A composite index for workers' bargaining power and the inflation rate in the United States, 1960–2018

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ABSTRACT

This paper aims to construct a synthetic index of workers' bargaining power and investigate the relationship between it and inflation in the U.S. economy. As a first step, we identify the factors affecting the bargaining power of workers, referring to different groups of variables: labour market indicators; institutional indicators (e. g., collective bargaining coverage, union density); characteristics of the economy (e.g., degree of freedom for capital mobility, share of employment by sector). We then implement Principal Component Analysis (PCA) to assess the adequacy of the indicators and calculate the weights to aggregate the single indicators into a composite index. As a second step, we estimate the impact of our Bargaining Index on inflation by estimating an equation of the determinants of inflation. The composite index thus has a twofold use: it sheds light on the extent to which changes in the labour market in recent decades have weakened workers' bargaining power, and it can be used to test how the evolution of the wage bargaining system affects inflation.

1. Introduction

After the Great Recession and before the recent upswing in prices, the concept of hysteresis (Blanchard and Summers, 1986) was redis-covered and used to explain the persistence of a high level of unem-ployment associated with a stable inflation rate (Blanchard et al., 2015). However, this has not led to a theoretical rethinking of the functioning of the labour market (Summa and Braga, 2020), but has consisted of a series of exceptions introduced to the traditional neoclassical framework in order to explain the phenomenon of missing deflation when there is an increase in the unemployment rate. On the one hand, the long-run effects of aggregate demand have been limited to productivity growth, population participation rates and the skill and expertise of workers, dismissing the adjustment of productive capacity to changes in the aggregate demand as implied by the tendency of firms to achieve a normal degree of capacity utilization. On the other hand, inflation has still been viewed as stemming mainly from demand excesses in the la-bour market, and its lower sensitivity to unemployment in the last decade has been explained by several sources of imperfections such as insider-outsider wage setting or an increase in long-term unemployment (Paternesi Meloni et al., 2022; Romaniello, 2023).

A different view of the functioning of the labour market is advanced, however, in a conflict theory of inflation combined with a demand-led growth perspective (Braga and Serrano, 2023). In this theory, periods of high involuntary unemployment can be a normal situation and the root of inflation is mainly traced in conflicting claims over the income distribution of the parties involved in wage bargaining. Therefore, a non-vertical long-run Phillips curve may exist. Moreover, different inflation rates can correspond to the same unemployment rate according to the social and political factors affecting the bargaining power of the 'competing parties'. This implies that the missing deflation/inflation matter of the last decades can be explained without any reference to exceptions or imperfections in the labour market as in the traditional framework. It also implies that the recent fall in real wages after the worsening in terms of trade in several advanced countries can easily be interpreted in terms of the weakened strength of workers in wage bargaining.

The aim of this paper is to construct a synthetic index of workers' bargaining power starting from the experience of the United States and use it to shed light on how the changes in the US labour market that have occurred over the last decades have affected the bargaining position of workers. As a first step, we will clarify (Section 2) the main elements of

the literature on conflict inflation and the determinants of workers' bargaining power, identifying them in the United States over the last decades. Specifically, we will refer to different groups of variables: labour market indicators; institutional indicators (e.g., collective bargaining coverage, union density); characteristics of the economy (e.g., degree of freedom for capital mobility, share of employment by sector). After a brief exposition of the methodology adopted to construct a synthetic index, we will then move on in Section 3 to aggregate individual indicators into synthetic components making use of Principal Component Analysis (PCA). In this respect, we will also compare different possible synthetic indexes. We will then move on to the second step of our analysis where we estimate (Section 4) the impact of our Bargaining Index on inflation by estimating an equation of the determinants of inflation. The composite index thus has a twofold use: it sheds light on the extent to which changes in the labour market in recent decades have weakened workers' bargaining power and is used to test how the evolution of the wage bargaining system affects inflation. In this sense, our exercise represents a specific test of the Phillips curve in which the unemployment rate is jointly considered with other factors that are expected to affect the inflation rate. Since we include changes in terms of trade in these factors, the exercise may also shed light on recent phenomena affecting the labour market.

2. Workers' bargaining power and the conflict-augmented Phillips curve

The bargaining power of workers is a multidimensional and complex concept. Broadly speaking, the relative strength of the parties involved in wage bargaining is affected by *past* as well as *current* social and economic circumstances (see Levrero, 2012 and 2013; Stirati, 1994). The past situation is consolidated into social norms, workers' habits, minimum wages, and generally accepted rules of bargaining that affect the floor represented by the subsistence wage from which wage bargaining will start and below which, under normal conditions, real wages will not fall, or will fall only temporarily. The current circumstances are those listed for example by Smith (1976) and Marx (1961-63) when positing, for a given technique, a positive relationship between the pace of capital accumulation and the wage rate, or discussing the effects on it of technical changes. Thus, according to Smith, the wage rate will rise above the subsistence level when the amount of labour unemployment and underemployment falls due to capital accumulation (the increase in the average demand for labour) overtaking the increase in the working-age population (the increase in the supply of labour). Like Smith and Marx, in this second set of circumstances, we can also include those social and institutional factors such as the social and political situation of a country, or the degree of organization of the workers, which are partly independent of the amount and rate of unemployment and thus represent truly autonomous elements determining the bargaining position of the workers. For instance, the workers' current degree of organization will be influenced by, in addition to unemployment, changes in labour legislation, the degree of class consciousness, greater or lower cohesion among the different groups of workers, the degree of concentration of the labour force and its greater or lower substitutability in the labour process (Levrero, 2013). Finally, in open economies, the threat of delocalization of production, the impact on employment of increasing international competition and the constraints imposed upon expansionary macroeconomic policies by free capital movements are all phenomena that can directly or indirectly affect the strength of workers in wage bargaining (see Epstein and Burke, 2001; Pivetti, 2013; Rodrick, 1997; Wood, 1994).

A reference to this strength is usual in economic theory both when considering the determination of income distribution and when explaining the course of money wages and prices. As regards income distribution, in the classical approach of Smith, Ricardo and Marx, through the bargaining process, the wages in real terms will *eventually* have to reflect the relative strength of the workers in wage bargaining. Thus, Buchanan (1966, p. 53) wrote in response to Malthus that "the (l)abourer (…) when he found his increased wages attended with no real improvement of his condition, would demand a second rise on the same principle which enabled him to obtain the first; and thus the money price of labour would continue rising until stopped by a real rise of wages".[1] It is an effect of the wage bargaining process on real wages which is also recognized when developing the idea advanced by Sraffa (1960, §44) that the *real* mark-up on prices can be affected by the money rate of interest arguing that the former will depend on the relationship between the long-term *nominal* rate of interest on risk-less assets fixed on average by the monetary authorities (plus the margin for profits of enterprise) relative to the rate of change of nominal unit labour costs.[2]

However, a reference to the bargaining strength of workers can also be traced in other streams of thought, especially when explaining the *actual* course of income distribution. Automation and just-in-time production processes, with the related phenomena of reduction of firm size and outsourcing, as well as ICT capital goods and related increasing rates of capital obsolescence, are thus said to have weakened the bargaining position of workers and lowered the wage share (see, for instance, Bental and Demougin, 2010; and Hornstein et al., 2007). Moreover, in a very Classical-Marxian vein, it is argued that capital «select[ed] and develop [ed] technologies that [were] much less labour intensive», as a reaction of the wage-push of the 1960s and the labour protection laws of the Seventies (see Caballero and Hammour, 1997, p. 4). Finally, and perhaps more significantly, in several models — especially those of the so-called New Keynesian school founded on a mixture of the principles of factor substitutability and optimization on the one hand, and "frictions" operating in labour and commodity markets on the other — "shifts" in the relation between the relative prices of the factors of production and the capital-labour ratio are ascribed, on empirical grounds, not to technological factors, but to an increase in the profit margins on prime production costs caused by a rise in the money rates of interest at the end of the 1970s (see, for example, Bagli, Cette and Sylvain, 2003; Landmann and Jerger, 1993), or by a reduction in the trade unions' bargaining power. The change in dismissal laws and rules of collective bargaining, unfavourable to workers, and the fall in union power, are in fact said to have influenced, together with an increase in monopsony power in the labour market (OECD, 2020), the trend of the share accruing to wages — reducing the amount of the "monopoly rents" the workers allegedly managed to "appropriate" (see Bentolilla and St.

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[1] We abstract here from any consideration regarding the effect of wage bargaining in a commodity or fiat money economy, and we only refer to Buchanan's suggestion.

[2] As written by Garegnani (1979: 81) "the policy of the monetary authorities is not conducted in a vacuum and the movement of prices and the money wages determined in the wage bargain will be amongst the most important considerations in the formulation of that policy". See also Pivetti (1991). This is especially true when a continuous increase in money wages and its effect on the *real* interest rate are taken into account.

Table 1
List of variables.

