

Two routes back to the old Phillips curve: the amended mainstream model and the conflict-augmented alternative

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Abstract: Blanchard recently stated that the old Phillips curve is alive and well. In this paper we argue that there are two routes to this old Phillips curve. The mainstream route assumes demand-pull inflation and full incorporation of inflation expectations into money wages, and amendments to avoid its accelerationist behavior. The alternative non-neoclassical conflict-augmented Phillips curve assumes no labour scarcity, cost-push inflation and that expectations are not always fully passed on to nominal wages. Additionally, this alternative is also more general than the Heterodox-NAIRU models, as it is compatible both with stable and accelerating inflation, depending on the strength of the workers' bargaining power.

Keywords: Phillips curve, distributive conflict, natural rate of unemployment

JEL classification: B51, E31, E13.

INTRODUCTION

Almost sixty years after the seminal work of Phillips (1958), Olivier Blanchard stated that the (old) Phillips curve is alive and well, as empirical works find evidence of a relation between the *level* of inflation and the *level* of unemployment, for many advanced economies (Blanchard et al., 2015), including the US (Blanchard, 2016). This is a striking assertion made by a prominent mainstream macroeconomist in light of the historical development of the Phillips curve's traditional interpretation. Since Friedman (1968), the old Phillips curve was replaced by the accelerationist Phillips curve, in which the gap between the actual unemployment rate and the natural rate of unemployment affects the *change* and not the level of

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inflation.¹ The view that the ‘accelerationist curse’ is over is also somehow accepted by Gordon (2018) and Solow (2018).

The theoretical route taken by the mainstream from the accelerationist Phillips curve back to the previous old Phillips curve does not discard the theoretical central assumptions of the former: (i) that wage inflation is demand-pull, a result of a situation of scarcity in the labour market and (ii) that expected inflation has to be fully incorporated into nominal wage increases, as workers are assumed not to have money illusion. Instead, it consists of amending the accelerationist Phillips curve by introducing imperfections in the functioning of the neoclassical labour market and/or specific assumptions about expectation formations. According to this amended old Phillips curve version, the accelerationist view is the usual, more general case, but the old Phillips relation can occur under specific circumstances.

However, there is another route to arrive at the old Phillips curve. Following Serrano (2019), we shall call this alternative the “conflict-augmented” Phillips curve. This view interprets nominal wage increases in the original Phillips work as cost-push inflation in terms of conflicting-claims over distribution (Rothschild, 1971; Desai, 1975; Palley, 2018). Wages may start rising because of the increased bargaining power of workers when unemployment rates are reduced, long before full employment. In this alternative view, labour is usually not scarce, and the bargaining position of workers often does not allow for expected inflation to be fully incorporated into nominal wage increases. The “conflict-augmented” Phillips curve is both compatible with the old Phillips relation between unemployment and inflation but also with accelerating inflation, depending on the relative strength of the workers’ bargaining power. But it is the old Phillips relation that is seen to occur more often, and the accelerationist relation only happens when the distributive conflict is very intense.

This paper aims to compare and contrast these two routes back to the old Phillips curve and to argue that the conflict augmented alternative has the advantage of not being constrained by the two crucial neoclassical assumptions which lead to the accelerationist behavior.² We also make a further distinction between the conflicting-claims Heterodox NAIRU models and the more general conflict-augmented Phillips curve. The former drops the first assumption of labour scarcity but keeps the second assumption of fully incorporated inflation expectations. Thus, it also presents an accelerationist behavior. By contrast, in the conflict-augmented Phillips curve, the relation between inflation and unemployment is compatible both with

the old Phillips curve and also with accelerating inflation, depending on the relative strength of the workers' bargaining power.

After this introduction, we briefly present the accelerationist Phillips curve, its key assumptions, and the theoretical attempts to amend this model. In the next section, we look at the alternative conflict-augmented old Phillips curve. This is followed by a section to address the empirical literature about the flattening of the accelerationist curve, the change in the relative strength of the workers' bargaining power in advanced countries since the 1970s and its correlation with inflation. Final remarks are made in the last section.

