The longer the weaker? Incorporating long-term unemployment in a non-linear conflict augmented Phillips curve

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Abstract

A recent explanation of hysteresis in unemployment refers to long-term unemployed as a cause of downward wage rigidity, since they are detached from the labour market and therefore they are no good inflation fighters. Therefore, the debate on the Phillips curve has regained significant traction in order to explain the missing inflation matter. Based on the above-mentioned interpretation of hysteresis some scholars tried to provide a new estimation of the NAIRU incorporating short-term unemployed uniquely or taking into account the relative weight of unemployment duration. This essay is situated within this line of inquiry as it investigates whether the conclusion that long-term unemployment is less relevant for the inflation path than the short one depends on the assumption of linearity in the Phillips curve. The thesis I want to test is whether the lower effect of long-term unemployment on wage dynamics comes from not considering the convexity of the Phillips curve. Indeed, the phenomenon of long-term unemployment spreads in correspondence to a very high total unemployment rate, when the Phillips curve is flat. By contrast, no appreciable differences between short and long-term unemployment in affecting nominal wage would appear when convexity is considered. By means of panel data of 25 OECD countries for the 1970-2016 period as a first step, I test the difference between short- and long-term unemployment rates coefficients in a linear version of the Phillips curve and verify that there is no statistical difference between them. Then, I impose a convex shape to the relationship and test the relevance of very high incidence of long-term unemployment in nominal wage inflation. Our findings indicate that once convexity in the Phillips curve is proved, no relevant difference between long and short-term unemployed in wage-setting exist.

1. Introduction

The theory of hysteresis introduced in the neo-Keynesian by Blanchard and Summers (1986) tale goes as follows: after a prolonged recession with an ensuing high level of unemployment rate, also the natural rate, or the non-accelerating inflation rate of unemployment (NAIRU), is expected to change. In other words, hysteresis is a way to deny the pure exogeneity of the NAIRU. Another side to interpret this topic is to consider the evidence of several unemployment rate corresponding to a stable inflation rate: this means a change in the NAIRU but also introduces the missing inflation matter that is the passing of inflation fall even if unemployment rate is high. Despite this innovation, the basic assumptions of the neoclassical theory have not been questioned by this strand of literature (Summa and Braga, 2021). The most recent explanation of hysteresis refers to the long-term unemployment as a cause of downward wage rigidity, as the long-term unemployed would not be perceived as competitors by other workers. If their share on total unemployment increases, the NAIRU also increases. Not taking them into account, therefore, would lead to an underestimation of the NAIRU and thus to expect more disinflation than that estimated by models not incorporating the risk of hysteresis.

The hysteresis, mostly if explain by long-term unemployment increase, needs also a reconsidering of the Phillips curve. Notably, the current form of the Phillips curve is so far from its first exposition provided by Phillips (1958). In his seminal contribution, the author provided an empirical relationship between the monetary wage inflation and the average unemployment rate in a period of more than 50 years (1861-1913). While this relationship was found to be negative, it was not stable in time nor linear due to institutional and economic factors able to influence the bargaining power of workers. This institutional, conflict-based explanation of unemployment-inflation linkage is very different from the subsequent formulation of the Phillips curve. Since Lypsey (1960), this latter has become the field where the neoclassical scholars found the labour market disequilibrium. Friedman (1968) provided a coherent explanation arguing that, from a marginalist point of view, the relationship is between real (not monetary) wage growth and unemployment. Introducing adaptive expectations, the author forged the monetarist (or accelerationist) Phillips curve in which inflation is caused by disequilibrium in the labour market (generally, by an excess of labour demand). In the long run, unlike Phillips, there is no trade-off between unemployment and inflation, he argues.

Despite the presence of involuntary unemployment, also the new-Keynesian labour market equilibrium (i.e. the NAIRU) has the same features as the monetarist natural rate. Removing the perfect competition hypothesis, in this class of models lower unemployment would push up wage aspirations of workers, and so their bargained monetary wage. In the subsequent period, firms will increase the price to restore real wages and preserve their real mark-up. But workers will respond to claim higher monetary wages, and so on. Therefore, in the short run, we will witness a negative Phillips curve in which the magnitude of change in the inflation rate, from year to year, depends on the sign and the magnitude of the unemployment gap (the difference between unemployment and NAIRU). Nevertheless, in the long run, the actual unemployment will approach to long-run fixed NAIRU through neoclassical mechanism or by means of the action of the Central Bank, being this

latter operating using a Taylor rule. After the Grear recession the hysteresis, in his two sides, the endogeneity in the NAIRU and the flattening of the Phillips curve comes back on the stage because the inflation-unemployment dynamics showed different features and magnitudes than those expected. For this reason, the validity of the Phillips curve, has been called into question (Ball and Mazumder, 2011). Based on the interpretation of hysteresis looking at the role of long-term unemployment, some scholars tried to provide a new estimation of the NAIRU considering only the short-term unemployed (Gordon, 2013); or taking into account the relative weight of unemployment duration (Llaudes, 2005; Rusticelli, 2015).

2. Theoretical background

2.1 The original Phillips curve

The original Phillips curve, provided by Phillips (1958) represented an "on average" long-run, and no cyclical, relationship between unemployment and the rate of change in nominal wages. Moreover, no concept of equilibrium of unemployment existed correspond to the unemployment rate where the money wage inflation was zero. Another, important and forgotten feature of the relationship found by Phillips, was the non linearity. The trade off between unemployment rate and inflation could change in time and for some years also in direction, but interestingly he found a significant flattening of the curve for very high level of unemployment.