Trade union and worker conflict	
1	Total Union Membership (TUM)
2	Effective numbers of unions
3	Membership concentration at confederation level
4	Membership concentration at unions level
5	Union Density
6	Workers in stoppage
7	Number of stoppages
Labour Market conditions	
8	Unemployment rate
9	Short-term unemployment rate
10	Incidence of short-term unemployment
11	Long-term unemployment rate
12	Incidence of long-term unemployment
13	Employment rate
14	Participation rate
15	Share of Involuntary part-time
16	Minimum relative to average wage
17	Ratio of temporary vs permanent layoffs
18	Replacement Rate
19	Share of employed in Manufacturing
Macroeconomic conditions	
20	Openness index
21	Share of outward FDI on GDP
22	Federal Funds Rate

Paul, 2003; Blanchard, 1997, p. 103; Giammarioli et al., 2002).[3]

Moving on to the course of prices and money wages, and irrespective of the forces shaping the *real* mark-up on prices, the workers' bargaining power is crucial in the theory of cost inflation typical of the post-Keynesian approach in which the root of price inflation resides mainly in conflicting claims over income distribution whose results may be different in different situations and be affected by the dynamic of "exogenous" nominal variables such as the exchange rate (Amico and Fiorito, 2013; Vernengo, 2022; Morlin, 2023) and the interest rate (Stirati, 2001; Levrero, 2023). Two elements in this approach are relevant to the unemployment-inflation nexus and in line with the original contribution of Phillips (1958) before the introduction by Friedman (1968) of the notion of a non-accelerating unemployment rate (Paternesi Meloni and Stirati, 2018). First, it entails that periods of high

involuntary unemployment (or, in Marxian terms, the presence of a large industrial reserve army) can be a normal situation in market economies, especially in the absence of an appropriate aggregate demand stimulus (Garegnani 1990; Stockhammer, 2008). Second, according to this approach, the level and evolution of wages are determined by political, historical and institutional factors that could also change the relationship between unemployment and the wage rate because unemployment is just one, but not the only, source of the strength of workers in wage bargaining. Therefore, a central role in determining the outcomes of wage bargaining is attributed to the social and institutional context, understood also in a broad and political sense (Kalecki, 1943). This means that wage inflation can occur well before the situation of full employment and that a lower level of unemployment can be associated with a weak inflation dynamic due to the effects of other factors. In other words, an increasing inflation path can occur even if the economy is still quite far away from a situation of labour scarcity and the relationship between unemployment and the rate of change of money wages can vary over time due to the influence of political-institutional factors.[4] More precisely, under the action of these factors, the slope and position of the Phillips curve can change and a different wage and price dynamic can be observed in relation to a certain average rate of unemployment. Therefore, in the following we try to synthesize in a single index the elements that influence wage bargaining, including the above-mentioned political-institutional factors, and extrapolate the overall effect of workers' bargaining strength on wage and price dynamics.

A simple way to rationalize the conflict theory of inflation is, indeed, by means of a conflict-augmented Phillips curve obtained by listing the rate of unemployment as one of the elements influencing workers' claims in wage bargaining and introducing the possibility of an aspiration gap between the real wage targeted by workers in wage bargaining and the actual wage rate as determined by firms defending their real mark-up on prices in the presence of continuous increases in money wages (Hein and Schoder, 2011; Levrero, 2023; Rochon and Setterfield, 2012; Rowthorn, 1977; Stockhammer, 2008).

Let us indicate with

$$\widehat{w} = \beta(\widehat{p}^e + \gamma) \tag{1}$$

the rate of change of nominal wages, where $\widehat{p}^e$ is the expected inflation rate, γ the workers' desired increase in real wage and β the ability of workers to translate, in the bargaining process of nominal wage, their prices expectations and real wage aspirations. Let us also assume that the bargaining position of workers (γ) and their ability to obtain their real wage aspiration β are negatively influenced by the unemployment rate (u). Specifically, let us put

$$\gamma = \gamma_o - \varphi u \tag{2}$$

where γ_o represents the so-called autonomous claim (Isaac, 2009) and φ

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[3] Of course, these factors affecting "monopoly rents" are introduced in these models to explain the changes in distribution together with those in the average rate of unemployment, based on the assumption that the "equilibrium" unemployment rate and the real wages vary in the same direction due to the principle of factor substitutability. In this respect, these models fail to account for the empirical facts because the fall in the wage share explained in the models by "labour market deregulation" and a lower union power occurred precisely when there was a rise, and not a fall, in the average rate of unemployment. It is still significant, however, that these factors are seen in these models to be crucial to explaining the shift in distribution in the last thirty years as they are to an interpretation along Classical-Marxian lines. The difference is that in the Classical theory factors such as institutional changes are not seen to affect only "monopoly rents" since they are not seen as "disturbances" to underlying supply and demand forces. More importantly, the classical theory can easily account for the rise in unemployment and fall in wages (relative to productivity) because the unemployment rate and the wage rate are not viewed as related in a direct, functional way. On the contrary, unemployment is seen to be determined by technical progress and the pace of effective demand which in turn may be negatively influenced by a fall in real wages. Also, technical innovation and globalization — the factors usually cited as the main causes of the changes in functional income distribution by official publications of the International Monetary Fund (see IMF, 2007) and the European Commission (see EC, 2007) — are not mechanically linked to wages in the Classical theory. They are seen as having an influence on wages to the extent to which they affect the strength of labour in wage bargaining, through their effects on the amount of unemployment, and the cohesiveness and degree of organization of workers.

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[4] For an admission also at Central Bank level of the relevance of the erosion of worker bargaining power in explaining the flattened Phillips curve in the last decade, see Ratner and Sim (2022). The interest in the relationship between labour market conditions and inflation is compelling in the debate that has developed following the fiscal stimulus programme implemented by the Biden administration to cope with the pandemic crisis (Blanchard, 2021; Summers, 2021; Roubini, 2021), as well as nowadays with the upswing in the prices of intermediate and energy goods. However, this debate has been developed in the mainstream framework which interprets the price dynamic in the light of the unemployment gap (or output gap) and from this comes the feared risk of hyperinflation. We believe that our approach could provide interesting and more general answers to this issue.

is the influence of the unemployment rate on the workers' bargaining position, and both (φ and γ_o) are interpreted as influenced by the institutional, political, and historical situation (see, for example, Stirati, 1994, 2001; Levrero, 2013 and 2023).[5] Finally, for the sake of simplicity, let us assume that price inflation ($\widehat{p}$) is equal to the increase in nominal wage ($\widehat{w}$) minus productivity growth ($\widehat{\pi}$)[6] and that inflation expectations are fulfilled. By substitution we obtain:

$$\widehat{p} = \beta\widehat{p} + \beta\gamma - \pi = \frac{1}{1-\beta}(\beta\gamma_0 - \widehat{\pi}) - \frac{\beta}{1-\beta}\varphi u \qquad (3)$$

From an empirical point of view, in order to test the overall effect on inflation of both the institutional and economic conditions affecting the relative strength of workers, we estimate the following equation:

$$\widehat{p} = \alpha_0 + \alpha_1 BI + \alpha_2 \widehat{\pi} + \sum_i \alpha_i x_i \qquad (4)$$

where *BI* represents our composite index of workers' bargaining power[7] and x_i represents a vector of several covariates that could be relevant in determining the dynamic of nominal variables as the terms of trade. With reference to the theory of the conflict-augmented Phillips curve, our composite index BI can be interpreted as γ, the measure of the bargaining position of workers in equation [2].[8]

In the following sections we will identify the factors affecting the bargaining power of workers in the specific historical case of the United States. In general, these factors include labour market conditions as measured by unemployment, employment and participation rates, the duration of unemployment and distribution of workers by contract type (part-time, involuntary part-time and/or open-ended vs fixed-term contracts) and the extension of segmentation (namely, the role of gender and ethnicity in the relationship between workers). Moreover, they include the institutional characteristics of the labour market (for example, the coverage of collective bargaining, the rate of membership of workers in trade unions, the bounty of unemployment benefits and the minimum wage level), as well as factors related to the structure of the economy (such as its social structure, the degree of freedom for capital mobility, the average dimension of firms and the share of employment by sector). We will test the weight and relationship between these factors in the United States and their changes over time and construct a synthetic index of the workers' bargaining power. Having constructed this index, it will be inserted in the estimation of the determinants of inflation to evaluate the relevance of "pro-workers conditions" in price inflation and its evolution over time.

To test the robustness of our index, we will compare its changes with those in the adjusted wage share in the United States over the last decades, as suggested by several strands of literature (Hein and Schulten, 2004; Elsby et al., 2013; Stockhammer, 2017; Stansbury and Summers,

Table 2
Selected variables for Index 1, Index 2 and Index 3.

