Macroeconomic estimates of Italy's mark-ups in the long-run

Preliminary draft

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Summary

In order to compute Italy's mark-ups via indirect measures as a proxy of competition in the product markets, we explore three alternative methodologies employed in the existing international economic history literature. We use the new historical national accounts series provided in Baffigi (2014) and Giordano and Zollino (2014); owing to current data limitations, only the mark-up for the total economy may be computed for the whole period since Italy's unification. Whereas Roeger (1995)'s model allows to estimate only average mark-ups over sub-periods, Crafts and Mills' (2005) and Morrison's (1988) methods produce time series of price-cost margins, but at the same time are more data-demanding and present several econometric and computational issues. Resulting levels and developments of the estimated mark-ups are dissimilar, yet two features of Italy's history are robust across the three methodologies: *a)* the increase in market power under the Fascist regime (in particular in the 1930s) and *b)* the strengthening of competition since 1993, at least relative to the two post-WWII decades. We then move on to a more limited time-span (1970–2007) in order to explore the underlying developments across main sectors by using the same model as in Bassanetti, Torrini and Zollino (2010), which extends Roeger's (1995) methodology to include imperfect competition also in the labour market. Our contributions are to nearly double the number of sectors considered, as well as to expand the time horizon by almost 15 years. We find evidence of a reduction in mark-ups in Italy after the completion of the Single Market, both for the whole economy and the main groupings of sectors, owing mostly to decreases in workers' bargaining power than in firms' margins. Moreover, we find large heterogeneity in mark-ups across sectors, with regulated service sectors displaying weaker competition than manufacturing and market services, confirming the importance of sectoral analysis also in indirect mark-up estimation.

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1 Introduction

Measuring the level of competition of an economy and of its sectors has become a relevant topic in recent years, since many theoretical and empirical studies have pointed to beneficial effects of competition on economic growth (see Cohen, 2010 for a survey of the literature). According to the nature of the data available and to the size of the relevant market considered, alternative measures of the degree of competition may be used. It may in fact be measured directly, on the basis of microdata, via for instance the construction of concentration indices, Lerner indices, the elasticity of profits to marginal costs (see Ciapanna, 2008 for a detailed overview) or indirectly, on the basis of national accounts series, via a range of alternative methods.

In order to estimate the mark-up of prices on marginal costs of the Italian economy in the long-run we make use of the second field of indirect macroeconomic measures. In the first part of the paper, we experimentally estimate Italy's mark-ups over the past 150 years, by investigating three alternative methodologies employed in the economic history literature in order to appraise the evolution of competition in Italy during its various phases of growth, to the extent that a larger mark-up actually does imply weaker competition in the product market[1]. In particular we employ the methods described in Roeger (1995), Crafts and Mills (2005) and Morrison (1988). To our knowledge, this is the first study referred to the Italian economy which attempts to achieve this aim; it has been made possible by the recent reconstruction of new historical national account data for Italy (Baffigi 2014; Giordano and Zollino 2014). However, owing to the current unavailability of disaggregated data for the overall period since 1861, only a total economy mark-up could be estimated. Two features of Italy's economic history robustly stand out: the drop in competition under Fascism and the strengthening of competition after 1993, at least compared with the immediate post-WWII period. Strong conclusions on other sub-periods of Italy's history cannot be reached.

The three methodologies used in our historical analysis present both theoretical shortcomings and econometric issues. In the second part of the paper, we attempt to overcome both sets of drawbacks. On the one hand we adopt an extension of Roeger's (1995) model, developed in Bassanetti, Torrini, Zollino (2010), which relaxes the assumption of perfect competition in the labour market too. On the other hand, we choose to focus on a shorter time-span, i.e the past forty years of Italy's history, for which disaggregated data are available, thereby estimating more robust total-economy, as well as sectoral, mark-ups. Evidence of a strengthening of competition after 1993 is clear-cut, also across sectors. Yet large variation of mark-ups across sectors also stands out, confirming the relevance of sectoral analysis in the estimation of mark-ups.

The paper is structured as follows. Section 2 briefly outlines the three approaches which have been applied in the economic history literature to indirectly measure mark-ups, put forward respectively in Roeger (1995), Crafts and Mills (2005) and Morrison (1988). Section 3 describes the historical dataset used and the total economy mark-up estimation results according to the three methodologies. Section 4 describes the approach derived in Bassanetti, Torrini and Zollino (2010), which overcomes a major shortcoming of Roeger's model (i.e. the assumption of perfect competition in the labour market). Section 5 describes the EU-KLEMS dataset, which refers to a shorter time-span (1970-2007) but which presents a detailed sectoral breakdown. Section 6 estimates total-economy and sectoral mark-ups, by applying Bassanetti, Torrini and Zollino's (2010) model to the EU-KLEMS dataset. Section 7 draws up our conclusions and defines a future research agenda. Appendix 1 outlines the derivations underlying Hall's (1988) and Roeger's (1995) seminal models, as well as Bassanetti, Torrini and Zollino's (2010) methodology.

[1]High mark-ups cannot be taken unconditionally as evidence of persistent rents stemming from market power. They may, for instance, reflect temporary innovation rents. In this paper, however, we consider mark-ups as a loose inverse proxy of competitive pressures.

2 Three alternative approaches to estimating historical mark-ups

2.1 Roeger's (1995) model

Roeger's (1995) model to estimate mark-ups builds upon seminal work by Hall (1988), in turn based on a standard growth accounting exercise. Hall's paper however presents some severe empirical drawbacks which were overcome by Roeger.

Hall's method of estimating price mark-ups on marginal costs is a rearrangement of the Solow residual, once the assumption of perfect competition on the product markets is relaxed.

The basic equation in growth accounting exercises is the following:[2]

$$\Delta q = \varepsilon_{Q,L}\Delta l + \varepsilon_{Q,M}\Delta m + \varepsilon_{Q,K}\Delta k + \Delta e \tag{1}$$

where q is the log of gross output, l 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 $\varepsilon_{Q,f}$ ($f = L$, M, K) represent output elasticities relative to labour, intermediate and capital inputs, respectively. Under the assumptions of perfect competition on both output and input markets, as well as of constant returns to scale, the output elasticities are the input shares of total output. Hall (1988) proved 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 (see Appendix I for a derivation):

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

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

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

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

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

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

which on the right hand side gives a decomposition of the standard Solow residual shown on the left hand side. Hall (1998) therefore shows that under imperfect competition in the product market, the Solow residual is not solely a a measure of technological change, but a weighted sum of technological change and the growth rate of the capital-output ratio, where the weights are a function of the mark-up. If the mark-up were equal to 1 (i.e. perfect competition), then the Solow residual would be equal to the technological change (since B would be equal to 0). Equation 4 can be estimated in order to obtain an estimate of B and therefore of μ. However, given that the efficiency term $(1 - B)\Delta e$ is not observed, instrumental variables are required to obtain consistent estimates.

By combining primal and dual accounting methods, Roeger (1995) devised a way to cancel out the unobservable efficiency term and therefore to eliminate the need to resort to instrumental variables. He showed that the following equations holds (again see Appendix I):

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

where $(\Delta q + \Delta p)$, $(\Delta l + \Delta w)$, $(\Delta m + \Delta j)$ and $(\Delta k + \Delta r)$ represent, respectively, the growth rate of nominal output and inputs 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 (observable) nominal revenue-capital ratio. In other terms, the NSR is a function of the mark-up and the difference between nominal output growth and nominal capital cost growth.

[2] Time subscripts are dropped for simplicity.