2.2 From the natural rate to the NAIRU

The first to interpret the Phillips curve in terms of neoclassical demand-supply curvers has been Lipsey (1960) for who the rate of change of nominal wage would depend from the difference between the tow curves and so from a situation of disequilibrium in labour market. If labour demand exceeds the supply, the nominal wage rate will increase but, with an unchanged price level, the increase in real wage will reduce labour demand and conduct system towards the equilibrium. In line with IS-LM interpretation, only with increasing price inflation that leavess unchanged the real wage, is possible to obtain a lower than the equilibrium unemployment rate.

According to Friedman (1968), the Lypsey interpretation is grounded on the hypothesis of monetary illusion tha is not consistent with the marginalist neoclassical approach. For this reason, the Phillips curve must be formulated as a function of the rate of change in real wages instead of nominal ones. Assuming that workers bargain their monetary wages based on the expected inflation rate and that expectations are formed on the inflation observed in the previous period (adaptive expectations), we can write the so-called *monetarist (or accelerationist) Phillips curve*. Therefore, we will have several short-run Phillips curves, each corresponding to the inflation rate of the year preceding the one in

which the bargaining takes place. Friedman's analysis is carried out within a paradigm of perfect competion in which the effect of economic policy is only temporary and due to the delay to fulfill expectations. The behavior of the monetary wage, therefore, is the same as in the Lipsey analysis, with the difference that in bargaining it, the workers also take into account the expected inflation. Moreover, recovering the term from the theory of interest rate of Wicksell , Friedman calls the natural unemployment rate as the result that would be obtained from the resolution of a Walrasian system of general equilibrium equations. It refers to a certain amount of individuals who, for a given real wage, are voluntarily unemployed, either because they are unwilling to work or because they are looking for a job better paid work (Rothschild, 1993). This natural rate is determined solely by supply-side factors, such as the degree of worker protection. When the effective unemployment rate is equal to the natural unemployment rate, price expectations are fulfilled and inflation does not accelerate but remains constant from period after period.

Furthermore, if the unemployment rate were to be lower than the natural unemployment rate, there would be an increase in the inflation rate, and viceversa. All the points where inflation expectations are verified, therefore there is no acceleration or deceleration of the price between one period and another, correspond to the natural unemployment rate and form the so-called *vertical long-run Phillips curve*.

Friedman completely recovers a neoclassical labor market model in which, however, the formation of price expectations by workers allows the expansionary monetary policy to have temporary and short-term effects, at the cost of an increasing change in inflation over the period. following. In the long run, the relationship postulated by the Phillips curve, the trade-off between inflation and unemployment, would disappear. At the same conclusion, albeith with some differences become the New-keynesian approach. Lucas (1972) and the New Classical Macroeconomics go beyond the Monetarist argument by constructing a vertical Phillips curve even in the short term and thus affirming the total ineffectiveness of monetary policy. A model is therefore constructed which, under the assumption of rational expectations of the representative agent and full flexibility of prices and wages, ensures that the economic system is constantly in equilibrium. The latter, correspond to a non-inflationary unemployment rate and represent a full employment equilibrium, being the result of maximizing choices of completely rational agents operating in a context of full flexibility of prices and wages.

The New Keynesian school seemed to respond to this resurrection of neoclassical orthodoxy constructing macroeconomic models of general equilibrium, characterized by fully rational agents, which however act in contexts of markets that are not perfectly competitive. The accreditation of this school within the Keynesian paradigm - rather than adhering to the principle of effective demand

elaborated Keynes (1936), derives from the adoption of models of imperfect competition, in which the presence of nominal rigidities guarantees the existence of equilibria with involuntary unemployment and the non-neutrality of the money in the short term, that is, the presence of a trade-off between inflation and unemployment (Romer, 1993).

The downwards rigidity of wages hinders the perfect functioning of the labor market in the long term, while in the short term, together with the stickiness of prices and no-perfect competition, it favors the role of monetary policy. Starting from the premise that there are rigidities in prices, we can obtain the Phillips curve of these models grounded in the micro foundation of the labor market.

As said, the neoclassical labour market model consists of a demand and supply curves of labor where the reaction of the real wage to excesses of labor supply or demand allows the market to be constantly in equilibrium. This equilibrium is characterized by the presence of only voluntary unemployed and therefore can be considered a full employment equilibrium. The Keynesian revolution had instead shown the involuntary unemployment is a normal condition of system. Referring precisely to this, the neo-Keynesian school has built a model of the labor market considered capable of explaining the existence of involuntary unemployed50 even in conditions in which the system is in equilibrium.

However, the departure from the neoclassical theory is expressed exclusively in the abandonment of the hypothesis of perfect competition since unlesss there are imperfections in the labor market, it is not possible for there to be involuntary unemployment when the labor market is in equilibrium (Carlin and Soskice, 2006 p. 45).

