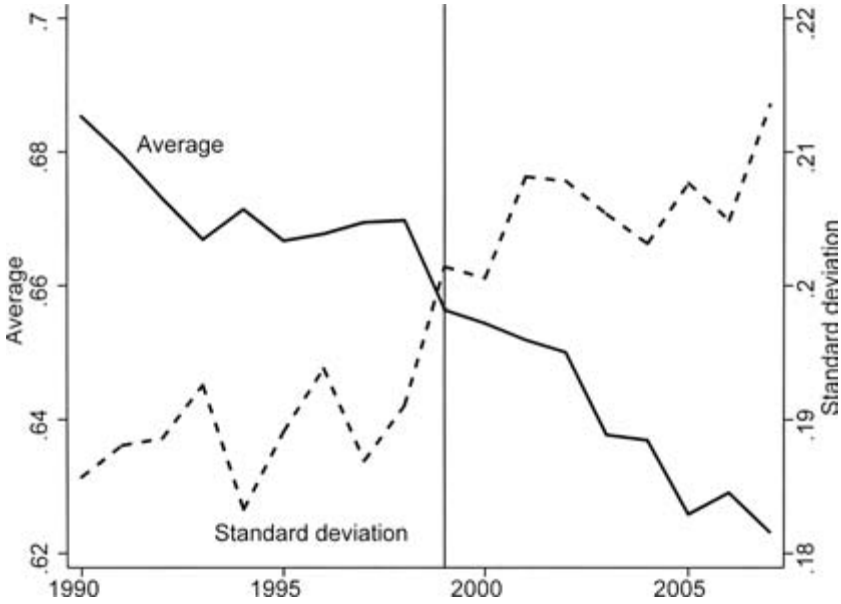

Fig. 3.7 Cross-firm average and standard deviation of the share of blue-collar workers

Source: Based on INVIND database.

for the share of blue-collar workers for the four groups of firms. In general, the paths are similar to the aggregate, with a pause in the decrease after the 1992 devaluation and an acceleration starting in 1999. A clear exception is the group of high-tech firms for which no clear pattern emerges, while the decrease is sharpest among the low-tech firms, which reduced the share of blue-collar workers by around 8 percentage points between 1999 and 2007. A similar picture emerges when considering the cross-firm dispersion in the share of blue-collar workers: again, the largest increases are recorded by low- and medium-low tech firms.

To corroborate the graphical analysis, we have run some diff-in-diff regressions of the following form:

$$(4)\quad \mathrm{ShBlue}_{ft} = \alpha_0 + \alpha_1 * \mathrm{LOW}_f * \mathrm{POST}_t + \alpha_2 \mathrm{LOW}_f + \alpha_3 X_{ft} + \mathrm{YEAR}_t + \varepsilon_{ft},$$

where ShBlue_{ft} is the share of blue-collar workers in firm f at time t, LOW is a dummy equal to 1 if the firm belongs to the low-tech group, POST is a dummy equal to 1 for the years 1999 to 2007, YEAR is a full set of year dummies, and X_{ft} includes firm size (log of total employment) and four regional dummies (northwest, northeast, center, and south). The LOW dummy controls for fixed group attributes—in particular for the fact that low-tech firms have a higher share of blue-collar workers than other firms;