THE ACCELERATIONIST PHILLIPS CURVE AND SOME AMENDMENTS

The accelerationist Phillips curve and its assumptions

In general terms, the mainstream position views inflation π depending on inflation expectations π^e and a gap denoting demand pressures, here defined by a gap between the unemployment rate U and the natural rate of unemployment, U^* . Inflation expectations are passed fully through to inflation, and the parameter α in Equation (1) is equal to 1. The parameter β is the sensitivity of inflation to the unemployment gap:

$$\pi = \alpha\pi^e - \beta(U - U^*), \quad \alpha = 1 \quad (1)$$

If expectations are backward-looking, and if we suppose the simplest case where there is only one lag (Equation 2), substituting (2) into (1) we get the accelerationist Phillips curve (Equation 3):

$$\pi^e = \pi_{-1} \quad (2)$$

$$\pi = \pi_{-1} - \beta(U - U^*) \quad (3)$$

Friedman (1968) arrives at this result by assuming expectations are adaptive. Gordon (2011) shows Equation (2) can be interpreted not only by adaptive expectations but also by inertia (due to sticky prices, lengthy contracts, and also input-output supply chains), which is also compatible with rational expectations. Equation 3 represents a simplified version of the accelerationist Phillips curve (Taylor, 2000; Ball, 2009).

As defined in Blanchard et al. (2015), the accelerationist Phillips curve is the one in which the deviation between unemployment and the natural rate of unemployment affects the change in inflation. Consequently, one single temporary demand shock – that is, a temporary deviation of the unemployment rate from the natural rate of unemployment - changes the

level of inflation permanently. A permanent demand shock – a permanent deviation of the unemployment rate from the natural rate of unemployment - leads to continuously increasing (or declining) inflation and, consequently, hyper-inflation (or hyper-deflation). The only possible situation where inflation is stable occurs if the economy lies in the natural rate of unemployment.³

This accelerationist Phillips curve, however, is a direct result of two assumptions that were progressively incorporated in the mainstream Phillips curve: (i) that wage inflation is a result of a situation of scarcity in the labour market (Lipsey, 1960), and (ii) expected inflation is fully incorporated into nominal wage increases (Friedman, 1968). These assumptions are directly derived by interpreting inflation as resulting from the operation of a competitive neoclassical labour market, as we will explain in the next paragraphs. A detailed record of the history of the economic thought of the Phillips curve can be found in Humphrey (1985), Furher et al. (2009), Gordon (2011), and Hoover (2015). For our purposes, we will only focus on these two crucial assumptions.

The first assumption – changes in nominal wages as a measure of scarcity in the labour market - was first proposed by Lipsey (1960). He interpreted Phillips' (1958) empirical findings within a neoclassical framework, in which wage inflation is seen as a consequence of a disequilibrium position between labour demand and supply, where the situation of full employment is only compatible with zero wage rate inflation.⁴ The old Phillips curve of the 1960s, which Blanchard (2016) is referring to, is the one alluded to above which is then incorporated into the neoclassical synthesis framework after the contributions of Lipsey (1960) and Samuelson and Solow (1960) by specifying it in terms of price inflation.⁵

The second assumption is introduced by Friedman (1968) where it is correctly pointed out that within the neoclassical framework if wage inflation is a result of disequilibrium in the labour market, the correct variable which governs labour demand and supply decisions is not the nominal wage but the *real wage*. In this way, expected real wages must be taken into account. From this assumption, Friedman deduces that the whole of expected inflation is incorporated into nominal wage increases and is thus passed through to current inflation - which in Equation (1) means that α is equal to one. Moreover, labour scarcity will happen at U^* , which was called by Friedman the *natural rate of unemployment*, and when positive (negative) demand shocks occur, the unemployment rate deviates from the natural rate of unemployment at the cost of accelerating (or decelerating) inflation (Humphrey, 1985; Dixon, 1995; Tobin, 1995).^{6,7}

Mainstream amendments in the accelerationist Phillips curve

The accelerationist Phillips curve as a result of these two assumptions can be quite unstable since a permanent demand shock can lead to a situation of hyper(de)inflation. The theoretical exercises found to avoid instability within the inflation rate generated by this accelerationist model, in simple terms, are related to the introduction of imperfections in the functioning of the neoclassical labour market. More specifically, while maintaining the two crucial neoclassical assumptions, the procedures of the amendments on the accelerationist Phillips curve to avoid accelerating inflation behavior are: a) mitigating the effects of demand shocks on inflation (by reducing the size and duration of the unemployment gaps); b) introducing temporary supply shocks (like productivity shocks); c) introducing downward rigidity in the nominal wages; d) assuming agents are only near rational, and this affects expectation formation in a low inflation environment and e) assuming that inflation expectation can be exogenous.

Regarding a), the attempt to mitigate the effect of demand shocks, one alternative is done through introducing hysteresis effects in the natural rate of unemployment (or in the NAIRU), that is, by allowing it to change endogenously over time. For Gordon (1989), hysteresis occurs (in the simplest case) when the Time-Varying NAIRU (TV-NAIRU) is a function of the lagged actual unemployment rate (U_{t-1}) (Gordon, 1997; Ball and Mankiw, 2002)⁸. Equation (4) depicting the NAIRU exemplifies the idea of hysteresis for Gordon (1989):

$$U^* = \eta U_{-1} + (1 - \eta) Z \quad (4)$$

In this model, hysteresis is partial (where $0 < \eta < 1$), and the TV-NAIRU varies in the short run. Changes in the current unemployment rate will also affect the NAIRU and reduce the size as well as the duration of unemployment gaps thereby generating less inflation. In the long run, Z , which is determined by microeconomic supply-side variables, is a slow attractor.