In the absence of perfect competition, the real wages negotiated51 between workers and employers would be above the level of market clearing. Furthermore, unlike imperfect competition regimes, the price is not equal to the marginal cost but it is suggested that companies fix it by adding a mark-up margin to their costs. In this context, the NAIRU will be defined as that unemployment rate for which the real wage is compatible with the expectations of both workers and companies and will be determined exclusively by

2.3 Hysteresis, long-term unemployment and missing inflation

In order to better clarify the object of our research, we propose below a formal reconstruction of the NAIRU and hysteresis in New Keynesian models.[1] Our model can be represented by the usual wage (w) and price (p) equations, i) and ii) respectively (parameters generally assumed as positive):

[1] The formalization is grounded on the textbook contributions by Layard et al. (1994), Carlin and Soskice (2006) and Blanchard (2017).

i) $w = p^e (1 + \alpha Z - \beta u)$ hence: i') $w^{br} = \frac{w}{p^e} = \alpha Z - \beta u$

ii) $p = (1 + \mu) * \frac{w}{lp}$ hence: ii') $w^{ps} = \frac{w}{p} = \frac{lp}{(1+\mu)}$

where w^b is the bargained real wage; w^p is the price-determined real wage; p^e is the log workers' expected price level; Z represents an index of wage push factors (conditions that increase the bargaining power of workers and represent frictions in the downward effect of unemployment on wages); u is the unemployment rate; p is the actual price level set by firms, under the assumption they can maintain the mark-up (μ) unaltered by immediately adjusting prices to current costs; lp is the (marginal) labour productivity (assumed as constant). By replacing the i) in the ii), we obtain equation iii), where inflation rates are explicitly considered. After some maths, and assuming adaptive expectation ($\dot{p}_t^e = \dot{p}_{t-1}$), we have:

iii) $\dot{p}_t - \dot{p}_{t-1} = \frac{1-\beta u+\alpha Z-lp}{lp}$

The iii) implies that a unique unemployment rate is compatible with stable inflation ($\pi_t - \pi_t^e = 0$), that is the NAIRU, identified as u^* in equation iv):

iv) $u^* = \frac{1+\alpha Z-lp}{\beta}$

If the actual unemployment rate is equal to the NAIRU, workers wage aspirations are consistent with capitalist claims (w^{br}=w^{ps}), and actual prices are at their expected level. In words, the NAIRU is the unemployment rate such that no unexpected changes in prices due to conflicting and inconsistent claims take place. In case the system is not at that equilibrium point, from the iii) we can obtain a behavioural equation of inflation:

v) $\dot{p}_t - \dot{p}_{t-1} = -\frac{\beta}{lp}(u - u^*)$

According to equation v), when the actual unemployment rate is lower than the NAIRU, inflation will rise until u^* has been reached again. In New Keynesian models, the change in inflation gives rise to aggregate demand adjustment through interest rate changes that may be caused endogenously by a rise in the ratio of the price level to a given money supply or by appropriate Central bank policy in reaction to inflation rate and output gap.

The role of hysteresis in determining the equilibrium in the labour market and in the path of inflation can be appreciated in Figure 1, grounded on equations i) and ii). Starting from an initial equilibrium (E_1) with the actual unemployment rate (u_1) equal to a long-run, initial NAIRU (u_1^*), a recession and the consequent drop in labour demand will increase the unemployment rate (u_2). There resulting (positive) unemployment gap ($u_2 > u_1^*$) would generate a certain disinflation. Nevertheless, if the increase in unemployment is associated to an increase in its long-term component, the w_1^b schedule will shift upwards (w_2^b). The new equilibrium (E_2) is featured by a 'new' NAIRU, and therefore by a lower (but still positive) unemployment gap ($u_2 > u_2^*$): consequently, weaker disinflation is expected at point B, as this latter is closer to the w^p than point A. While the change in equilibrium (from E_1 to E_2) is a sign of hysteresis, its degree depends on how much long-term unemployment is supposed to be reversible: indeed, if the reduction in actual unemployment rate (engendered by disinflation) also involves its long-term component, w_2^b would shift leftwards (w_3^b) towards the long-run, initial NAIRU.

[FIGURE 1 ABOUT HERE]

2.4 Long-term unemployment in mainstream Phillips curve: empirical review

In order to understand the matter of missing deflation, the literature has followed three ways: using only the short-term unemployment rate as a measure of unemployment (Ball and Mazumder, 2019) - considered the only relevant ones in the unemployment-inflation relationship; constructing an unemployment index that takes into account the distribution of duration and useful for calculating a new NAIRU (Llaudes, 2005; Lehmus, 2018; Rusticelli, 2015; Speigner, 2014) - in order to estimate the different (expected) role of the unemployed short and long term in wage setting; consider a new labour market slack measure considering the duration of unemployment, a range of measures of underemployment and the effects of labour market deregulation (Blanchflower and Posen, 2014; Bell and Blanchflower 2014; Linder, 2014; Yellen, 2011; Pacitti, 2016).

For our purpose, we will focus on the literature, recent and not particularly extensive, that looks at the role of the long-term unemployed in the estimation of the Phillips curve, expressly referring to the hysteresis theory and therefore to the link between long-term unemployment and NAIRU.