Variables	BI 1	BI 2	BI 3
Total Union Membership	X	X	X
Effective numbers of unions	X	X	X
Membership concentration at confederation level	X	X	X
Membership concentration at union level	X		
Union Density	X		
Workers in stoppage	X		
Number of stoppages		X	X
Unemployment rate		X	
Short-term unemployment rate	X		
Incidence of short-term unemployment			X
Long-term unemployment rate			X
Incidence of long-term unemployment	X	X	
Employment rate		X	X
Participation rate	X		
Share of Involuntary part-time	X	X	X
Minimum relative to average wage		X	X
Temporary on permanent layoffs		X	X
Replacement Rate		X	X
Share of employed in Manufacturing		X	
Openness index			X
Share of outward FDI on GDP			X
Federal Fund rate			X

2020). We will concentrate on the 'relative or real wages', that is the relative share of the total product that the workers receive because we consider it is the right way to evaluate the social position of the workers (see Marx, 1978, II, pp. 404 and 419).[9] The index must be able to explain the major historical change in income distribution and inequality over the last thirty years which puts an end to the distributive compromise between capital and labour and creeping inflation in the years 1950–1968 (Armstrong, Glyn and Harrison, 1991; Marglin and Schor, 1994).[10]

The fact that a significant change occurred after 1977–79 in the labour market institutional setting compared with what was in place during the so-called "Golden age" of capitalism can be easily grasped by examining the following facts (Levrero 2012):

a) a constant or even declining real wage rate like the one we observe for ten years or more in the period 1977–2007 in some of the advanced capitalist countries is unusual even when looking at the

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[5] If β is negatively affected by the unemployment rate *u* as is γ, the effect of a change in *u* on nominal wage inflation will be magnified, as shown by relation [1]. However, the formal intricacies arising from introducing a relation similar to [2] for β led us to avoid this introduction and take β as given. In this respect, it is worth noting that factors affecting β such as the timing of wage bargaining and monetary wage indexation clauses can interact in a complex way, sometimes moving in opposite directions irrespective of the rate of unemployment, as in the Italian experience of the 1970s (see Levrero and Stirati, 2004).

[6] The analysis can be easily extended to consider the effect of changes in the profit margins and the prices of imported goods expressed in the domestic currency.

[7] It is widespread practice in economic analysis to obtain a broader definition of labour market slack (Pacitti, 2020; Cauvel and Pacitti 2021, Lombardi et al., 2023). However, our index intends to be more general since it refers not only to labour market indicators, but also to institutions and economic structure.

[8] The estimated value of α_1 will also reflect elements affecting the pass-through of unit labour cost on prices (see Sylos Labini, 1984), as affected by factors such as the weight ascribed by firms to the historical costs of capital and the intensity of international competition. See below, note 31.

[9] The robustness of the synthetic index could also be tested by comparing its changes and those in money wages. However, for the same level of workers' bargaining power, you may have different rates of change in money wages insofar as the real wage targeted by the workers remains different from the actual one.

[10] In the period 1950-1977, except in the United States (where the wage rate growth was more similar to its secular trend), the real wage annual percentage increase was greater than in any previous historical phase after the first industrial revolution (see, for instance, Hansen, 1925; Phelps Brown, 1968; Scholliers, 1989) — and, a fortiori, greater than in any previous historical period. The situation changed starting in the years 1977-1979, irrespective of the wage rate considered (contractual wages, earnings, or labour compensation), and irrespective of the deflator used (the cost of living index, or the GDP price deflator). For instance, since 1977-79, the growth rate of real earnings in terms of the cost living index has fallen, and in some phases and countries reached zero (in Italy in 1990s), or even became negative (in the United States in the years 1977-1997). However, the constancy or even fall of the real wages in some countries and phases in the period 1980-2010 is less apparent in terms of the GDP price deflator, due to the increase in the cost-of-living price index with respect to the GDP price (see, for example, Bosworth, Perry & Shapiro, 1994). Moreover, in the United States, real earnings grew less than labour compensation, since in some years fringe benefits and other social contributions rose and real earnings referred only to production and not to supervisory workers, whose compensation grew considerably.

historical wage trends in these countries since the 1850s, except for the period 1895–1913 in France and the United Kingdom, and the experience of the fascist regimes in Italy and Germany;

b) this is even truer when considering that the slowdown in the real wage growth rates since the end of 1970s was not accompanied by an analogous change in the trend of labour productivity: although lower (in most countries) than in the years 1950–1970, productivity growth rates were in fact usually higher than those of real wages;

c) while the correlation between actual real earnings and productivity became lower than in the years 1950–1970 (see, for example, Becker and Gordon (2005) for the United States), the correlation between real earnings and the unemployment rate rose (often displaying what we might call a real Phillips wage curve). Moreover, greater sensitivity of both money and real wages to cyclical variations in output, and of real wages to price changes, emerged;

d) looking at the trend in the adjusted wage share of the total economy, since the years 1980–85 a falling trend in the wage share has occurred in advanced capitalist countries (Bental and Demougin, 2010; EC, 2007; Ellis and Smith, 2007; IMF, 2007; Paternesi Meloni and Stirati, 2021; Stockhammer, 2010)[11] which in some cases, reached values which were lower than those in the 1960s. In the United States, for instance, the adjusted wage share in the 2000s returned to the value of the 1950s, when (see Kravis, 1959) it was around 65 per cent. In France, in 1998, it had the same value as in 1925 (see Piketty, 2003);

e) the falling wage share trend does not seem to reflect changes in the composition of value added towards sectors characterized by a lower wage share, but a true change in distribution. The same effect of privatization and thus the tendency to reduce the weight of the public sector, while it may to some extent explain that fall (since in the public sector the value added is equal to the wage bill) can by itself be seen as an aspect of the change in the institutional setting of the advanced market economies that occurred in these years — and that brought to an end that positive contribution of the public sector towards a secular increase of the total economy wage share that had usually been acknowledged in the previous periods (see Budd, 1960; Kravis, 1959; Phelps Brown and Hart, 1952);

f) in Anglo-Saxon countries in particular, the benefits of economic growth have been concentrated at the top end of personal income distribution whose share in personal income in the United States actually returned to the 1922–1945 values. Thus, while in the US, until 1973, the average real household income increased in any quintile, but more in the lower ones, since 1973 its growth rate has fallen, but the higher quintile has had the greater rate of growth. As outlined by Becker and Gordon (2005, p. 105) «(o)f the total increase in real labor income of over $2.8 billion, less than 12 per cent went to the bottom half of the income distribution. More of the income change accrued to the top 1 percent than to the entire bottom 20 percent»;[12]

g) together with this change in personal income distribution, an increasing segmentation of the labour market occurred, with an increase in wage differentials among sectors and between skilled and unskilled workers. Although the wage skill premium had usually fallen in advanced capitalist countries between 1870 and 1970 (especially in the years 1915–1950), in 1980 it began to rise, also due to the weakening of the trade unions and labour solidarity. Moreover, an increasing "wage drift" can also be seen, once again as a result of the weakening of the trade unions.

Several factors affecting the bargaining power of workers have helped to determine the above-mentioned phenomena. While in European countries, the labour market has undergone an enormous, widespread process of deregulation, in the US, the bargaining power of workers has diminished without an analogous process of deregulation. Elements such as the depressed role of trade unions (Stansbury and Summers, 2020),[13] precariousness ("being partly unemployed") and the high duration of unemployment (Yellen, 2014; 2016) could have increased the "cost of job loss" (Pacitti, 2020) and impaired the ability of workers to achieve wage increments.[14] Moreover, a relevant matter relies on the segmentation of the labour market both at gender and ethnical level (see, for example, Ferry and Mayoral, 2021).[15] Put simply, the presence of a significant share of marginal workers has influenced the bargaining power of workers as a whole from several points of view that go from the low propensity of marginal workers to join the trade unions to the emergence of conflicts within the working class (Barba and Pivetti, 2016). Furthermore, the recent literature has drawn attention to the role of involuntary part-time employment and the dynamics of vacancy rates (especially after the pandemic crisis). While scientific research has disproved the effectiveness of labour market deregulation in improving the employment performance of the labour market, its effect on wage dynamics is now recognized even among mainstream authors (Blanchflower and Posen, 2014; Linder et al., 2014; Yellen, 2014, 2016).