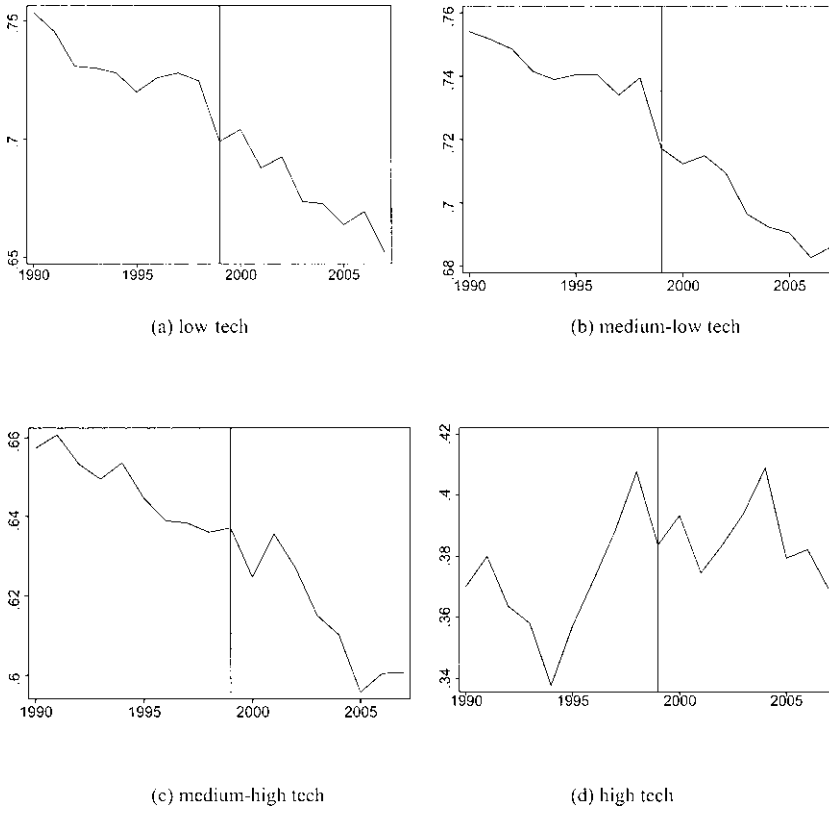

Fig. 3.8 Share of blue-collar workers by technological intensity
Source: Our elaborations on INVIND database.

the year dummies control for possible time trends. The coefficient α_1 therefore measures the change in the share of blue-collar workers for the firms in the LOW group before and after the euro as a deviation from the change for firms in the control group (firms not in the LOW group). As such, it can be interpreted as the extra effect of the euro on the LOW firms, compared to the control group. The results reported in table 3.10 clearly confirm the graphical analysis. The first column applies only the dummy for the low-tech firms; the control group therefore comprises all other firms. The coefficient indicates the decrease in the share of blue-collar workers has been 3 percentage points greater among low-tech firms than among others since 1999, with a strong statistical significance. In the second column, we also include a MEDIUM-LOW*POST dummy, so now the control group consists of medium-high and high-tech firms. Again, we find that low and medium-low-tech firms decreased the share of blue-collar workers more substantially; the same occurs when we include a dummy for medium-high-tech firms as

Table 3.10 Share of blue-collar workers

	Period: 1990 to 2007			Period: 1984 to 1990		
	(1)	(2)	(3)	(4)	(5)	(6)
LOW * POST	–0.031***	–0.031***	–0.072***	0.003	0.004	0.038*
	(0.005)	(0.006)	(0.013)	(0.009)	(0.011)	(0.021)
MED-LOW * POST		–0.019***	–0.059***		–0.006	0.029
		(0.006)	(0.013)		(0.010)	(0.021)
MED-HIGH * POST			–0.050***			0.036*
			(0.013)			(0.021)
LOW	0.076***	0.132***	0.336***	0.073***	0.127***	0.304***
	(0.004)	(0.005)	(0.010)	(0.007)	(0.008)	(0.015)
MED-LOW		0.135***	0.339***		0.135***	0.310***
		(0.004)	(0.010)		(0.007)	(0.014)
MED-HIGH			0.242***			0.215***
			(0.010)			(0.015)
ln(emp)	–0.030***	–0.024***	–0.018***	–0.035***	–0.029***	–0.021***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Observations	24,143	24,143	24,143	5,142	5,142	5,142
R^2	0.09	0.15	0.20	0.14	0.22	0.32

Note: The dependent variable is the share of blue-collar workers at the level of the firm; ln(emp) is the log of total employment; LOW is a dummy equal to 1 for low-tech firms, and similarly for MED-LOW and MED-HIGH; POST is a dummy equal to 1 for the post-1998 years. Robust standard errors in parentheses.

***Significant at the 1 percent level.

*Significant at the 10 percent level.

well (column [3]). The intensity of the decrease is inversely related to the technological content. Consistent with the findings of the previous section, the effect of the euro on workforce composition decreases monotonically with technological intensity. These results are very robust to changes in the specification. We have also included additional firm controls, such as indicators of productivity, export propensity, and sales (as an alternative measure of size), finding no significant differences in the results.

