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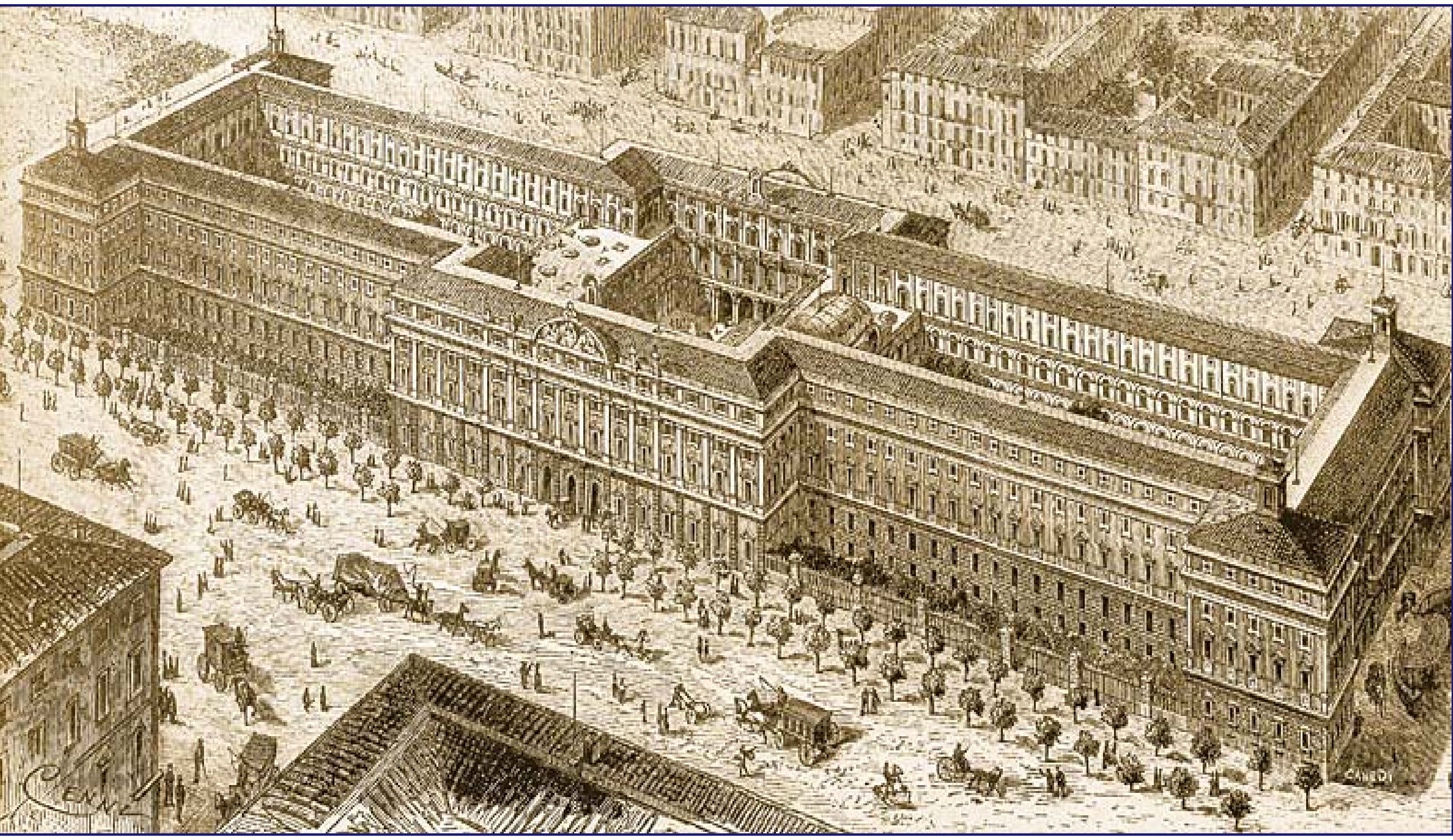

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Antonio Bassanetti, Roberto Torrini, Francesco Zollino[1]

Abstract

In this paper, we investigate whether the completion of the Single Market Programme has enhanced competition on the product markets across European countries, while taking into account the companion structural reforms undertaken by the member countries. In particular, since the Single Market Programme went hand in hand with major reforms in the labour market and in the institutional setting of important industries (i.e. network industries), we test for a break in both mark-ups and the division of rent between capital and labour. For this purpose we encompass efficient bargaining in the labour market in both our theoretical and empirical model. Using industry data for ten EU countries we find that, without controlling for changes in the rent sharing, mark-up estimates tend to increase in the 1990s. However, once we assume efficient bargaining in the labour market, mark-ups remain virtually unchanged or even decrease in some sectors or groups of countries; the result stems from the declining shares of rents accruing to workers owing to a decline in their bargaining power. Without controlling for this development, a rise in firms' profitability due to rent reallocation could be wrongly interpreted as an increase in market power. At the industry level the evidence is particularly strong for high and medium-tech manufacturing, for construction and for those activities that went through deep institutional changes and privatization programmes.

JEL Classification: J50, L50
Keywords: Mark-ups, Rent Sharing, Bargaining

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[1] Banca d'Italia.

CONTENTS

1 Introduction[1]

Since the early nineties, economies in the European Union (EU) have gone through deep structural changes driven by widespread institutional reforms and the evolution of the international context. The implementation of the Single Market Programme and several EU directives on network industries and other highly regulated activities reshaped goods and service markets in an effort to enhance competition while reforms at the country level greatly increased labour market flexibility. At the same time, the surge of new competitors at global level added to the competitive pressures on European firms and necessitated an intense reorganization of their production processes.

A large body of research has investigated the actual impact of these trends across EU countries. In particular, following the approaches to mark-up estimation put forward by Hall (1988) and Roger (1995), recent contributions have focused on detecting the pro-competitive impact of the Single Market Programme. However, most studies are limited to the manufacturing sector and do not come up with clear-cut evidence of declining market power (Allen et al., 1998; Bottasso and Sembenelli, 2001; Sauner-Leroy, 2003; Griffith et al., 2010). Badinger (2007) even finds an unexpected increase in mark-ups in most service activities.

Unfortunately, this literature disregards the contemporaneous labour market reforms, which enhanced flexibility and job-creation in the EU and are deemed to account for a large share of the employment increase since the mid-1990s (European Commission, 2004; Bassanini and Duval, 2006; Dew-Becker and Gordon, 2008). Developments in the labour markets likely reduced the unions' bargaining power, leading to a decline of rents accrued to workers and thus explaining part of the fall in the labour share of total value added observed in most European countries (Blanchard, 1997 and 2000; Blanchard and Giavazzi, 2003).[2] Controlling for these trends is particularly relevant for mark-up estimation; otherwise, a rise in firms' profitability due to rent redistribution could be wrongly interpreted as an increase in market power, even though the overall amount of rents is declining thanks to stronger product market competition.

In the empirical literature on mark-up estimation the issue of simultaneous imperfections on the product and the labour markets has been addressed only in a few recent contributions, which

[1] We are grateful for comments and suggestions received on an earlier version of the paper by participants in the EU KLEMS final conference on "Productivity in the European Union: A Comparative Industry Approach" at the University of Groningen, the European Economic Association conference at the Barcelona Graduate School of Economics, the European Association of Labour Economists at the University College London, the seminars in the Bank of Italy and the European Commission. The views expressed in the paper are those of the authors and do not involve the responsibility of the Bank of Italy. Correspondence to: antonio.bassanetti@bancaditalia.it; roberto.torrini@bancaditalia.it and francesco.zollino@bancaditalia.it.

[2] Additionally, the privatization of public firms shifted management incentives towards increasing the shareholder values (Torrini, 2005; Azmat et al., 2007). This factor proved particularly strong in network utilities.

embed efficient bargaining between firms and unions within the standard approach set out by Hall (Bughin, 1996; Crépon et al., 2002; Neven et al., 2002; Dobbelaere, 2004; Dobbelaere and Mairesse, 2007). They show that mark-up estimates tend to be downward biased when the rent allocation is not explicitly taken into account.

We move from this strand of literature to investigate to what extent the changes in the unions' power can affect the assessment of the break in mark-ups expected from the completion of the Single Market Programme. In particular, the aim of the paper is to provide estimates of the evolution of mark-ups in Europe since the nineties, by taking explicitly into account the effects of changes in the division of rent between labour and capital inputs. For this purpose, we embed the efficient bargaining model within the dual approach put forward by Roeger (1995), which makes it possible to get consistent OLS estimates of key parameters and to work with current price variables, thus avoiding the bias caused by errors in the measurement of volumes.

We provide estimates at both the aggregate and the industry level by exploiting the EU KLEMS dataset covering the whole business sector, including such highly regulated industries as energy, telecommunications and finance, which have recently gone through major institutional changes. We concentrate on a set of countries broadly representing the European Union, though we also provide results for the subset of those belonging to the euro area and for clusters of countries defined by the intensity of the regulatory changes.

Among our main findings, we show that without controlling for changes in rent sharing, mark-up estimates tend to increase in the 1990s. However, once we assume efficient bargaining in the labour market, mark-ups remain virtually unchanged or even decrease in some sectors or groups of countries; this result stems from the declining shares of rents accruing to workers due to a fall in their bargaining power.

In the remaining part of the paper, we first sketch the model and discuss our paper's links to the received literature. After a description of the dataset, we comment on our main empirical findings and conclude with some final observations.

2 The model and the links to the literature

In this section we sketch the model adopted for the estimation of mark-ups and rent sharing between capital and labour. In the literature two approaches are usually followed for mark-up estimation, both relying on the assumption that employment levels are determined by the labour demand schedule: the seminal model developed by Hall (1988), which starts out from the solution of the primal optimization problem of the firm, and the one put forward by Roeger (1995) which combines the primal and the dual solutions. In particular, by computing a suitable measure of the user cost of capital, Roeger provides a strategy to get rid of the unobservable TFP term that poses serious problems for the empirical implementation of Hall's approach.

Hall's approach has recently been extended to the case that firms and workers divide rents according to efficient bargaining on both wages and labour input (Dobbelaere, 2004). Indeed, the efficient bargaining model has been receiving renewed attention in the literature addressing the recent decline in the labour share of total value added across most industrial countries, since in such a model the institutional changes affecting bargaining power can explain part of that reduction (Blanchard and Giavazzi, 2003; Torrini, 2005; Azmat et al., 2007). This feature also proves relevant for mark-up estimation, as Hall's and Roeger's standard approaches both suffer from misspecification when rents are shared according to efficient bargaining. In fact, the observed wage rate absorbs part of the rents that firms are able to elicit in the product market, so that the observed price-cost margin underestimates the overall amount of rents and thus the market power of firms. Instead the relevant margin to detect the actual market power of firms (the Lerner index) should be measured with respect to the reservation wage of workers. Since both Hall's and Roeger's original models look at the wedge between the price and the observed wage rate, any rise (fall) in the price-cost margin due to a decrease (increase) in the workers' rent share is wrongly interpreted as a rise (fall) in the market power of firms. We consider this a major drawback of the standard models when applied to assess the evolution of the firms' market power in Europe during the nineties, since the labour market went through important structural changes that probably affected the bargaining power of unions.