Llaudes (2005), constructs an unemployment index in which the weights to be attributed to the short-term and long-term unemployed are estimated, as we shall see, within a system of simultaneous equations built around a classical formulation of the Phillips curve, using the Kalman filter technique. The peculiarity of this work is to use, on the basis of what has been said about the role of the long-term unemployed in wage bargaining, in the estimate of the Phillips curve, instead of the aggregate unemployment rate, 169 an index170 which assigns different weights to unemployed according to the length of the unemployment period. Like other latent variables (NAIRU), optimal weights are obtained through a variety of filters commonly used for estimating long-term variables. His results would confirm that the short-term unemployed have a greater role in determining wages and prices, especially in European countries, nevertheless arriving at theoretically controversial results in our opinion regarding the NAIRU estimates. Following the results of Llaudes, Guichard and Rusticelli (2010), assume that the long-term unemployment rate that becomes structural is equal to 1/3 in non-European countries and 2/3 in European countries. In this way, the authors believe they are taking into account the risk of hysteresis due to the increase in long-term unemployment in the post-crisis period and to underline the differences between different models of capitalism and welfare. In fact, the focus is, right from the start (e.g. Blanchard and Summers, 1986) centered on the situation of European economies, afflicted by persistent unemployment and historically less flexible labor markets, and the comparison with the more liberal countries (USA and UK) is done in order to underline the differences in terms of best-performance. Logeay and Tober (2006), applying the Kalman filter to the classic OECD model, found that in the euro area the coefficient referred to the delayed unemployment rate on the NAIRU was significant and equal to 0.26, thus confirming the presence of hysteresis. Focusing on Germany, the only one in Europe to provide a sufficient amount of data on the duration of unemployment, they verify the presence of hysteresis by inserting long-term unemployment in the NAIRU estimate, they estimate a coefficient equal to 0.82 which multiplied by the incidence of long-term unemployment (0.3) gives about 0.25 percent, similar to the previously estimated coefficient. In the same vein, Kajuth (2010) adds the long-term unemployment rate to the NAIRU estimate for Germany obtaining a coefficient comparable to those of the previous studies (0.28) and an estimate of the NAIRU, at the end of the estimation period (2009). equal to 8%. Speigner (2014), with respect to the situation in Great Britain, as we shall see, supports a different thesis: considering a linear Phillips curve is a mistake and leads to a wrong interpretation of the role of the long-term unemployed. Considering a non-linear but convex Phillips curve, in the wake of

what Phillips himself (1958) argues, long-term unemployment would become a relevant phenomenon in the flat part of the curve, in correspondence with high unemployment rates, corresponding to a rate of change in wages representing a kind of floor. Considering a linear Phillips curve would therefore have meant that the downward rigidity of wages found for these levels of unemployment was attributed to the long-term unemployed. Furthermore, Kiley (2015), with reference to the USA, using cross-sectional data on 24 US metropolitan areas, shows that the inverse relationship between inflation and unemployment changes reappears when the differences between the different regional labor markets are taken into account. . Fixed effects by year and area are included in the estimation procedure and long-term unemployment is defined as a period of unemployment of 27 weeks or more. Kiley includes both the short-term and long-term unemployment rate. In this context, no significant difference would exist between the role of the short-term and long-term unemployed and the hypothesis that the short-term and long-term unemployed have the same effect on inflation cannot be rejected

2.5 Conflict claim explanation of inflation

Referring to an alternative theory of inflation, combined with the long-term extension of the effective demand principle, a more convincing explanation could be found for the unemployment-inflation relationship observed in recent years without the need to adduce the exceptions proper to the marginalist theory. We refer to a theory of cost inflation, typical of the post-Keynesian approach, in which the root of inflation would be the conflict claim over income distribution that can take different results in different situations, and that could be influenced by the dynamics of "exogenous" nominal variables such as the exchange rate (Amico and Fiorito, 2013) and the interest rate determined by the monetary authority (Pivetti 1991; Stirati, 2001; Levrero, 2013) as they can influence costs monetary production. Recalling classical and Keynesian interpretation of employment and labour market, periods of high involuntary unemployment (or, in Marxian terms, the presence of a larger industrial reserve army) could be a normal situation, especially in absence of appropriate aggregate demand stimulus (Garegnani 1990, Stockhammer, 2008). 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 wage, because unemployment is just one, important but not the only, source of bargaining power of workers. From a point of view, this means that wage inflation can occur much before the situation of full employment but also that a lower level of unemployment can be associated with a weak inflation dynamic due to the effects of other factors. Therefore, a central role in determining the outcomes of bargaining is attributed to the institutional context, understood both in a broad and political sense (Kalecki, 1943) and about the institutions, various elements of the labour market and their mutual interaction (Garegnani 1990). Two consequences follow: an

increasing inflation path can occur even if the economy is still quite far away from a situation of labour scarcity, the relationship between unemployment and wage can also change over time due to the influence of political-institutional factors. And, above all, the wage and price dynamic does not stop once restoring the natural rate of equilibrium but it could result in a new distributional context with the same unemployment rate. In this sense, also the slope of the Phillips curve can change over time without the need to introducing particular exceptions to the normal functioning of the system. While in the European countries the labour market has undergone an enormous and widespread process of deregulation, in the US, also without a process of reform, the bargaining power of workers diminishes. Problems as the depressed role of trade unions (Stansbury and Summers, 2020), the precariousness (the matter of "partly unemployed") and the high duration of unemployment (Yellen, 2014; 2016) could have increased the "cost of job loss" (Pacitti, 2020) and depress the ability of workers to achieve wage increments. Moreover, a relevant matter relies on the segmentation of the labour market both at gender (as in Mediterranean countries, see for example Berlofa et al., 2020) and ethnic level (as in the US, see for example Ferry and Mayoral, 2021): to be simple, the presence of a relevant share of marginal workers could influence the total bargaining power from several points of view that go from the propensity to join the trade union of these categories, to the emergence of conflicts within the working class (Barba and Pivetti, 2016). Furthermore, recent literature has point attention to the role of involuntary part-time and the dynamic of vacancy rate (especially after the pandemic crisis). While scientific research has now disproved the effectiveness of labour market deregulation in improving the employment performance of the labour market, their effect on wage dynamics is still debated, although even among mainstream authors (Blanchflower and Poser, 2014; Linder et al., 2014; Yellen, 2014, 2016).