One important objection to this exercise is that we might be capturing differences in trends in the occupational mix. That is, it might simply be that low-tech firms were already reducing blue-collar workers more intensively before the euro launch. For a limited number of firms, we can reconstruct the technological classification since 1984. To check whether we are picking up differences in trends, we have rerun regression (4) for the period from 1984 to 1990, with the POST dummy equal to 1 for 1988 to 1990 and 0 before. (This splits the sample approximately equally.) If we are simply capturing differences in underlying trends, we should then find that α_1 is negative also in the 1980s, when competitive devaluations were still possible. But columns (4) through (6) of table 3.10 show that if anything, in the 1980s, low-tech firms were actually increasing the blue-collar intensity of the workforce com-

pared to the high-tech ones. These findings are robust to changes in the year of definition of the postperiod and to including years up to 1998. We can conclude that before the euro, low-tech firms used devaluations to regain price competitiveness and intensified their reliance on low-skilled workers; on the contrary, high-tech firms competed mostly in other dimensions and so were increasing the relative skill content of their workforce.

3.4.3 Restructuring and Firm Performance

Was restructuring effective in terms of firms' performance? We measure performance in terms of growth of value added and productivity and rely on a simple cross-sectional empirical specification of the following form:

$$g_{i,t_0t} = \beta_0 + \beta_1 \times \mathrm{RES}_{i,t_0} + \beta_2 X_{i,t_0} + \mathrm{YEAR}_{t_0} + \varepsilon_i, \tag{5}$$

where g_{i,t_0t} is the firm's average growth rate of real value added or productivity (value added per employee) in the period t_0t, and t_0 is the first available year for a firm in the sample, starting in 2000. To maximize the number of firms, we do not limit the sample to those that are surveyed both in 2000 and 2005 but also include firms sampled for at least a pair of consecutive years during the period. To net out cyclical effects, we compute the growth rate as the residual of a preliminary regression of the raw growth rate data on year dummies and the initial value of value added or productivity. The starting year is 2000 instead of 1999, because some of our proxies for restructuring take 2000 as the reference year. (The results do not change using 1999.) The variable YEAR_{t_0} is a set of dummies for the first year in which a firm is in the data set; X_{it_0} includes firm size (log of total employment), sectoral dummies at two digits of the NACE revision 1 classification, and the usual four regional dummies, all computed at t_0. We focus on the coefficient of RES, a measure of restructuring activity for which we use different proxies. The first comes directly from the previous analysis and refers to the share of blue-collar workers: here, we check both the initial level of the share (ShBlue) and its average annual change in 2000 to 2006 (ΔShBlue). If the reduced reliance on low-skilled workers has indeed been one of the dominant strategies to regain competitiveness after the introduction of the euro, we should find a negative relationship between this variable and firm performance. There is a clear negative effect of the initial share of blue-collar workers on value added and productivity growth (table 3.11, columns [2] and [5]), while the coefficient of the contemporaneous change in that share is not significantly different from 0 (columns [1] and [4]). The former result confirms the idea that if we control for sectoral differences in technology, firms that focused more on nonproduction activities through a larger share of white-collar workers have performed better. Given the likely smooth and ongoing nature of the restructuring process, it is not surprising that our contemporaneous indicator is not able to fully capture the impact of restructuring on performance.

We then search for a heterogeneous effect of restructuring across sectors.

Table 3.11 Firm performance and share of blue-collar workers

	Value added growth			Productivity growth		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(emp)	0.013***	0.016***	–0.001	0.012***	0.017***	0.002
	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.006)
ΔShBlue	–0.022			0.017		
	(0.072)			(0.052)		
ShBlue		–0.055**	–0.055		–0.094***	–0.035
		(0.023)	(0.036)		(0.020)	(0.035)
Observations	3,042	3,178	1,008	3,044	3,181	1,009
R^2	0.030	0.044	0.063	0.034	0.053	0.076

Note: Regressions are run over the period from 2000 to 2006, except for columns (3) and (6), where the period is 1990 to 1995. The dependent variable is the annual average real growth rate of value added/labor productivity in the two periods; ln(emp) is the log of total employment as of 2000; ShBlue is the share of blue-collar workers over the total number of employees as of 2000; ΔShBlue is the average annual change in the share of blue-collar workers between 2000 and 2006. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

As pointed out in the previous section, we might expect that when controlling for average sectoral differences in the blue-collar share, firm heterogeneity in performance is more strongly linked to the share in low-tech sectors. The data do not support this thesis, possibly because of a lack of sufficient statistical power. (The coefficient is negative but statistically insignificant.)