In what follows, after sketching the standard approaches to mark-up estimation and the extension put forward by Dobbelaere to include efficient bargaining in Hall's model, we show how efficient bargaining can also be embedded in Roeger's. This provides us with a new model to be estimated, whose results can be compared with the evidence found by Badinger (2007), who applied Roeger's standard approach to study the changes in mark-ups following the completion of the Single Market Programme.

The standard models. Hall's empirical strategy to estimate price mark-ups on marginal costs can be seen as a rearrangement of the Solow residual, once the assumption of perfect competition on the product markets is removed. The basic equation in growth accounting is the following:[3]

$$\Delta q = \varepsilon_{Q,N}\Delta n + \varepsilon_{Q,M}\Delta m + \varepsilon_{Q,K}\Delta k + \Delta e \qquad (1)$$

[3]Time subscripts are dropped for simplicity's sake.

where q is the log of gross output, n is the log of labour input, m is the log of intermediate inputs, k is the log of capital input, Δe is technical progress, and the parameters $\varepsilon_{Q,f}$ ($f = N$, M, K) represent output elasticities with respect to labour, intermediate and capital inputs. Under the assumptions of perfect competition on both output and input markets and of constant returns to scale, the output elasticities are just the input shares of total output. Hall showed that with imperfect competition on the output market, these elasticities are given by the product of input shares and the mark-up, so that equation (1) can be rewritten as follows (details in Appendix I):

$$\Delta q = \mu\alpha_N \Delta n + \mu\alpha_M \Delta m + \mu\alpha_K \Delta k + \Delta e \tag{2}$$

where α_f are the input shares of output ($f = N$, M, K) and the mark-up μ is defined as the ratio of the output price to marginal cost.

Assuming constant returns to scale, equation (2) can be rearranged to obtain:

$$\Delta q = \mu\alpha_N \Delta n + \mu\alpha_M \Delta m + (1 - \mu\alpha_N - \mu\alpha_M)\Delta k + \Delta e \tag{3}$$

and defining $\mu = 1/(1 - B)$, it follows that

$$\Delta q - \alpha_N \Delta n - \alpha_M \Delta m - (1 - \alpha_N - \alpha_M)\Delta k = B(\Delta q - \Delta k) + (1 - B)\Delta e \tag{4}$$

which in the right-hand side gives a decomposition of the standard Solow residual shown in the left-hand side.

This equation can be estimated to retrieve B and therefore μ. However, given that the efficiency term $(1-B)\Delta e$ is not observed, instrumental variables are required to obtain consistent estimates.

Roeger (1995) worked out an ingenious way to get rid of the unobservable efficiency term, by combining the primal and the dual solution to the firm's program. He showed that the following equations holds (see Appendix I for the derivation):

$$\begin{aligned}&(\Delta q + \Delta p) - \alpha_N (\Delta n + \Delta w) - \alpha_M (\Delta m + \Delta j) - (1 - \alpha_N - \alpha_M)(\Delta k + \Delta r)\\ &= B[(\Delta q + \Delta p) - (\Delta k + \Delta r)]\end{aligned} \tag{5}$$

where $(\Delta q + \Delta p)$, $(\Delta n + \Delta w)$, $(\Delta m + \Delta j)$ and $(\Delta k + \Delta r)$ represent, respectively, the growth rate of nominal output and input compensation (p, w, j, r being the logs of output and input prices). The term on the left-hand side can be defined as the nominal Solow residual (NSR), which only depends on the changes in the revenue-capital ratio expressed in nominal terms. Unlike Hall's model, which requires instrumental variables, this equation can be estimated simply through OLS.

Moreover, once a suitable user cost of capital r is computed, it only includes nominal variables and it is not affected by possible biases in the measurement of input and output deflators.

The efficient bargaining model. A number of recent contributions (Dobbelaere, 2004; Dobbelaere and Mairesse, 2008; Crépon et al., 2007; Abraham et al., 2009) have modified Hall's model by introducing the hypothesis that firms and unions bargain over labour input and wages in order to share existing rents. In this setting both the labour share and the elasticity of output to labour input become a function of the bargaining power of unions (see Blanchard and Giavazzi, 2003), whose estimate is thus needed (together with that of the mark-up μ) in order to retrieve the correct value of the output elasticity.[4]

More specifically, following Dobbelaere (2004) and Abraham et al. (2009) it is assumed that firms and workers, while taking the other factors of production as given, choose W and N by solving the standard efficient bargaining problem defined as follows:

$$\max_{W,N} \left(NW + \left(\overline{N} - N\right) \overline{W} - \overline{NW}\right)^{\phi} (R - WN)^{1-\phi} \tag{6}$$

or

$$\max_{W,N} (NW - N\overline{W})^{\phi} (R - WN)^{1-\phi}$$

where $\overline{W}$ is the reservation wage, $\overline{N}$ is trade union membership, R is the firm's revenue; ϕ is the unions' bargaining power.

The first order condition for N leads to:

$$W = R_N + \phi \frac{R - R_N N}{N} = (1 - \phi) R_N + \phi \frac{R}{N} \tag{7}$$

This condition shows the well-known result that under efficient bargaining firms and workers set wages at a level equal to a weighted average of the marginal and the mean revenue of labour, defining a pair of W and N on the contract curve (point B in Figure 1), which lies above the labour demand (marginal revenue). Moreover, with risk-neutral unions, as assumed in (6), the contract curve describing the set of possible solutions to the maximization program is vertical and production is set at the efficient level which makes the marginal revenue equal to the opportunity cost of labour (the reservation wage; point A in Figure 1):

[4] With efficient bargaining the employment level does not lie on labour demand and no longer reflects the marginal revenue of labour contrary to other models, like the 'right to manage' or 'the monopoly union' , where the labour input decision is left to the firm for given wages.

$$R_N = \overline{W} \tag{8}$$

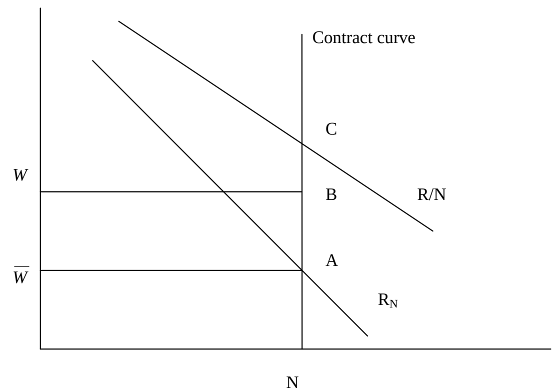

Figure 1 - Efficient bargaining solution

Under imperfect competition and assuming an isoelastic demand for output, we can use the following results:

$$P = Q^{-\frac{1}{\eta}}, \qquad R = PQ = Q^{1-\frac{1}{\eta}}, \qquad R_N = (1 - \frac{1}{\eta})Q^{-\frac{1}{\eta}}\frac{\partial Q}{\partial N} = \frac{1}{\mu}P(Q)\frac{\partial Q}{\partial N}, \qquad \frac{N}{Q}\frac{\partial Q}{\partial N} = \varepsilon_{Q,N}$$

and rewrite equation (8) as follows:

$$\mu = \frac{P}{(\overline{W}/\frac{\partial Q}{\partial N})} \tag{9}$$

Accordingly, under efficient bargaining the price strategy of firms depends on the reservation wage $\overline{W}$, so that the relevant price-cost margin measuring firms' market power has to be computed with respect to the reservation wage instead of the observed wage W. This correctly measures the overall rent to be shared, which is not affected by changes in the bargaining power of unions.

Hall's and Roeger's models with efficient bargaining. Hall's model can be adjusted by plugging into equation (1) the new expression for the elasticity of output to labour that follows from rewriting equation (7) as:

$$\frac{WN}{PQ} = \frac{N}{Q}\frac{\partial Q}{\partial N}\frac{1}{\mu} + \phi - \phi\frac{N}{Q}\frac{\partial Q}{\partial N}\frac{1}{\mu}$$

since $\frac{N}{Q}\frac{\partial Q}{\partial N} = \varepsilon_{Q,N}$, we get:

$$\alpha_N = (1-\phi)\frac{\varepsilon_{Q,N}}{\mu} + \phi \tag{10}$$

and the elasticity of output to labour turns out to be a function of the labour share, the mark-up and union bargaining power:

$$\varepsilon_{Q,N} = \mu\alpha_N + \mu\frac{\phi}{1-\phi}(\alpha_N - 1) \tag{11}$$

Thus with efficient bargaining and assuming constant returns to scale, the whole set of output elasticities with respect to inputs becomes:[5]

$$\begin{cases} \varepsilon_{Q,N} = \mu\alpha_N + \mu\frac{\phi}{1-\phi}(\alpha_N - 1) \\ \varepsilon_{Q,M} = \mu\alpha_M \\ \varepsilon_{Q,K} = [1 - \mu\alpha_M - \mu\alpha_N - \mu\frac{\phi}{1-\phi}(\alpha_N - 1)] \end{cases} \tag{12}$$

By defining $\gamma = \frac{\phi}{1-\phi}$ and substituting for output elasticities (12) in equation (1), Dobbelaere (2004) and Abraham et al. (2009) obtained a modified version of Hall's equation:

$$\begin{aligned} &\Delta q - \alpha_N\Delta n - \alpha_M\Delta m - (1-\alpha_N-\alpha_M)\Delta k \\ &= B(\Delta q - \Delta k) + \gamma(\alpha_N - 1)(\Delta n - \Delta k) + (1-B)\Delta e \end{aligned} \tag{13}$$

where an extra term $\gamma(\alpha_N - 1)(\Delta n - \Delta k)$ shows up. Omitting this additional term would lead to biased estimates of both B and the mark-up μ.

Following the same approach, we modified Roeger's model to obtain (see Appendix I for the derivation):

$$\begin{aligned} &(\Delta q + \Delta p) - \alpha_N(\Delta n + \Delta w) - \alpha_M(\Delta m + \Delta j) - (1-\alpha_N-\alpha_M)(\Delta k + \Delta r) \\ &= B[(\Delta q + \Delta p) - (\Delta k + \Delta r)] + \gamma(\alpha_N - 1)[(\Delta n + \Delta w) - (\Delta k + \Delta r)] \end{aligned} \tag{14}$$

While controlling for the extra term $\gamma(\alpha_N - 1)(\Delta n - \Delta k)$, we can estimate this equation by OLS, benefiting from the advantages of Roeger's original approach.