The appeal of Equation 5 is that it can be estimated via Ordinary Least Squares (OLS), and the mark-up easily derived as $\hat{\mu} = \frac{1}{1-\hat{B}}$. 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[3]. However, aside perfect competition on the output market, the model preserves the remaining restrictive assumptions underlying a growth accounting exercise (constant returns to scale, perfect competition on the input market, full flexibility of inputs). Moreover, the main empirical drawback, as shown in Section 3.2 is that it does not provide a time series of mark-ups, but rather an average measure.

2.2 Crafts and Mills' (2005) methodology

Crafts and Mills (2005) instead rely on the definition of the mark-up as a function of the inverse demand elasticity, as derived from a standard firm's profit maximization problem:

$$M = \frac{p_Y}{MC} = \frac{1}{(1 + \varepsilon_P Y)} \tag{6}$$

In order to estimate the elasticity ε_P, they regress p_Y on Y:

$$p_{Y,t} = b_0 + b_1 Y_t + u_t \tag{7}$$

As a result,

$$\hat{b}_1 = \frac{\Delta p_Y}{\Delta Y} \tag{8}$$

and ε_P may be derived as a function of the estimated coefficient:

$$\hat{\varepsilon}_{PY} = \frac{\frac{\Delta p_Y}{p_Y}}{\frac{\Delta Y}{Y}} = \hat{b}_1 \frac{Y}{P} \tag{9}$$

Crafts and Mills (2005) estimated Equation 7 for both the United Kingdom and West Germany over the period 1954–1996, with real gross output as Y and wholesale prices as p_Y. In order to correctly identify their model as a demand equation, they employed $\Delta p_{Y,t-1}$, $\Delta p_{Y,t-2}$, ΔY_{t-1} and ΔY_{t-2} as instrumental variables and ran a two-stage least squares (2SLS) procedure.

The advantage of this methodology is that it does not require the restrictive assumptions on which Roeger's (1995) model is based. However, as will later become clear in Section 3.2, it presents numerous empirical issues, which cannot be entirely overcome in the case of the Italian data.

2.3 Morrison's (1988) model

Morrison (1988) intended to relax the restrictive assumptions underpinning a standard growth accounting exercise. This model, in its version employed by Rossi and Toniolo (1992; 1993; 1996) and by Crafts and Mills (2005), considers a representative firm which maximises profits under non-constant returns to scale and with semi-fixed inputs[4]. The short-term equilibrium of the firm's technology is described by the variable cost function: $c_v = c_v(w, y, k, t)$, where w is the price vector of flexible inputs, y is the output, k is the vector of semi-fixed factors of production, t is the technology. The application of Shephard's lemma to this cost function determines the demand equation for the variable inputs: $x = \frac{\Delta c_v(w,y,k,t)}{\Delta w}$. Assuming a Generalized Leontief variable cost function with two flexible inputs (labour and imports), one quasi-fixed input (private net capital stock) and two exogeneous arguments (private investment; public capital stock), the empirical counterpart to this demand equation is the following system of two equations:

[3] As we shall see, this issue is particularly relevant in the case of long-run data for Italy, in particular in the 1951-81 period.

[4] Formal derivations of this model may be found in Rossi and Toniolo (1993) and Crafts and Mills (2005), to which we refer.

$$
\begin{aligned}
x_l/Y = {} & \alpha_{ll} + \alpha_{lm}(w_m/w_l)^{0.5} + \beta_{ly}Y^{0.5} + \beta_{lt}t^{0.5} + \beta_{lb}b^{0.5} + \beta_{lx}x^{0.5} + \beta_{lk}(k/Y)^{0.5} + \\
& + \gamma_{yy}Y + \gamma_{tt}t + \gamma_{bb}b + \gamma_{xx}x \\
& + \gamma_{yt}(Yt)^{0.5} + \gamma_{yb}(Yb)^{0.5}\gamma_{yx}(Yx)^{0.5} + \gamma_{tb}(tb)^{0.5} + \gamma_{yk}k^{0.5} + \\
& + \gamma_{tk}(tk/Y)^{0.5} + \gamma_{bk}(bk/Y)^{0.5} + \gamma_{xk}(xk/Y)^{0.5} + \gamma_{kk}(k/Y)
\end{aligned}
\tag{10}
$$

and

$$
\begin{aligned}
x_m/Y = {} & \alpha_{mm} + \alpha_{ml}(w_l/w_m)^{0.5} + \beta_{my}Y^{0.5} + \beta_{mt}t^{0.5} + \beta_{mb}b^{0.5} + \beta_{mx}x^{0.5} + \beta_{mk}(k/Y)^{0.5} + \\
& + \gamma_{yy}Y + \gamma_{tt}t + \gamma_{xx}x + \gamma_{bb}b + \\
& + \gamma_{yt}(Yt)^{0.5} + \gamma_{yb}(Yb)^{0.5} + \gamma_{tb}(tb)^{0.5}t\gamma_{tx}(tx)^{0.5} + \gamma_{yk}k^{0.5} + \\
& + \gamma_{tk}(tk/Y)^{0.5} + \gamma_{bk}(bk/Y)^{0.5}\gamma_{xk}(xk/Y)^{0.5} + \gamma_{kk}(k/Y)
\end{aligned}
\tag{11}
$$

where x_l is the labour input, x_m represents imports, Y is the total supply defined as the sum of the total economy value added at factor costs and of imports, b is investment in private capital stock k, x is the stock of public infrastructure capital and t is technology, proxied by a linear trend in Crafts and Mills (2005).

The marginal cost is given by:

$$
\begin{aligned}
MC = \frac{\Delta C}{\Delta Y} = {} & \{\alpha_{ll}w_l + \alpha_{mm}w_m + (\alpha_{lm} + \alpha_{ml})(w_l w_m)^{0.5} + (\beta_{lt}w_l + \beta_{mt}w_m)t^{0.5} + \\
& + (\beta_{lb}w_l + \beta_{mb}w_m)b^{0.5} + (\beta_{lx}w_l + \beta_{mx}w_m)x^{0.5} + (\beta_{ly}w_l + \beta_{my}w_m)Y^{0.5} + \\
& + (w_l + w_m)[\gamma_{yy}Y + \gamma_{ll}l + \gamma_{bb}b + \gamma_{xx}x + \gamma_{yt}(Yt)^{0.5} + \gamma_{yb}(Yb)^{0.5} + \gamma_{yx}(Yx)^{0.5} + \\
& + \gamma tb(tb)^{0.5} + \gamma tx(tx)^{0.5} + \gamma bx(bx)^{0.5}]\} + \\
& + 0.5Y^{0.5}(\beta_{ly}w_l + \beta_{my}w_m) + (w_l + w_m)[\gamma_{yy}Y + \frac{1}{2}\gamma_{yt}(Yt)^{0.5} + \\
& + \frac{1}{2}\gamma_{yb}(bY)^{0.5} + \frac{1}{2}\gamma_{yb}(bY)^{0.5} + \frac{1}{2}\gamma_{xy}(xY)^{0.5}] + 0.5(\beta_{lx}w_l + \beta_{mx}w_m)(\frac{k}{Y})^{0.5} + \\
& + 0.5(w_l + w_m)[\gamma_{yk}(\frac{k}{Y})^{0.5} + \gamma tk(\frac{k}{Y})^{0.5} + \gamma bk(\frac{bk}{Y})^{0.5} + \gamma xk(\frac{xk}{Y})^{0.5}] + \\
& + 0.5(w_l + w_m)\gamma_{yk}k
\end{aligned}
\tag{12}
$$

The mark-up is thereby measured as the ratio of the total supply deflator to the marginal cost computed as in Equation 12.

Whereas this model overcomes the restrictive assumptions retained in Roeger's (1995) approach, similarly to Crafts and Mills (2005) its empirical implementation with Italian data, as shown in the next Section, is not straightforward.