We check whether the effect of the blue-collar share on performance is indeed related to the euro by running similar regressions for the period from 1990 to 1995, when Italian firms could rely on devaluation to gain international competitiveness. Over this period, we would expect no role for restructuring, and the results (columns [3] and [6]) show that this is indeed the case.

In the INVIND questionnaire referring to 2006, firms were asked about their business strategies—in particular about significant changes since 2000. The changes refer to significant renewals of the product menu and to greater reliance on branding strategies.[22] We exploit this information in two steps. First, we construct a dummy variable NEWSTRAT that is equal to 1 when a firm claims to have been either changing the product menu or investing more resources in product branding and that is equal to 0 otherwise. As shown in columns (1) and (5) of table 3.12, the dummy variable does have

22. More precisely, firms were asked the following question: "Which of the following statements better describe your strategic behavior during the 2000–06 period? 1 = the firm has not changed strategy; 2 = the firm has changed strategy, mostly by introducing relevant changes in the product menu; 3 = the firm has changed strategy, mostly by investing more resources on its own brand; 4 = the firm has changed strategy, mostly by internationalizing its activity."

Table 3.12 **Firm performance and restructuring**

	Value added growth				Productivity growth			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(emp)	0.017***	0.018***	0.016***	0.016***	0.017***	0.018***	0.016***	0.016***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
NEWSTRAT	0.016*	0.015*			0.013*	0.011		
	(0.009)	(0.009)			(0.008)	(0.007)		
ShBlue		–0.099***		–0.080***		–0.138***		–0.107***
		(0.027)		(0.027)		(0.023)		(0.022)
SMALLCH			–0.004	–0.004			0.001	0.001
			(0.013)	(0.013)			(0.014)	(0.013)
LARGECH			0.119**	0.112**			0.066*	0.057*
			(0.050)	(0.049)			(0.036)	(0.032)
Observations	1,989	1,989	2,159	2,159	1,987	1,987	2,157	2,157
R^2	0.043	0.060	0.058	0.067	0.050	0.087	0.060	0.081

Note: The dependent variable is the annual average real growth rate of value added/labor productivity over the period from 2000 to 2006; ln(emp) is the log of total employment as of 2000; ShBlue is the share of blue-collar workers over the total number of employees as of 2000; NEWSTRAT is a dummy variable equal to 1 if a firm has claimed to have significantly changed its strategy over the 2000 to 2006 period mostly by changing the product menu or by investing more resources in product branding, and it is equal to 0 otherwise; SMALLCH is a dummy variable equal to 1 if a firm's product menu in 2006 results to be slightly (i.e., still falling in a similar sectoral grouping) renewed with respect to what it was in 2000, and it is equal to 0 otherwise; LARGECH is a dummy variable equal to 1 if a firm's product menu in 2006 results to be significantly (i.e., falling in a different sectoral grouping) renewed with respect to what it was in 2000, and it is equal to 0 otherwise. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

a significantly positive effect on performance; the effect also survives the introduction of the share of blue-collar workers (columns [2] and [6]), which indicates that the performance improvement following the new strategy is realized on the top of that coming from the workforce composition. More detailed information on the intensity of the product change is then used to distinguish firms that renewed products within the same sectoral grouping (SMALLCH) from those that started producing products so new as to actually change the productive sector (LARGECH).[23] The control group here consists of firms that between 2000 and 2006 kept on producing almost the same products. As shown in columns (3) and (4) for value added growth and columns (7) and (8) for productivity growth, the strongest boost to performance has come from significant changes in the product menu. As for the blue-collar share, again we find no sectoral heterogeneity in the effect of product change and branding on performance (not reported).

All in all, the evidence of this section indicates that firms that undertook restructuring activities recorded a higher growth of both value added and productivity growth. Although more work will be required to establish a clear causal relation between restructuring and performance, this evidence squares with and complements the results previously discussed in the chapter.

3.5 Conclusion

We have shown that the euro has been accompanied by a process of within-sector reallocation, consistent with the hypothesis that the end of devaluations has forced restructuring in the countries and sectors that had depended most heavily on them. We used productivity growth as an indirect indicator of reallocation. This begs the question of how restructuring actually took place. We therefore use firm-level data for Italy with detailed information on restructuring activity. A series of interviews with entrepreneurs suggested that since the adoption of the euro, firms have shifted their business focus from production to upstream and downstream activities related to R&D, product design, marketing, distribution, and postsale assistance. This search for market power has been stronger in the traditional, low-tech industries. Hard quantitative evidence on a sample of Italian manufacturing firms showed that the process has entailed a reallocation of workers, mainly within rather than across firms, with a decrease in the share of blue-collar workers. Finally, we found that restructuring has improved performance.