Another alternative to mitigate inflationary effects of demand shocks is done by assuming that the short-run unemployment gap, and not the total unemployment gap, is relevant in determining the inflation rate. The total unemployment is decomposed into short-run and long-run unemployment, and unemployed workers are classified between them depending on unemployment duration⁹. This point is justified theoretically by supposing the long-run unemployed are on the margins of the labour market and should not influence wage changes (Krueger et al., 2014). The result is that the

long-run unemployed should not be considered in the labour supply function, which implies an introduction of imperfection in the neoclassical labour market.

Another theoretical attempt to avoid (de)accelerating inflation is b), to introduce supply shocks - mainly productivity shocks - in the accelerationist Phillips curve. Ball and Moffit (2001) present a simple model to justify theoretically why real wages may not follow labour productivity in the short run. Wage aspiration represents the real wage that workers find fair. The model supposes that wage aspiration influences nominal wages and is a function of past real wages. The assumption is that workers are accustomed to a certain level of purchasing power and slowly adjust real wage aspirations upward to their productivity gains. Consequently, if productivity changes, this gain will not be incorporated into the current wage for a period of time. Ball and Moffit (2001) and Ball and Mankiw (2002) developed this model to consider the case in which an increase in productivity did help avoid accelerating inflation in the context of an unemployment rate lower than the NAIRU of the 1990s. Gordon (2013) uses the decrease in productivity to explain a missing deflationary period of the 2000s. Long run distributive neutrality (a constant wage share) is imposed in these models. Thus after some time, workers realize productivity has grown and fully incorporate it in their real wages. In this version, a labour market imperfection, namely a real wage rigidity, is assumed as wages are seen as being determined by bargaining instead of labour market clearing.¹⁰

Another procedure found in the literature is the assumption of c), downward nominal wage rigidity, that is, positive unemployment gaps do not generate continuously decelerating inflation because the level of nominal wages does not fall (Bernanke and Carey, 1996; Daly and Hobijn, 2014; Carlin and Soskice, 2018). But as noticed by Krugman (2018), the nominal wage rigidity assumption is just an ex-post explanation and not a modification of the theory that would allow policymakers to foresee the phenomenon. It is also important to stress that this assumption is not symmetric since it can avoid decelerating inflation in the case where unemployment is higher than the natural rate (or the NAIRU), but not the case of accelerating inflation¹¹.

Also, Akerlof et al. (2000) suppose d), that agents have near rational expectations in a low inflation environment. This makes expected inflation to respond less than proportionally to expected inflation, resulting in the same trade-off between unemployment and inflation as an old-type Phillips curve.

Finally, recently some authors are proposing e), anchored expectations to avoid accelerating inflation behavior. This vision is more related with the New Keynesian Phillips Curve, which is quite distinct to the backward-looking Phillips Curve discussed in equation (3). In general, in the New Keynesian Phillips curve it is assumed that agents have rational expectations, inflation expectations are forward-looking, depending on current expectations about inflation in future periods. Equation (5) introduces this idea:

$$\pi^e = E\pi_{+1} \quad (5)$$

Substituting (5) into (1) we arrive at the reduced form of the New Keynesian Phillips curve:

$$\pi = E\pi_{+1} - \beta(U - U^*) \quad (6)$$

Anticipated demand shocks will deviate the rate of inflation from its expected value. If Equation (6) is solved recursively, inflation will be equal to the sum of all expected unemployment gaps in the future.¹² Blanchard (2009) used to be more sympathetic to this version of the Phillips Curve, but recently has changed his mind about the nature of these forward-looking expectations: they should be anchored and represented by a constant term (equal, for example, to the target rate announced by the Central Bank).¹³

The premise of anchored expectations is that ‘expectations may have become so well anchored that inflation may be well characterized by random deviations around a constant’ (Fuhrer, 2011, p. 469) which dates back from Williams (2006), Mishkin (2007) and Fuhrer (2011). We translate Blanchard (2016)’s ideas using our notation. Inflationary expectations are fully passed through to inflation, and demand shocks are generated by deviations of the unemployment rate from the natural rate (equation 1). However, now expectations are in part exogenous with a constant (a) and in part dependent upon lagged inflation (equation 7):

$$\pi^e = \varphi\pi_{-1} + (1 - \varphi)a \quad (7)$$

Substituting (7) into (1), and assuming that inflation is static ($\pi = \pi_{-1}$), inflation will converge to:

$$\pi = a - \frac{\beta}{(1-\varphi)}(U - U^*) , 0 < \varphi < 1 \quad (8)$$

Equation 8 shows a considerable change in the reduced form of the Phillips curve with significant consequences to the accelerationist principle. According to Blanchard, the ‘accelerationist curse’ may have come to an end, since, “with anchored expectations, a period of high unemployment

implies a low level of inflation but not an ever-falling level” (Ball and Mazumder, 2018: p.115).