3. Data and findings

I refer to a panel data of 25 OECD economics from 1960 to 2016 (detailed on countries and each starting period in appendix). First of all, according to Kiley (2015) I test a linear version of Phillips curve. To discuss the New-keynesian explanation of hysteresis based on the role of long-term unemployment and its consequence for the estimated Phillips curve I consider both long-term (ltu) and short-term (stu) unemployment rate as two separate covariate. Moreover, according to Summa and Braga (2020) I test explicitly the role of institutions, that can influence the bargaining potion of worers, beside the leve of unemployment The eximated equation is:

1. $\dot{w}_{i,t} = \alpha_i + \delta_t + \beta_{stu} stu_{i,t} + \beta_{ltu} ltu_{i,t} + \beta_p \dot{p}_{i,t-1} + \beta_\pi \hat{\pi}_{i,t} + \beta_{REP} REP_{i,t} + \beta_5 EPL_{i,t} + \varepsilon_{i,t}$

Where, in addition to variables defined above, $\dot{w}$ is the monetary wage inflation, $\dot{p}$ the inflation rate and $\hat{\pi}$ the growth of labour productivity. REP is the *replacement rate* and represents the generosity of unemployment benefits, while EPL is the Employment Protection Legislation, an index referred to the extension of pro-workers labour market institutions. α_i and δ_t are two-way fixed effect. To avoid multicollinearity issue and use jointly stu and ltu. Hoewer, as table 1 shows, the correlation coefficient between these two variable is equal to 0.27 and so they can insert togheter in our regression.

[table 1 here]

Table 2 shows the results preliminar findings of our linear Phillips curve estimation. Albeit with a different intensity (given by the size of the coefficient), both the short-term unemployment rate and the long-term unemployment rate have a negative sign and the respective coefficients are always statistically significant. Moreover, the significance of the short-term unemployment rate coefficient decreases in the last two specifications. This may testify that the long-term unemployed also contribute to weakening the bargaining power of workers and nominal wage inflation, contrary to what is postulated in the neo-Keynesian approach which would have the long-term unemployed as *non-inflation fighters*. The short-term unemployment rate, however, seems to have a higher coefficient than the long-term one, although the latter does not assume in any specification a value that is not statistically different from zero (as the neo-Keynesian theory would like). In order to verify whether there is a statistically significant difference between the coefficients of the variables referring to the duration of unemployment, we carried out the Wald Test. The null hypothesis it assumes is that β_{stu}-$\beta_{stu} = 0$. In the last two specifications, where however the number of observations is reduced due to the insertion of the replacement rate variable (for the latter there is a substantial limitation of available data) the Wald Test does not allow to reject the null hypothesis of a difference statistically significant between the two coefficients of the two variables. We therefore believe that we can interpret these first results as an element of substantial weakness in the idea presented up to now and supported by the literature analyzed of the ineffectiveness of the long-term unemployed in determining the dynamics of monetary wages.

[table 2 here]

Furthermore, consistent with the literature on the Phillips curve, past inflation seems to have a relevant role in explaining the percentage change in nominal wages. The coefficient associated with it is always highly significant and always less than 1. From this, we believe we can argue that, in the period considered, there was a run-up of wages over prices, ultimately never perfectly completed (and therefore compatible with a reduction in the purchasing power of wages), and not vice versa.

Furthermore, in the last two specifications, in which, as mentioned, there is a significant reduction in observations due to the inclusion of the replacement rate available only for the period 2001-2016, the coefficient is further reduced, which can be interpreted as a further weakening the ability of money wages to 'keep' the pace of price growth. We also consider it interesting to focus on the estimate of the coefficient concerning the replacement rate itself. As we have seen, in fact, the literature (e.g., Guichard and Rusticelli, 2010; Rusticelli, 2015) argues that more generous unemployment benefits would increase the incentive of the unemployed to remain in this status, thus limiting the disinflationary effectiveness of unemployment. itself (the so-called missing deflation phenomenon). From our estimates, however, the coefficient associated with this variable is never statistically significant. On the other hand, the coefficient referring to the growth of output per work unit is always significant and positive. Not imagining any mechanical and univocal relationship between productivity growth and nominal wage growth, we tend to interpret this coefficient as a symptom of a greater inclination of capitalists to grant wage increases when labor productivity increases or, in other words, of a better opportunity. of workers to negotiate higher wages. As robustness check, we performed the same regressions on a sub-sample of countries that we will define, following the definition of Girardi et al. (2018), mature economies.

[table 3 here]

The results reported in table 3 confirm our thesis: not only does the Wald test certify the statistical non-significance of the difference between the coefficient of short-term and long-term unemployment but, in these estimates, the former gradually loses significance, while the magnitude of the latter increases compared to what emerged from the analysis of the whole pool of countries. It would therefore seem that in countries with more advanced capitalism, and probably with a structure of deep-rooted bargaining and 'traditional' industrial relations, it cannot be said that the long-term unemployed play a marginal, if any, role in wage dynamics. In the last specification proposed, the increase in the long-term unemployment rate would even seem to be the only one associated with a reduction in the percentage change in nominal wages, certifying the depressing effect on the balance of power of this category of workers.