23. The exact question asked to the firms is as follows: "With respect to your product menu in 2000, now you produce mostly: 1 = the same products; 2 = slightly different products that fall into a similar sectoral category; 3 = products that are so different to fall into a completely different sectoral category."

Appendix

Table 3A.1 Classification of NACE sectors into skill, ICT, and R&D intensity classes

Sector (NACE code in parentheses)	Skill content	ICT content	R&D content
Food products and beverages (15)	MEDIUM LOW	MEDIUM LOW	LOW
Tobacco products (16)	MEDIUM HIGH	MEDIUM LOW	LOW
Textiles (17)	LOW	LOW	LOW
Wearing apparel, dressing (18)	LOW	LOW	LOW
Leather, leather products, and footwear (19)	LOW	LOW	LOW
Wood and products of wood and cork (20)	LOW	LOW	LOW
Pulp, paper, and paper products (21)	MEDIUM HIGH	MEDIUM HIGH	MEDIUM LOW
Printing, publishing, and reproduction (22)	HIGH	MEDIUM HIGH	MEDIUM LOW
Coke, refined petroleum products, and nuclear fuel (23)	MEDIUM HIGH	LOW	MEDIUM HIGH
Chemicals and chemical products (24)	HIGH	MEDIUM HIGH	HIGH
Rubber and plastics products (25)	MEDIUM LOW	LOW	MEDIUM HIGH
Other nonmetallic mineral products (26)	LOW	MEDIUM LOW	MEDIUM LOW
Basic metals (27)	MEDIUM LOW	MEDIUM LOW	MEDIUM LOW
Fabricated metal products (28)	LOW	MEDIUM LOW	MEDIUM LOW
Machinery, n.e.c. (29)	MEDIUM LOW	HIGH	MEDIUM HIGH
Office, accounting, and computing machinery (30)	HIGH	HIGH	HIGH
Electrical machinery (31)	MEDIUM HIGH	HIGH	MEDIUM HIGH
Radio, television, and communication equipment (32)	HIGH	HIGH	HIGH
Medical, precision, and optical instruments (33)	HIGH	HIGH	HIGH
Motor vehicles, trailers, and semitrailers (34)	MEDIUM HIGH	MEDIUM HIGH	MEDIUM HIGH
Other transport equipment (35)	MEDIUM HIGH	MEDIUM HIGH	HIGH
Manufacturing, n.e.c.; recycling (36, 37)	MEDIUM LOW	MEDIUM HIGH	not allocated

Source: Based on EU KLEMS data.
Note: "n.e.c." = not elsewhere classified.

Table 3A.2 Descriptive statistics, dependent variables (percentage points)

	Productivity growth			Employment growth		
Country	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Austria	4.2	3.9	2.3	–1.1	–0.9	2.5
Belgium	2.2	1.9	1.5	–1.4	–1.2	1.9
Denmark	1.9	1.2	2.4	–2.9	–2.4	2.9
Finland	4.5	3.2	4.9	–0.5	–0.4	2.8
France	3.6	2.8	4.2	–1.4	–0.9	2.5
Germany	2.6	1.7	3.2	–1.2	–0.6	1.8
Greece	1.7	0.2	4.8	–1.8	–1.0	2.4
Ireland	7.5	6.0	6.2	–1.2	–0.2	4.3
Italy	0.1	0.1	2.2	–0.4	–0.2	1.5
Luxembourg	2.6	1.9	3.9	–0.5	0.6	3.2
The Netherlands	3.1	2.6	2.1	–1.7	–1.2	1.8
Portugal	1.1	0.9	2.1	–1.8	–1.5	1.7
Spain	1.0	0.4	1.3	1.4	1.7	2.6
Sweden	6.6	3.4	10.1	–1.5	–1.3	1.7
United Kingdom	4.4	3.8	2.1	–4.6	–3.5	3.7

Source: Based on EU KLEMS data.

Note: Manufacturing sector. Average growth across sector, weighted with sectoral employment, calculated over the period from 1998 to 2005.

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