3 Our 1861-2011 dataset and total-economy mark-up estimates

3.1 The data

In order to produce estimates of mark-ups in Italy in the long-run according to the three described methods, a large historical dataset was required. Demand and supply-side national account aggregates, both at current and constant prices, are provided in Baffigi (2014) for the period 1861-2011. However, whereas the supply-side estimates are available for eleven sectors, the demand-side ones are available only for the total economy. The absence of a sectoral breakdown for many series therefore hindered us from computing sectoral mark-ups.

With respect to inputs, 1861–2011 capital and labour series, as well as wage and user costs of capital data, were taken from Giordano and Zollino (2014). The labour input series are available for ten sectors of the economy[5]. The current and constant, net and gross, capital stock series were built by using Baffigi's (2014) investment data and therefore refer only to the total economy[6].

As well as employing the 150 year-long series, constant price data were also broken down into the original six sub-periods, delimitated by benchmark years, the so-called *piloni*[7], for which specific price deflators exist: 1861-1911; 1911-1938; 1938-1951; 1951-1970; 1970-1992; 1992-2011. These sub-periods also roughly coincide with the different historical phases of Italy's long-run development. Owing to missing and poor quality data for the World War Two years, as well as the highly exceptional circumstances of war periods, the observations referring to the two World Wars were discarded. Crafts and Mills' (2005) method also required a number of additional series, other than national account data, which we describe in the relevant sub-section.

3.2 Our estimation results

Our Roeger estimates. Owing to the absence of long-run series on intermediate inputs and gross production, we had to adapt Equation 5 in the following manner:

$$\begin{aligned}&(\Delta v + \Delta d) - \alpha_L (\Delta l + \Delta w) - (1 - \alpha_N) (\Delta k + \Delta r) \\ &= B[(\Delta v + \Delta d) - (\Delta k + \Delta r)]\end{aligned} \tag{13}$$

where $(\Delta v + \Delta d)$ represents the growth rate of nominal value added v and of the value added deflator d[8].

Our mark-up estimates employing the Roeger approach, run on data net of the housing sector, are presented in Table 3.2.[9] According to Wald tests, the estimated mark-up proved to be significantly different than 1. However, over the 150 years of Italy's unified history appreciable variation in the total economy mark-up arises. In particular, in the three decades after the country's political unification, the level of competition was at a historical low; the estimated mark-up was then halved during the so-called Giolitti era, when monopolistic pressures were alleviated in many sectors and when external trade was liberalised (see James and O'Rourke, 2013). Competition weakened once again under the Fascist regime; due to the limited numerosity of the sample, it is not however possible, via the Roeger method, to separate the 1920s, a more liberal phase, from the 1930s, when specific anti-competition industrial policies were introduced[10]. In the two decades following WWII, the estimated mark-up was still very high, whereas it dropped in the most recent 1971–2011 period. However, standing to the results presented in Table 3.2, competition was stronger in the Seventies and Eighties relative to the past twenty years[11]. Our results for short sub-periods are however strongly conditioned by the small numerosity of the sample, issue which

[5]The sectors coincide with the supply-side national account ones in Baffigi (2013), with the exception of the housing sector which by definition has no workers.

[6]Sources and methodological details are documented in Giordano and Zollino (2014). The series provided are a revision, extension and refinement of those used in Broadberry, Giordano and Zollino (2011; 2013).

[7]See Baffigi (2014) for details.

[8]Also Roeger's (1995) original model was estimated on value added data, which however induces an upward bias in the mark-up estimation (see for example Norrbin, 1993; Griffith and Harrison, 2004). This issue will be tackled by us in Section 6.

[9]Nominal output is measured at factor costs, thereby avoiding potential upward biases stemming from the inclusion of net indirect taxes (see Oliveira Martins, Scarpetta and Pilat 1996a). All details and regression diagnostics of our estimation results, which for the sake of brevity are omitted in the whole of this section, are available upon request.

[10]See Giordano and Giugliano (2014) which documents how the competition policy shift during the Fascist regime did indeed affect the degree of market power, measured via sectoral concentration indices. See also Giordano, Piga and Trovato (2013) on the same period.

[11]A similar result is found in Griffith and Harrison (2004), who estimate business economy mark-ups over value added in 1980–2002 for a selection of EU countries in an equivalent framework to Roeger's (1995). Their estimate of Italy's mark-up shows an increasing trend as of the early Eighties, peaking in the last years of their sample (the early 2000s). In particular, Italy's business sector mark-up rises from 1.3 to 1.5 in the twenty years considered, proving to be the highest of their 13-country sample over the entire time-span.

Table 1: Italy's total economy mark-up estimated via Roeger's (1995) methodology

Years	Mark-up estimates
1861–1911	2.06
1861–1897	2.66
1898–1914	1.37
1911–1950	2.06
1920–1938	2.01
1951–1970	2.37
1971–2011	1.82
1971–1992	1.76
1993–2011	2.01

will be overcome for the most recent period by employing sectorally disaggregated data in Section 6.

Our Crafts and Mills estimates. Also in the computation of the Crafts and Mills' (2005) model, some data adjustments were made necessary in order to adapt it to the Italian case. Instead of employing gross output and wholesale prices, we had to rely on the existing data on total value added and its relative price deflator. However, we were able to net out both the housing sector and Government services from the total economy in order to focus on the productive private sector[12]. Furthermore, the model specification used for United Kingdom and West Germany by Crafts and Mills (2005) (Equation 7), together with the listed instrumental variables, turned out to be too parsimonious in the Italian case, since it was not sufficient to identify the equation as a demand function[13].

We therefore modified the specification of Equation 7 to better adapt to the Italian case over its various phases. In particular, we estimated the following equation (in first differences, due to the non-stationary properties of the original series, issue to which we will later return):

$$\Delta p_{Y,t} = b_0 + b_1 \Delta Y_t + b_2 \Delta e_t + b_3 \Delta c_t + b_4 \Delta M2_t + b_5 \Delta n_t + v_t \tag{14}$$

where e_t is the lire(euro-lire)-UK sterling pound exchange rate; c_t is the price of coal until 1951 and the price of oil thereafter; $M2_t$ is the M2 monetary supply and n_t is the net emigration rate (emigrants net of return migrants on total resident population in Italy).

In particular, we derived the exchange rate series by splicing Ciocca and Ulizzi (1990)'s 1861–1979 series, with the *Ufficio Italiano Cambi* series for 1918–1998 and with the official European Central Bank rates for the remaining period. The price of coal was taken from Bardini (1998) for the 1870–1914 period and then spliced with the series in Rey (1991) for the subsequent years; oil prices as of 1957 are sourced from the International Monetary Fund. The M2 series was also the result of a reconciliation of various series: elaborations on De Mattia (1990)[14] for the 1861–1913 period were spliced with Ufficio ricerche storiche della Banca d'Italia (1997) for 1890–1936, Garofalo and Colonna (1998) for 1936–1965 and Banca d'Italia (2005) for 1948–1998. The net emigration rate is taken from Giffoni and Gomellini (2013).

The choice of our control variables, suggested by economic theory, was strongly conditioned by data availability. Our instrumental variables were also similarly constrained. As well as the four instruments chosen by Crafts and Mills (2005), mentioned in Section 2.2 we also employed ΔX_{t-1}, ΔX_{t-2} and ΔFM_{t-1}, where X is the series of Italy's exports (taken

[12]The latter refinement was not possible when implementing Roeger's methodology since the available capital stock data taken from Giordano and Zollino (2014) includes the contribution of the Government sector.

[13]Our estimated $\hat{b}_1$ of Equation 7 was in fact positive, even when we replaced Y with the domestic demand and p_Y with its corresponding deflator.