It therefore appears that in a linear Phillips curve it is not possible to say with certainty that there is no significant role for the long-term unemployed in determining money wages. It would not be possible, therefore, to say that the worsening of the phenomenon of long-term unemployment contributes to the disappearance of the Phillips curve, thus weakening the link between unemployment and inflation. To corroborate these results we carry out a further exercise. Outside of the literature linked to an accelerationist Phillips curve, in fact, which argues that inflation originates

in the distribution conflict - at least until full effective employment is reached - the unemployment rate maintains its inverse relationship with respect to the inflation rate. Indeed, it is an important indicator of workers' bargaining power and therefore of their ability to negotiate wage increases or resist reductions (Stirati, 2001; Stirati and Paternesi, 2018; Serrano, 2019; Summa, 2019). We have also seen how Phillips (1958) was firmly convinced of the non-linearity of the relationship between the unemployment rate and inflation and how Speigner (2014) believed that precisely not considering this non-linearity had determined the conclusions about the role of the long-term unemployed. in wage bargaining. Conclusions that would depend on an error that one would run into thinking of the Phillips curve as a linear relationship. In fact, long-term unemployment is a phenomenon that emerges with greater gravity in correspondence with high levels of overall unemployment. At these levels, as clearly argued by Phillips (1958), we find ourselves in the flat part of the Phillips curve itself: what has been interpreted as the lack of impact on wage inflation of the long-term unemployed would be nothing more than the manifestation of this condition; that for which there would be a sort of zero lower bound of monetary wages that is difficult to overcome due to the resistance of workers (Speigner, 2014). For our part, therefore, let's try to keep these arguments together by verifying whether there is non-linearity in the relationship we are investigating, in what relationship are unemployment and inflation of money wages in our sample and whether or not the incidence of long-term unemployment is a variable useful to explain it. The motivation for believing that the Phillips curve is not linear, in addition to what Phillips (1958) already noted, can be well understood if we look graphically at the relationship it expresses. As the figures below show, the slope of the curve, for particularly low levels of the unemployment rate (in our case the red line refers to unemployment rates below 3%) is significantly greater than the slope of the curve (green line) for higher unemployment rates. This is true whether you look at the already defined mature economies, or if you look at our full panel. A lower inclination, therefore, corresponds to a lower propensity to change nominal wages which can be read in one direction or another but which, in any case, testifies to a certain downward 'resistance' in nominal wages.

[figure 1&2 here]

The 'non-linearity' that emerges on a graphic level convinced us to empirically verify the possible existence of a curvilinear relationship. To verify the possible determinants of the dynamics of nominal wages we will therefore estimate the following equation:

2. $\dot{w}_{i,t} = \alpha_i + \beta_u u_{i,t} + \beta_{usq} u^2{}_{i,t} + \beta_{cub} u^3{}_{i,t} + \beta_p \dot{p}_{i,t-1} + \beta_\pi \hat{\pi}_{i,t} + \beta_{REP} REP_{i,t} + \delta_t + \gamma\, I_{i,t} + \varepsilon_{i,t}$

Compared to equation 1, the total unemployment rate (u) is the main covariate. (u^2) and (u^3) serve the purpose to verify whether the assertion that the Phillips curve is convex-shaped can be statistically

sustained. Moreover, to test the role of long-term unemployed, the dummy $I_{i,t}$ was included. Its value is 1 whenever the incidence of long-term unemployed on total unemployment is above one standard deviation than the country's average. According to the literature on hysteresis its coefficient (γ) is expected to be both positive and statistically significant because long-term unemployment is at the root of wage rigidity. Alternatively, had we find either a non statistically significant or a negative coefficient, there would be evidence in favour of an alternative theoretical approach to inflation.

4. **Robustsness check**
5. **Conclusive remarks**

Our findigs seems to suggest the existence of some matter between the empirical evidence and the postulates of neo-Keynesian hystereis theory based on the role of long-term unemployment. Indeed, in the last instance, the persistence of unemployment should be attributed to the lack of appropriate wage deflation due to detachment of long-term unemployed. Our exercise support the idea the also this category of workers has a role in achieve wage deflation. If it is true, it more difficult argue that hysteresis in unemployment and missing deflation are caused by high long-term unemployment rate. On the other hand, they support an alterntive theory of inflation providing a more convincing explanation of situation of high unemployment and stable inflation rate and for the absence of accelerating inflation(or deflation), for low (or high) unemployment rate. Indeed, the emphasis on the role of the long-term unemployed in wage bargaining, is usefull to a theory that explain situations of imbalance in the markets as caused by price stickness, in particular of factors of production. Hence, it is looking for a cause of wage rigidities that can provide an interpretation of why neoclassical mechanisms are not activated, even in the long term, and such as to guarantee the convergence of the system towards a stable equilibrium point. If those mechanisms are at work, in the long run, they will admit the neutrality of the money, and so the impossibility of guaranteeing stable and lasting increases in the activity rates of the economy, albeit at the expense of a growing inflation rate (Serrano, 2019). The hysteresis theory that we have analyzed in this thesis, therefore, while attempting to consider the role of aggregate demand in determining the long-term equilibrium, remains anchored to a supply side interpretation of the NAIRU in which, where the persistent effect of aggregate demand fall are due wage rigidities. Furthermore, favoured by the empirical evidence of unemployment rate close to full employment (Pacitti, 2020), especially in the USA, without a strong recovery in wage and price inflation, a flourishing trend of research - while anchored within the dominant paradigm - has looked at long-term unemployment from a completely different direction. Accordingly, it would represent a further cause of weakening of workers bargaining power, who would look with fear at the possibility of running into a high duration of unemployment and therefore would not be incentivized to engage

in the distribution conflict to obtain higher wages. According to Yellen (1996), a condition of widespread and long-lasting unemployment would make higher the *cost of job loss*. This phenomenon worsened after the Great Recession, animating the search for better measures of labour market slack able to considering the worsening of the contractual and social security conditions of workers, the growing insecurity represented the spread of part-time and fixed-term contracts, as well as the reduction of participation in the labour market (Yellen, 2014, 2016; Bell and Blanchflower, 2014; Linder, 2014; Blanchflower, 2015; Stansbury and Summers, 2020). It is important to underline that this approach looks at the slack of the labor market to justify the existence of an even lower NAIRU than the actual unemployment rate, therefore it remains within the neo-Keynesian paradigm, nevertheless it seems underlines some important aspects that have characterized the labor market for almost thirty years. As Figure 3 shows, the flattening of the Phillips curve begins well before the Great Recession and the rediscovery of the role of the long-term unemployed as a cause of hysteresis.