[5]It should be noticed that in the 'right to manage' or in the 'monopoly union' model, where employment is chosen by firms on the labour demand, the usual first order condition for profit maximization $R_N = W$ continues to hold true, although W is no longer set at the competitive level. In this case Hall's results would not be modified, as the elasticity of output with respect to labour would remain $\varepsilon_{Q,N} = \mu\alpha_N$; moreover, the bargaining power of workers would not show up in the equation to be estimated and therefore would not affect the estimation of the mark-up either.

More specifically, our empirical model is given by:

$$NSR_{i,t} = \beta_0 + \beta_1 XMARK_{i,t} + \beta_2 VBARG_{i,t} + u_{i,t} \tag{15}$$

where, by dropping subscripts: $NSR = [(\Delta q + \Delta p) - \alpha_N(\Delta n + \Delta w) - \alpha_M(\Delta m + \Delta j) - (1 - \alpha_N - \alpha_M)(\Delta k + \Delta r)]$ is the nominal Solow residual; $XMARK = [(\Delta q + \Delta p) - (\Delta k + \Delta r)]$ is the nominal change in the output to capital ratio, whose coefficient is linked to the mark-up through the equation $\mu = 1/(1-\beta_1)$; $VBARG = (\alpha_N - 1)[(\Delta n + \Delta w) - (\Delta k + \Delta r)]$ is the weighted nominal change in the labour to capital ratio and its coefficient gives us the bargaining power of unions through $\phi = \beta_2/(1+\beta_2)$.

3 The data

Our empirical analysis is based on the EU KLEMS Growth and Productivity Accounts, which in the release of March 2008 provide a comprehensive and coherent dataset for most European countries with annual statistics at industry level on hours worked by skills, net capital stock by main assets, intermediate inputs and gross production.[6] However, as data are not available with the same level of sectoral disaggregation for all countries, we decided to work with a selection of 15 industries belonging to the non-farm business sector in 10 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, United Kingdom and Spain. Again to avoid an unbalanced panel, we restricted our analysis to the period spanning 1982-2005. We also drew on supplementary estimates to make the dataset fully suitable for our investigation. First, for Belgium, France and Spain data on real capital stock, gross fixed capital formation and consumption of fixed capital, not included in the EU KLEMS dataset, were taken from the STAN-OECD database.[7] Second, for all countries the user cost of capital was estimated by multiplying the gross fixed capital formation price index by the rental rate of capital, which, in turn, is measured by the sum of the real interest rate and the depreciation rate, net of the expected capital gains.[8]

As for the selection of sectors of activity, we did not include agriculture and mining, for which data are missing for a large number of countries for the early years in the sample, public administration, health care and education, where State supply play a predominant role in most European

[6] http://www.euklems.net/

[7] For Spain the consumption of fixed capital was also missing in the STAN-OECD database and therefore it was calculated implicitly for each sector as $CFK_t = K_{t-1} - K_t + GFKF_t$, where CFK is consumption of fixed capital, K is net capital stock and $GFKF$ is gross fixed capital formation.

[8] For each sector in a given country, we have calculated the depreciation rate at time t as the contemporaneous ratio of the consumption of fixed capital to the net capital stock; the expected capital gains at time t are proxied by a moving average of three terms (*t, t-1, t-2*) of the rate of growth of the gross fixed capital formation deflator.

countries; moreover, in the public sector the concepts of profit and mark-up make little sense, given that only labour compensation and capital depreciation contribute to value added. We also excluded housing services, which is mostly made up of imputed rents pertaining to owner-occupied dwellings.

Equations (5) and (15) have been estimated for the entire dataset and separately for distinct aggregates of industries, which we believe could have been affected in different ways by the institutional changes that occurred since the early nineties. In particular, we focused on manufacturing industries (further split in high, medium-tech and traditional industries), construction, highly regulated services (energy, gas and water supply; transport, storage and communication; financial intermediation) and other (remaining) services (Table 1). Regarding manufacturing industries, given the importance of international trade for this sector, one could expect a sizeable impact of the implementation of the Single Market Programme; on the other hand, since this sector was already exposed to high levels of international competition, one could argue that there was little room for further improvement. In regulated industries, public ownership and regulation traditionally limited competitive pressure; however, several EU directives have been issued to harmonize the regulatory framework across member countries and foster competition. Moreover, in a number of countries privatization programmes have deeply changed their market organization. Finally, other business services remain quite closed to international competition; the Directive on services was subsequently passed and in a watered-down version that still awaits a full implementation. Accordingly, the Single Market Programme is expected to play a minor role in these activities, even if they might have been affected by the labour market reforms like the rest of the business sector.

The empirical counterparts to the theoretical variables in equations (5) and (15) are given by the following:[9] Q_t is real gross output and P_t refers to its price index; N_t is total hours worked by employees and W_t is hourly labour compensation;[10] M_t is the volume index of intermediate inputs and J_t refers to its price index; K_t is net real fixed capital stock; R_t is the user cost of capital.

In a first stage, the shares of labour and intermediate inputs were calculated as $\alpha'_N = WN/PQ$ and $\alpha'_M = JM/PQ$, respectively; further, since we assume constant returns to scale, the capital share was obtained as $\alpha'_K = (1 - \alpha'_N - \alpha'_M)$. Unfortunately, as outlined also in the EU KLEMS methodology, the capital share happens to be negative in some cases. Instead of restricting the negative values to zero, as suggested by the EU KLEMS consortium,[11] since we believe it is

[9] The description of the variables is valid for each sector in the dataset, although for brevity we do not report a suffix to identify it.

[10] In the EU KLEMS dataset it is assumed that, at the industry level, the compensation per hour of self-employed is equal to the compensation per hour of employees.

[11] See "EU KLEMS Growth and productivity accounts – Part I Methodology", page 41.

reasonable to posit a minimum return to capital we proceeded as follows: first, we calculated the implicit return on capital as $rimp = (\alpha'_K PQ)/K$; second, where it turns negative, $rimp$ was substituted with the minimum positive $rimp$ across sectors for the same year and country; third, the final adjusted capital share was calculated as $\alpha_K = (rimp \cdot PQ)/K$ and, on the assumption that the sign inconvenience described above was due to an improper measurement of the intermediate inputs, the finally adjusted share of the latter was obtained as $\alpha_M = (1 - \alpha_K - \alpha_N)$, with an unchanged labour share $\alpha_N = \alpha'_N$.

	Industries	Shares on total gross production		Shares on total worked hours		Factor shares on industry gross production: Capital		Labour		Intermediate	
		1986-90	2001-05	1986-90	2001-05	1986-90	2001-05	1986-90	2001-05	1986-90	2001-05
1	Food, beverages and tobacco	8.42	5.85	4.04	3.44	8.34	8.95	15.14	16.81	76.5	74.24
2	Textile, leather and footwear	3.28	1.79	4.09	1.95	8.55	7.03	27.51	25.26	63.93	67.71
3	Pulp, paper, printing and publishing	3.63	2.84	2.75	2.22	11.97	12.54	26.19	24.49	61.84	62.97
4	Chemical, rubber and plastics	8.13	7.49	3.71	2.89	12.89	11.66	17.63	15.29	69.47	73.05
5	Basic metals and fabricated metal	6.06	4.76	4.84	4.01	10.8	8.72	24.98	24.81	64.21	66.47
6	Machinery, n.e.c.	4.65	3.98	3.83	2.89	10.01	8.69	29.65	26.25	60.34	65.06
7	Electrical and optical equipment	4.73	4.18	4.04	2.83	11.33	9.15	30.21	23.79	58.45	67.06
8	Transport equipment	4.86	5.32	3.06	2.35	6.28	5.87	23.5	17.92	70.22	76.21
9	Electricity, gas and water supply	3.55	3.19	1.34	0.89	30.51	28.81	17.94	13.15	51.55	58.04
10	Construction	10.53	9.81	12.19	12.15	8.86	8.66	32.09	31.13	59.05	60.21
11	Wholesale and retail trade	14.54	15.06	24.21	23.69	13.98	15.01	43.67	38.06	42.35	46.93
12	Hotels and restaurants	3.21	3.78	6.24	7.66	7.04	9.18	41.15	39.78	51.81	51.04
13	Transport, storage and communication	9.07	11.22	10.12	9.83	17.99	18.68	36.64	26.96	45.37	54.36
14	Financial intermediation	6.3	7.07	4.89	4.59	20.41	22.42	40.27	30.61	39.32	46.97
15	Renting of m.&eq. and other business activities	9.07	13.65	10.61	18.62	13.59	12.96	43.26	43.34	43.15	43.7
	Aggregations:										
1 to 8	Manufacturing	43.76	36.21	30.38	22.56	10.02	9.08	24.35	21.83	65.63	69.09
9, 13, 14	Regulated Services	18.92	21.48	1.34	0.89	30.51	28.81	17.93	13.15	51.56	58.04
11, 12, 15	Other Services	26.72	31.95	36.97	42.65	13.64	14.48	39.51	34.98	46.85	50.54

Table 1 - Main features of industries included in the analysis; percentage values

Table 1 provides a descriptive overview of the industries considered in the analysis, featuring the main changes between the years preceding the completion of the Single Market Programme and the final period in our sample. Besides the declining shares of hours worked in most manufacturing industries, in contrast with the rise in services, it is worth mentioning that the widespread fall in the labour shares of gross production was accompanied by a surge in those of intermediate inputs.

4 Estimates for changing structural parameters

In this section we describe our estimation strategy and main findings. Special attention was devoted to looking for possible structural breaks on both the mark-up μ and the unions' bargaining power ϕ at some date between the late eighties (when the Single Market Programme was first announced) and the mid-nineties (when it was formally completed). For this purpose, the simplest approach is to assume that the supposed regime shift was instantaneous, so that it can be modelled as a level shift in the modified Roeger equation (15):[12]

$$
\begin{aligned}
NSR_{it} &= \beta_0 + \beta_1 XMARK_{it} + \beta_2 VBARG_{it} + \\
&+ \beta_3 D_t^{T_M} XMARK_{it} + \beta_4 D_t^{T_B} VBARG_{it} + u_{it}
\end{aligned} \tag{16}
$$

where $D_t^{T_h}$ takes value 0 for $t < T_h$ and 1 for $t \geqslant T_h$ $(h = M, B)$, with T_h being the timing of the break, which is allowed to differ between the mark-up and the bargaining power; index i orders observations by sector-country. If the standard t-test on $\widehat{\beta}_3$ and $\widehat{\beta}_4$ rejects the null of no significance, the value of the structural parameters before and after the breaks would be respectively obtained as: $\widehat{\mu}_{t<T_M} = 1/(1-\widehat{\beta}_1)$, $\widehat{\phi}_{t<T_B} = \widehat{\beta}_2/(1+\widehat{\beta}_2)$ and $\widehat{\mu}_{t\geqslant T_M} = 1/(1-\widehat{\beta}_1-\widehat{\beta}_3)$, $\widehat{\phi}_{t\geqslant T_B} = (\widehat{\beta}_2+\widehat{\beta}_4)/(1+\widehat{\beta}_2+\widehat{\beta}_4)$. On the contrary, were the shift coefficients not statistically different from zero, there would be no change in the two parameters for $t \geqslant T_h$.