[14]We are grateful to Federico Barbiellini Amidei for these elaborations.

Table 2: Italy's total economy mark-up estimated via Crafts and Mills' (2005) methodology

Years	**Mark-up estimates**
1861–1911	1.08
1861–1897	*1.07*
1898–1914	*1.11*
1920–1938	1.27
1985–2011	1.49
1985–1992	*1.58*
1993–2011	*1.45*

from Baffigi, 2014) and FM is the series of UK imports (taken from Feinstein, 1972) until 1911 and the series of US imports (taken from US Census Bureau, various years) thereafter. In the XIX century the United Kingdom was in fact the leader country in the Western world, until it was overtaken by the United States at the beginning of the following century (Broadberry, Giordano and Zollino, 2013).

We implemented Crafts and Mills' (2005) methodology on four sub-periods of Italy's unified history, excluding World War years (i.e. 1861–1914, 1920–1939, 1951–1970 and 1970–2011). Our regressions were estimated via 2SLS; for each sub-period the best specification was chosen. Only for the most recent years all variables were used; for the previous sub-periods more parsimonious specifications were employed, owing to data availability and to historical reasons[15].

The model allows us to estimate one coefficient $\hat{b_1}$ for each sub-period; the variation of the mark-up time series is therefore derived entirely by the $\frac{Y}{P}$ component of $\varepsilon \hat{P}_Y$, as defined in Equation 9. Three main issues arise when estimating the inverse demand elasticity on the basis of Italian data. First, our variables of interest are I(1), whereas the data used by Crafts and Mills (2005) are stationary. We dealt with the non-stationary nature of our data by running our regressions on first differences. Secondly, the coefficient $\hat{b_1}$ of our equation is never significant, not even for the most recent years, although correctly signed[16]. Different specifications were attempted, yet the non-significance issue always remained. Finally, for the years 1951–1985 the ratio $\frac{Y}{P}$ computed on Baffigi (2014)'s data is exceptionally high, thereby pushing up the estimated mark-up to unrealistic levels[17]. The twenty-five problematic years have thus been excluded from this analysis.

Table 3.2 presents sub-period averages of Italy's price-cost margins according to Crafts and Mills (2005) methodology. Overall results point to a low price-cost margin in the decades following Italy's unification, with no significant effect of the rise to power of Giovanni Giolitti. Competition weakened during the Fascist era; in the 1930s the estimated mark-up was significantly higher than that of the 1920s, confirming other recent research on the period (Giordano and Giugliano, 2014). Competition appears to be weak also during the most recent decades, although the estimated mark-up is set on a downward trend, with a strengthening of competitive pressures after 1993.

These mark-up levels are comparable with those referring to the United Kingdom and to West Germany, reported in Crafts and Mills (2005). Table 3.2 therefore compares the Italian experience to the British and German ones for overlapping years. Italy's mark-up is higher than that measured in the other two economies, yet its reduction from the 1980s

[15] For instance, the net migration rate was only available for the last fifteen years of the first sub-period, hence the variable was dropped in this case. Furthermore, as previously mentioned, the definition of the price of energy inputs and of the leader country's imports changed over time.

[16] Unfortunately, Crafts and Mills (2005) do not report regression diagnostics in their paper, so we do not know if they faced a similar problem for Germany and the United Kingdom.

[17] On average the resulting mark-up was around 2.60, which in the Crafts and Mills' (2005) framework is very high.

Table 3: Total economy mark-ups for Italy, the United Kingdom and West Germany

Years	Italy	United Kingdom	West Germany
1980–1989	1.63	1.15	1.06
1990–1996	1.47	1.10	1.07
1974–1996	1.53	1.21	1.07

Note: For Italy the sub-periods considered are: 1985–1989; 1990–1996; 1985–1996.
Sources: Our estimates for Italy; Crafts and Mills (2005) for the U.K. and Germany.

Table 4: Italy's total economy mark-up estimated via Morrison's (1988) methodology

Years	Mark-up estimates
1911–1950	2.70
1920–1938	*2.56*
1951–1970	2.73
1971–1990	2.40

to the 1990s is larger than the fall documented in the British case (the German price-cost margin is instead stable over the years considered).

Our Morrison estimates. Finally, we attempted to implement Morrison's (1988) methodology. Unfortunately, new data for public capital, consistent with Baffigi (2014) and Giordano and Zollino (2014), are not available, whereas they were provided by Rossi, Sorgato and Toniolo (1993), the main reference for Italy's historical national accounts until the most recent statistical reconstructions. For consistency reasons, we estimated Equations 10 and 11 on the latter data, which however only cover the period 1911–1990[18]. Another serious issue, present in Rossi, Sorgato and Toniolo (1993) series, and explicitly not tackled by Rossi and Toniolo (1992; 1993; 1996), is the non-stationary nature of the data. Although the latter problem may be dealt with by taking first differences (as done by us when implementing Crafts and Mills' model), the theoretical implication of deriving equation 12 in growth rates, rather in levels, is not trivial. As in Rossi and Toniolo, we do not deal with this statistical issue in the implementation of the Morrison method, although we are aware it could affect our results.

The system of level equations presented in Section 2.3 is therefore estimated as a SUR model via Zellner's iterated FGLS estimator. The advantage of Morrison's (1988) method, relative to the previous two, is that it provides a yearly historical series of mark-ups; averages over sub-periods are provided in Table 3.2. The estimated mark-ups are quite stable over time, presenting an appreciable reduction only as of the 1970s.

A wrap-up of our estimation results. In order to better comparatively appraise our results, Figure 3.2 plots the three estimated mark-up series in a single chart[19]. Mark-up levels are very different across methodologies, although the magnitudes are consistent with estimates obtained with similar methods in other studies (Crafts and Mills, 2005; Rossi and Toniolo 1992, 1993 and 1996). More worryingly than for the levels, the developments of the estimated mark-ups are also dissimilar across methods. To state a relevant example, whereas

[18]Not all required price data are made available in Rossi, Sorgato and Toniolo (1993); for the missing series we resorted to Giordano and Zollino (2014). We were therefore not able to exactly reproduce the mark-up estimates reported in Rossi and Toniolo (1993), also owing to various semplifications adopted in our model and estimation procedure (e.g. a smaller number of variable inputs; a simple modelling of technology).

[19]In the case of Roeger's (1995) methodology an average point estimate is shown, in the middle of the sub-period considered.

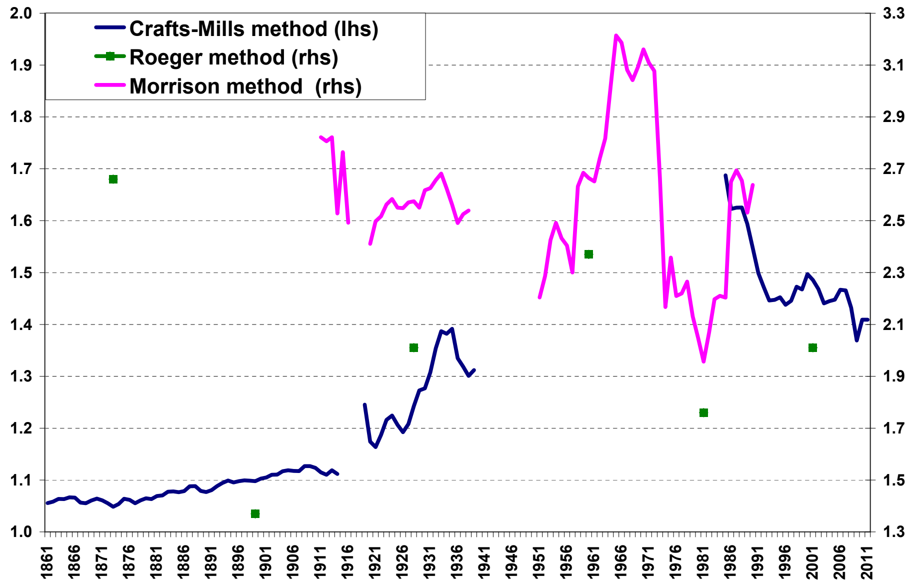

Figure 1: Italy's total mark-up estimated via three alternative methods

the Giolitti regime shift stands out as having reduced the degree of market power with Roeger's (1995) methodology, the Crafts and Mills' (2005) approach points to a substantial stability of price-cost margins over the entire first half century of Italy's unified history, thereby not shedding light on the impact of the liberalization measures introduced at the beginning of the XX century.

