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Little innovation, many jobs: An econometric analysis of the Italian labour productivity crisis

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Over the past 20 years, Italy has realised changes in labour legislation, leading to a decentralisation of wage bargaining and increased flexibility in labour relations. Both these factors have helped to curb wage growth and to enhance employment growth, but have also led to a crisis in Italian labour productivity growth. Our estimates among 3,000 firms show that firms with a high share of flexible workers, a high labour turnover and lower costs of labour (relative to capital) experienced significantly lower rates of labour productivity growth. Our findings raise doubts about the mainstream call for flexibilisation of European labour markets. We argue that the Italian shift towards a low-productive and labour-intensive growth path is problematic against the background of an ageing population.

Key words: Flexible labour, Deregulation of labour markets, Innovation, Labour productivity growth
JEL classifications: J50, J24, J31, J41, M54, O12, O13, O33

1. Introduction

Over the past decade, the Italian economy has experienced a serious slowdown of labour productivity growth, as illustrated in Table 1. Italian labour productivity growth has systematically lagged behind the average of 15 European Union (EU-15; see Table 1) countries. In this paper, we make the point that this decline is not only due to the business cycle downturn since 2001, but that it also has structural roots. The slowdown has coincided with a deterioration of Italian economic performance in such related fields as exports, reseach and development (R&D) spending and patenting, as observed by Faini and Sapir (2005) and Barca (2005).

Table 2 provides information about the composition of the Italian labour productivity slowdown. Based on a shift-share procedure (see Appendix A for details), the figure breaks

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Table 1. *Labour productivity growth in Italy versus EU-15*[a] *(growth rates of value added per working hour at 1995 prices)*

	Italy	EU-15	Difference
1990–94	1.55	1.88	–0.33
1995–99	0.31	1.11	–0.80
2000–05	–0.07	0.98	–1.05
2003	–1.45	0.69	–2.14
2004	0.42	1.25	–0.83
2005	0.33	1.32	–0.99

[a]The European countries comprising the EU-15 are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK.
Source: EU-KLEMS database (http://www.euklems.net/euk07i.shtml).

Table 2. *Decomposition of average annual labour productivity growth in Italy*

	1984–88	1988–92	1992–96	1996–2000	2000–04
Structural change	1.21	0.51	0.27	0.45	0.15
Intra-industry productivity growth	0.92	0.69	1.63	0.61	–0.05
Interaction effects	–0.27	–0.13	–0.04	–0.11	–0.08
Total	1.86	1.08	1.87	0.95	0.02

For explanations see Appendix A
Source: Own calculations from ISTAT National accounts, covering 30 sectors.

down the growth of labour productivity into three components, i.e. (i) labour productivity growth inside sectors, (ii) reallocation of labour force towards industries with higher (or lower) productivity, and (iii) a residual or 'interaction' effect. It can be seen from Table 2 that the average annual increase of labour productivity (the sum of the three components) slowed from 1.86% in the period 1992–96 to 0.95% in the 1996–2000 period, and came close to zero in 2000–04. Among the three factors that explain the productivity slowdown, the interaction effect is small in all periods. The structural change effect has been relatively small and positive in recent years. Table 2 shows that, apart from a lower contribution of structural change effects, the main contribution to the productivity slowdown came from the reduction of labour productivity growth *within* sectors ('intra-industry').

The decline in labour productivity growth followed a period of reforms in various fields, aiming at increased competition and efficiency by reducing rigidities in factor markets. In particular, rules for wage bargaining institutions changed, bringing an end to the period of automatic wage indexation (*scala mobile*), which dated back to the mid-1970s. It should be noted that abandoning the *scala mobile* also relaxed wage compression.[1] The new

[1] Under the *scala mobile*, from 1975 (even if the system was partly offset in 1984) each worker received an analogous wage increase (*punto unico di contingenza*). That is, everyone received the same *absolute* wage increase, causing a strong compression of wage differentials. In the new system (introduced in 1993), contracts are negotiated every 4 years. In the first 2 years, wage increases are based on a forecast of future inflation made at the beginning of the period. In the last 2 years, if a difference has occurred between forecast and actual inflation, that difference will be compensated.

bargaining arrangements confined national labour contracts to maintaining the purchasing power of real wages, while the distribution to workers of company-level productivity increases was left to decentralised (non-compulsory) firm-level bargains. At the same time, higher flexibility of labour relations was pursued through laws 196/1997, 368/2001 and 30/2003, which, in different phases, abandoned rules that had limited the use of fixed-term contracts, allowed employment via manpower agencies, and introduced other 'atypical' contractual arrangements, e.g. jobs-on-call or staff leasing.

In the early 1990s, decentralisation of wage bargaining and greater flexibility, both in wage formation and in labour relations, were considered necessary for tackling high unemployment, which was seen to be mainly a problem of labour market rigidity (Corsi and Roncaglia, 2002). As can be seen from Table 3, these reforms seem to have resulted in substantial changes in (un)employment rates. Between 1995 and 2006, the Italian unemployment rate fell by 4.9%, compared to a 3% fall in the EU-15. In the same period, the Italian employment rate increased by 7.6%, compared with a 6.3% increase in the EU-15. Admittedly rough estimates of black-market labour (Table 4) indicate that black-market labour might have diminished in the same period, by about 1%. Critics might suggest that part of the improvement in (un)employment rates might come from a transformation of black-market jobs into flexible jobs. In spite of this, we can conclude that Italy has improved its (un)employment records, which, however, continue to be less favourable than those of the EU-15. Table 4 shows that this improvement is not equally distributed across sex and regions. For example, in the South, black-market labour seems to have increased, while in the North it has diminished.[1] Moreover, unemployment in the South remains very high. In general, it looks as if the position of woman improved a bit more than that of males, although their labour market position remains quite unfavourable, notably in the South.