[figure 3 here]

If considered only over the period from 1980 to 2016 (green line), the relationship between the unemployment rate and the percentage change in nominal wages becomes much flatter than that estimated for the entire sample (red line). Among the various causes of the phenomenon, as argued by several scholars, the progressive process of deregulation of the labor market must certainly be included (Seccareccia, 1996; Stockhammer, 2011; Brancaccio et al., 2018) which concerned at a global level, with a particular emphasis in the countries of southern Europe. Therefore, if these reforms, strongly encouraged by international institutions (OECD, 1994, 2012; IMF, 2011; ECB, 2015), have failed to favour an increase in employment (Baccaro and Rei, 2007; Howell et al, 2007; ILO, 2015); they also contributed to weakening the bargaining power of workers and thereby worsening the functional distribution of income (Stockhammer, 2013; Brancaccio et al., 2018). However, the amazement that emerges in the orthodox literature is a bit trivial: the weakening of the wage dynamics was in fact a declared objective both of the theoretical and political analysis since, precisely the stringent institutional rules of the labour market, reducing the downward flexibility of wages, would have caused high levels of unemployment (Blanchard and Giavazzi, 2003). This is especially true if we look at the arguments that have looked at the incidence of long-term unemployment as a cause of hysteresis as it is guilty of not induce the adequate reduction of wages downwards to reabsorb unemployment.

At this point, therefore, it appears evident that weaknesses are shown by the very concept of NAIRU, which is at times difficult to grasp, as an equilibrium unemployment rate, distinct from a full employment unemployment rate, which seems open to multiple and often alternative interpretations within the same neo-Keynesian paradigm that elaborated it.

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Tabel 1 Correlation matrix of Phillips curve estimation

	stu	ltu	$\hat{\pi}$	epl	$l.infl$	$Replacement\ rate$
stu	1.00					
ltu	0.27	1.00				
$\hat{\pi}$	-0.05	0.05	1.00			
epl	-0.30	0.28	-0.01	1.00		
$l.infl$	0.04	0.05	0.13	0.06	1.00	
$Replacement\ rate$	-0.05	-0.05	-0.07	0.19	-0.15	1.00

Tabel 1 Linear Phillips curve: nominal wage inflation versus short and long term unemployment. 25 OECD countries

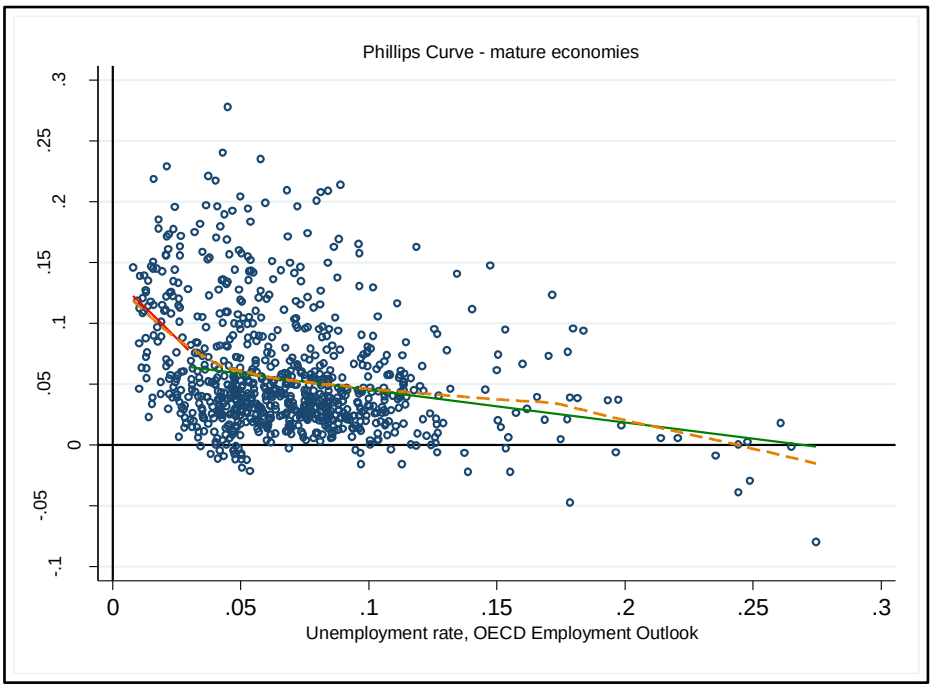
	(1)	(2)	(3)	(4)	(5)
VARIABLES	R.E.	F.E.	F.E.	F.E.	F.E.
stu rate (<6 months)	-0.330*** (0.0624)	-0.595*** (0.109)	-0.706*** (0.160)	-0.731** (0.330)	-0.623* (0.348)
ltu rate (>6 months)	-0.153*** (0.0270)	-0.191*** (0.0495)	-0.232*** (0.0767)	-0.254*** (0.0372)	-0.377*** (0.0667)
Growth of Labour Productivity	0.447*** (0.0387)	0.400*** (0.0839)	0.478*** (0.0897)	0.284** (0.0962)	0.339*** (0.106)
Inflation rate (lagged)	0.817*** (0.0200)	0.724*** (0.0750)	0.724*** (0.0861)	0.331*** (0.148)	0.321*** (0.099)
Replacement rate				0.0000 (0.0000)	0.00015 (0.0001)
Employment Protection Legislation			-0.0019 (0.0055)		-0.00493 (0.0182)
Constant	0.0264*** (0.00259)	0.0521*** (0.0080)	0.0526*** (0.0177)	0.0654*** (0.0077)	0.072 (0.0435)
Observations	816	816	620	396	307
Wald test (p-value) $\beta_{stu} = \beta_{ltu}$	0.0196	0.022	0.024	0.173	0.489
R-squared	0.762	0.724	0.728	0.522	0.508
Number of countries	25	25	25	25	25