Two key features of Italy's history are however confirmed by all three models: *a)* market power during the Fascist era increased relative to the pre-WWI period, in particular in the 1930s; and *b)* competition after 1993 was stronger compared with that recorded in the 1951–1970 period[20].

All three methodologies present numerous data and computation-related issues when applied to Italy in the long-run. To sum them up, Roeger's method only provides sub-period average estimates and is affected by the small number of observations. Furthermore, it is here implemented on value added data when gross output series would instead be required. Crafts and Mills' approach in turn presents numerous econometric issues, and leads to rather implausible results in the 1950–1985 period. Finally, Morrison's methodology, the most data-demanding of the three, can only be implemented on the old version of Italy's historical national accounts (Rossi, Sorgato and Toniolo, 1993), which is known to present flaws and only covers the 1911–1990 period. Non-stationarity of the data may also affect results in this last approach.

The current availability of Italy's historical national accounts, although much improved and expanded owing to specific studies undertaken within the Bank of Italy in recent years (Baffigi, 2014; Giordano and Zollino, 2014), is thus still not sufficient to undertake the task

[20]The developments of the 1970s and 1980s are instead not clear according to the different approaches used.

of reliably estimating Italy's total economy mark-up over the whole 150 years of Italy's unified history. The two mentioned key trends, in the inter-war period and in recent years, however stand out and confirm previous findings of the received economic history literature.

Both theoretical and empirical drawbacks of the previous models may be in part overcome by limiting our analysis to the most recent period of Italy's history, for which more data exist and for which a finer industry disaggregation may be achieved, thereby leading to the measurement also of sectoral price-cost margins. This task is set out in the next Sections.

4 An extension of Roeger's (1995) model: including a control for imperfect competition in the labour market

In this section we outline the model we will use in the estimation of total-economy and sectoral mark-ups in Italy in the past 40 years, developed in Bassanetti, Torrini and Zollino (2010), referred to hereafter as BTZ. As recalled in Section 2.1 in the most recent literature two models are usually applied for mark-up estimation: the seminal one developed by Hall (1988) and Roeger (1995)'s model which provides a strategy to eliminate the unobservable technological change term in Hall's equation, that posed serious problems in its empirical implementation. Hall's model has also been extended in another direction, that is to take into account the possibility that firms and workers share rents according to the solution of an efficient bargaining model Ã la Mac Donald and Solow (1981), where firms and workers bargain over both wages and labour input (Dobbelaere, 2004; Crepon, Desplatz and Mairesse 2005). The efficient bargaining model has received new attention in the literature on the evolution of factor shares in the 1990s, as a possible explanation for the observed decline in labour shares. In an efficient bargaining model, such a decline can be related, amongst other factors such as increasing globalization, to a drop in the bargaining power of workers, possibly due to institutional changes like the privatisation of companies (Blanchard and Giavazzi, 2003; Torrini, 2005 and 2010; Azmat, Manning and Van Reenen, 2012). When rents are shared according to this bargaining mechanism the standard model for mark-up estimation suffers from misspecification. Without appropriately controlling for rent-sharing, any decline in the share of rents which goes to workers would in fact show up as a rise in the mark-up. We consider this as a potentially large drawback of standard models when they are used to interpret mark-up dynamics over a long time-span, as is the case in this paper.

BTZ extended Roeger's (1995) model to the case of efficiency bargaining, applying the same strategy used by Dobbleaere (2004) and Crepon, Desplatz and Mairesse (2005) to extend Hall's (1988) model. Hall and Roeger's models have been briefly recalled in Section 2.1 and derived in Appendix I. In BTZ it is assumed that firms and workers, while taking the other factors of production as given, choose W and L by solving the standard efficient bargaining problem defined as follows:

$$\max_{W,L} \left(LW + \left(\overline{L} - L\right) \overline{W} - \overline{LW}\right)^{\phi} (R - WL)^{1-\phi} \tag{15}$$

or

$$\max_{W,L} (LW - L\overline{W})^{\phi} (R - WL)^{1-\phi}$$

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

The first order condition for L leads to:

$$W = R_L + \phi \frac{R - R_L L}{L} = (1 - \phi) R_L + \phi \frac{R}{L} \tag{16}$$

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

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

to rewrite Equation 16 as follows:

$$\mu = \frac{P}{\left(\overline{W}/\frac{\partial Q}{\partial L}\right)} \tag{17}$$

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.

Since $\frac{L}{Q}\frac{\partial Q}{\partial L} = \varepsilon_{Q,L}$, BTZ obtain:

$$\alpha_L = (1-\phi)\frac{\varepsilon_{Q,L}}{\mu} + \phi \tag{18}$$

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

$$\begin{cases} \varepsilon_{Q,L} = \mu\alpha_L + \mu\frac{\phi}{1-\phi}(\alpha_L - 1) \\ \varepsilon_{Q,M} = \mu\alpha_M \\ \varepsilon_{Q,K} = [1 - \mu\alpha_M - \mu\alpha_L - \mu\frac{\phi}{1-\phi}(\alpha_L - 1)] \end{cases} \tag{19}$$

By defining $\gamma = \frac{\phi}{1-\phi}$ and substituting for these output elasticities in equation 1, Dobbelaere (2004) obtained a modified version of Hall's equation, which encompassed the efficient bargaining hypothesis:

$$\begin{aligned} &\Delta q - \alpha_L\Delta n - \alpha_M\Delta m - (1-\alpha_L-\alpha_M)\Delta k \\ &= B(\Delta q - \Delta k) + \gamma(\alpha_L - 1)(\Delta n - \Delta k) + (1-B)\Delta e \end{aligned} \tag{20}$$

where an extra term $\gamma(\alpha_L - 1)(\Delta n - \Delta k)$ shows up relative to Equation 4. Omitting this additional term would lead to biased etimates of both B and the mark-up μ.

Following the same approach (see Appendix 1 for the derivation), BTZ modified Roeger's (1995) model to obtain:

$$\begin{aligned} &(\Delta q + \Delta p) - \alpha_L(\Delta n + \Delta w) - \alpha_M(\Delta m + \Delta j) - (1-\alpha_L-\alpha_M)(\Delta k + \Delta r) \\ &= B[(\Delta q + \Delta p) - (\Delta k + \Delta r)] + \gamma(\alpha_L - 1)[(\Delta l + \Delta w) - (\Delta k + \Delta r)] \end{aligned} \tag{21}$$

While controlling for the extra term $\gamma(\alpha_L - 1)(\Delta l - \Delta k)$, this equation can be estimated via OLS, benefiting from the advantages of the original Roeger (1995) approach.

More specifically BTZ's empirical model is given by:

$$NSR_{i,t} = \beta_0 + \beta_1 XMARK_{i,t} + \beta_2 VBARG_{i,t} + u_{i,t} \tag{22}$$

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

In the next sections we estimated Equation 22 to obtain more robust total-economy and sectoral mark-ups for Italy since 1970.