Not surprisingly, the growth of jobs coincided with a modest real wage growth. Real wages increased, on average, less than labour productivity, leading to a decline of the labour share in national income (Tronti, 2007). In an international comparison, Italy ranked bottom among industrialised countries for real wage growth during the decade 1992–2002 (Zenezini, 2004). Notwithstanding the fact that systematic statistical data on flexible work are sparse, we can say that employment growth has been accompanied by a substantial increase in various types of flexible work. At least for one category of flexible work, we do have fairly reliable statistics: the share of fixed-term employees in total employees increased by more than five percentage points, from 7.3% in 1995 to 13.1% in 2006 (Table 3).[2]

In this paper, we shall argue that the rise of flexible labour and changes in wage bargaining arrangements, while allowing for the expected job growth, also had an important downside: they took away incentives for labour productivity growth. The resulting crisis of labour productivity growth is economy-wide. Due to limitations of data availability, our micro-econometric analysis of the slowdown has to be confined to the manufacturing sector. We have made use of the ninth edition of firm-level survey data by *Capitalia* Bank Research Centre (formerly *Mediocredito Centrale*). This database covers the period 2001–03 and has the advantage that it includes data on flexible work.

[1] Closer inspection of the original data shows that activity rates in the South (where unemployment is highest) declined, whereas in all other regions they increased. This suggests that official unemployment rates in the South may be downward biased, due to a 'discouraged workers' effect. The simultaneous rise of black-market labour could be an indication that a number of people may have shifted from official employment to black-market labour, in spite of a deregulation of the labour market.

[2] Note that the values are not fully comparable due to a break in the Italian national statistical institute (ISTAT) labour force survey in 2004.

Table 3. *Some key figures about Italy compared with the EU-15, 1995 versus 2006*

	1995		2006	
	Italy	EU-15	Italy	EU-15
Employment rates	50.8%	59.9%	58.4%	66.2%
Unemployment rates	11.8%	10.8%	6.9%	7.8%
Percentages of temporary contracts	7.2%	11.5%	13.1%	14.4%

Source: Eurostat, LFS.

Table 4. *Black-market labour and employment in Italy, by regions and sex (1995 versus 2006)*

Estimates of black-market labour input by regions:		1995	2006	
North		11.2%	8.8%	
Centre		14.2%	12.4%	
South and Islands		20.7%	22.8%	
All of Italy		14.5%	13.4%	
Unemployment rates by regions:	Males. 1995	Females. 1995	Males. 2006	Females. 2006
North West	6.2%	10.4%	3.0%	5.1%
North East	3.8%	9.7%	2.4%	5.3%
Centre	6.5%	15.0%	4.5%	8.2%
South and Islands	14.5%	24.9%	9.9%	16.5%
Total of Italy:	8.6%	15.4%	5.4%	8.8%
Employment rates by regions				
North West	68.9%	44.8%	75.2%	56.0%
North East	73.0%	46.2%	76.8%	57.0%
Centre	67.7%	39.6%	72.9%	51.3%
South and Islands	59.8%	26.6%	62.5%	31.1%
Total of Italy:	66.2%	37.5%	70.5%	46.3%

Source: Istat LFS and National Accounts.

The paper is organised as follows. Section 2 provides theoretical arguments of why modest wage growth and flexible labour will lead to a slowdown of innovative activity and productivity growth. In Section 3 the data are described, and model estimates are presented in Section 4. Our conclusions are set out in Section 5.

2. Theoretical background

The literature tends to distinguish three categories of labour market flexibility (e.g. Beatson 1995):

(i) 'Numerical' (external) flexibility that allows firms to adjust the volume of their labour force to changes in demand. Numerical flexibility depends primarily on legislation about hiring and firing, fixed-term contracts and working hours.

(ii) 'Functional' (internal) flexibility, which allows firms to reorganise their workforce in internal labour markets. Functional flexibility relies strongly on training and on multi-skilled employees.

(iii) 'Wage flexibility' (notably in a downward direction), which concerns the responsiveness of wages to economic shocks, largely depending on the features of wage-setting institutions.

The Italian reforms concentrated on the first and third type of flexibility. As others have shown, the introduction of these two types amounted to entering a rather long period of 'institutional' wage moderation (Brandolini *et al.*, 2007; Tronti, 2007; Zenezini, 2004).

The introduction of second level bargaining (about wage increases above the inflation rate) was originally intended to distribute company-level productivity increases among the workers. It should have allowed for wages higher than those set by national contracts, thus enabling 'upward' wage flexibility. In practice, however, decentralised bargaining was rarely applied, particularly among smaller firms, due to their low degree of trade unionisation. Consequently, wage increases in smaller firms tended to be confined to compensation for inflation, thus leading to modest wage growth. During our observation period, yet another explanation for wage moderation was experienced: the systematic under-estimation of future inflation, forecasts of inflation being at the heart of the new bargaining system (Brandolini *et al.*, 2007).

The remainder of this paper will focus on external flexibility and wage moderation as possible explanations for the poor productivity performance of Italian firms. The impact of *functional* flexibility on productivity growth will be ignored for two reasons. First, it played only a minor role in Italian reforms; second, our database covers no indicators of functional flexibility. It should be noted, however, that some studies suggest a *positive* link between functional flexibility and productivity growth (Bassanini and Ernst, 2002; Kleinknecht *et al.*, 2006; Michie and Sheehan, 2003).

It is likely that institutional reforms towards making wages more (downwardly) flexible and those allowing for more (externally) flexible labour relations, both work in the same direction: they allow savings on a firm's wage bill. In principle, one might expect that workers accepting a temporary job (implying a higher risk of becoming unemployed) would receive some risk premium above the 'normal' wage. In practice, however, such a risk premium does not exist. In fact, the contrary appears to be the case. Multivariate estimates of wage equations at the person level in other countries (Addison and Surfield, 2005; Booth *et al.*, 2002; McGinnity and Mertens, 2004; Sànchez and Toharia, 2000; Segal and Sullivan, 1995) and in Italy (Picchio 2006) show that fixed-term workers, on average, earn *less* than regular workers (controlling for other personal characteristics). This evidence from person-level wage equations is confirmed by estimates in the Netherlands of firm-level wage equations (Kleinknecht *et al.*, 2006). A possible explanation is the abundant supply of labour in certain segments of the labour market.

Below, we discuss four major channels of transmission from lower wage growth and flexible labour to low productivity growth:

(i) effects on firms' innovative activity;

(ii) effects on workforce training;

(iii) trust and productivity growth;

(iv) the impact of aggregate demand on productivity growth.

The reader should note that all four channels work in the same direction, i.e. they are expected to reduce labour productivity growth. The data do not allow for analysis of the separate effects of one or the other channel. Moreover, even if such data were available, we would be likely to encounter substantial problems with multi-collinearity.