Other factors, however, have also contributed to weakening workers in wage bargaining both in the decade 1979–1989, which we can label "the Age of Restoration" (see also Serrano, 2004), and in "the Age of Capital", which is now in crisis. Labour supply easily augmented at will by immigration and a process of "restructuring", outsourcing, and industrial delocalization of production in developing countries occurred. Until 1995, the pressure of increasing international competition was felt less due to devaluation of the dollar after the Plaza Agreement in 1985 which set the American interest rates below those of the major European countries (see Frenkel, 2015) and favoured exports. However, the North American Free Trade Agreement (NAFTA) signed in 1993 helped to suppress real wages for production workers and reduced fringe benefits. Moreover, since the early 1990s, expanding global trade, propelled by China's spectacular growth, played a much more important role in the U.S. labour market (Autor et al., 2013; Blair and Gurevich, 2021). Although modest in relation to the decline in U.S. manufacturing employment of 5.2 million workers between 2001 and 2011, import competition reduced aggregate U.S. employment between 600,000 and 1.25 million jobs between 1991 and 2011. The effect was strong, especially on the wages of low-skilled workers, and was attenuated only thanks to expansionary fiscal policies that led to a sharp rise in overall employment with an expansion of non-trade and service sectors. This ensured an unemployment rate in the United States that was lower than

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[11] The fall is particularly strong in the Euro area when compared with the United States and the United Kingdom: stopping the data before the last output downturns determined by the financial crisis of 2007 and by the pandemic crisis, the adjusted wage share passed in the eurozone from 72.5 in 1982 to 63.3 in 2007 (cf. Stockhammer, 2010). However, also in the former countries, there is a strong fall when considering the wage share net of the wages of the managers.

[12] Especially in Anglo-Saxon countries, but in general in all industrialized nations, a polarization of society occurred, with the top income groups increasing their income share (see, for instance, Atkinson, 1997; Matthews, 2011; Piketty & Saez, 2003). In some countries, this was accompanied by real earnings actually falling (this is the case of the United States) or remaining constant over time, for the lower deciles of the distribution.

[13] As is known, a different political climate regarding trade unions and the determination of firms to change the rules of production and wage bargaining they bear witness to occurred after 1979. The defeats in 1981 in the Fiat strike in Italy and in the air traffic controllers' dispute in the US, as well as the miners' strike in the UK in 1984-85 and the struggles of IG Metall in Germany in 1984, are all symptomatic of this attack.

[14] Blecker and Setterfield (2022) refer to "an incomes policy based on fear" against workers. See also Bowles, Gordon and Weisskpof (1990) and Mishel and Bivens (2021).

[15] On the increasing polarization of the US labour market, see also Temin (2015) and Taylor and Omer (2020).

those experienced in other advanced countries unlike what occurred in the period 1950–1970 (see Maffeo, 2011).[16]

3. A synthetic index of workers' bargaining power: the methodology

The construction of a composite indicator consists of numerous stages, any of which can be approached with different methodologies. The usual basic steps in the procedure (OECD, 2008) are: (1) defining the phenomenon to be measured (theoretical framework); (2) selecting a group of individual indicators; (3) normalizing the individual indicators; (4) aggregating the normalized indicators; and (5) validating the composite indicator.

To build our synthetic indicator for *workers' bargaining power*, our latent phenomenon, we refer to the so-called formative model where the individual indicators used to define a phenomenon are causes of the latent variable, rather than its effect.[17] This means that if the phenomenon changes, the single indicator will not change (OECD, 2008). In order to combine the individual indicators, we implement Principal Component Analysis (PCA) which allows us to reduce the number of variables (i.e., aggregating them in components) and preserves the maximum proportion of the total variation. After standardizing the indicators, we use PCA to assess the adequacy of the indicators[18] and, subsequently, to calculate weights that allow the different components to be aggregated into a single composite indicator. Finally, the obtained aggregate index is validated to assess if it can describe the object of the analysis.

3.1. The principal component analysis

PCA is a multivariate statistical technique used to reduce the number of variables in a dataset into a smaller number of components. In practice, starting from a set of correlated variables, PCA creates *uncorrelated components*, where each component is a linear weighted combination of the initial variables, and the weight is represented by the eigenvectors of the correlation matrix between variables.

The idea under PCA is to account for the highest possible variation in the indicator set using the smallest possible number of factors. The variance (σ_i) for each principal component is given by the eigenvalue of the corresponding eigenvector. The components are ordered in terms of the explained variance in the original dataset because PCA tries to put the maximum possible information in the first component, then the maximum remaining information in the second and so on. In this sense, under the constraint that the sum of the squared weights is equal to one, the first component (PC1) explains the largest possible amount of variation. The second component (PC2) is completely uncorrelated with the first component and explains additional but less variation than it. Since the sum of the eigenvalues equals the number of variables in the initial data set (*n*), the proportion of the total variation in the original dataset accounted by each principal component is equal to σ_i/n. The higher the degree of correlation among the original variables in the data, the fewer components are required to capture common information.

As a first step, we proceed by standardizing the selected variables. The chosen standardization method consists of taking the difference between the actual value of the variable and its means, divided by the

standard deviation. The result is that each individual indicator will have 0 mean and standard deviation equal to 1. When we suppose that the individual indicator has a negative polarity with respect to the latent phenomenon, we multiply its standardized value by −1 (OECD, 2008). Secondly, we test the adequacy of the data. To select which variables to include in the synthetic index, we implement three selection criteria:

1. variables that share a correlation greater than 0.9 cannot be included in the same index;
2. variables with KMO[19] of less than 0.4 have been dropped;
3. variables that show a correlation with any component of less than 0.3 have been dropped.

The threshold values of these parameters can be found in the literature; however, some degree of discretion exists in the choice. We therefore present three different indices as a result of alternative mixes of variables.

Once the variables have been selected, we proceed with the identification of the number of latent components representing the data. Each component depends on a set of coefficients (*loadings*) that measure the correlation between the individual indicator and the latent component. Standard practice is to choose the component that: (i) has associated eigenvalues greater than one; (ii) contributes individually to the explanation of overall variance by more than 10 %; and (iii) contributes cumulatively to the explanation of the overall variance by more than 60 %.

After this, we proceed with the varimax rotation[20] of factors in order to minimize the number of individual indicators that have a high loading on the same factor. The objective is to obtain a structure in which each variable is loaded exclusively on one of the selected components.

The last step in the PCA analysis consists of constructing the weights used to aggregate the components. To weigh each rotated component, we use the share of the total variance explained by each component, i.e., we divide the eigenvalue of each rotated factor by the sum of the eigenvalue of all factors. Thus, the composite index is a weighted average of rotated principal components with weights calculated as follow:

$$w_i = \frac{eigenvalues_i}{\sum_i eigenvalue_i}$$

where w_i stands for the relative weight of the *i-th* principal component. This formula implies that the component that explains the highest share of total variance will have the highest relative weight.

3.2. Data and composite index construction

We implement our strategy on a set of variables for the USA from 1960 to 2018 and construct three alternative Bargaining Indexes (*BI*). Data come from the OECD/AIAS ICTWSS database, Bureau of Labor Statistics (BLS), the Federal Reserve Economic Dataset (FRED) of the Federal Reserve Bank of St. Louis, and the AMECO database. We can divide our set of variables into three main groups (Table 1). The first one consists of the variables related to trade union setting and worker conflict (variables from 1 to 7). The second group (8–17) consists of the variables related to the condition of the labour market, while the third one (20–22) contains other relevant macroeconomic variables, such as

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[16] This is confirmed in our synthetic indexes by the effects of their different components on it since those concerning the labour market conditions often move in a different direction from the other components.

[17] In the case of the bargaining power of workers, we consider a formative rather than a reflective model to be more appropriate, given the multidimensional character of the workers' bargaining power and the tautological assumption that higher real wages mean a higher strength of workers.

[18] As an extension of this work, we are also going to use a subjective or expert weighting approach.

[19] The Kaiser-Meyer-Olkin (KMO) test measures sampling adequacy for each variable and for the complete sample of a factor analysis. It compares the magnitudes of the observed correlation coefficients with the magnitudes of the partial correlation coefficients. The idea is that the partial correlations should not be very large if distinct variables are expected to emerge from factorization.

[20] The Kaiser-Varimax rotation is a standard practice in PCA analysis that maximizes the sum of the squared loadings where 'loadings' represent the correlations between components and variables.

Fig. 1. The bargaining indexes.

Fig. 2. Bargaining indexes and the labour share.

the interest rate and the trade openness index. Moreover, we also consider the Replacement rate (18) which measures the generosity of the unemployment benefits and the share of employed in the manufacturing sector (19) that describe, in a certain sense, the structural organization of the economy.

From the original list of variables, we only take the indicators that meet the criteria listed above. We experimented with several combinations of variables but for the sake of brevity, we report only three of them in the text.[21] Table 2 shows how the different variables listed in Table 1, according to our methodology, enter in the three BI formulations. The first two indexes differ in the choice of variables that share a correlation greater than 0.9 (e.g., different labour market variables; union density and the share of manufacturing employment), and they do not consider the variables referred to the third group. However, these variables are considered in BI3.

Among the variables utilized in constructing our indexes, the most significant weighting is assigned to those related to trade unions and workers' conflicts such as union membership, union density, and the number of work stoppages. Additionally, the various measurements of the unemployment rate (total, short-term, or long-term) play a crucial role. Furthermore, the share of involuntary part-time employment also holds significance. Finally, among the macroeconomic variables, the most relevant seems to be the Federal Fund rate.[22]

Fig. 1 reports the graph of the 3 indexes. Although the path of the bargaining power of workers shows a clearly decreasing trend, different phases can be identified.