However, Blanchard warns that the central bank must be aware of the dangers of exploiting this trade-off since ‘prolonged deviations of inflation from target may de-anchor expectations’ (Blanchard, 2016: p. 33). In our scheme, this is equivalent to a tendency of φ to increase when a macroeconomic policy stimulates the economy. If φ converges to one, the Phillips curve became accelerationist again (see equation 7).

The aforementioned proposal is flexible enough to make the model compatible with both stable and accelerationist inflation, by supposing that expectations can quickly change and became backward-looking again if the government tries to explore the output-inflation trade-off. In this version, the accelerationist Phillips curve is alive but maybe “hibernating” (Hooper at al., 2019). Central Banks should maintain the natural rate assumption as a baseline but consider other alternatives (Blanchard, 2018a). However, it is not explicit why and when exactly the parameter φ will change.

Recently, Gordon (2018) and Solow (2018) seem to agree with Blanchard regarding anchored expectations and its implications on the accelerationist behavior. However, they are quite skeptical about using this scheme in the long run. Even in the medium run, anchored expectations are a significant departure from the assumption of rational expectations. The premise that agents do not adjust their expectations in the medium run, even if they know that the economy will not stay at the natural rate of unemployment during this period, cannot be reconciled with rational expectations.

THE ALTERNATIVE ROUTE BACK TO THE OLD PHILLIPS CURVE

Persistent unemployment and conflict inflation

The alternative route back to the old Phillips curve begins by rejecting the neoclassical principle of factor substitution and the associated idea of a tendency towards full employment of labour for any available quantity of capital. This idea, whose theoretical foundations have been found since the Sraffian critique of capital theory, is the basis for the first crucial assumption of the neoclassical view of the price of labour being the measure of the relative scarcity of this factor of production (represented by the natural rate of unemployment)¹⁴. Once we reject this view and assume that capital and labour are complementary and the availability of labour is usually higher than that of capital, the situation of labour scarcity should happen only in

exceptional circumstances in capitalist economies (Kalecki, 1950). In this way, long-run unemployment (or the presence of an ‘industrial reserve army’) is a normal phenomenon (Rowthorn, 1977; Garegnani, 1990; Carlin and Soskice, 1990; Pollin, 1998; Stockhammer, 2008; Levrero, 2013).

With persistent unemployment, the traditional neoclassical idea of flexible real wages also ceases to be logical, since a situation of chronic excess labour supply would lead to real wages falling to zero (Garegnani, 1990; Levrero, 2011). Wage determination thus must be explained by other means than a measure of relative scarcity of labour. The classical surplus approach has a long tradition in providing an alternative explanation of the functioning of the labour market and wage determination. In this view, the evolution of nominal and real wages are necessarily determined by political, institutional and social factors that can affect workers’ bargaining power in influencing their money and real wages (Stirati, 1994). This means that wage inflation can happen much before the situation of full employment and must be a result of conflicting claims over income distribution (Okishio, 1959; Kalecki, 1971; Lavoie, 2014).

The Heterodox NAIRU

There are some conflict inflation models that maintain the notion of a level of the unemployment rate that guarantees inflation does not accelerate because, at that point, the claims over distribution are consistent (Rochon and Rossi, 2018). We will call this level the ‘Heterodox NAIRU’.

In this Heterodox NAIRU view, the economy presents persistent unemployment (some authors refer explicitly to the concept of ‘industrial reserve army’), but there is a level of unemployment which turns the real wage desired by workers and the real mark-up of firms (that is, the real wage firms desire to pay) consistent (Rowthorn, 1977; Carlin and Soskice, 1990; Screpanti, 2000; Cassetti, 2003; Stockhammer, 2008; Lavoie, 2014). Workers desired real wages depend on the unemployment rate (as a measure of their bargaining power). The real wage firms are willing to pay in some specific models depends on the unemployment rate (Lavoie, 2014) but do not depend on this variable in others (Carlin and Soskice, 1990)¹⁵.