2.1 Effects on firms' innovative activity

Three types of arguments substantiate a causal link from higher wages to productivity growth. First, one can argue that a price increase of labour (relative to capital) will stimulate the adoption of labour-saving innovations, as proposed by Sylos Labini (1984, 1993, 1999).[1] Second, in a Schumpeterian perspective, it has been argued that, due to their monopoly rents from innovation, innovators are better able than technological laggards to live with wage increases (or with high adjustment costs due to stricter regulation). Therefore, high real wage growth and labour market rigidities may enhance the process of *creative destruction* in which innovators compete-away non-innovators (Kleinknecht, 1998). In other words, deregulation of labour markets and (downward) wage flexibility increase the chances of survival for technological laggards that rely on cost-cutting (Antonucci and Pianta, 2002). While their survival is favourable for employment (at least in the short run), it is likely to result in a lower average quality of entrepreneurship and the ultimate loss of innovative dynamism. Third, using vintage models, it is easy to demonstrate that more aggressive wage policies on the part of the trade unions will lead to the quicker replacement of old (more labour-intensive) vintages of capital by new and more productive ones. A policy of modest wage claims will allow firms to exploit old vintages of capital for longer. This can result in a growing age of capital stock (shown to be one of the reasons behind the productivity crisis in the Netherlands; see Naastepad and Kleinknecht, 2004).

Against such arguments, there are three counter-arguments. Firstly, labour market rigidity could have negative effects on productivity by reducing the reallocation process of labour 'from old and declining sectors to new and dynamic ones' (for a review of the effects of labour market institutions on economic performance, see Nickell and Layard, 1999). Second, the difficult or expensive firing of redundant personnel can frustrate labour-saving innovations at the firm level (Bassanini and Ernst, 2002; Scarpetta and Tressel, 2004). Third, there is a possibility that well-protected and powerful personnel could appropriate rents from innovation and productivity gains through higher wage claims, thus reducing the incentive to take innovative risks (Malcomson, 1997; Menezhes-Filho and Van Reenen, 2003; Metcalf, 2002). This latter argument might indeed be relevant to Italy, since Italian reforms allow for decentralised bargaining over productivity gains. It is less likely to be relevant to rigid 'Rhineland' labour markets, which tend to rely on centralised bargaining.

The argument that the difficult firing of personnel will hamper labour-saving innovations might be less relevant for three reasons. First, if firing is difficult, firms have incentives to invest in functional flexibility by means of education and training, which will facilitate the shifting of labour from old to new activities in internal labour markets.

[1] Note that the dynamic substitution between capital and labour, in this context, differs from the static substitution, with constant technology, implied by neoclassical theory as a response to the relative variation in factor prices. The former, in fact, involves technological change incorporated in new capital goods (Sylos Labini, 1993).

Second, in many countries, redundant personnel need not be a problem for labour-saving innovations as high percentages leave their firms voluntarily.[1] Third, protection against dismissal may actually enhance productivity performance, as secure workers will be more willing to cooperate with management in developing labour-saving processes and in disclosing their (tacit) knowledge to the firm (see Lorenz, 1992, 1999). Workers threatened by easy firing have strong incentives to hide information about how their work might be done more efficiently.

2.2 Effects on manpower training

The negative impact of highly flexible labour on training and human capital accumulation appears quite straightforward. If labour relations are of short duration, firms have little incentive to invest in workforce training, simply because the payback period is too short. In addition, workers will be reluctant to acquire firm-specific skills if they do not feel a long-term commitment to their employers (Bélot *et al.*, 2002). A similar conclusion emerges from the hypothesis that highly flexible labour reduces compression of the wage structure (both within and between firms), which is one of the main reasons for the provision of training by firms (Acemoglu and Pischke, 1999; Agell, 1999). The result of higher labour flexibility could therefore be under-investment in training, with potentially negative effects on productivity growth. Empirical evidence of a correlation between fixed-term employment and a lower probability of work-related training has been provided for the UK by Arulampalam and Booth (1998) and Booth *et al.* (2002).

2.3 Trust and productivity growth

With regard to workplace cooperation, one strand of literature supports the idea of productivity-enhancing effects arising from 'high trust' or 'high road' human resource management practices, and from cooperative labour relations (Buchele and Christiansen, 1999 a,b; Huselid, 1995; Lorenz, 1999; Michie and Sheehan, 2001, 2003; Naastepad and Storm, 2005). According to these theories, higher job protection and subsequent cooperative relationships between management and employees may positively affect firm performance, encouraging innovative activity and promoting efficiency gains. Long-lasting working relations and strong protection against dismissal might be interpreted as an investment in trust, loyalty and commitment, which might favour productivity growth in three ways. First, it is likely to reduce costs for monitoring and control. Second, it might reduce the leakage of knowledge to competitors (i.e. it reduces positive externalities). Third, it might be favourable to the 'routinised' innovation model that requires long-run historical accumulation of (tacit) knowledge, this being favoured by continuity in personnel (Kleinknecht *et al.*, 2006).

2.4 The impact of aggregate demand on productivity growth

Finally, wage moderation and flexible labour can have negative effects on aggregate demand, both directly and indirectly, e.g. through simple lack of purchasing power (if not compensated by increased consumer credit) and/or through increased precautionary

[1] Kleinknecht *et al.* (2006) report that, on average, 9–12% of a firm's personnel in the Netherlands leave voluntarily each year, the exact percentage depending on the state of the business cycle.

savings by employees in temporary jobs who fear firing. Bhaduri and Marglin (1990) have argued that lower wages may indeed depress demand if an economy is 'wage-led' rather than 'profit-led'. The well-known Verdoorn–Kaldor law proposes a positive impact of demand growth on productivity growth (Verdoorn, 1949; Kaldor, 1996, 1997). In a different strand of literature, the Verdoorn–Kaldor law is paralleled by Schmookler's (1966) *demand-pull* hypothesis for patenting activity. In recent literature, McCombie *et al.* (2002) demonstrate the realism of the Verdoorn–Kaldor law, while Brouwer and Kleinknecht (1999) show that Schmookler's demand-pull argument also explains changes in firm-level R&D intensities. The conclusion is that, insofar as modest wage growth leads to lower demand, it may reduce the speed of innovation and productivity growth. It cannot be excluded that this, in turn, will further reduce demand via export–import relations, given the impact of innovation and productivity on international market shares (Carlin *et al.*, 2001; Hughes, 1986; Kleinknecht and Oostendorp, 2002).