The peak workers' bargaining power occurred for all three indexes at the end of the 1960s, more specifically in 1970 for BI1 and in 1969 for BI2 and BI3. Afterwards, a long-term decreasing trend began. The first significant reduction in workers' bargaining power occurred in the mid 1970s and continued until the mid 1980s. During this time, BI1 and BI2 fell by approximately 20 %, while BI3 decreased by around 17 %. However, the indexes showed only a minimal recovery of about 1.13 % until the end of the 1980s.

A new period of reduction began thereafter, with BI1 and BI3 falling by around 9 % and 10.3 % respectively between 1989 and 1994 and BI2 decreasing by approximately 8 % between 1990 and 1993. The second half of the 1990s marked a period of stagnation for BI3 and poor recovery for BI1 and BI2. From 2000 to 2010, a new phase of strong contraction occurred, with the indexes falling by 27.5 %, 26.7 %, and 25 %, respectively. The sharpest erosion of workers' bargaining power occurred during the Great Recession. In fact, the minimum value of all three indexes was reached in 2010 and it was not until 2018 that workers regained the bargaining power level of 2005.

The final step in our PCA analysis consists of validation of the estimated indexes in order to explore the robustness of the choice of inclusion and exclusion of individual indicators and the setting of different criteria to construct the composite indicator. As mentioned in Section 2, to assess whether our composite index describes the workers' bargaining power, we test the relationship between it and the labour share since we expect the factors affecting bargaining power to influence functional income distribution. The labour share represents the share of income that belongs to workers and is measured as compensation per employee as a percentage of GDP per person employed.[23] In terms of fitting in with the latent phenomenon, namely the workers' bargaining position that our indexes aim to explain, BI1

explains 86.5 % of the variance, BI2 87.04 %, and BI3 85.7 %.[24] The graphical comparison, presented in Fig. 2, confirms that all the Bargaining Indexes are related to the labour share. Indeed, over the whole period, they show a strong correlation (the correlation coefficients are 0.86 % for BI1; 0.85 % for BI2 and 0.86 % for BI3) with the labour share.[25]

4. The relevance of "pro-workers condition" in price inflation: an empirical estimation

In order to assess the impact of our BI on price dynamics, estimates have been made using four different models. Model 1 is the simplest model and includes the dependent variable, i.e., the inflation rate ($\widehat{p}_t$), its lagged value and our synthetic index for the workers' bargaining power (BI_t). Following the empirical literature, we include the first lag of inflation among the regressors to account for the relevance of past inflation on the present one. The impact of the growth of labour productivity ($\widehat{\pi}_t$) is considered in Model 2. Moreover, step by step we add a set of control variables referring to the percentage change of the price of oil ($\widehat{p}_t^{oil}$)[26] in Model 3 and the relative price of export goods in terms of import ones (Δtot_t) in Model 4.[27] Since we found influential outliers in the residuals, we also insert a set of year-dummy variables (α_t) which may vary in each model. The equation of our complete model (Model 4) is:

1. $\widehat{p}_t = \alpha + \beta_n \widehat{p}_{t-n} + \gamma_1 BI_t + \gamma_2 \widehat{\pi}_t + \gamma_3 \Delta tot_t + \gamma_3 \widehat{p}^{oil}_t + \alpha_t + \varepsilon_t$

where subscript "t" stands for time and the error term ε_t is assumed to be i.i.d. Thus, the inflation rate is expressed as a function of past inflation, the level of workers' bargaining power, the growth of productivity, the change in the terms of trade,[28] and the growth of the price of oil. The complete list of variables is reported in Appendix 1. Applying the ADF test, we verified that all variables are I(1). In order to check whether the non-stationarity of the BI level could distort the outcome of our results, we replicated the estimation of all models replacing the level with the change in BI. All our results are qualitatively confirmed, with the exception of the effect of the growth of productivity, which, in some models, is no longer significant.[29]

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[21] Results of other combinations can be provided by the authors upon request.

[22] Table A2 in the Appendix 2 presents the loadings of each variable for every rotated principal component within each index. As detailed in Section 3.1, these loadings reflect the correlation between the individual indicator and the latent component. It is important to note that, in accordance with the OECD Handbook (2008), a straightforward interpretation of the component may not be readily available.

[23] Source: AMECO database.

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[24] With regard to the criteria used to identify the number of latent components considered to construct the synthetic index, note that the explained variance of all three indexes is well above 60%.

[25] In addition to visual inspection and correlation, we also tested this with simple regression-based correlations and found a strong and statistically significant relationship between the Bargaining Index and the Labour share. In particular, the regression coefficient is equal to 0,67 for Index 1, 0.67 for Index 2 and 0.75 for Index 3. More importantly, we found this during both the negative and positive phases of the bargaining position of workers.

[26] We use the Spot Crude Oil Price of the West Texas Intermediate (WTI), Dollars per Barrel. All data information can be found in Table A1 in Appendix 1.

[27] Both with the first difference in the terms of trade and the percentage change of the price of oil, we control for exogenous shocks that can influence the path of the inflation rate. Moreover, inserting them in our specifications, we isolate the effect of our preferred variable, the Bargaining Index, on inflation. On the introduction of these variables while estimating price inflation see, for example, Maynard (1958) and Hooper et al. (2019).

[28] Roughly speaking, a worsening in the terms of trade reduces (coeteris paribus) the real income to be divided between wages and profits, thus worsening the distributive conflict (see Bruno and Sachs, 1985; Schmitt-Grohé and Uribe, 2018; and ECB, 2022). Starting from Smith's and Marx's analysis of the relationships between peripheral and core countries, see, on the effects of a change in the terms of trade, also the literature related to the dependency theory.

[29] It should be noted that when considering the increase in the change in BI instead of its unit increase, the effect on inflation is on average higher, about 1.5 versus 0.34. For detailed results, see Table A3.2; A3.3; A3.4 in Appendix 3.

Table 3
Estimation with Bargaining Index 1.

VARIABLES	Model 1	Model 2	Model 3	Model 4
$\widehat{p}_{t-1}$	0.648***	0.641***	0.711***	0.739***
	(0.0701)	(0.0638)	(0.0594)	(0.0428)
BI_t	0.322***	0.399***	0.344***	0.292***
	(0.119)	(0.110)	(0.0748)	(0.0709)
$\widehat{\pi}_t$		−0.543***	−0.469***	−0.458***
		(0.157)	(0.107)	(0.100)
$\widehat{p}^{oil}_t$			0.0370***	0.0245***
			(0.00590)	(0.00542)
Δtot_t				−0.109***
				(0.0371)
d74	4.763***	3.333***		
	(1.268)	(1.225)		
d76			−1.938***	−1.882**
			(0.318)	(0.760)
d80	4.248***	3.484***		
	(1.329)	(1.228)		
d82				−2.007**
				(0.798)
Constant	1.189***	2.123***	1.694***	−2.007**
	(0.302)	(0.386)	(0.261)	(0.798)
Observations	58	58	58	58
R-squared	0.799	0.837	0.9027	0.936

Standard errors in brackets.
*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Notes: $\widehat{p}_{t-1}$ is the lagged value of the inflation rate, BI_t is the level of Index 1 for workers' bargaining power, $\widehat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\widehat{p}^{oil}_t$ is the percentage change of the oil price, d74, d76, d80, d82 are dummies for the years 1974, 1976, 1980 and 1982.

Table 4
Estimation with Bargaining Index 3.

VARIABLES	Model 1	Model 2	Model 3	Model 4
$\widehat{p}_{t-1}$	0.654***	0.625***	0.694***	0.659***
	(0.0677)	(0.0654)	(0.0621)	(0.0444)
BI_t	0.224**	0.361***	0.328***	0.303***
	(0.105)	(0.101)	(0.0660)	(0.0472)
$\widehat{\pi}_t$		−0.532***	−0.463***	−0.423***
		(0.157)	(0.104)	(0.108)
$\widehat{p}^{oil}_t$			0.0378***	0.0222***
			(0.00586)	(0.00380)
tot_t				−0.147***
				(0.0339)
d72				−1.416***
				(0.209)
d74	4.851***	3.408***		
	(1.187)	(1.223)		
d76			−1.886***	
			(0.332)	
d80	4.218***	3.587***		
	(1.246)	(1.230)		
d09	−3.401***			
	(1.202)			
Constant	1.218***	2.158***	1.742***	1.789***
	(0.288)	(0.390)	(0.265)	(0.189)
Observations	57	57	57	57
R-squared	0.827	0.836	0.9062	0.9211

Standard errors in brackets.
*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Notes: $\widehat{p}_{t-1}$ is the lagged value of the inflation rate, BI_t is the level of Index 3 for workers' bargaining power, $\widehat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\widehat{p}^{oil}_t$ is the percentage change of the oil price, d72, d74, d76, d80, d09 are dummies for the years 1972, 1974, 1976, 1980 and 2009.