Tabel 2 Linear Phillips curve: nominal wage inflation versus short and long term unemployment. 21 OECD mature economies

VARIABLES	(1)	(2)	(3)
stu rate (<6 months)	-0.626***	-0.667*	-0.531*
	(0.133)	(0.321)	(0.286)
ltu rate (>6months)	-0.248***	-0.329***	-0.377***
	(0.0947)	(0.0552)	(0.0795)
Growth of Labour Productivity	0.441***	0.197**	0.272**
	(0.0911)	(0.0837)	(0.0748)
Inflation rate, lagged	0.547***	0.089	0.123
	(0.0881)	(0.682)	(0.104)
Employment Protection Legislation index	0.0047		0.0123
	(0.00594)		(0.0152)
Replacement rate		0.0000	0.000048
		(0.00005)	(0.00008)
Constant	0.0462***	0.0685***	0.0366
	(0.0157)	(0.0111)	(0.0354)
Observations	556	332	262
Wald test (p-value)	0.065	0.291	0.592
R-squared	0.685	0.599	0.579
Number of countries	21	21	21

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figures 1 and 2. Phillips curve, no parametric best fit and two linear best fit for unemployment rate minor (red line) and higher (green line) than 3%.



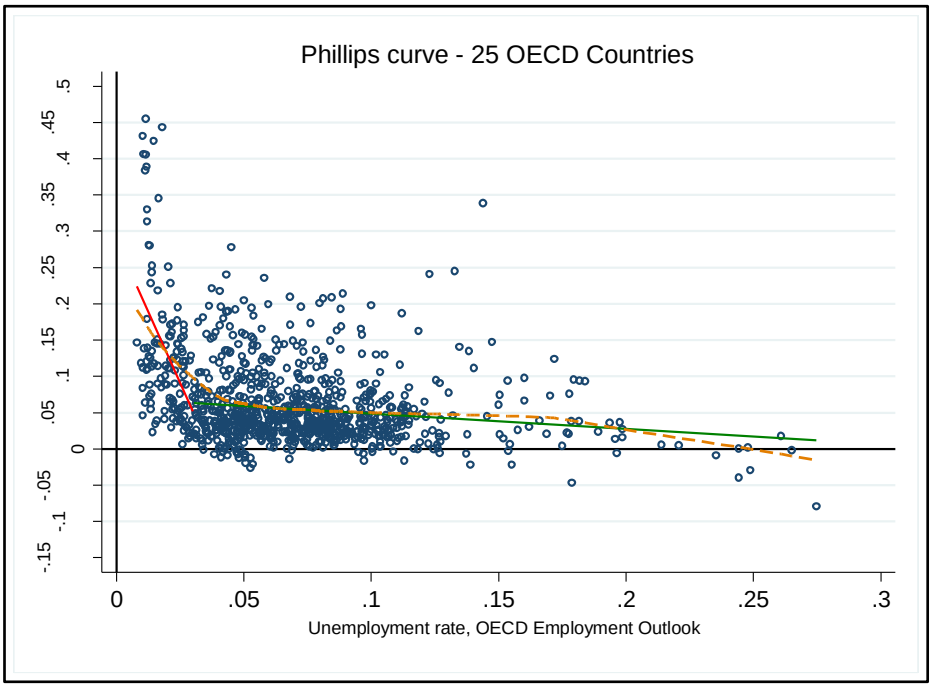


Tabella 3 Not linear Phillips curve in total unemployment rate 25 OECD countries

VARIABLES	(1) FE - convexity	(2) FE - convexity - two diffent incidence of LTU	(3)	(4) FE - convexity -two different incidence of LTU and Replacement rate	(5)
Unemployment rate	-1.152***	-1.206***	-1.165***	-1.313***	-1.270***
	(0.237)	(0.282)	(0.246)	(0.243)	(0.217)
Unemployment rate square	0.0695***	0.0721***	0.0700***	0.0628***	0.0603***
	(0.0232)	(0.0252)	(0.0235)	(0.0162)	(0.0151)
Unemployment rate cube	-16.13**	-16.58**	-16.19**	-12.44***	-11.98***
	(5.842)	(6.189)	(5.896)	(3.599)	(3.479)
Inflation rate, lagged	0.757***	0.757***	0.756***	0.491***	0.486***
	(0.0476)	(0.0472)	(0.0488)	(0.116)	(0.117)
Growth of labour productivity	0.442***	0.438***	0.442***	0.337***	0.342***
	(0.0803)	(0.0779)	(0.0799)	(0.0919)	(0.0924)
LTU_1 Incidence		0.00167		0.00222	
		(0.00224)		(0.00270)	
LTU_2 Incidence			0.000908		0.00289
			(0.00277)		(0.00360)
Replacement rate				0.000143*	0.000129
				(8.24e-05)	(7.86e-05)
Constant	0.0614***	0.0631***	0.0620***	0.0698***	0.0696***
	(0.00764)	(0.00892)	(0.00822)	(0.00796)	(0.00794)
Observations	817	816	816	396	396
R-squared	0.723	0.723	0.723	0.477	0.477
	25	25	25	25	25

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3. the change in the slope of Phillips curve in recent times