Recent literature provides a number of empirical analyses of the relationship between flexible labour and productivity growth (labour productivity and/or TFP (total factor productivity)), or the innovative activity of firms. Most studies, however, are confined to using country or sector data (Auer *et al.*, 2005; Bassanini and Ernst, 2002; Buchele and Christiansen, 1999A, 1999B; Naastepad and Storm, 2005; Nickell and Layard, 1999; Scarpetta and Tressel, 2004).[1] Only a few report firm-level evidence. For example, Michie and Sheehan (2001, 2003) report a positive impact of 'high road' human resource management practices on innovation in British firms. Kleinknecht *et al.* (2006) found negative effects of external flexibility and positive effects of functional flexibility on labour productivity growth in Dutch firms. Arvanitis (2005) found a positive relationship between functional flexibility and labour productivity for a sample of Swiss companies, but an insignificant effect of external flexibility. Autor *et al.* (2007) analysed the effects of dismissal protection (envisaged as legal exceptions, adopted by some state courts in the USA, to the 'employment-at-will' common law doctrine) on a sample of US firms, finding a positive effect of employment protection on capital investment, skills and labour productivity, but a negative effect on total factor productivity.

Boeri and Garibaldi (2007) found a negative effect of the share of fixed-term contracts on labour productivity growth in a sample of Italian manufacturing firms during the period 1995–2000.[2] In their empirical specification, however, they neglected some of the controls that, according to our theoretical arguments above, should be relevant to explain the recent labour productivity slowdown in Italy.[3] Finally, Pieroni and Pompei (2008) found a negative effect of labour turnover (as a proxy for external flexibility) on patenting

[1] Most of these studies observe a positive effect of employment protection (measured by the OECD index or other indicators) on productivity growth or innovation indicators. Auer *et al.* (2005) find a positive (though decreasing) relation between job stability, measured as average tenure, and labour productivity. The paper by Scarpetta and Tressel, however, shows a negative effect of employment protection, mainly in countries with uncoordinated wage bargaining. The distinction among different industrial relations models is also considered by Bassanini and Ernst (2002), who assert that EPL (employment protection legislation) strictness is significantly correlated to technological specialisation in countries with coordinated relations.

[2] They also used data from the *Capitalia* survey on manufacturing firms but considering a sub-sample of firms continuously followed in the period 1995–2000. This data choice has the disadvantage of a significant rate of attrition (i.e. less than 700 hundred firms are maintained in the final specification from an original sample of about 4,500 firms in each wave).

[3] Their evidence complements a theoretical model dealing with the effects of labour deregulation on the utilisation of fixed-term contracts. According to this model, the decrease in labour productivity stems from decreasing returns to labour (the introduction of fixed-term contracts is expected to increase average employment, even if only in the short run), while effects on firms' innovative activity are ignored.

activity in the regions of Northern Italy. Although their analysis is not at firm but at region level, it is consistent with our view of the Italian case. Below, we contribute to the sparse evidence from firm-level data.

3. The data

We use micro data from the ninth survey ('Indagine sulle imprese manifatturiere') by *Capitalia* Bank Research Centre (formerly *Mediocredito Centrale*), covering the period 2001–03. The sample covers 4,289 firms and is representative of Italian manufacturing companies with more than 10 employees. It is stratified by industry, geographic area and firm size. The survey covers information about the composition of a firm's workforce by contract type (full-time or part-time; permanent or temporary), hirings and lay-offs, sales, investment in fixed capital and innovation indicators. Unfortunately, it does not include information on working hours; moreover, information about agency and freelance workers is provided only for year 2003 and therefore cannot be used for our analysis.

Using fiscal codes as an identifier, the *Capitalia* database was combined with the *Bureau Van Dijk AIDA* dataset, the latter covering balance sheet data for firms with a turnover higher than €500,000. This gave us additional data, particularly on value added and labour costs. Firms with complete balance sheet data for the three years number 3,351. Table 5 shows that the reduced numbers of observations did not produce relevant modifications in the composition of the sample by size class, geographic area and sector [using Pavitt's (1984) taxonomy for classifying the latter]. Finally, due to missing values in some variables, the total number of firms is further reduced to about 3,000 for the full model specification (see Section 3 for details).

We standardised several independent variables (value added, investments, labour costs) by firm size and deflated them, using the appropriate price deflators.[1] Moreover, two labour flexibility indicators were defined: (i) shares of fixed-term contracts and (ii) total labour turnover per year. The data were cleaned for extreme values by excluding observations falling into the highest and lowest 0.5 percentiles (working on the *Capitalia* survey, Benfratello *et al.*, 2005 and Parisi *et al.*, 2006 used a similar method). A list of all variables, with detailed information and descriptive statistics, is given in Appendix B.

4. The model

In our productivity equation, we modify earlier equations by Sylos Labini (1984, 1993, 1999), adapting the model to the use of micro data and including indicators of externally flexible labour. Sylos Labini explained productivity growth by means of three components:

(i) wage costs relative to capital costs ('Ricardo effect');
(ii) the growth of aggregate demand (Verdoorn–Kaldor law);
(iii) investment expenditures, capturing new technology embodied in new vintages of capital.

Sylos Labini estimated his model (at macro level) with different lag structures exploring delayed effects of the explanatory variables on productivity growth.

[1] Alternative specifications without deflation do not change the results significantly.

Table 5. *Percentage composition of the sample by size class. geographic area and sector*

	Full sample (n = 4,289)	With balance sheet data (n = 3,351)
11–20 employees	20.9	20.2
21–50 employees	30.9	31.7
51–250 employees	37.0	37.1
251–500 employees	5.2	5.0
More than 500 employees	6.1	6.0
Total	*100.0*	*100.0*
North-West	35.9	35.3
North-East	30.1	32.1
Centre	17.6	18.0
South	16.4	14.7
Total	*100.0*	*100.0*
Supplier-dominated sectors	51.2	51.1
Scale-intensive sectors	17.6	17.5
Specialised suppliers	27.1	27.5
Science-based sectors	4.1	3.8
Total	*100.0*	*100.0*

Applying Sylos Labini's model to micro data, we first standardised variables by firm size. Second, the lack of data on working hours forced us to use value-added per employee (rather than value-added per hour worked) as a measure of labour productivity. Fortunately, since we explain *growth rates* rather than *levels* of labour productivity, this shortcoming is not severe, assuming that the average working time per employee is not likely to change substantially during our observation period.[1] Third, explaining productivity growth during 2001–03 by lagged values of independent variables (relating to 2001) we try to avoid problems with endogeneity.[2] Unfortunately, the short time horizon (3 years) did not allow us to estimate our dynamic model by means of panel methodologies in order to take individual firms' effects into account.