In spite of the simplicity of this approach, the assumption of an instantaneous regime shift may sound very restrictive. On the one hand, rational economic agents possibly anticipated the effects of the Single market Programme, on the other the adjustment of the institutional setting in each country possibly took some time to be completed. In this respect, as stressed in Badinger (2007), the specification of a continuous regime shift may be preferable, at least as a preliminary step, in order to check the degree of approximation that the linear model (16) would impose. As a consequence, in a first step we followed Badinger and introduced a smooth transition function interacted with both $XMARK$ and $VBARG$:

$$
\begin{aligned}
NSR_{it} &= \beta_0 + \beta_1 XMARK_{it} + \beta_2 VBARG_{it} + \\
&+ \beta_3 F^M(t) XMARK_{it} + \beta_4 F^B(t) VBARG_{it} + u_{it}
\end{aligned} \tag{17}
$$

where $F^h(t) = 1/[1 + e^{-\rho(t-\tau_h)}]$ are symmetric logistic functions mapping time t onto the interval $(0, 1)$, with $h = M$, B. The slope of $F^h(t)$ is determined by the parameter ρ: the lower its estimated value, the smoother the function and the stronger the evidence in favour of a continuous regime change (on the contrary, the higher is ρ, the steeper the function and the more plausible the approximation of a discrete shift). For the sake of simplicity, the speed of transition has been imposed to be the same for both the product and the labour market. The parameters τ_h represent the regime transition mid-points to be estimated jointly with the other coefficients, instead of being

[12] An instantaneous regime change is adopted by Allen et al. (1998), Bottasso and Sembenelli (2001), Sauner-Leroy (2003).

imposed exogenously as in (16).[13]

Equation (17) has been estimated through non-linear least squares (detailed results in Appendix II), confirming the evidence found in Badinger (2007) of very high values for ρ. More specifically, the speed of transition validates an instantaneous break in most of the largest industrial sectors (manufacturing, construction and non-regulated – "Other" – services); as for the total dataset and the regulated services, the value of ρ proves relatively smaller. All in all, the simpler option of discrete breaks, equation (16), turns out to be a plausible approximation. As for the dating, we retained the break years endogenously selected as transition mid-points when we estimated (17), and we accordingly set the shift dummies $D_t^{T_h}$; we maintained some limited degree of flexibility just in the choice of the breaks years where we found evidence of a slightly lower speed of transition (total dataset and regulated services).

4.1 Results at the aggregate level

The modified Roeger equation (16) was estimated through OLS with country-sector fixed effects. First we concentrated on the total dataset, exploiting all sample variations over time; then we looked at the evidence for main industries.

In order to check for endogeneity problems potentially coming from measurement errors, we performed GMM estimates (in system specification), finding results invariably in line with the OLS counterparts (Appendix II).

Starting with the total dataset, in the Columns A to D of Table 3 we report as a benchmark the results that we obtained by setting the break at year 1993, just after the restrictions on the free circulation of goods and factors across the EU were definitively removed. Column E describes our favourite model (though results are quite similar), where the level shift was postponed to 1994 in line with our estimates of the non-linear equation (17) (Table AII.1 in Appendix II).

In line with the received empirical evidence mostly based on Hall's approach, in our framework the assumption of efficient bargaining significantly raises the estimated size of the mark-up. Specifically, it appears to be 15 per cent higher when estimated by explicitly controlling for rent allocation (columns A and C in Table 3 and Table AIII.1 in Appendix III).[14] Indeed, rents prove reasonably larger when they are measured *ex ante,* before a share of them is distributed to workers.

[13] As Badinger outlined, equation (16) is nested in equation (17) that collapses into a linear model with an instantaneous break at $\tau = t$ when $\rho \to \infty$.

[14] Standard errors for structural parameters reported in the tables are computed according to the delta-method. In general, when the reduced form parameter is statistically significant, the structural parameter is significant as well. The same holds true for tests on strutural breaks.

Dependent variable: Nominal Solow Residual, or *NSR* in (16)						
	(A)	(B)	(C)	(D)		(E)
Regressors' coefficients						
XMARK	0.18***	0.16***	0.28***	0.31***	*XMARK*	0.31***
	(0.013)	(0.016)	(0.018)	(0.021)		(0.019)
VBARG	-	-	0.17***	0.24***	*VBARG*	0.24***
			(0.031)	(0.030)		(0.029)
*XMARK*D93*	-	0.05*	-	-0.04	*XMARK*D94*	-0.05
		(0.026)		(0.036)		(0.037)
*VBARG*D93*	-	-	-	-0.15***	*VBARG*D94*	-0.16***
				(0.056)		(0.058)
Estimated structural parameters						
$\hat{\mu}_{t<93}$	1.22	1.19	1.40	1.45	$\hat{\mu}_{t<94}$	1.46
	(0.019)	(0.023)	(0.035)	(0.043)		(0.041)
$\hat{\mu}_{t\geq93}$	1.22	1.27††	1.40	1.37	$\hat{\mu}_{t\geq94}$	1.36
	(0.019)	(0.031)	(0.036)	(0.055)		(0.058)
$\hat{\phi}_{t<93}$	-	-	0.14	0.19	$\hat{\phi}_{t<94}$	0.20
			(0.023)	(0.020)		(0.019)
$\hat{\phi}_{t\geq93}$	-	-	0.14	0.08†††	$\hat{\phi}_{t\geq94}$	0.07†††
			(0.023)	(0.040)		(0.042)
Diagnostics						
R-sq.	0.569	0.578	0.595	0.610	R-sq.	0.611
F-stat.	25.54	26.50	37.56	36.07	F-stat.	36.26
Prob>F	0.00	0.00	0.00	0.00	Prob>F	0.00
No. Obs.	3776	3776	3776	3776	No. Obs.	3776

Notes: time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%.

Table 3 - Fixed effects OLS estimates: total dataset

Exploiting the time coverage of our dataset, larger than in previous contributions, when we do not control for rent reallocation we find evidence of a positive structural break in mark-ups (of 4-5 per cent;columns A and B in Tables 3 and AIII.1), which would entail an unexpected reduction in competitive pressures following the implementation of Single Market Programme. However, the impact on mark-ups turns negative, though it is not significant, when the companion adjustments on the labour market are considered too. Indeed, we find a strong evidence for a structural break in the rent share distributed to workers, which fell by half from 1993-94 on (columns D and E in

Tables 3 and AIII.1).

Regressions meet the usual diagnostic checks; results prove robust across estimation methods and controlling for non-spherical errors due to the endogeneity issues raised in Hylleberg and Jorgensen (1998).[15] Moreover, as a robustness check we dropped, in turn, each of the countries included in the dataset: outcomes remained almost unchanged, irrespective of the sample composition. The same evidence broadly emerged also when we concentrated only on the subset of countries belonging to the euro area, as reported in Tables AIII.2 and AIII.3 in Appendix III.[16]

Tentatively, considering the remaining possible measurement issues, it follows that confining attention to the product market may result in the missing of important ingredients in the appraisal of both the extent and the transmission channel of the competitive impulse exerted by the Single Market Programme. Our evidence suggests that institutional changes have mainly affected the equilibrium on the labour market through a reduction in workers' bargaining power, while the impact on the pricing rules in the product market is more controversial. Even if we assume that the total amount of rents tends to decrease, firms' profit margins could well remain unchanged or even increase due to the fall in the share of rents distributed to workers.

We believe that the result does not stem only from the Single Market Programme, whose implementation came hand in hand with broader innovation in the institutional and productive set-up that was spurred in part by privatization and increasing globalization. In order to investigate in more detail this first set of results, we grouped our countries according to the intensity of the regulatory changes since the beginning of the nineties. For this purpose, we adopted the OECD indicators regarding employment protection legislation (EPL) and product market regulation (PMR).

[15] In each regression we added a country-specific output gap measure to control for aggregate cyclical effects that are not captured by the coefficients of the time dummies estimated for the whole sample. However results did not change when the output gap variable was not included.

[16] In this case the break years were set equal to those adopted for the total dataset.

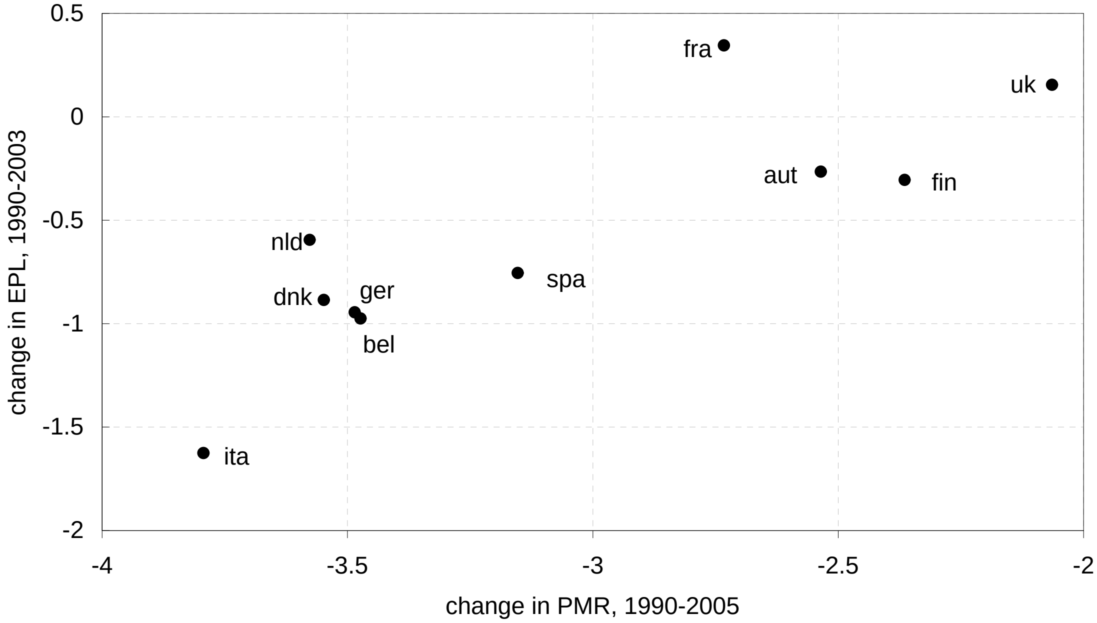

Figure 2 - OECD indicators of changes in employment protection legislation (EPL) and product market regulation (PMR)

Figure 2 shows that the total sample can be split quite clearly into two groups, one (lower left area of the graph) made up of countries that underwent a sizeable reduction in both product and labour market regulations (Italy, Germany, Belgium, Denmark, the Netherlands and Spain), the other (upper right area) comprising countries characterized by less pronounced deregulation (Austria and Finland), France, with persistently high labour market protection, and the UK, which endorsed significant reforms before the implementation of the Single Market Programme. Estimating the modified Roeger equation (16) separately for the two subgroups, we find that the outcomes just described for the total dataset are driven exclusively by the "recently reformed" countries, which since the mid-nineties have registered a significant decline both in mark-ups and in the share of rent distributed to workers (Table 4 and Table AIII.4 in Appendix III). We interpret this as corroborating evidence that the identified breaks have to be linked to the reform effort of the last decade.