Table 3 reports our preliminary results of the OLS estimations using the second formulation of our Bargaining Index.[30] The coefficient of our synthetic index of workers' bargaining power is significant and positive in all models, ranging from 0.3 to 0.4. Thus, a positive effect of workers' bargaining strength on inflation is confirmed even when we consider all covariates. This means that our results are robust to the specification of the model. Looking at the results of the complete model (Model 4), the coefficient of our index is equal to 0.29, i.e. a unit increase in workers' bargaining power is associated with an increase in the inflation rate of 0.29 percent. The lagged value of the inflation rate seems to have a relevant impact on the current inflation rate, with a coefficient of around 0.7. When it is considered, the *growth of labour productivity* has a negative impact on the inflation rate of about 0.5 percent, while an increase in the change in the *terms of trade* produces a reduction in the inflation rate of 0.11 percent. On the contrary, a percentage increase in the *price of oil* determines an increase of about 0.03 percent in the inflation rate.

The previous results are confirmed in Table 4 which reports the estimates with the third formulation of the Bargaining Index. Again, the coefficient of the Index for workers' bargaining power is positive and significant in all specifications and its magnitude increases when all the covariates are included. In Model 4, a unit increase in the *BI* is associated with a percentage increase in the inflation rate of about 0.3 percent. As for the previous specification, the coefficient of *labour productivity* is negative and equal to −0.42 percent, as well as the coefficient of change in *terms of trade* that is equal to −0.15 percent. Moreover, a percentage increase in the *oil price* is associated with a 0.02 percent increase in the inflation rate.

Our results confirm that workers' bargaining power contributes to determining price dynamics, showing that the root of inflation resides mainly in conflicting claims over income distribution, in line with the theory of the conflict-augmented Phillips curve (see Section 2).[31] Given the broad set of political, economic, and institutional factors considered when summarizing the index of workers' bargaining power, our findings suggest that several elements, in addition to unemployment, may concur to influence the level and evolution of wages and prices. This means that a lower level of unemployment may be associated with weak or declining inflationary dynamics due to the effects of other factors. Similarly, a rising inflation path may occur even if the economy is still far from a situation of labour shortages, and the relationship between unemployment and the rate of change in monetary wages may vary over time due to the influence of other political-institutional factors.[32] The role of these factors in affecting the workers' bargaining power is therefore crucial to explaining changes in the slope and position of the Phillips curve.

5. Conclusion

Although the bargaining power of workers is affected by social and institutional factors which cannot be easily synthesized by a quantitative index and acquire concreteness only for specific historical cases, our analysis shows that a synthetic index of it is useful when shedding light

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[30] Estimates were also made with the second BI formulation; this is not presented in the main text to enhance readability, but can be found in Table A3.1 in Appendix 3.

[31] We also conducted our analysis by considering the percentage change of monetary wage as the dependent variable instead of price inflation. The results, presented in Tables A3.5-A3.7 in the Appendix, indicate that the Bargaining Indexes have a notable and statistically significant influence on explaining the evolution of monetary wage inflation. Interestingly, the coefficient of Bargaining Indexes appears to be significantly higher for monetary wages compared to consumer prices, possibly indicating the influential role of various other factors in price determination.

[32] For an example of these changes over time, consider the current situation in Europe and the United States where the disinflationary process is accompanied by historically low *levels* of the unemployment rate, which, on the other hand, are not associated with particularly strong growth in wages which lag behind price growth.

on the factors shaping the course of money wages and prices.[33] Specifically, by embodying a set of economic and institutional variables, our index confirms the significance of the erosion of the strength of workers in wage bargaining in explaining the recent phenomenon of missing inflation in the US when labour market conditions have improved in terms of employment or low unemployment rates. Indeed, the erosion of workers' bargaining power provides an explanation for the flattening of the Phillips curve during the recovery phase, in line with recent research (see Ratner and Sim, 2022). It also helps to explain its "downward shift" over time, namely why wages and price inflation which are lower than in previous decades are associated with the same unemployment rate due to elements other than employment in influencing the workers' bargaining power.[34]

Additionally, our exercise suggests a possible interpretation of the temporary nature of the inflationary surge that occurred between 2021 and 2022. In order to fight inflation and avoid wage-price spirals, the Fed implemented a strong restrictive monetary policy. According to conventional theoretical models, the idea is to increase unemployment, reduce workers' claims, and suppress wage and price inflation. However, not only do the causes of inflation seem to be unrelated to wage surges, and the wage spiral has often appeared unlikely (Galbraith, 2023), but the long-lasting deterioration in the workers' bargaining position – as demonstrated in our research – could explain the actual inability of nominal wages to keep pace with prices. This has led to a decline in real wages and may also explain the temporary nature of the inflationary surge. The poor reaction of nominal wages, indeed, lies at the core of the absorption of inflation in just a few quarters.

Summing up, our analysis widens the first results after Phillips (1958) where the rate of change in money wages was explained by some indicators of unionization and workers' militancy in addition to the unemployment rate (see, for example, Eckstein and Wilson 1962; Hines, 1964; Mulvey and Trevithick, 1970; Pierson, 1968). It also confirms that an increase in labour productivity and an improvement in terms of trade may help to reconcile the conflicting claims regarding the income distribution of workers and capitalists, thus reducing the inflation rate. Obviously, the opposite can intensify the distributive conflict and, in conditions of workers' weakness in wage bargaining and slow contract renewals, lead to a fall in real wages, as has recently occurred in many advanced countries. Further results in these directions could be provided by an extension of the work that uses a subjective or expert weighting approach, analyses different sub-periods for the United States, and constructs a synthetic index of workers' bargaining power for other advanced countries.

CRediT authorship contribution statement

Claudia Fontanari: Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation. **Enrico Sergio Levrero:** Writing – original draft, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Davide Romaniello:** Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation.

Data availability

Data will be made available on request.

Appendix 1

Table A1
List of variables.

Variables	Description and sources	Time span
CENT	Centralization of bargaining system Source: OECD/AIAS ICTWSS database	1960–2018
Days Idle for strike	Days of idleness due to all stoppages in effect during the reference period Source: BLS-WSP	1960–2018
Effective number of unions	Effective number of unions. Source: OECD/AIAS ICTWSS database.	1960–2018
Employment rate	People employed (15+) on working age population. Source: BLS-CPS	1960–2018
Federal Funds effective rate	The federal funds rate is the interest rate at which depository institutions trade federal funds (balances held at Federal Reserve Banks) with each other overnight. Source: FRED database	1960–2018
Incidence of long-term unemployment (STU incidence)	Incidence of long-term unemployment is the ratio between the long-term unemployed (persons, 27 weeks or more) and unemployed people. Source: BLS-CPS	1960–2018
Inflation rate (CPI index)	Annual percent change of CPI index. Source: OECD.Stat, Economic Outlook No 101, June '17.	1960–2018
Labour productivity growth	Annual percent change of gross domestic product per hours worked (in real terms). Source: OECD.Stat, GDP per capita and productivity levels.	1960–2018
Labour share	Adjusted wage share as percentage of GDP at current prices (Compensation per employee as percentage of GDP at market prices per person employed). Source: AMECO database	1960–2018
Membership concentration at confederation level	Membership concentration at confederation level Source: OECD/AIAS ICTWSS database	1960–2018
Membership concentration at union level	Membership concentration at union level Source: OECD/AIAS ICTWSS database	1960–2018

(*continued on next page*)

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[33] As suggested in Section 3, it also sheds light on the fall in the wage share in the last decades (see Fig. 2).

[34] Note that changes in the slope and position of the Phillips curve can occur together. For example, a past increase on average in the unemployment rate can affect the institutional set of the labour market reducing both the sensitivity of price inflation to changes in the unemployment rate and the inflation rate associated with a certain unemployment rate.