We have modified Sylos Labini's original equation in the following aspects. First, we include a firm's initial level of value added per employee among the regressors. This indicates a firm's distance towards best-practice firms, i.e. the possibilities for catching-up; moreover, this variable might control for exceptional fluctuations in capacity utilisation.[3] We expect the initial level of value added per employee to show a negative sign. For our test of what Sylos Labini calls the 'Ricardo effect', we use two approximations: first, the level of real labour costs per employee in 2001; second, a measure of wage costs relative to capital costs, i.e. labour costs per worker were divided by the deflator (at sector level) of gross fixed investment (as a proxy of the 'price of machinery'). We calculated growth rates as logarithmic differences. For both indicators we expect a positive sign. Therefore, we estimate two model versions. The first includes the lagged (2001) *level* of real labour costs

[1] Taking account of numbers of part-time employees in measuring labour productivity (e.g. considering a part-time worker as a half full-time) did not produce relevant changes in our coefficients.

[2] This solution appears to be valid in the absence of serial correlation of the residuals, which, however, cannot be tested in a cross-section framework.

[3] If, for whatever reason, a firm shows an abnormally low (or high) productivity level at the beginning of our observation period, and then returns to its 'normal' level, it might wrongly be inferred that its productivity has strongly increased (decreased), while it was due only to a fluctuation in capacity utilisation.

per employee. The second includes *growth* of wage costs relative to capital costs during 1998–2000 (taken from balance sheet data).[1] We test the Verdoorn effect by including the growth of value added in a firm's sector of principal activity (at 2-digit level; taken from ISTAT national accounts).[2] As a robustness check, we also present model versions without the latter variable, including industry dummies instead. We further include investments in equipment and machinery per employee as a measure of 'embodied' new technology.

The two most interesting variables in the context of this paper are the indicators of externally flexible labour, i.e. the share of employees under temporary contract, and a measure of total labour turnover (the sum of annual hirings and layoffs divided by total personnel). Finally, we include dummies for firm size classes, geographic area and firm age as controls.

The empirical specification of the model, therefore, is:

$$\Delta_{01-03}\ln\pi_{ijt} = \alpha + \beta_1 \ln\pi_{ijt-2} + \mathbf{x}_{ijt-2}'\boldsymbol{\beta}_2 + \mathbf{flex}_{ijt-2}'\boldsymbol{\beta}_3 + \beta_4 \Delta_{01-03}\ln y_{jt} + \mathbf{d}_i'\gamma + \epsilon_{ijt}$$

where the dependent variable is growth of value added per employee between 2001 and 2003 in firm i belonging to sector j (measured as a logarithmic difference). Right-hand variables include:

- the lagged level of (log)value added per employee;
- a vector of lagged variables $\mathbf{x}_{ijt-2}$ (including investments per employee and one of the two indicators for real labour costs per employee);
- a vector of lagged flexibility indicators $\mathbf{flex}_{ijt-2}$ (the share of employees under fixed-term contracts and total labour turnover);
- the growth of value added $\Delta_{01-03}\ln y_{jt}$ in a firm's sector of principal activity (as an alternative to industry dummies);
- a vector of firm-specific dummies $\mathbf{d}_i$ (industry, firm size and age class).

Robust standard errors have been calculated. The White and Koenker statistic always rejects the null of no heteroskedasticity.

Several versions of our model have been estimated. Table 6 shows estimates using the *levels* of real labour costs per employee, while Table A1 uses the *growth rates* of labour costs relative to capital costs. Column (1) in both tables reports the coefficients of the baseline model, without flexibility indicators, in order to have a benchmark with the highest number of observations (about 3,000). All coefficients in Table 6 exhibit the expected signs and are highly significant. As expected, a negative effect of the initial productivity level was found, suggesting that firms with high levels of labour productivity (in 2001), show lower growth rates, i.e. they take less advantage of catching-up effects. The effect of investments in fixed capital is positive as expected, as is the effect of initial labour costs per employee. The latter indicates that firms facing higher labour cost at the start of the period display, on average, a higher productivity growth, which is consistent with our theoretical considerations.

Interpreting our control variables, we can conclude that scale effects are relevant: firms in larger size classes tend to achieve higher labour productivity growth. We also find

[1] A third version of our estimates (not documented here) used changes in labour costs alone during 1998–2000, giving similar results.

[2] We consider this variable as exogenous, as the effect of a single firm's performance on its industry average is negligible. This could be problematic for some very large firms, of course. As a robustness check, we also present specifications without this variable.