5 Our 1970-2007 dataset

We estimated Italy's mark-ups by employing the November 2009 release of EU KLEMS Growth and Productivity Accounts, which provides a comprehensive dataset with annual statistics at industry level on hours worked, net capital stock, intermediate inputs and gross production for Italy for the 1970–2007 period. Our dataset is therefore an updated version of accounts than those employed in BTZ, in turn based on the March 2008 EU KLEMS release, that contained series until 2005[21]. Among the main revisions, the capital stocks prove regularly higher across sectors in the new, compared to the old, release. Our dataset covers 26 sectors of the total economy (against 15 in BTZ), considered as part of industry aggregations. In particular, we focused on manufacturing and total industry, as well as regulated services (transport and storage; post and telecommunications; financial intermediation; utilities), in which monopolies, quasi-monopolies and network effects could be largely at play, and private unregulated services. Measuring competition in services, as well as the more traditional industrial sectors, is relevant to the extent that high market power in upstream service activities can affect economic performance also in downstream industrial sectors (see Barone and Cingano, 2011). We excluded public administration, healthcare and education from our sample, as the State plays a relevant role in Italy also in the latter two branches and because mark-ups are scarcely meaningful in the public sector, where value added is determined mainly by labour compensation and capital depreciation. We also excluded real estate, since it is mostly made up of imputed rents pertaining to owner-occupied dwellings.

As in BTZ , the user cost of capital, which is the main statistical requirement of Roeger's (1995) framework, was estimated by multiplying the gross fixed capital formation price index by the rental rate of capital, in turn derived as the sum of the long-term real interest rate and the depreciation rate, net of the expected capital gains. In particular, the depreciation rate at time t is gauged as the contemporanous ratio of the consumption of fixed capital to the net capital stock[22]; the expected capital gains are computed as a moving average of three terms of the gross fixed capital formation deflator growth rate.

The shares of labour and intermediate inputs on gross production were calculated as $\alpha'_L = WL/PQ$ and $\alpha'_M = JM/PQ$. Since we assume constant returns to scale, the capital share was obtained as $\alpha'_K = (1 - \alpha'_L - \alpha'_M)$.

Table 5 provides an overview of the industry-specific factor shares in relevant sub-periods. The decline in labour shares over time, which was particularly intense in regulated services where a large programme of privatizations was implemented as of the early Nineties (Torrini, 2010), was offset in particular by the increasing use of intermediate inputs, a by-product of the increasing internazionalization of production processes. The rise in the latter shares was also particularly evident as of 1993. Capital shares were instead roughly stable over the entire time-span.

6 Our total-economy and sectoral mark-up estimates for 1970–2007

We estimated Equations 5 (Roeger's model) and 22 (BTZ's model) both via pooled OLS and via a fixed-effects model. First we concentrated on the total dataset, then we looked at the evidence for the main industries[23]. We also split the time horizon into two periods (1970–1992 and 1993–2007), which allows to test for change in the mark-ups with the completion of the Single Market in the EU. Time dummies are always considered, as well as a constant. Standard errors are heteroskedasticity and autocorrelation consistent (HAC)[24]. Pooled OLS

[21] Owing to the fact that they conducted an international comparison, BTZ's analysis was furthermore restricted to the 1982–2005 period; we therefore gained 14 years relative to their paper. We could not use the even more recent March 2011 EU KLEMS release, since this is limited to a smaller set of variables, which does not include gross production.

[22] In this manner, we overcame the restrictive assumption of arbitrarily fixing the depreciation rate across industries and over time, as done in Oliveira Martins, Scarpetta and Pilat (1996b) and Griffith and Harrison (2004), respectively at 5 and 8 per cent.

[23] A clear advantage of Roeger's method and its extensions in estimating sectoral mark-ups is that, as it requires solely nominal variables, mark-ups for services are reliable, notwithstanding the poor statistical information on prices.

[24] Together with the inclusion of a constant, Hylleberg and Jorgensen (1998) suggest that HAC standard errors correct for some of the endogeneity owing to the fact that the mark-up computed in Roeger's (1995) framework is unlikely to be time-invariant and has the form of a constant and some i.i.d. noise.

Table 5: Factor shares on industry gross production (percentage values)

Industries	**Labour**				**Capital**				**Intermediate input**			
	1970-1985	*1986-1992*	*1993-2000*	*2001-2007*	*1970-1985*	*1986-1992*	*1993-2000*	*2001-2007*	*1970-1985*	*1986-1992*	*1993-2000*	*2001-2007*
1. Agriculture, hunting, forestry and fishing	17.4	21.2	18.0	17.2	40.4	38.9	45.4	43.2	42.3	39.8	36.5	39.6
2. Mining and quarrying	22.0	20.8	16.5	16.4	56.2	49.4	49.4	39.8	21.8	29.7	34.1	43.7
3. Food, beverages and tobacco	10.3	11.5	11.1	10.4	10.0	13.4	13.0	12.4	79.7	75.1	75.9	77.2
4. Textiles, leather and footwear	25.2	20.3	17.6	16.0	13.5	15.7	13.9	12.5	61.4	64.0	68.6	71.6
5. Wood and cork	22.6	17.1	15.4	14.7	21.2	23.6	20.9	19.1	56.1	59.3	63.7	66.1
6. Pulp, paper, printing and publishing	26.5	22.0	19.2	17.1	12.3	16.2	15.6	15.0	61.2	61.9	65.2	67.9
7. Coke, refined petroleum and nuclear fuel	3.5	5.6	5.3	3.6	2.3	11.3	15.9	7.9	94.2	83.1	78.7	88.5
8. Chemicals and chemical products	21.2	17.2	14.9	13.6	10.8	13.1	12.8	10.1	68.0	69.7	72.3	76.3
9. Rubber and plastics	25.0	20.2	17.4	16.5	13.8	13.9	14.5	10.8	61.2	65.8	68.1	72.7
10. Other non-metallic minerals	28.3	22.2	20.3	17.3	20.4	19.1	16.6	15.7	51.2	58.8	63.1	66.9
11. Basic metals and fabricated metal	23.1	20.1	18.2	17.1	14.5	14.0	15.2	13.2	62.4	65.9	66.6	69.7
12. Machinery, nec	26.0	22.3	19.9	19.2	14.8	13.1	12.1	10.7	59.2	64.7	68.0	70.1
13. Electrical and optical equipment	30.7	23.6	20.8	19.6	16.2	16.5	13.4	13.6	53.1	59.9	65.8	66.8
14. Transport equipment	28.5	24.1	19.9	15.2	10.1	7.1	4.8	5.1	61.3	68.7	75.2	79.7
15. Manufacturing nec, recycling	19.7	17.1	15.2	14.5	17.6	16.5	15.4	13.6	62.6	66.3	69.4	72.0
16. Electricity, gas and water supply	22.5	24.3	16.5	9.0	14.5	29.4	31.5	28.0	63.0	46.3	52.1	63.0
17. Construction	21.6	17.3	16.9	17.1	23.6	23.1	22.7	24.1	54.8	59.6	60.4	58.7
18. Sale, maintenance and repair of motor vehicles	16.2	15.9	13.5	13.5	29.5	30.6	29.1	23.2	54.3	53.5	57.3	63.3
19. Wholesale trade and commission trade	14.5	14.3	12.3	12.2	32.7	33.6	31.6	30.0	52.8	52.0	56.2	57.8
20. Retail trade; repair of household goods	16.9	16.7	16.5	17.1	48.4	49.8	40.3	27.2	34.7	33.6	43.2	55.7
21. Hotels and restaurants	30.0	22.1	20.5	22.1	28.4	29.6	28.7	25.9	41.6	48.2	50.8	52.0
22. Transport and storage	33.9	26.7	22.3	19.7	14.0	19.1	20.8	20.2	52.1	54.2	56.8	60.1
23. Post and telecommunications	52.7	41.4	29.2	18.1	20.0	28.1	29.1	35.5	27.3	30.5	41.7	46.4
24. Financial intermediation	49.6	50.8	41.2	29.5	34.6	24.6	21.1	26.8	15.7	24.6	37.7	43.7
25. Renting of m&e and other business activities	16.8	20.7	19.6	20.4	42.3	38.8	38.6	35.9	40.9	40.4	41.8	43.7
26. Other community, social and personal services	32.2	25.9	22.2	22.6	27.9	32.7	31.0	26.3	39.9	41.4	46.9	51.1
3-15 Manufacturing	20.9	18.7	16.7	15.2	13.2	14.7	13.8	12.2	65.9	66.7	69.6	72.6
2-17 Total Industry	21.1	18.7	16.7	15.1	15.3	17.0	16.3	15.2	63.6	64.3	67.0	69.7
22-24 Regulated services	30.9	25.4	20.1	15.6	39.7	43.2	44.1	44.9	29.4	31.5	35.8	39.5
18-21+25-26 Private unregulated services	33.9	32.4	29.9	29.1	28.7	29.3	28.1	25.2	37.5	38.3	42.1	45.7