Table A1 (*continued*)

Variables	Description and sources	Time span
Minimum relative to median wage	Minimum relative to median wage of full-time workers Source: OECD	1960–2018
Nominal wage percentage change	Annual percentage change of nominal wage per person employed. Source: BLS-CPS	1961–2018
Number of stoppages	Number of work stoppages in the period Source: BLS-WSP	1960–2018
Oil price, percentage change	Annual percent change of the WTI crude index Source: FRED database	1960–2018
Openness index	The openness index is the sum of imports and exports over the GDP Source: FRED database	1960–2018
Participation rate	Active labour force as a percentage of working age population (15–64 years). Source: BLS-CPS	1960–2018
Ratio of temporary vs permanent layoffs*	Ratio of unemployed people on temporary layoff over permanent job losers. Source: BLS-CPS	1960–2018
Replacement rate**	Replacement rate in unemployment measures the level of unemployment benefits as proportion of the previous income Source: OECD database	1960–2018
Share of employed in Manufacturing	People employed in Manufacturing sector (NAICS 31–33) on total person employed Source: BLS-CES	1960–2018
Share of outward FDI on GDP***	Outward FDI from US to rest of world on GDP Source: FRED database	1960–2018
Short-term unemployment rate	Short-term unemployment rate is the ratio between the number of short-term unemployed (persons, less than 27 weeks) and labour force (15–64 years). Source: BLS-WSP	1960–2018
Total union membership	Total union membership Source: OECD/AIAS ICTWSS database	1960–2018
Unemployment rate	Unemployed people as a percentage of active labour force Source: BLS-CPS	1960–2018
Union Density	Union density rate is the net union membership as a proportion of wage and salary earners in employment Source: OECD database	1960–2018
Workers in stoppages	Number of workers in stoppages in the period Source: BLS-WSP	1960–2018

* The values from 1960 to 1961 are imputed implementing a linear regression with other covariates coming from our dataset; **The data are provided only for odd-numbered years. According to standard practice, we use the lagged value to impute the missing data in the even-numbered years; *** The values from 1960 to 1970 are imputed implementing a linear regression with other covariates from our dataset.

Appendix 2

Fig. A2.1. Bargaining Index 1: scores for rotated principal component.
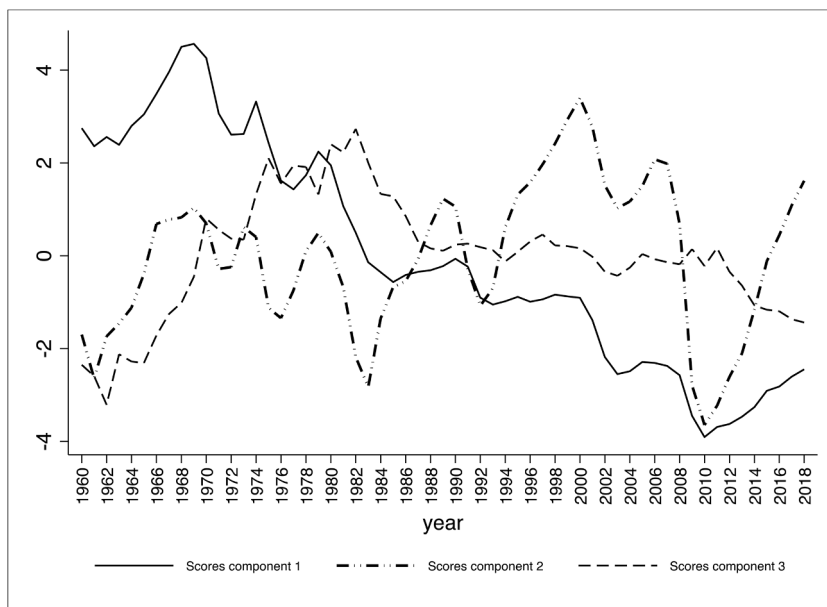
Fig. A2.2. Bargaining Index 2: scores for rotated principal component.
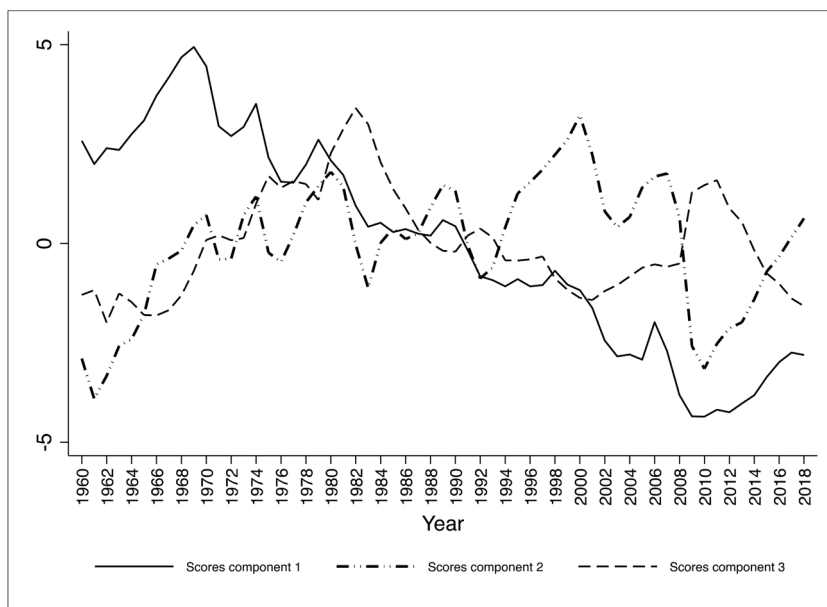
Fig. A2.3. Bargaining Index 3: scores for rotated principal component.

Table A2
Loading of rotated principal components for Index 1, Index 2 and Index 3.

	BI 1			BI 2			BI 3		
	Comp 1	Comp 2	Comp 3	Comp 1	Comp 2	Comp 3	Comp 1	Comp 2	Comp 3
Total Union Membership			0.721			0.6587		0.5691	
Effective numbers of unions	0.3812					0.3101		0.3028	
Membership concentration at confederation level	0.3075			0.3144			0.3049		
Membership concentration at union level	−0.358								
Union Density	0.4665								
Workers in stoppage	0.3918								
Number of stoppages				0.3594			0.3339		
Unemployment rate					0.6087				
Short-term unemployment rate		−0.626							
Incidence of short-term unemployment									−0.3001
Long-term unemployment rate									0.5245

(continued on next page)

Table A2 (*continued*)

	BI 1			BI 2			BI 3		
	Comp 1	Comp 2	Comp 3	Comp 1	Comp 2	Comp 3	Comp 1	Comp 2	Comp 3
Incidence of long-term unemployment		0.3656			0.3379				
Employment rate				−0.4080			−0.3835		0.3169
Participation rate	−0.468		0.4964						
Share of Involuntary part-time		0.661			0.5686				0.6199
Share of employed in Manufacturing				0.4099					
Replacement Rate				−0.3900		0.3219	−0.3692	0.3145	
Minimum relative to average wage				0.4125			0.3826		
Temporary on permanent layoff						0.4680		0.3706	
Openness index							0.3815		
Share of outward FDI on GDP							0.3180		
Federal Fund rate								0.5472	

Appendix 3

Table A3.1
Price inflation: estimation with Bargaining Index 2.

Variables	Model 1	Model 2	Model 3	Model 4
$\widehat{p}_{t-1}$	0.637***	0.628***	0.643***	0.697***
	(0.0706)	(0.0640)	(0.0505)	(0.0484)
BI_t	0.341***	0.422***	0.374***	0.306***
	(0.120)	(0.111)	(0.0763)	(0.0482)
$\widehat{\pi}_t$		−0.551***	−0.488***	−0.424***
		(0.156)	(0.119)	(0.108)
$\widehat{p}^{oil}_t$			0.0345***	0.0246***
			(0.00487)	(0.00420)
Δtot_t				−0.123***
				(0.0397)
d74	4.740***	3.285***		
	(1.260)	(1.212)		
d76				−1.793***
				(0.304)
d80	4.412***	3.676***	2.018***	
	(1.322)	(1.214)	(0.499)	
Constant	1.224***	2.180***	1.919***	1.658***
	(0.303)	(0.385)	(0.272)	(0.183)
Observations	57	57	57	57
R-squared	0.801	0.840	0.9035	0.9197

Standard errors in brackets.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Notes: $\widehat{p}_{t-1}$ *is the lagged value of the inflation rate,* BI_t *is the level of Index 2 for workers' bargaining power,* $\widehat{\pi}_t$ *is the percentage change of labour productivity,* Δtot_t *is the first difference in terms of trade,* $\widehat{p}^{oil}_t$ *is the percentage change of the oil price, d74 d76 d80 are dummies for the years 1974,1976, 1980.*

Table A3.2
Price inflation: estimation with first difference in Bargaining Index 1.

Variables	Model 1	Model 2	Model 3	Model 4
$\widehat{p}_{t-1}$	0.870***	0.983***	0.934***	0.821***
	(0.0926)	(0.0781)	(0.0519)	(0.0487)
ΔBI_t	2.449***	1.673**	1.837***	1.648***
	(0.741)	(0.776)	(0.474)	(0.450)
$\widehat{\pi}_t$		−0.349*	−0.137	−0.0742
		(0.195)	(0.131)	(0.119)
$\widehat{p}^{oil}_t$			0.0364***	0.0201***
			(0.00439)	(0.00556)
Δtot_t				−0.159***
				(0.0363)
d74	3.873***			
	(0.577)			
d76		−2.184*	−2.229***	
		(1.244)	(0.831)	
d79				1.842**
				(0.792)

Table A3.2 (*continued*)

Variables	Model 1	Model 2	Model 3	Model 4
d80	3.565***			
	(0.634)			
d82		−3.482***	−2.316***	
		(1.284)	(0.865)	
d09				−2.364*
				(1.326)
Constant	0.480	0.857*	0.449	0.635**
	(0.301)	(0.503)	(0.329)	(0.304)
Observations	57	57	57	57
R-squared	0.8198	0.823	0.921	0.932

Standard errors in brackets.