Table 6. *Determinants of labour productivity growth between 2001 and 2003 (models with levels of labour costs; standard errors in parentheses)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log value added per worker (2001)	–0.323***	–0.323***	–0.322***	–0.322***	–0.273***	–0.272***	–0.272***
	(0.026)	(0.026)	(0.026)	(0.026)	(0.025)	(0.025)	(0.025)
Investment per worker (2001)	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log labour costs per worker (2001)	0.129***	0.123***	0.123***	0.118***	0.096***	0.096***	0.093***
	(0.035)	(0.035)	(0.035)	(0.036)	(0.034)	(0.034)	(0.034)
Share of employees with fixed-term contract (2001)		–0.158***		–0.140**	–0.141**		–0.123**
		(0.058)		(0.061)	(0.058)		(0.062)
Total labour turnover (2001)			–0.059*	–0.033		–0.058*	–0.034
			(0.031)	(0.032)		(0.031)	(0.033)
Growth of value added in sector of principal activity (2001–03)					0.931***	0.918***	0.932***
					(0.105)	(0.105)	(0.106)
Size: 21–50 employees	0.021	0.022	0.023	0.023	0.019	0.021	0.02
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Size: 51–250 employees	0.047***	0.049***	0.050***	0.050***	0.045***	0.045***	0.046***
	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Size: 251–500 employees	0.063**	0.065**	0.067**	0.068**	0.069**	0.071**	0.071***
	(0.027)	(0.027)	(0.028)	(0.028)	(0.027)	(0.028)	(0.028)
Size: more than 500 employees	0.113***	0.113***	0.105***	0.106***	0.126***	0.118***	0.118***
(reference: <21 employees)	(0.028)	(0.028)	(0.029)	(0.029)	(0.028)	(0.029)	(0.029)
Age: 15–40 years	–0.045***	–0.044***	–0.045***	–0.043***	–0.047***	–0.047***	–0.046***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Age: >40 years	–0.057***	–0.057***	–0.058***	–0.057***	–0.053***	–0.055***	–0.054***
(reference: <15 years)	(0.017)	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Constant term	0.787***	0.819***	0.810***	0.828***	0.702***	0.699***	0.708***
	(0.079)	(0.080)	(0.081)	(0.081)	(0.076)	(0.077)	(0.077)
Sector dummies	Yes	Yes	Yes	Yes	No	No	No
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Numbers of observations	3017	3002	2979	2964	3002	2979	2964
F-test (*P* value)	12.12	11.77	11.67	11.29	16.77	16.53	15.32
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
White/Koenker (*P* value)	94.31	93.53	94.64	(93.65)	76.52	78.07	76.81
	(0.00)	(0.00)	(0.00)	(0.000)	(0.00)	(0.00)	(0.00)
R-squared	0.18	0.18	0.18	(0.18)	0.13	0.13	0.13

Robust standard errors in parentheses.
Significant at: *10%; **5%; ***1%.

Table 7. *Descriptive statistics (full sample, 2001–03)*

Variable	Mean	Median	SD	Min	Max
Value added per worker ($\times 10^3$ euros)	46.094	40.905	23.785	3.432	195.180
Growth of value added per worker (2001–03)	–0.025	–0.017	0.336	–2.444	2.772
Investment per worker ($\times 10^3$ euros)	5.197	2.210	8.162	0.000	65.944
Labour cost per worker ($\times 10^3$ euros)	26.403	25.341	8.535	4.267	74.022
Share of fixed-term contracts	0.032	0.000	0.098	0.000	0.944
Total labour turnover	0.143	0.095	0.197	0.000	1.875

evidence that younger firms (less than 15 years old) perform significantly better than older ones, which might be due to more rapid learning-by-doing. Coefficients on regional dummies, dividing Italy into four large areas, show little variation in growth (other than levels) of labour productivity among regions. Our industry controls (not reported in the tables) show above-average labour productivity growth in petroleum refining, chemicals and pharmaceuticals, rubber and plastics products, and basic metal companies, against the reference group (food products).

Interpreting our indicators of flexible labour, we see that, when included separately, both fixed-term contracts and total labour turnover are negatively and significantly correlated with productivity growth. When the variables are included jointly, however, the effect of fixed-term employment seems to dominate that of labour turnover, the latter then becoming insignificant. It is likely that this is due to multicollinearity (the coefficient of correlation between the two variables is 0.37). Nevertheless, it seems safe to conclude that our estimate supports the hypothesis of a trade-off between *external* flexibility and productivity growth at the firm level. In particular, according to the different specifications of the model (Table 6), a share of fixed-term contracts standing at 10% of total employees appears correlated with an average decrease of labour productivity ranging from 1.23 to 1.58 percentage points in the reference period 2001–03.

In model versions 5, 6 and 7, industry dummies are replaced by the average growth of value added in the firm's sector of principal activity. The coefficients suggest that demand expansion at the sector level has a very strong effect on productivity growth, which is consistent with the Verdoorn–Kaldor Law. Our Verdoorn coefficients, however, are larger than those found by others. Our Verdoorn effects are above 0.90, whereas most estimates in the literature vary between 0.30 and 0.70 (see McCombie *et al.*, 2002). Our high Verdoorn coefficients probably have to do with capturing short-term variations in the degree of capacity utilisation. Our observation period (2001–03) falls within a business cycle slowdown, the turning point being 2001. In this situation, some labour hoarding is likely, as firms cannot immediately fire redundant personnel, or perhaps they do not wish to do so. Assume for a moment that personnel are constant, while new orders lessen. Each percentage decline in output then means a 1% decline in labour productivity. Turning that around, assume that a firm has many personnel 'underemployed' and happens to obtain orders for extra production (in spite of the business cycle slowdown); each extra percentage growth of output will then result in a full percent productivity increase. In conclusion, an appropriate test of the magnitude of the Verdoorn effect would require data covering longer periods than that of our database. For the present purpose, it is reassuring that inclusion or exclusion of demand growth at the sector level hardly affects the coefficients of the other variables (compare models 1–4 with models 5–7).

Table A1 shows the same estimates as Table 6, but *levels* of labour costs are replaced by *growth rates* of labour costs relative to capital costs (in the period 1998–2000).[1] In the latter case, too, we find a positive effect of past 'wage push' on productivity growth. Inclusion of this variable does not affect the coefficients on lagged productivity levels and investments per worker. It is remarkable, however, that the negative impact on labour productivity growth of fixed-term jobs and labour turnover appears stronger, even though the latter remains not significant in the full specification. Replacing industry dummies by demand growth in a firm's industry reduces somewhat the effect of past wage increases, but our interpretation remains essentially the same.

5. Discussion and conclusions

Italian labour market reforms have followed the mainstream economics call for flexibilisation of European labour markets. There is evidence in recent literature that these reforms achieved the aim of reducing wage cost pressure by decentralising the wage bargaining mechanism as well as by facilitating the hiring of flexible personnel. The latter resulted in a substantial increase of flexible personnel and in a larger personnel turnover. At first sight, these reforms seem to have been rewarding. Unemployment has declined and labour participation has increased more than the average of the EU-15 (Tables 3 and 4). At the same time, however, Italy experienced a serious slowdown in labour productivity growth, coinciding with weaker performance in related fields (e.g. exports, patenting and R&D).