Table 6: Authors' calculations on EU-KLEMS data.

results are presented in Table 6[25].

First, by exploiting the variation across sectoral data, which potentially increases the efficiency of estimation due to the large gain in the degrees of freedom, we find that the standard Roeger model leads to different results compared with the historical mark-up estimates presented in Section 3.2, obtained using the same method. Differences may also be due to the fact that in this section we use sectoral capital user costs rather than the total economy one computed by Giordano and Zollino (2014). Moreover, here we measure output based on gross production rather than on value added, as we need to jointly identify the mark-ups appropriated by both firms and workers: the latter data are known to lead to an over-estimation of mark-ups. Given the increasing share of intermediate inputs over time, as reported in Table 5, the upward bias in Section 3.2's estimates is larger in the most recent sub-periods. In particular, we find that mark-ups measured as in Roeger (1995) prove lower in the two sub-periods here under investigation than those in Section 3.2 and with a declining trend since the early Nineties (Table 6). Accordingly, the completion of the Single Market in Italy spurred an increase, not a decrease, in competitive pressures as found with aggregate data. This result is also at odds with evidence found for a panel of EU countries and presented in BTZ, that however, as previously mentioned, was based on a first release of EU-KLEMS data, that has been largely revised in the version we now adopt, in particular regarding the series on capital stocks. It is instead in line with evidence found by us in Section 3.2, using Crafts and Mills' (2005) approach.

As in BTZ, adding the control for the results of rent bargaining in the labour market significantly raises the estimated size of the full mark-up, namely the spread between market output prices and marginal costs of production. Interestingly, the decline in the full mark-up since the completion of the Single Market was driven by a reduction in rents appropriated by both firms and workers, but for the latter the loss was almost double in magnitude (0.10 percentage points versus 0.06)[26].

Looking at the evidence for the main industries (Table 7), we find that in the whole sample the full mark-ups (here considered only before the rent redistribution that would take place in the oligopolistic labour markets) are significantly higher in the regulated services than in manufacturing, where there are virtually similar to those in the other market services. The gap was dramatic in the Seventies and Eighties, but since the early Nineties the regulated services marked a swift gain in terms of competitive pressures, with the respective measure of mark-up remaining significantly higher compared to manufacturing but proving just higher than in the other market services, that on the contrary show some loss in competition (mostly due to business services). An important remark is that the declining trends of mark-ups in the regulated services correspond to a pronounced change in the pattern of rent distribution between workers and the property of firms, that was mostly public at the beginning and turned gradually private following the liberalization process started in the early Nineties. Impressively, despite the swift reduction in the spread between market output prices and marginal production costs, firms managed to obtain a drop in the bargaining power of workers (that was particularly high in previous years) and to record a strong increase in their margins on the actual labour costs from 0.25 up to 1.37, or the highest level compared with the other main groupings of industries. In other terms firms seemed to have maintained substantial market power and the result of privatizations has thereby been a reallocation of rents from wages to profits instead of a drastic increase in competition in the goods market[27]. The bulk of the adjustment was realized in the utilities, in line with evidence found for the UE as a whole by BTZ.

[25]For the sake of brevity, fixed-effect results are not reproduced here, also because they are very similar to the OLS estimates; they are available upon request.

[26]The rents appropriated by workers are controlled by the structural parameter ϕ, while those going to the firms are proxied by the difference between the joint estimates of μ and ϕ. Ideally this difference should be equal to the single estimate of the mark-up on the product market, but some discrepancy may occur empirically.

[27]Torrini (2005) suggests that the privatizations in these sectors brought about a change in the structure of bargaining, i.e. a shift from an efficiency bargaining framework, where firms and workers bargain over both wages and employment (MacDonald and Solow, 1981), to a right to manage framework, where only wages are negotiated and firms retain the right to set the employment level unilaterally (Nickell and Andrews, 1983). Dobbelare and Mairesse (2008) prove that in the latter framework the mark-up of price over marginal cost is consistent with the assumption that the labour market is perfectly competitive.

Table 6
OLS estimates of structural parameters - Total dataset

Dependent variable: nominal Solow residual

	Total sample		1970-1992		1993-2007	
	Regressors' coefficients					
X	0.19	0.37	0.25	0.38	0.12	0.33
	0.04	*0.05*	*0.03*	*0.07*	*0.03*	*0.06*
V		0.27		0.29		0.26
		0.06		*0.09*		*0.07*
	Estimated structural parameters					
μ	1.23	1.60	1.33	1.62	1.13	1.49
Φ		0.38		0.41		0.36
	Diagnostics					
R-sq.	0.43	0.52	0.57	0.52	0.39	0.43
F-stat.	11.93	14.62	12,39	11.75	11.38	24.40
Prob>F	0.00	0.00	0.00	0.00	0.00	0.00
No. Obs.	955	955	567	567	388	388

Note: HAC standard errors are in italics. Time dummies and a constant are included as regressors.

Table 7
OLS estimates of structural parameters - Disaggregated economy

Dependent variable: nominal Solow residual

	Total industry			Manufacturing			Regulated services			Other market services		
	Total sample	1970-1992	1993-2007	Total sample	1970-1992	1993-2007	Total sample	1970-1992	1993-2007	Total sample	1970-1992	1993-2007
	Regressors' coefficients											
X	0.36	0.38	0.31	0.27	0.28	0.23	0.52	0.67	0.39	0.26	0.22	0.40
	0.09	*0.13*	*0.09*	*0.09*	*0.13*	*0.08*	*0.07*	*0.08*	*0.14*	*0.06*	*0.07*	*0.05*
V	0.30	0.33	0.25	0.21	0.24	0.17	0.37	0.74	0.21	0.03	-0.04	0.35
	0.10	*0.14*	*0.10*	*0.10*	*0.14*	*0.09*	*0.16*	*0.13*	*0.25*	*0.10*	*0.11*	*0.10*
	Estimated structural parameters											
μ	1.57	1.62	1.45	1.36	1.39	1.30	2.09	3.02	1.64	1.34	1.28	1.67
Φ	0.44	0.49	0.33	0.26	0.32	0.20	0.58	2.77	0.26	--	--	0.54
	Diagnostics											
R-sq.	0.50	0.52	0.45	0.45	0.47	0.43	0.73	0.71	0.46	0.77	0.78	0.93
F-stat.	14.09	10.40	23.51	23.43	15.99	100.00	11.70	41.59	26.59	17.67	13.93	56.87
Prob>F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No. Obs.	592	330	225	482	286	195	148	88	66	215	127	88

Note: HAC standard errors are in italics. Time dummies and a constant are included as regressors.