In these models, if the unemployment rate is different from the heterodox NAIRU, this will lead to (decelerating) accelerating inflation. In all of the models, although not supposing labour scarcity, it is the maintenance of the second assumption – full incorporation of inflationary expectations into wages - which will cause this result. As a consequence, conflict inflation must be a temporary phenomenon, that is, it must be accommodated;

otherwise a permanent conflict will lead to a hyper-(deflation) inflation.

It is crucial noting that the Heterodox NAIRU is not an attractor in these models, as noticed by Stockhammer (2008). In this way, stabilization must be made by the management of Macroeconomic Policies. In Isaac (1991), the stabilization of the model to the heterodox NAIRU (called by him as the steady-state Unemployment rate) is guaranteed by the Monetary Authority through managing aggregate demand to keep the unemployment rate equal to the heterodox NAIRU.¹⁶ Stirati (2001) proposes, from a Sraffian perspective, a model with fully passed-through expected inflation to nominal wages. Inconsistent claims over income distribution would lead to accelerating inflation, but the Central Bank can stabilize the model by reconciling the distributive claims by the fall in the real rate of interest and thus also of the profit share.¹⁷

In sum, within Heterodox NAIRU models, it is the full incorporation of expected inflation on nominal wages, which will lead to the accelerationist behavior of inflation, from a conflict-claims perspective.

Expectation formation versus incorporation

While in the neoclassical tradition the assumption of full incorporation of expected inflation on nominal wages is derived by the necessary relation between real wages and unemployment, in the heterodox tradition we can drop this assumption and still be consistent within the conflict inflation framework. Rowthorn (1977) starts his analysis by differentiating expectations and anticipations of inflation. While the first is only a state of mind, the second refers to the capacity to act upon the expectations. So, he calls to attention that the critical question is not the ability of workers in forecasting future inflation, or how expectations are formed, but the extent of the actual power of workers to incorporate expected inflation in their negotiated wage contracts. Although, as we saw in the last sub-section, Rowthorn did not explore this remarkably interesting insight and presupposed that workers can fully anticipate their expectations and incorporate them in their nominal wages.^{18, 19}

This idea of partial incorporations of expectations was explored by Palley (1994, 2012, 2018), Setterfield and Leblond (2003), Lavoie (2014) and Serrano (2019). They show that if inflation expectations are partially incorporated into nominal wages, an old type-Phillips curve – and therefore a relation between the level of inflation and the level of unemployment - will result. Palley (1994, 2012) explain this partial incorporation of expectations by lack of labour scarcity in some segmented disaggregated

markets while Setterfield and Leblond (2003), Palley (2018) and Serrano (2019) relate the extent by which expected inflation is incorporated into wages to the strength of the bargaining position of workers in the conflict between capital and labour²⁰.

THE CONFLICT-AUGMENTED PHILLIPS CURVE

We can now derive the conflict-augmented Phillips Curve by taking into account the two theoretical principles discussed in the last section, that is, that wage determination must be explained by other means than a measure of the relative scarcity of labour and that expectations are not necessarily always fully passed on to nominal wages.

Abstracting from changes in the nominal mark-up, inflation is equal to nominal wage increases minus productivity growth):

$$\pi = w - y \quad (9)$$

We will suppose that a nominal wage change will be the result of workers' aspiration, which is composed of expected inflation plus the desired increase in the real wage (c) and the capacity of workers' in incorporating this wage aspiration into their nominal wages, measured by the parameter α :

$$w = \alpha(\pi^e + c) \quad (10)$$

By substituting equation (10) into equation (9), if inflation expectations are fulfilled, $\pi^e = \pi$ (Palley, 2009), inflation will converge to:

$$\pi = \left[\frac{1}{1-\alpha} \right] (\alpha c - y) \quad (11)$$

Conflict will be permanent and will explain the level of inflation. The higher the parameter c (the bargained increase in wages over expected inflation) and the degree of incorporation of inflation expectations, α , the higher will be inflation. Cost-push inflation is understood as a consequence of 'workers "excessive" demands' (or claims) relative to productivity growth (and not of excess of aggregate demand in relation to potential output).

Additionally, we can better formulate the desired increase in real wage, c , assuming that it depends on the level of the unemployment rate, as well as on other political, institutional and social aspects such as minimum wage policy, the power of trade unions, labour protection legislation, etc. that influence workers' bargaining power (Stirati, 1994, 2001, Levrero, 2011).

$$c = c_0 - \psi U \quad (12)$$

Here it is important to notice that both parameters c_0 and ψ depend upon

the degree of bargaining power of workers in setting their wages and so can vary according to institutional, social and political changes. A parameter similar to c_0 is called as ‘autonomous claims’ by Isaac (1991) and ‘the degree of autonomous militancy’ by Screpanti (2000).