Dependent variable: Nominal Solow Residual, or *NSR* in (16)		
	Recently reformed countries[1]	Others countries[2]
Regressors' coefficients		
XMARK	0.31***	0.32***
	(0.024)	(0.032)
VBARG	0.23***	0.29***
	(0.034)	(0.052)
*XMARK*D94*	-0.10***	0.02
	(0.040)	(0.059)
*VBARG*D94*	-0.22***	-0.10
	(0.079)	(0.081)
Estimated structural parameters		
$\hat{\mu}_{t<94}$	1.45	1.47
	(0.051)	(0.070)
$\hat{\mu}_{t\geq94}$	$1.26^{\dagger\dagger\dagger}$	1.51
	(0.050)	(0.113)
$\hat{\phi}_{t<94}$	0.18	0.22
	(0.023)	(0.031)
$\hat{\phi}_{t\geq94}$	$0.01^{\dagger\dagger\dagger}$	0.16
	(0.070)	(0.044)
Diagnostics		
R-sq.	0.630	0.600
F-stat.	25.34	16.97
Prob>F	0.00	0.00
No. Obs.	2252	1524

Notes: time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. (1) Germany, Italy, Spain, Belgium, Netherlands, Denmark. (2) United Kingdom, France, Austria, Finland.

Table 4 - Fixed effects OLS estimates: recently reformed and other countries

4.2 Results at the industry level

In order to investigate the main drivers of the aggregate results, we tested for structural breaks for selected sectors. For industry (further split into manufacturing and construction), in the left panel of Table 5 we report the estimates based on 1994 as a break year, which is the same option chosen for the total dataset; in the right panlel the regime change has been set at the transition mid-points endogenously selected through the estimation of equation (17).

Dependent variable: Nominal Solow Residual, or *NSR* in (16)	(A) Manuf.	(B) Manuf.	(C) Constr.	(D) Constr.		(E) Manuf.	(F) Constr.
Regressors' coefficients							
XMARK	0.10***	0.20***	0.06***	0.20***	*XMARK*	0.21***	0.21***
	(0.008)	(0.016)	(0.020)	(0.054)		(0.012)	(0.042)
VBARG	-	0.16***	-	0.22***	*VBARG*	0.17***	0.22***
		(0.022)		(0.075)		(0.018)	(0.051)
*XMARK*D94*	0.01	-0.02	-0.05	-0.07	$XMARK*DT^M$	-0.06***	-0.08***
	(0.011)	(0.021)	(0.031)	(0.072)		(0.017)	(0.033)
*VBARG*D94*	-	-0.05*	-	-0.06	$VBARG*DT^B$	-0.09***	-0.14***
		(0.030)		(0.103)		(0.023)	(0.052)
Estimated structural parameters							
$\hat{\mu}_{t<94}$	1.11	1.25	1.06	1.25	$\hat{\mu}_{t<T^M}$	1.26	1.26
	(0.009)	(0.024)	(0.022)	(0.083)		(0.019)	(0.066)
$\hat{\mu}_{t\geq 94}$	1.12	1.22	1.01†	1.14	$\hat{\mu}_{t\geq T^M}$	1.17†††	1.14†
	(0.009)	(0.021)	(0.024)	(0.064)		(0.021)	(0.046)
$\hat{\phi}_{t<94}$	-	0.13	-	0.18	$\hat{\phi}_{t<T^B}$	0.14	0.18
		(0.017)		(0.050)		(0.013)	(0.034)
$\hat{\phi}_{t\geq 94}$	-	0.10†	-	0.14	$\hat{\phi}_{t\geq T^B}$	0.07†††	0.07††
		(0.016)		(0.055)		(0.018)	(0.055)
Diagnostics							
R-sq.	0.486	0.535	0.267	0.344	R-sq.	0.543	0.385
F-stat.	29.80	34.99	3.43	4.49	F-stat.	35.07	4.07
Prob>F	0.00	0.00	0.00	0.00	Prob>F	0.00	0.00
No. Obs.	1893	1893	240	240	No. Obs.	1893	240

Notes: time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. T^M is equal to 1999 for Manufacturing and to 1993 for Construction; T^B is equal to 1997 for Manufacturing and to 1998 for Construction.

Table 5 - Fixed effects OLS estimates: industry

In this sector the regime shift may have taken place in the second half of the nineties, with some asynchrony between the product and the labour market. Again, when changes in the labour market are not controlled for, there is no evidence of any significant break in the product market (left panel of Table 5 and Table AIII.5 in Appendix III); on the contrary, once efficient bargaining is allowed for and break years are properly selected, outcomes point to a significant decrease in mark-up and union bargaining power (right panel of Tables 5 and AIII.5).

Dependent variable: Nominal Solow Residual, or *NSR* in (16)							
	(A) Regul.	(B) Regul.	(C) Others	(D) Others		(E) Regul.	(F) Others
Regressors' coefficients							
XMARK	0.25***	0.37***	0.17***	0.39***	*XMARK*	0.36***	0.39***
	(0.017)	(0.039)	(0.013)	(0.047)		(0.033)	(0.044)
VBARG	-	0.21***	-	0.38***	*VBARG*	0.20***	0.38***
		(0.067)		(0.083)		(0.055)	(0.077)
*XMARK*D94*	0.08***	-0.01	-0.05***	-0.00	$XMARK*DT^M$	0.01	0.00
	(0.030)	(0.083)	(0.019)	(0.085)		(0.029)	(0.060)
*VBARG*D94*	-	-0.16	-	0.07	$VBARG*DT^B$	-0.16***	0.07
		(0.123)		(0.144)		(0.046)	(0.102)
Estimated structural parameters							
$\hat{\mu}_{t<94}$	1.33	1.58	1.21	1.64	$\hat{\mu}_{t<T^M}$	1.57	1.64
	(0.031)	(0.097)	(0.019)	(0.126)		(0.082)	(0.118)
$\hat{\mu}_{t\geq 94}$	$1.49^{\dagger\dagger\dagger}$	1.56	$1.15^{\dagger\dagger}$	1.64	$\hat{\mu}_{t\geq T^M}$	1.60	1.64
	(0.053)	(0.174)	(0.018)	(0.199)		(0.108)	(0.160)
$\hat{\phi}_{t<94}$	-	0.17	-	0.28	$\hat{\phi}_{t<T^B}$	0.17	0.28
		(0.046)		(0.044)		(0.038)	(0.040)
$\hat{\phi}_{t\geq 94}$	-	0.04	-	0.31	$\hat{\phi}_{t\geq T^B}$	$0.04^{\dagger\dagger}$	0.31
		(0.094)		(0.058)		(0.061)	(0.047)
Diagnostics							
R-sq.	0.804	0.814	0.546	0.659	R-sq.	0.821	0.659
F-stat.	32.09	29.07	16.32	21.75	F-stat.	34.36	21.50
Prob>F	0.00	0.00	0.00	0.00	Prob>F	0.00	0.00
No. Obs.	720	720	923	923	No. Obs.	720	923

Notes: time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. T^M is equal to 1994 for both Regulated and Other services; T^B is equal to 1996 for Regulated services and to 1995 for Other services.

Table 6 - Fixed effects OLS estimates: services

By disaggregating further the manufacturing sector, significant and sizeable shifts in parameters are detected in medium and high-tech industries, grouped in the two aggregates "Paper, chemicals, plastics and metals" and "Machinery, electrical and transport equipment". Both subgroups experienced a reduction in mark-ups and union bargaining power (Tables AIII.7 and AIII.8

in Appendix III); on the contrary, traditional industries such as "Food, beverages, textiles and leather" do not show statistical evidence of a regime change.

In the service sector, without controlling for imperfect labour markets we find a significant rise in mark-ups in regulated industries (by more than 10 per cent) and a decline in other services (by around 5 per cent; left panel in Table 6 and Table AIII.6 in Appendix III). However, when rent sharing is taken into account, the shift becomes statistically insignificant in both groups of activities, and we find strong evidence of a drop in bargaining power only in the sole regulated sectors (right panel in Tables 6 and AIII.6 in Appendix III). This is consistent with results in Torrini (2005) and Azmat et al. (2007), showing that the main outcome of privatizations and changes in regulation in some sectors, notably in network industries, was a reallocation of rents - from labour to capital - rather than a reduction in their amount. This would be due to either a shift in the managers' objectives from politically related targets to profit maximization or a decline in union power after ownership is transferred from the government to private shareholders.

Summing up, in manufacturing and construction there is clear evidence of a reduction in both mark-ups and workers rent shares around the mid-nineties; in highly regulated industries, mark-ups remained roughly unchanged while workers' bargaining power declined significantly; in other business services, both mark-ups and rent sharing remained virtually unchanged.

5 Concluding remarks

We investigate the extent to which the EU Single Market Programme has affected firms mark-ups over marginal costs. Since the Programme went hand in hand with structural reforms in the labour market and in the institutional setting of important industries (i.e. network industries), we control for a simultaneous break in the mark-ups and rent sharing between capital and workers by encompassing the hypothesis of efficient bargaining in the labour market both in the theoretical and in the empirical model. Using industry data for ten EU countries, at the aggregate level we find that the mark-up tended to increase in the nineties when we do not control for rent sharing. However, once we assume efficient bargaining in the labour market, the mark-up remain virtually unchanged while the share of rents accruing to workers declined. Disregarding the fall in the unions' bargaining power, a rise in firms' profitability due to rent reallocation could be wrongly interpreted as a reduction in competitive pressures in the product markets. At the sector level, the evidence proves particularly clear for manufacturing, construction and highly regulated industries, which went through deep institutional changes and privatization programmes. Our findings of both a sustained difference between prices and marginal costs on the product markets and a declining hedge between wages and labour productivity have further implications for the correct measurement of total factor productivity under imperfect markets. In our research agenda, we plan to undertake TFP estimation by explicitly taking into account our estimates of the mark-ups and unions' bargaining power in order to make the Solow residual a closer proxy for disembodied technical progress.