This has given rise to the question of whether the macro-level relations between, on the one hand, lower wage demands and flexible work and, on the other hand, higher employment growth and low productivity gains, were causally connected. Our econometric analysis with manufacturing data shows that a link indeed exists between the two at the micro-level. Levels of wage costs (in 2001) and, alternatively, changes in wage costs relative to capital costs (during 1998–2000) had a significantly positive impact on labour productivity growth in the period 2001–03 at the firm level. Moreover, firms employing high shares of temporary labour in 2001 (or experiencing a higher labour turnover in 2001) had significantly lower rates of labour productivity growth during 2001–03. This holds after controlling for a firm's initial level of productivity, its investments, Verdoorn effects, size and age, as well as after including sector and region dummies. It is reassuring that our key finding of a positive impact of wage costs (taken absolutely or relative to capital costs) and of a negative impact of flexible labour on labour productivity growth is robust to adding or omitting several control variables in 14 versions of our regression estimates. Finally, in spite of estimating a somewhat different model in a different country, our Italian results are consistent with recent findings by Kleinknecht *et al.* (2006) in the Netherlands. Using different data and slightly different control variables (and a substantially smaller sample), the latter also find that firms using higher shares of (numerically) flexible labour experience lower labour productivity growth.

These empirical findings are consistent with our theoretical discussion in Section 2: through various mechanisms, lower wages and flexible labour relations translate into lower labour productivity growth. Obviously, a strategy of reducing wage cost pressure and

[1] It should be noted that the variable on changes in labour costs relative to capital costs comes from the balance sheet information in the *AIDA* dataset. This implies that the number of employees (used as denominator) is not fully comparable with that declared by firms in the *Capitalia* survey. The number of employees in *AIDA* is counted as an average over years, while the *Capitalia* survey measures the stock of employees at the end of the year.

introducing flexible labour relations can be favourable for employment growth, but this is not a free lunch. It happens at the expense of labour productivity growth. According to our theoretical arguments in Section 2, we expect the productivity slowdown to be caused mainly by a slowdown of productivity growth among *existing* workers, but an inflow of low-productive workers may also explain part of the slowdown in productivity. A recent study by the Organisation for Economic Cooperation and Development (OECD) suggests that the 'growth-of-low-productive-workers' hypothesis is *the* major cause of the slowdown, implying that productivity growth among existing workers is hardly affected by flexibilisation of labour markets. The OECD (2003) argues that 'a weak trade-off may exist between gains in employment and productivity' as arising from newly created jobs at the bottom of the labour market: 'For example, decentralization of wage bargaining and trimming back of high minimum wages may tend to lower wages, at least in the lower ranges of the earnings distribution. Similarly, relaxing employment protection legislation .^.^. may encourage expansion of low-productivity/low-pay jobs in services' (OECD, 2003, p. 42, Box 1.4). These low-productive jobs—the OECD's reasoning continues—are created in flexible countries, but *not* in rigid countries due to too high (minimum) wages or social benefits. In this view, the loss in average labour productivity growth is mainly a negative by-product of extra jobs created in the low wage segment—so, why complain about the productivity slowdown?

In our view, the reasoning by the OECD is unsatisfactory for several reasons. First, it does not take account of our above theoretical arguments that suggest a causal link from wage growth to labour productivity growth. Several of these arguments would lead us to expect losses in productivity growth among *existing* workers, and not only through hiring of new low-productive workers. Second, if correct, the OECD argument would imply that 'flexible' countries exhibit higher gross domestic product (GDP) growth than 'rigid' countries do. This can be derived as follows: if modest wage growth and flexible labour relations do *not* affect labour productivity growth of *existing* workers (as implied in the OECD argument), then the *new* (albeit low-productive) workers in flexible countries should produce *extra* GDP growth, as more people are working. GDP figures do not seem to support the latter implication. Moreover, the 'growth-of-low-productive-jobs' hypothesis also appears implausible from some simple back-of-an-envelope calculations. There is *additional* growth of employment in Italy (compared with the EU-15 average, as seen in Table 3). Even if we assumed that *all* the employment growth in Italy (and not just the *extra* growth compared with the EU-15 average) would come from workers with low productivities, this would still explain only a fraction of the total productivity slowdown.[1] Clearly, this point would need to be worked out in more detail in a separate paper. For the moment, however, there is reason to conclude that the bulk of the labour productivity slowdown must be due to losses of productivity growth among *existing* workers.

[1] For example, between 2000 and 2005, value added per worker in Italy increased from €43.964 to €44.032—an increase of 0.15%. In the same period, labour input increased by 4.27% (from 23.412 to 24.411 units). Making the *strong* assumption that all workers in 2000 are still working in 2005 (no retirements or lay-offs), and that these existing workers have a productivity growth equal to the average of the EU (i.e. approximately 6% during 2000–05), we would conclude: in order to achieve an average labour productivity growth of 0.15%, the newly hired workers (having a share of 4.1% of the total labour force in 2005) would need to have a *negative* (absolute) labour productivity (i.e. *minus* €16.181 per worker)! Making a more conservative assumption (i.e. an increase of productivity of 'old' workers by 3%—i.e. half of the EU average—between 2000 and 2005), labour productivity of 'new' workers should have been quite low (only €14.719, less than the median value) in order to achieve the average labour productivity growth rate of 0.15%.

Finally, one might raise the question of whether the goal of lower unemployment rates could not have been achieved in ways that do not sacrifice labour productivity growth, for example by reducing standard working times. We acknowledge that the latter is controversial in the literature. For example, Faggio and Nickell complain about a 'mistaken belief' (2007, p. 437) that shorter working hours would reduce unemployment. Against this, Kleinknecht *et al.* (2006) argue that such a strategy was successful in the 1950s and 1960s: in spite of a fairly labour-*ex*tensive growth pattern in Europe (i.e. stagnating growth of labour hours in spite of high GDP growth), most EU countries tended towards full employment in the early 1970s. This was achieved because, in that period, trade unions managed to reduce working hours per week and to negotiate longer holidays. This would appear to be a more intelligent strategy than creating jobs by sacrificing wages, thereby bringing down labour productivity growth. In any case, free time is also welfare!

Clearly, reducing working time raises concerns about education and re-training, but this would be stuff for separate studies. Rather than engaging in a discussion of the various pros and cons of working time reduction, we would, in principle, like to emphasise that such a strategy could maintain high wage cost pressure and hence incentives for high rates of labour-saving innovations, without necessarily impairing employment. We are aware that critics might object to shorter standard working times, looking at the challenges of an ageing population in Europe. On the other hand, the ageing population in Europe is also a challenge to those who propagate the flexibilisation of labour markets. Ageing will not only reduce labour supply. It will also increase the need of care services for the growing group of elderly people, and these services are likely to be quite labour-intensive. Growing scarcity of labour would make it desirable to return to high growth rates of labour productivity and a labour-saving growth path (as in the 1960s and 1970s). The Italian reforms shifted Italy towards the exact opposite: a labour-intensive and low-productive growth path. Sooner or later this will result in a tight labour market (as in the Netherlands; see Kleinknecht *et al.*, 2006). This will make the mastering of problems related to ageing much more difficult.