Persistently lower trend rates of unemployment strengthen the bargaining power of the labour force, especially under favorable political and institutional circumstances (Kalecki, 1943, 1971; Garegnani, 1990). This can be captured in Equation (12) as the effect of the level of unemployment on the desired increase in real wage, c , agreeing with Pollin (1998), who believes that the size of the ‘reserve army of labour’, and thus a persistent and structural level of unemployment, is crucial to put downward pressure on wages through the bargaining power effect. The relation between the level of unemployment and wage change can occur even if the economy is still quite far away from a situation of labour scarcity.

It is crucial to note that the unemployment rate that affects workers’ bargaining position in claiming for higher nominal wages should be related to the actual ‘degree of utilization of the available labour force’. This must consider the flexibility of the labour if there are job opportunities, the number of hours worked and the participation rate.²¹ Other indicators reflecting the labor market situation can also influence wage change if it affects the bargaining power of workers. First, Phillips (1958) himself believed that the change in the unemployment rate was important to explain wage growth.²² Also, the time for which the unemployment rate remains high or low can influence workers’ bargaining power through the ‘discipline effect’ (Kalecki, 1943). Finally, some authors think that the relation between unemployment and wage inflation is not so systematic, and maybe there can be a threshold of the unemployment rate below in which wage inflation did not change (Tobin, 1995).²³

Substituting (12) into (11), for a given level of productivity, the resulting inflation rate in this conflict augmented Phillips curve will be:

$$\pi = \left[\frac{1}{1-\alpha} \right] (\alpha c_0 - y) - \left[\frac{\alpha}{1-\alpha} \right] \psi U \quad (13)$$

If we assume that workers do not fully incorporate their aspirations into their wages ($\alpha < 1$), we arrive in an old-type Phillips curve, with a relation between the level of inflation and the level of the unemployment rate. Also, equation 13 is compatible with accelerating inflation episodes, when conflict is so strong that workers fully incorporate their expected inflation over nominal wages. In this case, the parameter α is equal to 1, and there will be a level of unemployment capable of stabilizing inflation,

$U^* = \frac{c_0 - \gamma}{\psi}$. In this case, the heterodox NAIRU is seen as a special case of a more general conflict-augmented Phillips curve, when workers' bargaining power is strong enough to guarantee the full incorporation of expected inflation into wages.

We can also notice that equation (13) is quite similar, in general terms, to equation (8), the reduced form of the old Phillips curve as proposed by Blanchard (2016), but with a significantly different explanation and macroeconomic and policy implications.²⁴ First of all, Blanchard (2016) includes a natural rate of unemployment in his equation while we do not include it in our conflict-augmented Phillips curve²⁵. This reflects the view that in Blanchard (2016) inflation is a result of disequilibrium in the labour market, but the 'acceleration curse' is avoided as they maintain the exogenous anchored expectations despite the existence of unemployment gaps. Presumably, this happens because of the belief that the central bank will not allow inflation to accelerate. In the conflict-augmented alternative, there is no natural rate of unemployment at all and cost inflation occurs with persistent unemployment, and the evolution of money wages depends on the workers' bargaining power. Second, and related to this point, in Blanchard (2016), the shift from the old-type to the accelerationist Phillips curve could be quite sudden as expectations can de-anchor quickly and become backward-looking again if the government tries to explore the unemployment-inflation trade-off systematically, losing credibility. In comparison, in the conflict-augmented view, only when institutional and political changes happen to strengthen the workers' bargaining power sufficiently and/or unemployment is persistently extremely low, we tend to observe the full incorporation of expectations into wages. This means that the trade-off between unemployment and inflation can be quite persistent and fiscal and monetary policies can have long-run effects on output.

The conflict-augmented Phillips curve seems to us to provide a much more solid basis for analyzing the relation between money wages and unemployment. Although interpretations along these lines have been around for a long time, they have attracted much less attention because of the accelerationist Phillips curve's predominance since the 1970s.

Indeed, interpretations of the original Phillips seminal work based on bargaining power and a long-run relation between nominal wage changes and the unemployment rate more related to institutional factors than disequilibrium in the neoclassical labour market have been proposed by Rothschild (1971), Desai (1975, 1984, 1995), Palumbo (2010) and Stirati and Meloni (2018). Abba Lerner (1951) first distinguished between the

situation of labour scarcity ('High Full Employment') and the situation where wages can rise due to stronger workers' bargaining power ('Low Full Employment'). Some years later, though, recognized that he was thinking much along the old Phillips curve lines, implying that he interpreted the Old Phillips curve, in general, reflecting cost-push inflation (Lerner, 1967). Moreover, even situations of accelerating inflation (with full incorporation of expected inflation) could also be interpreted as cost-push, instead of a demand-pull phenomenon (Lerner, 1977)²⁶. For these reasons, Lerner (1951, 1977) was in favor of income policies to deal with the cost-push inflation that starts from what he called 'Low Full Employment'.