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Appendix I

Hall's standard model. The basic equation in growth accounting is the following:[17]

$$\Delta q = \varepsilon_{Q,N}\Delta n + \varepsilon_{Q,M}\Delta m + \varepsilon_{Q,K}\Delta k + \Delta e \tag{A.1}$$

where q is the log of gross output, n is the log of labour input, m is the log of intermediate inputs, k is the log of capital input, Δe is technical progress, and the parameters $\varepsilon_{Q,f}$ $(f = N,\ M,\ K)$ represent output elasticities with respect to labour, intermediate and capital inputs. Under the assumption of perfect competition and constant returns to scale, the output elasticities are just the input shares of total output. With imperfect competition these elasticities are given by the product of input shares and the mark-up term. This can be easily seen by expressing the marginal cost in the following way:

$$x = \frac{W\Delta N + R\Delta K + J\Delta M}{\Delta Q - \Delta e Q} \tag{A.2}$$

where W, R and J are, respectively, the price of labour, capital and intermediate goods. This can be rearranged in the following way:

$$\frac{\Delta Q}{Q} = \frac{WN}{xQ}\frac{\Delta N}{N} + \frac{JM}{xQ}\frac{\Delta M}{M} + \frac{RK}{xQ}\frac{\Delta K}{K} + \Delta e \tag{A.3}$$

by log-approximation:

$$\Delta q = \frac{WN}{xQ}\Delta n + \frac{JM}{xQ}\Delta m + \frac{RK}{xQ}\Delta k + \Delta e \tag{A.4}$$

Since the mark up μ is equal to P/x (that is output price over marginal cost), we obtain:

$$\Delta q = \mu\alpha_N\Delta n + \mu\alpha_M\Delta m + \mu\alpha_K\Delta k + \Delta e \tag{A.5}$$

where α_f are the input shares of output $(f = N,\ M,\ K)$.

As shown in section 2, assuming constant returns to scale this can be rearranged as:

$$\Delta q = \mu\alpha_N\Delta n + \mu\alpha_M\Delta m + (1 - \mu\alpha_N - \mu\alpha_M)\Delta k + \Delta e \tag{A.6}$$

Redefining $\mu = 1/(1 - B)$, we obtain:

$$\Delta q - \alpha_N\Delta n - \alpha_M\Delta m - (1 - \alpha_N - \alpha_M)\Delta k = B(\Delta q - \Delta k) + (1 - B)\Delta e \tag{A.7}$$

[17] Time subscripts dropped for simplicity.

which gives a decomposition (right hand side) of the standard Solow residual (the left hand side).

This equation can be estimated to retrieve B and therefore μ. However, given that the efficiency term $(1-B)\Delta e$ is not observable, instrumental variables are required to obtain consistent estimates.

Roeger's standard model. Roeger (1995) combines the primal and the dual solution to the firm's program to get rid of the unobservables. Starting from cost minimization, price variation can be expressed as:

$$\Delta p = \varepsilon_{Q,N}\Delta w + \varepsilon_{Q,M}\Delta j + (1 - \varepsilon_{Q,N} - \varepsilon_{Q,M})\Delta r - \Delta e \tag{A.8}$$

where $\Delta w, \Delta j, \Delta r$ are, respectively, the Δ log of input prices. This can be written as:

$$\Delta p = \frac{WN}{C}\Delta w + \frac{JM}{C}\Delta j + (1 - \frac{WN}{C} - \frac{JM}{C})\Delta r - \Delta e \tag{A.9}$$

where C is the total cost, WN and JM are the cost of labour and intermediate inputs. Cost shares represent both the output elasticities with respect to inputs and the cost and price elasticities with respect to the price of inputs. With perfect competition, for each production factor output share and cost share coincide; with imperfect competition, cost shares can be expressed as the product of the mark-up and the output shares, or, taking labour as an example:

$$\alpha_N = \frac{WN}{PQ}, \quad P = \frac{1}{1-B}x \quad \Longrightarrow \quad \frac{WN}{C} = \frac{\alpha_N}{1-B}$$

Equation (A.8) can be written:

$$\Delta p = \frac{\alpha_N}{1-B}\Delta w + \frac{\alpha_M}{1-B}\Delta j + (1 - \frac{\alpha_N}{1-B} - \frac{\alpha_M}{1-B})\Delta r - \Delta e \tag{A.10}$$

Rearranging we obtain:

$$\Delta p - \alpha_N\Delta w - \alpha_M\Delta j - (1 - \alpha_N - \alpha_M)\Delta r = B(\Delta p - \Delta r) - (1 - B)\Delta e \tag{A.11}$$

This can be used to substitute for $(1 - B)\Delta e$ in equation (7) to get:

$$[\Delta q - \alpha_N\Delta n - \alpha_M\Delta m - (1 - \alpha_N - \alpha_M)\Delta k] + [\Delta p - \alpha_N\Delta w - \alpha_M\Delta j - (1 - \alpha_N - \alpha_M)\Delta r] \tag{A.12}$$

$$= B[(\Delta q - \Delta k) + (\Delta p - \Delta r)] \tag{18}$$

As outlined in section 2, this equation, unlike Hall's, can be estimated through OLS, with the possibility of expressing all the variables in nominal terms, once a suitable user cost of capital is computed; in fact, rearranging:

$$(\Delta q+\Delta p)-\alpha_N(\Delta n+\Delta w)-\alpha_M(\Delta m+\Delta j)-(1-\alpha_N-\alpha_M)(\Delta k+\Delta r) \tag{A.13}$$
$$=B[(\Delta q+\Delta p)-(\Delta k+\Delta r)] \tag{19}$$

where $(\Delta q+\Delta p)$, $(\Delta n+\Delta w)$, $(\Delta m+\Delta j)$ and $(\Delta k+\Delta r)$ represent, respectively, the growth rate of nominal output and of nominal inputs compensation.

Hall's and Roeger' models with efficient bargaining. As shown in the main text, by assuming that firms and workers take other factors of production as given and choose W and N by solving a standard efficient bargaining problem, the elasticities of output with respect to inputs become (under the hypothesis of constant returns to scale):

$$\begin{cases} \varepsilon_{Q,N}=\mu\alpha_N+\mu\frac{\phi}{1-\phi}(\alpha_N-1) \\ \varepsilon_{Q,M}=\mu\alpha_M \\ \varepsilon_{Q,K}=[1-\mu\alpha_M-\mu\alpha_N-\mu\frac{\phi}{1-\phi}(\alpha_N-1)] \end{cases} \tag{A.16}$$

Defining $\gamma=\frac{\phi}{1-\phi}$ and using (A.16) to substitute for output elasticities in equation (A.1), we get the modified version of Hall's equation adopted by Dobbelaere (2004) and Abraham et al. (2009):

$$\Delta q-\alpha_N\Delta n-\alpha_M\Delta m-(1-\alpha_N-\alpha_M)\Delta k \tag{A.17}$$
$$=B(\Delta q-\Delta k)+\gamma(\alpha_N-1)(\Delta n-\Delta k)+(1-B)\Delta e \tag{20}$$

In order to get a correspondingly modified Roeger model, we can now substitute (A.16) in equation (A.8), obtaining a new version of equation (A.11):

$$\Delta p-\alpha_N\Delta w-\alpha_M\Delta j-(1-\alpha_N-\alpha_M)\Delta r \tag{A.18}$$
$$=B(\Delta p-\Delta r)+\gamma(\alpha_N-1)(\Delta w-\Delta r)-(1-B)\Delta e \tag{21}$$

Finally, combining equations (A.17) and (A.18) we obtain the modified version of Roeger's equation:

$$[\Delta q-\alpha_N\Delta n-\alpha_M\Delta m-(1-\alpha_N-\alpha_M)\Delta k]+[\Delta p-\alpha_N\Delta w-\alpha_M\Delta j-(1-\alpha_N-\alpha_M)\Delta r] \tag{A.19}$$
$$=B[(\Delta q-\Delta k)+(\Delta p-\Delta r)]+\gamma(\alpha_N-1)(\Delta n-\Delta k+\Delta w-\Delta r) \tag{22}$$

Rearranging it can be written as:

$$(\Delta q + \Delta p) - \alpha_N(\Delta n + \Delta w) - \alpha_M(\Delta m + \Delta j) - (1 - \alpha_N - \alpha_M)(\Delta k + \Delta r) \tag{A.20}$$

$$= B[(\Delta q + \Delta p) - (\Delta k + \Delta r)] + \gamma(\alpha_N - 1)[(\Delta n + \Delta w) - (\Delta k + \Delta r)] \tag{23}$$

which is equation (14) in the main text.

Appendix II

The modified Roeger equation reads:

$$\begin{aligned} NSR_{it} &= \beta_0 + \beta_1 XMARK_{it} + \beta_2 VBARG_{it} + \\ &+ \beta_3 F^M(t) XMARK_{it} + \beta_4 F^B(t) VBARG_{it} + u_{it} \end{aligned}$$

where $F^h(t) = 1/(1 + e^{-\rho(t-\tau_h)})$, with $h = M,\ B$, has been estimated through non-linear least squares.[18] In order to prevent non-convergence in the estimation process, we followed Badinger (2007) and ran a grid search setting the parameter ρ from the outset, starting from the value of 0.2 (a very smooth transition) and reaching 10 (a very steep shape, approximating a discrete regime shift), with a step increase of 0.01. At each step, we stored the non-linear least squares estimates of the remaining parameters, together with the sum of squared residuals (RSS), and eventually chose the parameter estimates and the value of ρ corresponding to the minimum RSS, once implausible outcomes, as a result of the convergence process, were discarded.

	Dependent variable: Nominal Solow Residual, or *NSR* in (17)				
	Total dataset	Manufacturing	Construction	Regulated services	Other services
	Regressors' coefficients				
XMARK	0.30***	0.20***	0.21***	0.36***	0.44***
	(0.02)	(0.00)	(0.04)	(0.04)	(0.03)
VBARG	0.22***	0.15***	0.23***	0.19***	0.46***
	(0.03)	(0.02)	(0.05)	(0.06)	(0.06)
F^M*(t)*XMARK*	-0.07*	-0.08***	-0.07*	-0.01	-0.10
	(0.04)	(0.02)	(0.04)	(0.08)	(0.08)
F^B*(t)*VBARG*	-0.18***	-0.10***	-0.20***	-0.20*	-0.09
	(0.07)	(0.02)	(0.06)	(0.12)	(0.14)
	Estimated parameters for regime change				
$\hat{\rho}$	2.13	9.94	9.97	1.32	6.90
$\hat{\tau}_M$	1997.4	1998.8	1992.8	1995.6	1990.1
$\hat{\tau}_B$	1997.3	1997.1	1998.0	1996.1	1990.6
	Diagnostics				
R-sq.	0.600	0.527	0.319	0.810	0.650
No. Obs.	3776	1893	240	720	923

Notes: economy wide output gap is included as regressor. Non linear least squares estimates; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significantat 10%.