***$p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Notes: $\hat{p}_{t-1}$ is the lagged value of the inflation rate, ΔBI_t is the first difference in Index 2 for workers' bargaining power, $\hat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\hat{p}^{oil}_t$ is the percentage change of the oil price, d74, d76, d80, d09 are dummies for the years 1974, 1976, 1980 and 2009.

Table A3.3

Price inflation: estimation with first difference in Bargaining Index 2.

Variables	Model 1	Model 2	Model 3	Model 4
$\hat{p}_{t-1}$	0.786***	0.761***	0.854***	0.828***
	(0.0833)	(0.0713)	(0.0708)	(0.0516)
ΔBI_t	1.373**	1.093*	1.094***	1.081**
	(0.609)	(0.559)	(0.278)	(0.410)
$\hat{\pi}_t$		−0.368**	−0.276**	−0.229*
		(0.171)	(0.114)	(0.116)
$\hat{p}^{oil}_t$			0.0393***	0.0229***
			(0.00604)	(0.00615)
Δtot_t				−0.156***
				(0.0403)
d74	4.982***	4.155***		
	(0.348)	(1.260)		
d76			−2.930***	−2.562***
			(0.485)	(0.912)
d80	4.228***	3.760***		
	(0.648)	(1.294)		
d15		−2.513**		
		(1.204)		
Constant	0.709***	1.447***	0.887***	0.890***
	(0.245)	(0.425)	(0.296)	(0.301)
Observations	57	57	57	57
R-squared	0.7779	0.823	0.8646	0.917

Standard errors in brackets.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Notes: $\hat{p}_{t-1}$ is the lagged value of the inflation rate, ΔBI_t is the first difference in Index 1 for workers' bargaining power, $\hat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\hat{p}^{oil}_t$ is the percentage change of the oil price, d74, d76, d80, d15 are dummies for the years 1974, 1976, 1980 and 2015.

Table A3.4

Price inflation: estimation with first difference in Bargaining Index 3.

Variables	Model 1	Model 2	Model 3	Model 4
$\hat{p}_{t-1}$	0.810***	0.888***	0.914***	0.846***
	(0.0729)	(0.0922)	(0.0604)	(0.0540)
ΔBI_t	1.710***	1.073**	1.425***	1.564***
	(0.541)	(0.521)	(0.424)	(0.465)
$\hat{\pi}_t$		−0.411*	−0.221*	−0.0924
		(0.235)	(0.121)	(0.108)
$\hat{p}^{oil}_t$			0.0380***	0.0245***
			(0.00468)	(0.00408)
Δtot_t				−0.154***
				(0.0404)
d74	4.350***	3.346***		
	(1.262)	(0.755)		
d76			−2.438***	−1.873***
			(0.325)	(0.334)
d80	3.987***			

Table A3.4 (*continued*)

Variables	Model 1	Model 2	Model 3	Model 4
	(1.302)			
d82		−3.089***	−2.414***	
		(0.628)	(0.373)	
d10			0.952***	
			(0.213)	
Constant	0.666**	1.141**	0.628*	0.622**
	(0.295)	(0.545)	(0.353)	(0.243)
Observations	57	57	57	57
R-squared	0.807	0.7853	0.9068	0.9210

Standard errors in brackets.

***$p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Notes: $\widehat{p}_{t-1}$ is the lagged value of the inflation rate, ΔBI_t is the first difference in Index 3 for workers' bargaining power, $\widehat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\widehat{p}^{oil}_t$ is the percentage change of the oil price, d74, d76, d80, d82, d10 are dummies for the years 1974, 1976, 1980, 1982 and 2010.

Table A3.5
Nominal wage inflation: estimation with Bargaining Index 1.

Variables	Model 1	Model 2	Model 3	Model 4
$\widehat{p}_{t-1}$	0.396***	0.395***	0.406***	0.384***
	(0.0530)	(0.0547)	(0.0491)	(0.0425)
BI_t	0.740***	0.760***	0.648***	0.675***
	(0.0945)	(0.0976)	(0.0914)	(0.0777)
$\widehat{\pi}_t$		−0.0557	0.108	0.0808
		(0.133)	(0.125)	(0.115)
$\widehat{p}^{oil}_t$			0.00925*	0.00427
			(0.00531)	(0.00842)
Δtot_t				−0.0759*
				(0.0390)
d94				−1.310***
				(0.149)
d98	1.791*	1.833*	2.107**	2.209***
	(1.000)	(1.025)	(0.939)	(0.308)
d02	−1.708*		−1.908**	−1.795***
	(1.002)		(0.928)	(0.194)
d09			−2.655***	
			(0.985)	
Constant	3.210***	3.273***	2.991***	3.070***
	(0.240)	(0.339)	(0.314)	(0.257)
Observations	57	57	57	57
R-squared	0.783	0.772	0.829	0.7805

Standard errors in brackets.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Notes: $\widehat{p}_{t-1}$ is the lagged value of the inflation rate, BI_t is the level of Index 2 for workers' bargaining power, $\widehat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\widehat{p}^{oil}_t$ is the percentage change of the oil price, d94, d98, d02, d09 are dummies for the years, 1994, 1998, 2002, 2009.

Table A3.6
Nominal Wage Inflation: estimation with Bargaining Index 2.

Variables	Model 1	Model 2	Model 3	Model 4
$\widehat{p}_{t-1}$	0.375***	0.391***	0.374***	0.373***
	(0.0537)	(0.0508)	(0.0514)	(0.0503)
BI_t	0.787***	0.696***	0.755***	0.710***
	(0.0959)	(0.0953)	(0.0936)	(0.0948)
$\widehat{\pi}_t$		0.0400	0.00646	0.0654
		(0.126)	(0.128)	(0.129)
$\widehat{p}^{oil}_t$			0.0121**	0.00656
			(0.00538)	(0.00708)
Δtot_t				−0.0573
				(0.0469)
d98			2.305**	2.256**
			(0.977)	(0.957)
d02		−1.771*		−1.617*
		(0.954)		(0.948)
d09		−2.833***		
		(0.991)		
Constant	3.286***	3.241***	3.171***	3.103***
	(0.240)	(0.315)	(0.329)	(0.323)

Table A3.6 (*continued*)

Variables	Model 1	Model 2	Model 3	Model 4
Observations	57	57	57	57
R-squared	0.772	0.813	0.806	0.822

Standard errors in brackets.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Notes: $\hat{p}_{t-1}$ is the lagged value of the inflation rate, BI_t is the level of Index 2 for workers' bargaining power, $\hat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\hat{p}^{oil}_t$ is the percentage change of the oil price, d98, d02, d09 are dummies for the years 1998, 2002 and 2009.

Table A3.7

Nominal wage inflation: estimation with Bargaining Index 3.

Variables	Model 1	Model 2	Model 3	Model 4
$\hat{p}_{t-1}$	0.360***	0.362***	0.383***	0.372***
	(0.0512)	(0.0518)	(0.0474)	(0.0475)
BI_t	0.633***	0.624***	0.609***	0.590***
	(0.0762)	(0.0838)	(0.0679)	(0.0802)
$\hat{\pi}_t$		0.0696	0.119	0.148
		(0.127)	(0.103)	(0.119)
$\hat{p}^{oil}_t$			0.0108*	0.00369
			(0.00570)	(0.00667)
Δtot_t				−0.0739*
				(0.0429)
d76			−0.677**	
			(0.257)	
d80	1.000**	1.081**		
	(0.374)	(0.476)		
d94	−2.780***	−2.895***	−2.435***	
	(0.222)	(0.301)	(0.325)	
d98	−1.459***	−1.441***	−1.293***	2.157**
	(0.130)	(0.141)	(0.137)	(0.883)
d02	1.709***	1.697***	2.149***	−1.804**
	(0.144)	(0.137)	(0.248)	(0.875)
d09				−2.415**
				(0.935)
Constant	−1.715***	−1.797***	−1.810***	−1.831***
	(0.148)	(0.191)	(0.144)	(0.147)
Observations	57	57	57	57
R-squared	0.786	0.813	0.767	0.799

Standard errors in brackets.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Notes: $\hat{p}_{t-1}$ is the lagged value of the inflation rate, BI_t is the level of Index 2 for workers' bargaining power, $\hat{\pi}_t$ is the percentage change of labour productivity, Δtot_t is the first difference in terms of trade, $\hat{p}^{oil}_t$ is the percentage change of the oil price, d76, d80, d94, d98, d02, d09 are dummies for the years 1976, 1980, 1994, 1999, 2002 and 2009.

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