CHANGES IN THE BARGAINING POWER OF WORKERS AND THE PHILLIPS CURVE: THE EMPIRICAL EVIDENCE

We think that the stylized facts of large and long-lasting unemployment gaps not associated with accelerating (or decelerating) inflation that lead Blanchard (2016) to advocate for an old Phillips curve can be better explained by the conflict-augmented Phillips curve than by the mainstream amendments. The mainstream amendments provide a large number of specific elements to account for the stylized facts. Nevertheless, from the conflict-augmented Phillips curve perspective, we consider that the lower and more stable process of inflation in the U.S. and Europe since the 1980s can be traced to a single key element: the decrease in the intensity of the distributive conflicts that resulted from the significant reduction of the bargaining power of workers.

The mainstream accelerationist Phillips curve has faced many well recognized empirical difficulties posed by long-lasting negative (positive) unemployment gaps occurring without (decelerating) accelerating inflation. The first was the deep recession of the European economies in the 1980s, when high and lasting unemployment rates did not lead to continuous reduction in inflation (Blanchard and Summers, 1986). The second were the low levels of unemployment (below the presumed value of the NAIRU at the time) with a controlled and stable inflation rate in the US economy during the 1990s (Ball and Mankiw, 2002). The third is the 'missing deflation' in the US after the 2008 crisis, as high and long-lasting unemployment rates have coexisted with low but stable, instead of decreasing, inflation (Ball and Mazumder, 2011). Finally, the very low unemployment rates in 2018-19 did not trigger a significant rise in inflation in the US (Powell, 2020: p. 6).

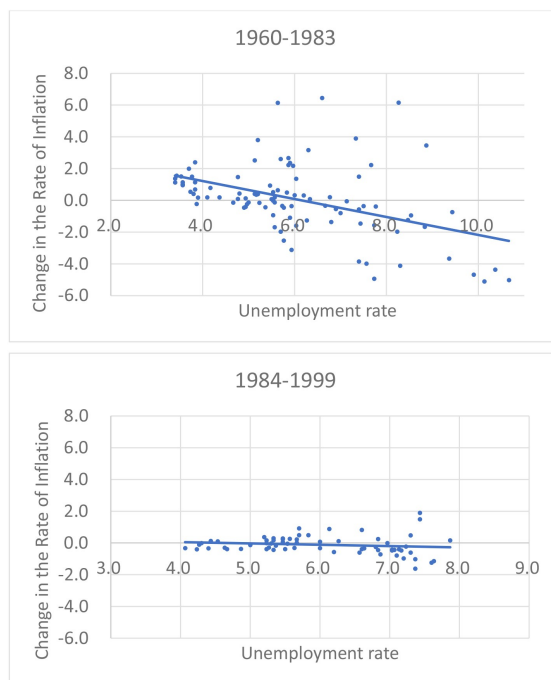
There is also strong evidence in the empirical literature that the accelerationist Phillips curve has flattened since the 1980s (Mishkin, 2007;

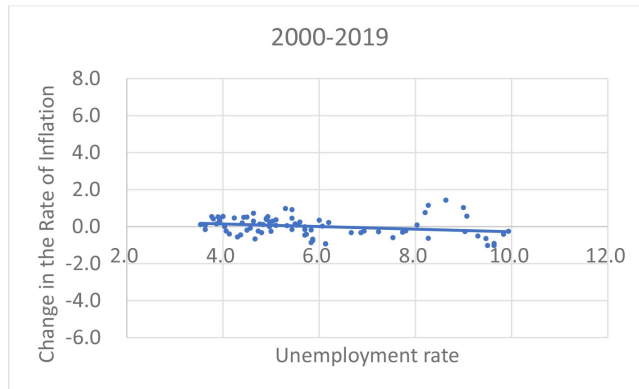
Ball and Mazumder, 2011; Blanchard, 2016; Murphy, 2018; Stock and Watson, 2019). As can be seen in Figure 1, for the US economy, the estimated accelerationist Phillips curve is much more pronounced in the period 1960-1983 than it is in recent years (1984-1999 and 2000-2019).

From the standpoint of the mainstream, the flattening of the curve reflects a weak response of wage and price changes due to disequilibrium position in the labour market. According to Blanchard, ‘the most convincing [explanation] is that as the level of inflation has decreased, wages and prices are changed less often, leading to a smaller response of inflation to labour market conditions. Blanchard (2016: p. 32)’. Nevertheless, this explanation is either incomplete or involves circular reasoning: low levels of inflation lead to weak responses of disequilibrium in the labour market, but the initial reduction of the level of inflation itself should be explained by the history of the imbalances on the labour market.