Table AII.1 - non linear least squares estimates of the model with smooth transition functions

[18] The starting values of the coefficients $\beta_1$and β_2 were set equal to the corresponding least squares estimates of the linear model without any regime change (i.e. imposing $\beta_3 = \beta_4 = 0$); the starting value of β_0 was set at 1, while those of β_3 and β_4 were set at 0. The timing of the shifts τ_h ($h = M,\ B$) was initially set at 1993.

In Table AII.1, besides the β's coefficients for $XMARK$, $XBARG$ and their relative smooth transition variables, we report the estimated transition mid-points τ_h $(h = M, B)$ and the value of ρ minimizing RSS as the outcome of the grid search. The value of ρ has been selected among those implying transition mid-points falling between the end of the eighties and the end of the nineties, that is, the time range in which the actual regime shift towards the Single Market Programme settings most plausibly took place.

Appendix III

Dependent variable: Nominal Solow Residual, or *NSR* in (16)	(A)	(B)	(C)	(D)		(E)
Regressors' coefficients						
XMARK	0.17***	0.15***	0.27***	0.29***	*XMARK*	0.30***
	(0.023)	(0.023)	(0.030)	(0.029)		(0.028)
VBARG	-	-	0.16***	0.23***	*VBARG*	0.23***
			(0.041)	(0.040)		(0.039)
*XMARK*D93*	-	0.06	-	-0.02	*XMARK*D94*	-0.04
		(0.037)		(0.051)		(0.048)
*VBARG*D93*	-	-	-	-0.13**	*VBARG*D94*	-0.15**
				(0.062)		(0.062)
Estimated structural parameters						
$\hat{\mu}_{t<93}$	1.21	1.18	1.37	1.41	$\hat{\mu}_{t<94}$	1.42
	(0.033)	(0.031)	(0.056)	(0.058)		(0.057)
$\hat{\mu}_{t\geq 93}$	1.21	$1.27^{\dagger\dagger}$	1.37	*1.37*	$\hat{\mu}_{t\geq 94}$	*1.35*
	(0.033)	*(0.036)*	(0.056)	*(0.093)*		*(0.090)*
$\hat{\phi}_{t<93}$	-	-	0.14	0.19	$\hat{\phi}_{t<94}$	0.19
			(0.031)	(0.027)		(0.026)
$\hat{\phi}_{t\geq 93}$	-	-	0.14	$0.08^{\dagger\dagger}$	$\hat{\phi}_{t\geq 94}$	$0.07^{\dagger\dagger}$
			(0.031)	(0.048)		(0.050)
Diagnostics						
wald chi2 (*df*)	399.62 (*25*)	407.89 (*26*)	608.12 (*26*)	578.67 (*28*)	wald chi2 (*df*)	578.04 (*28*)
P-value	0.00	0.00	0.00	0.00	*P-value*	0.00
Hansen test (*df*)	138.69 (*322*)	145.59 (*322*)	140.45 (*645*)	132.21 (*645*)	Hansen test (*df*)	126.08 (*645*)
P-value	1.00	1.00	1.00	1.00	*P-value*	1.00
AR(1)	-3.830	-4.360	-3.780	-4.300	AR(1)	-4.270
P-value	0.00	0.00	0.00	0.00	*P-value*	0.00
AR(2)	1.32	1.34	1.30	1.29	AR(2)	1.33
P-value	0.19	0.18	0.19	0.20	*P-value*	0.18
No. Obs.	3776	3776	3776	3776	No. Obs.	3776

Notes: system GMM estimates with instruments given by all the regressors, exploiting all available lags. Time dummies and economy wide output gap are included as regressors. Robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. AR(1) and AR(2): Arellano-Bond tests for, respectively, first and second order correlation in first differences.

Table AIII.1 - GMM estimates: total dataset

	(A)	(B)	(C)	(D)		(E)
Dependent variable: Nominal Solow Residual, or *NSR* in (16)						
Regressors' coefficients						
XMARK	0.19***	0.16***	0.30***	0.29***	*XMARK*	0.30***
	(0.013)	(0.014)	(0.016)	(0.021)		(0.020)
VBARG	-	-	0.17***	0.22***	*VBARG*	0.23***
			(0.024)	(0.031)		(0.030)
*XMARK*D93*	-	0.07***	-	0.02	*XMARK*D94*	0.01
		(0.024)		(0.036)		(0.036)
*VBARG*D93*	-	-	-	-0.08*	*VBARG*D94*	-0.09**
				(0.047)		(0.047)
Estimated structural parameters						
$\hat{\mu}_{t<93}$	1.24	1.19	1.42	1.41	$\hat{\mu}_{t<94}$	1.43
	(0.020)	(0.020)	(0.033)	(0.042)		(0.041)
$\hat{\mu}_{t\geq 93}$	1.24	$1.29^{\dagger\dagger\dagger}$	1.42	1.46	$\hat{\mu}_{t\geq 94}$	1.45
	(0.020)	(0.023)	(0.033)	(0.061)		(0.066)
$\hat{\phi}_{t<93}$	-	-	0.15	0.18	$\hat{\phi}_{t<94}$	0.19
			(0.018)	(0.021)		(0.020)
$\hat{\phi}_{t\geq 93}$	-	-	0.15	$0.12^{\dagger\dagger}$	$\hat{\phi}_{t\geq 94}$	$0.12^{\dagger\dagger}$
			(0.018)	(0.026)		(0.028)
Diagnostics						
R-sq.	0.590	0.606	0.620	0.640	R-sq.	0.639
F-stat.	31.89	32.07	40.40	38.55	F-stat.	38.27
Prob>F	0.00	0.00	0.00	0.00	Prob>F	0.00
No. Obs.	3008	3008	3008	3008	No. Obs.	3008

Notes: time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%.

Table AIII.2 - Fixed effects OLS estimates: euro area

Dependent variable: Nominal Solow Residual, or *NSR* in (16)						
	(A)	(B)	(C)	(D)		(E)
Regressors' coefficients						
XMARK	0.18***	0.15***	0.28***	0.28***	*XMARK*	0.28***
	(0.025)	(0.019)	(0.031)	(0.032)		(0.031)
VBARG	-	-	0.17***	0.20***	*VBARG*	0.21***
			(0.033)	(0.045)		(0.044)
*XMARK*D93*	-	0.07**	-	0.04	*XMARK*D94*	0.02
		(0.035)		(0.055)		(0.047)
*VBARG*D93*	-	-	-	-0.06	*VBARG*D94*	-0.08*
				(0.051)		(0.048)
Estimated structural parameters						
$\hat{\mu}_{t<93}$	1.22	1.18	1.40	1.38	$\hat{\mu}_{<94}$	1.40
	(0.037)	(0.026)	(0.060)	(0.061)		(0.060)
$\hat{\mu}_{t\geq 93}$	1.22	$1.29^{\dagger\dagger\dagger}$	1.40	1.46	$\hat{\mu}_{t\geq 94}$	1.45
	(0.037)	(0.026)	(0.060)	(0.114)		(0.109)
$\hat{\phi}_{t<93}$	-	-	0.14	0.17	$\hat{\phi}_{t<94}$	0.18
			(0.024)	(0.031)		(0.030)
$\hat{\phi}_{t\geq 93}$	-	-	0.14	0.12	$\hat{\phi}_{t\geq 94}$	$0.12^{\dagger}$
			(0.024)	(0.031)		(0.032)
Diagnostics						
wald chi2 (*df*)	649.16 (*25*)	625.17 (*26*)	814.39 (*26*)	839.97 (*28*)	wald chi2 (*df*)	821.05 (*28*)
P-value	0.00	0.00	0.00	0.00	*P-value*	0.00
Hansen test (*df*)	113.66 (*322*)	105.01 (*322*)	110.65 (*645*)	106.37 (*645*)	Hansen test (*df*)	112.05 (*645*)
P-value	1.00	1.00	1.00	1.00	*P-value*	1.00
AR(1)	-3.020	-3.420	-3.060	-3.560	AR(1)	-3.510
P-value	0.00	0.00	0.00	0.00	*P-value*	0.00
AR(2)	0.90	0.89	0.89	0.89	AR(2)	0.90
P-value	0.37	0.37	0.37	0.37	*P-value*	0.37
No. Obs	3008	3008	3008	3008	Nobs	3008

Notes: system GMM estimates with instruments given by all the regressors, exploiting all available lags. Time dummies and economy wide output gap are included as regressors. Robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. AR(1) and AR(2): Arellano-Bond tests for, respectively, first and second order correlation in first differences.

Table AIII.3 - GMM estimates: euro area

Dependent variable: Nominal Solow Residual, or *NSR* in (16)		
	Recently reformed countries[1]	Others countries[2]
	Regressors' coefficients	
XMARK	0.28***	0.32***
	(0.039)	(0.041)
VBARG	0.21***	0.29***
	(0.050)	(0.068)
*XMARK*D94*	-0.07	0.01
	(0.046)	(0.069)
*VBARG*D94*	-0.19**	-0.11
	(0.092)	(0.078)
	Estimated structural parameters	
$\hat{\mu}_{t<94}$	1.40	1.47
	(0.077)	(0.089)
$\hat{\mu}_{t\geq 94}$	$1.27^{\dagger}$	1.49
	(0.059)	(0.174)
$\hat{\phi}_{t<94}$	0.17	0.22
	(0.034)	(0.041)
$\hat{\phi}_{t\geq 94}$	$0.01^{\dagger\dagger}$	0.15
	(0.083)	(0.047)
	Diagnostics	
wald chi2 (*df*)	488.48 (*28*)	545.78 (*28*)
P-value	0.00	0.00
Hansen test (*df*)	73.07 (*645*)	38.48 (*645*)
P-value	1.00	1.00
AR(1)	-4.070	-2.600
P-value	0.00	0.01
AR(2)	1.44	0.81
P-value	0.15	0.42
No. Obs.	2252	1524

Notes: system GMM estimates with instruments given by all the regressors, exploiting all available lags. Time dummies and economy wide output gap are included as regressors. Robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. AR(1) and AR(2): Arellano-Bond tests for, respectively, first and second order correlation in first differences. (1) Germany, Italy, Spain, Belgium, Netherlands, Denmark. (2) United Kingdom, France, Austria, Finland.