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Appendix A. Explaining the decomposition of labour productivity growth

Labour productivity, at an aggregate level, is a weighted average of industry productivity levels with weights corresponding to the employment shares of each industry. Its trend therefore depends both on the variation of productivity in each sector and on the variation of the sectoral composition of employment. Productivity growth between two periods thus can be algebraically decomposed into a *between* component, a *within* component and a residual. The first represents the contribution to productivity growth coming from the reallocation of labour from low-productive to high-productive industries, corresponding to the increase in productivity that would be observed by maintaining productivity levels constant within sectors. The second component identifies the growth of productivity due

merely to intra-sectoral increases, in the absence of labour reallocation. Finally, the residual captures the interaction effects between productivity and employment at the industry level, taking a positive sign if the two variables are positively correlated, and a negative one in the opposite case. The formula used for the decomposition is the following:

$$\frac{\pi_t - \pi_0}{\pi_0} = \frac{\sum_{i-1}^{n} \pi_{it} q_{it} - \sum_{i-1}^{n} \pi_{i0} q_{i0}}{\sum_{i-1}^{n} \pi_{i0} q_{i0}} = \Sigma_{i-1}^{n} \left[\frac{q_{it} - q_{i0}}{\pi_0} \pi_{i0} + \frac{\pi_{it} - \pi_{i0}}{\pi_0} q_{i0} + \frac{(\pi_{it} - \pi_{i0})(q_{it} - q_{i0})}{\pi_0} \right]$$

where π_t is aggregate labour productivity at time t, π_{it} is labour productivity in sector i at time t, and q_{it} is the share of employed in sector i at time t. The first term in square parentheses is the 'structural change' (*between*) effect in sector i; the second term is the 'productivity growth' (*within*) effect in sector i; finally, the last term is the interaction effect in sector i.

The decomposition between 1984 and 2004 (by 5-year intervals) has been performed using value added per equivalent labour unit (at constant prices) as a labour productivity index; sectors have been selected according to the *Ateco* 2002 classification at one-digit level (sections and subsections, 30 sectors).

Appendix B. Variable definitions and descriptive statistics

Value added per worker. Calculated as the value of production (net sales ± variation of inventories + capitalised costs) less net consumption (materials ± variation of inventories) and services. It is deflated using the value added deflator disaggregated at two-digit level, and divided by the number of workers declared by firms in the questionnaire. Firms reporting negative or zero value added have been omitted.

Investment per worker. Investment in equipment and machinery as declared in the questionnaire, deflated with the gross investment deflator at two-digit level of disaggregation and divided by the number of workers.

Labour cost per worker. Labour costs deflated with the consumer price index (or with the gross investment deflator at two-digit level of disaggregation, when estimating the 'Ricardo' effect) and divided by the number of workers. In calculating changes in labour costs during the interval 1998–2000, the average number of employees during the year (taken from balance sheet data) has been used.

Share of fixed-term contracts. Percentage of workers (both full-time and part-time) under fixed-term arrangements.

Total labour turnover. Sum of hirings and layoffs in a year, divided by numbers of workers.

See Table 7 for breakdown of data.

Table A1. *Determinants of labour productivity growth between 2001 and 2003 (models with growth rates of labour costs relative to capital costs)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log value added per worker (2001)	–0.302***	–0.308***	–0.306***	–0.309***	–0.270***	–0.267***	–0.270***
	(0.024)	(0.024)	(0.025)	(0.025)	(0.023)	(0.024)	(0.024)
Investment per worker (2001)	0.002***	0.002***	0.002***	0.002***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
'Ricardo effect' (1998–2000)[a]	0.034**	0.034**	0.032**	0.032**	0.026*	0.024*	0.024*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)
Share of employees with fixed-term contract (2001)		–0.256***		–0.231***	–0.217***		–0.195***
		(0.063)		(0.066)	(0.063)		(0.067)
Total labour turnover (2001)			–0.089**	–0.047		–0.080**	–0.044
			(0.036)	(0.037)		(0.035)	(0.037)
Growth of value added in sector of principal activity (2001–03)					0.893***	0.881***	0.895***
					(0.115)	(0.115)	(0.116)
Size: 21–50 employees	0.007	0.007	0.009	0.009	0.007	0.009	0.008
	(0.016)	(0.016)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Size: 51–250 employees	0.048***	0.050***	0.050***	0.050***	0.045***	0.045**	0.045**
	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Size: 251–500 employees	0.045	0.049	0.049	0.051	0.055	0.056	0.056
	(0.038)	(0.038)	(0.041)	(0.041)	(0.042)	(0.042)	(0.042)
Size: more than 500 employees	0.161***	0.160***	0.152***	0.151***	0.167***	0.156***	0.155***
(reference: <21)	(0.035)	(0.035)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)
Age: 15–40 years	–0.039**	–0.037**	–0.038**	–0.036**	–0.037**	–0.039**	–0.036**
	(0.015)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Age: >40 years	–0.047**	–0.046**	–0.049**	–0.047**	–0.037*	–0.040*	–0.038*
(reference: <15 years)	(0.019)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Constant term	1.142***	1.181***	1.168***	1.189***	1.003***	0.996***	1.005***
	(0.097)	(0.098)	(0.100)	(0.101)	(0.091)	(0.092)	(0.093)
Sector dummies	Yes	Yes	Yes	Yes	No	No	No
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Numbers of observations	2400	2390	2375	2365	2390	2375	2365

Table A1. *Continued*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
F-test (*P* value)	9.16	9.02	8.71	8.53	13.02	12.53	11.75
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
White/Koenker (*P* value)	83.38	82.05	82.58	81.68	66.95	67.77	66.64
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-squared	0.21	0.21	0.21	0.21	0.16	0.16	0.16

[a]Growth rate of the ratio between labour cost per employee (taken from balance sheet data) and gross investment deflator at sector level.
Robust standard errors in parentheses.
Significant at: *10%; **5%; ***1%.