This evidence is still to be considered preliminary. In the first place, it could be affected by the time horizon we consider. In this respect, we plan to extend our dataset both forward to cover years until 2013, and backward, to include years since 1950 by appropriately splicing EU-KLEMS with Istat data. In the second place, the soundness of our estimates depends on the accuracy of measurement of output and inputs, even if by working with current price variables we get rid of the potential pitfalls in deflators. However the measurement of the capital stock as well as the user costs remain controversial. Christopolou and Vermeulen (2008) show that if capital costs are measured with error, mark-up estimates are upward biased; the bias is more severe the higher the capital shares. In addition, simultaneity bias may also affect our estimates. In order to moderate these problems, we plan to replicate our analysis by adopting a Generalised Method of Moments procedure. In the third place, our analysis in the current and previous Sections hinges upon the assumption of constant returns to scale. Under returns to scale λ the coefficient B becomes $1 - \frac{\lambda}{\mu}$ (Oliveira Martins, Scarpetta and Pilat, 2006b); therefore, it is not possible to disentangle the mark-up from returns to scale. Increasing returns to scale would bias our mark-up estimate downwards, wherease the opposite holds true in the case of decreasing returns. The presence of sunk costs, downward rigidities of the capital stock and labour hoarding are also likely to generate a downard bias on our mark-up estimates. Ideally total capital stock should also be netted of its sunk component, leading to a lower marginal cost and a higher mark-up. Similarly, when labour and capital do not adjust istantaneously downwards, the marginal costs would be higher than in the case of full flexibility of inputs, dampening mark-ups. As effectively summed up by Oliveira Martins, Scarpetta and Pilat (2006b), our estimates are likely to represent a lower bound for sectors operating under increasing returns to scale, large sunk costs or strong downward rigidities over the business cycle.

7 Conclusions

This paper aimed at indirectly estimating Italy's mark-ups since 1861. A variety of methodologies was implemented in order to check the soundness of our estimation results. The main contribution to Italy's economic history is the confirmation of a hike in total-economy market power during the Fascist era, with particular reference to the 1930s. Moreover, competition after the implementation of the Single Market in the EU has shown an increase, at least relative to the post-WWII period. The current state of Italy's historical national accounts does not however allow to draw any further robust conclusion on the various stages of Italy's development path since 1861 nor to indirectly estimate sectoral mark-up estimates. As a possible validation of the new accounts published in Baffigi (2014) and Giordano and Zollino (2014), this paper therefore suggests the need for further statistical reconstructions in the case of Italy. In particular, both a sectoral breakdown of historical investment and capital stock series and the construction of energy input, intermediate good and gross production data are necessary requirements for a fully-fledged application of the methods employed in this paper. More generally, the mentioned reconstructions are crucial to further delve into the proximate causes of Italy's long-run growth process, an attempt recently tackled by Broadberry, Giordano and Zollino (2013), yet restrained by the absence of sectoral capital input data.

Owing to these binding data limitations for the 150-year period, our paper next concentrated on the analysis of sectoral mark-ups of the Italian economy in the years between 1970 and 2007. We aim to further extend our dataset to cover years back to the Fifties and until the latest periods. Applying a more robust methodology which also allows to relax the assumption of perfect competition in the labour market, we found that the estimated mark-ups of prices over marginal costs are positive and statistically significant across almost all industries, implying that departures from perfect competition in the product and labour markets are the norm. Secondly, there is considerable variation of mark-ups across industries, further confirming the need to examine sectoral dynamics rather than total-economy results. We find that the completion of the Single Market in the EU channelled more competitive pressure in Italy's economy, in particular in the regulated services activities, where the workers' barganing power has collapsed. Only in the non-regulated market services the mark-up has increased since the early Nineties, mostly due to the fact that the workers' bargaining power, empirically nil in previous years, gained somewhat. This evidence may be however biased by the small number of observations available for the last fifteen years in our sample; in addition to a better control for endogeneity and measurement errors this issue is on the top of our agenda for future research.

8 Appendix I

Hall's standard model. The basic equation in growth accounting exercises is the following:[28]

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

where q is the log of gross output, l 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 $\varepsilon_{Q,f}$ ($f = L$, 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 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:

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

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

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

by log-approximation:

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

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

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

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

Assuming constant returns to scale this can be rearranged as follows:

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

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

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

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

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

Roeger's standard model. Roeger (1995) combined the primal and the dual solution to the firm's program. From cost minimization, price variation can be expressed as:

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

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

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

[28]Time subscripts are dropped for simplicity.

where C is the total cost, WL 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 output shares and cost shares coincide; with imperfect competition cost shares can be expressed as the product of the mark-up and the output shares. For instance:

$$\alpha_L = \frac{WL}{PQ}, \quad P = \frac{1}{1-B}MC \quad \Longrightarrow \quad \frac{WL}{C} = \frac{\alpha_L}{1-B}$$

Equation (A.8) can be written:

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

Rearranging we obtain:

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

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

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

$$= B[(\Delta q - \Delta k) + (\Delta p - \Delta r)]$$

This equation, conversely to Hall's one, 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:

$$\begin{aligned}&(\Delta q + \Delta p) - \alpha_L (\Delta l + \Delta w) - \alpha_M (\Delta m + \Delta j) - (1 - \alpha_L - \alpha_M)(\Delta k + \Delta r) \\ &= B[(\Delta q + \Delta p) - (\Delta k + \Delta r)]\end{aligned} \tag{A.13}$$

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

Hall 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 L by solving a standard efficient bargaining problem, the elasticities of output with respect to inputs become (under the hypothesis of constant returns to scale):

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

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), CrÃ©pon, Desplatz and Mairesse (2005) and Abraham, Konings and Vanormelingen (2009):

$$\begin{aligned}&\Delta q - \alpha_L \Delta l - \alpha_M \Delta m - (1 - \alpha_L - \alpha_M)\Delta k \\ &= B(\Delta q - \Delta k) + \gamma(\alpha_L - 1)(\Delta n - \Delta k) + (1-B)\Delta e\end{aligned} \tag{A.17}$$

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):

$$\begin{aligned}&\Delta p - \alpha_L \Delta w - \alpha_M \Delta j - (1 - \alpha_L - \alpha_M)\Delta r \\ &= B(\Delta p - \Delta r) + \gamma(\alpha_L - 1)(\Delta w - \Delta r) - (1-B)\Delta e\end{aligned} \tag{A.18}$$

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

$$[\Delta q - \alpha_L \Delta l - \alpha_M \Delta m - (1 - \alpha_L - \alpha_M)\Delta k] + [\Delta p - \alpha_L \Delta w - \alpha_M \Delta j - (1 - \alpha_L - \alpha_M)\Delta r] \tag{A.19}$$

$$= B[(\Delta q - \Delta k) + (\Delta p - \Delta r)] + \gamma(\alpha_L - 1)(\Delta l - \Delta k + \Delta w - \Delta r)$$

Rearranging it can be written as:

$$
\begin{aligned}
&(\Delta q + \Delta p) - \alpha_L(\Delta l + \Delta w) - \alpha_M(\Delta m + \Delta j) - (1 - \alpha_L - \alpha_M)(\Delta k + \Delta r) \\
&= B[(\Delta q + \Delta p) - (\Delta k + \Delta r)] + \gamma(\alpha_L - 1)[(\Delta l + \Delta w) - (\Delta k + \Delta r)]
\end{aligned}
\tag{A.20}
$$

which is equation 21 in the main text.

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