Table AIII.4 - GMM estimates: recently reformed and other countries

	Dependent variable: Nominal Solow Residual, or *NSR* in (16)						
	(A)	(B)	(C)	(D)		(E)	(F)
	Manuf.	Manuf.	Constr.	Constr.		Manuf.	Constr.
			Regressors' coefficients				
XMARK	0.09***	0.18***	0.06***	0.18***	*XMARK*	0.19***	0.19***
	(0.010)	(0.021)	(0.023)	(0.057)		(0.019)	(0.054)
VBARG	-	0.14***	-	0.18**	*VBARG*	0.15***	0.20**
		(0.029)		(0.083)		(0.027)	(0.084)
*XMARK*D94*	0.02	-0.00	-0.04**	-0.04	$XMARK*DT^M$	-0.05***	-0.08***
	(0.012)	(0.021)	(0.017)	(0.035)		(0.017)	(0.018)
*VBARG*D94*	-	-0.03	-	-0.01	$VBARG*DT^B$	-0.08***	-0.14***
		(0.030)		(0.061)		(0.026)	(0.027)
			Estimated structural parameters				
$\hat{\mu}_{t<94}$	1.10	1.21	1.07	1.21	$\hat{\mu}_{t<T^M}$	1.23	1.24
	(0.012)	(0.031)	(0.026)	(0.083)		(0.029)	(0.083)
$\hat{\mu}_{t\geq94}$	1.12	1.21	$1.02^{\dagger\dagger}$	1.15	$\hat{\mu}_{t\geq T^M}$	$1.16^{\dagger\dagger}$	1.13
	(0.013)	(0.027)	(0.023)	(0.091)		(0.025)	(0.078)
$\hat{\phi}_{t<94}$	-	0.12	-	0.15	$\hat{\phi}_{t<T^B}$	0.13	0.16
		(0.023)		(0.060)		(0.020)	(0.059)
$\hat{\phi}_{t\geq94}$	-	0.10	-	0.14	$\hat{\phi}_{t\geq T^B}$	$0.07^{\dagger\dagger}$	0.05
		(0.022)		(0.077)		(0.024)	(0.089)
			Diagnostics				
wald chi2 (*df*)	794.27 (*26*)	1263.57 (*28*)	129.11 (*26*)	1065.50 (*28*)	wald chi2 (*df*)	1268.20 (*28*)	221.99 (*28*)
P-value	0.00	0.00	0.00	0.00	*P-value*	0.00	0.00
Hansen test (*df*)	60.89 (*322*)	62.97 (*645*)	0 (*187*)	0 (*205*)	Hansen test (*df*)	58.17 (*645*)	0 (*205*)
P-value	1.00	1.00	1.00	1.00	*P-value*	1.00	1.00
AR(1)	-4.340	-4.250	-2.660	-2.590	AR(1)	-4.280	-2.640
P-value	0.00	0.00	0.01	0.01	*P-value*	0.00	0.01
AR(2)	-0.26	-0.27	-0.50	-0.56	AR(2)	-0.07	-0.05
P-value	0.80	0.79	0.62	0.58	*P-value*	0.95	0.96
No. Obs.	1893	1893	240	240	No. Obs.	1893	240

Notes: system GMM estimates with instruments given by all the regressors, exploiting all available lags. Time dummies and economy wide output gap are included as regressors. Robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. AR(1) and AR(2): Arellano-Bond tests for, respectively, first and second order correlation in first differences. T^M is equal to 1999 for Manufacturing and to 1993 for Construction; T^B is equal to 1997 for Manufacturing and to 1998 for Construction.

Table AIII.5 - GMM estimates: industry

	(A) Regul.	(B) Regul.	(C) Others	(D) Others		(E) Regul.	(F) Others
	Dependent variable: nominal Solow residual, or *NSR* in (16)						
	Regressors' coefficients						
XMARK	0.24***	0.36***	0.17***	0.38***	*XMARK*	0.36***	0.38***
	(0.021)	(0.041)	(0.019)	(0.044)		(0.043)	(0.041)
VBARG	-	0.20**	-	0.36***	*VBARG*	0.19**	0.37***
		(0.077)		(0.078)		(0.078)	(0.073)
*XMARK*D94*	0.08***	0.00	-0.04*	0.02	*XMARK*DT* ^{M}	0.02	0.02
	(0.024)	(0.085)	(0.023)	(0.087)		(0.022)	(0.062)
*VBARG*D94*	-	-0.15	-	0.11	*VBARG*DT* ^{B}	-0.15***	0.10
		(0.140)		(0.141)		(0.035)	(0.099)
	Estimated structural parameters						
$\hat{\mu}_{t<94}$	1.32	1.56	1.21	1.61	$\hat{\mu}_{t<T^M}$	1.55	1.61
	(0.037)	(0.098)	(0.027)	(0.114)		(0.103)	(0.106)
$\hat{\mu}_{t\geq94}$	$1.49^{\dagger\dagger\dagger}$	1.57	$1.15^{\dagger}$	1.67	$\hat{\mu}_{t\geq T^M}$	1.61	1.66
	(0.046)	(0.206)	(0.025)	(0.219)		(0.130)	(0.177)
$\hat{\phi}_{t<94}$	-	0.16	-	0.27	$\hat{\phi}_{t<T^B}$	0.16	0.27
		(0.054)		(0.042)		(0.055)	(0.039)
$\hat{\phi}_{t\geq94}$	-	0.05	-	0.32	$\hat{\phi}_{t\geq T^B}$	$0.04^{\dagger}$	0.32
		(0.122)		(0.061)		(0.073)	(0.051)
	Diagnostics						
wald chi2 (*df*)	6395.63 (*26*)	27640.06 (*28*)	667.42 (*26*)	1547.90 (*28*)	wald chi2 (*df*)	92963.66 (*28*)	1546.70 (*28*)
P-value	0.00	0.00	0.00	0.00	*P-value*	0.00	0.00
Hansen test (*df*)	3.72 (*322*)	3.05 (*526*)	9.23 (*322*)	9.50 (*606*)	Hansen test (*df*)	3.47 (*526*)	8.85 (*606*)
P-value	1.00	1.00	1.00	1.00	*P-value*	1.00	1.00
AR(1)	-2.630	-2.700	-3.950	-3.710	AR(1)	-3.150	-3.670
P-value	0.01	0.01	0.00	0.00	*P-value*	0.00	0.00
AR(2)	0.80	0.78	-0.72	0.50	AR(2)	0.64	0.49
P-value	0.42	0.44	0.47	0.62	*P-value*	0.53	0.63
No. Obs.	720	720	923	923	No. Obs.	720	923

Notes: system GMM estimates with instruments given by all the regressors, exploiting all available lags. Time dummies and economy wide output gap are included as regressors. Robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. AR(1) and AR(2): Arellano-Bond tests for, respectively, first and second order correlation in first differences. T^M is equal to 1994 for both Regulated and Other services; T^B is equal to 1996 for Regulated services and to 1995 for Other services.

Table AIII.6 - GMM estimates: services

Dependent variable: Nominal Solow Residual, or *NSR* in (16)			
	Food, bever., text. and leath.[1]	Paper, chemic., plast. and metals[2]	Mach., electr. and transp. equip.[3]
Regressors' coefficients			
XMARK	0.16***	0.18***	0.28***
	(0.018)	(0.017)	(0.018)
VBARG	0.10***	0.12***	0.29***
	(0.023)	(0.024)	(0.029)
*XMARK*D99*	0.00	-0.05**	-0.10***
	(0.024)	(0.025)	(0.026)
*VBARG*D97*	0.01	-0.11***	-0.13***
	(0.024)	(0.033)	(0.037)
Estimated structural parameters			
$\hat{\mu}_{t<99}$	1.18	1.22	1.39
	(0.025)	(0.025)	(0.034)
$\hat{\mu}_{t\geq 99}$	1.19	$1.15^{\dagger\dagger}$	$1.23^{\dagger\dagger\dagger}$
	(0.035)	(0.031)	(0.038)
$\hat{\phi}_{t<97}$	0.09	0.11	0.22
	(0.019)	(0.019)	(0.017)
$\hat{\phi}_{t\geq 97}$	0.09	$0.02^{\dagger\dagger\dagger}$	$0.14^{\dagger\dagger\dagger}$
	(0.021)	(0.028)	(0.023)
Diagnostics			
R-sq.	0.585	0.656	0.529
F-stat.	17.56	22.03	18.80
Prob>F	0.00	0.00	0.00
No. Obs.	480	714	699

Notes: time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. (1) Food, beverages and tobacco; Textiles, leather and footwear. (2) Pulp, paper, printing and publishing; Chemicals, rubber, plastics and fuel; Basic metals and fabricated metals. (3) Machinery, n.e.c.; Electrical and optical equipment; Transport equipment.

Table AIII.7 - Fixed effects OLS estimates: low, medium and high tech industrial sectors

Dependent variable: Nominal Solow Residual, or *NSR* in (16)			
	Food, bever., text. and leath.[1]	Paper, chemic., plast. and metals[2]	Mach., electr. and transp. equip.[3]
Regressors' coefficients			
XMARK	0.16***	0.16***	0.27***
	(0.016)	(0.026)	(0.024)
VBARG	0.09***	0.10***	0.29***
	(0.024)	(0.036)	(0.034)
*XMARK*D99*	0.01	-0.04*	-0.08***
	(0.020)	(0.024)	(0.027)
*VBARG*D97*	0.01	-0.10***	-0.14***
	(0.029)	(0.037)	(0.035)
Estimated structural parameters			
$\hat{\mu}_{t<99}$	1.18	1.19	1.36
	(0.023)	(0.037)	(0.044)
$\hat{\mu}_{t\geq 99}$	1.20	1.14	$1.22^{\dagger\dagger\dagger}$
	(0.039)	(0.039)	(0.033)
$\hat{\phi}_{t<97}$	0.09	0.09	0.22
	(0.020)	(0.030)	(0.020)
$\hat{\phi}_{t\geq 97}$	0.10	$0.00^{\dagger\dagger}$	$0.13^{\dagger\dagger\dagger}$
	(0.026)	(0.038)	(0.019)
Diagnostics			
wald chi2 (*df*)	4399.89 (*28*)	15547.93 (*28*)	10836.09 (*28*)
P-value	0.00	0.00	0.00
Hansen test (*df*)	0 (*391*)	9.96 (*520*)	1.28 (5*18*)
P-value	1.00	1.00	1.00
AR(1)	-3.430	-4.630	-2.710
P-value	0.00	0.00	0.01
AR(2)	-0.32	-1.27	0.58
P-value	0.75	0.20	0.56
No. Obs.	480	714	699

Notes: system GMM estimates with instruments given by all the regressors, exploiting all available lags. Time dummies and economy wide output gap are included as regressors. OLS estimates with country-sector fixed effects; robust standard errors in parenthesis. *** Significant at 1%, ** significant at 5%, * significant at 10%. The level shift of the structural parameters (i.e. the difference between the estimates before and after the time breaks) is: ††† significant at 1%, †† significant at 5%, † significant at 10%. AR(1) and AR(2): Arellano-Bond tests for, respectively, first and second order correlation in first differences. (1) Food, beverages and tobacco; Textiles, leather and footwear. (2) Pulp, paper, printing and publishing; Chemicals, rubber, plastics and fuel; Basic metals and fabricated metals. (3) Machinery, n.e.c.; Electrical and optical equipment; Transport equipment.

Table AIII.8 - GMM estimates: low, medium and high tech industrial sectors

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