Figure 1 shows the relation between the change in inflation and unemployment for the US economy, following the suggestion of Stock and Watson (2019) to divide it into three different periods (1960-1983, 1984-1999, 2000-2019).²⁷

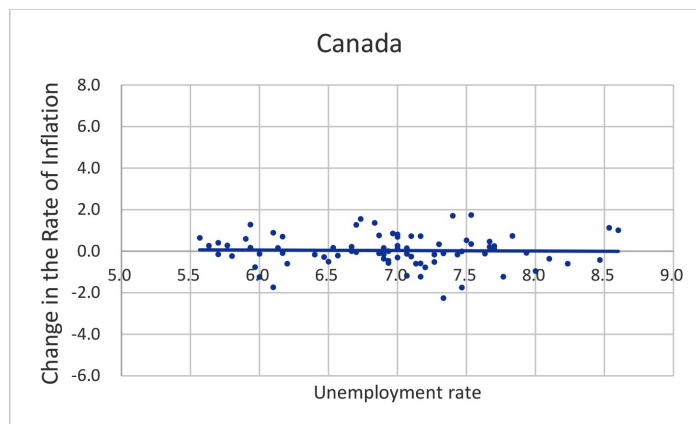
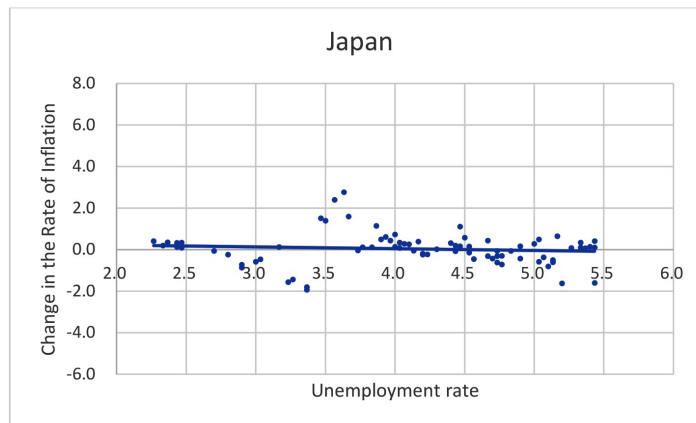
Figure 1 Accelerationist Phillips Curve for the US economy

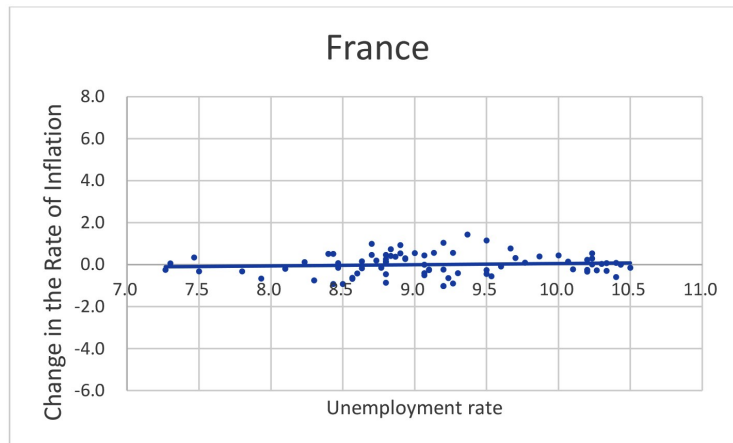
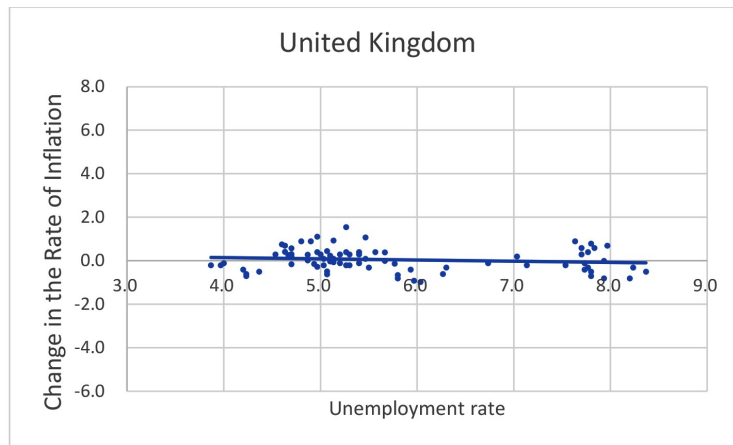
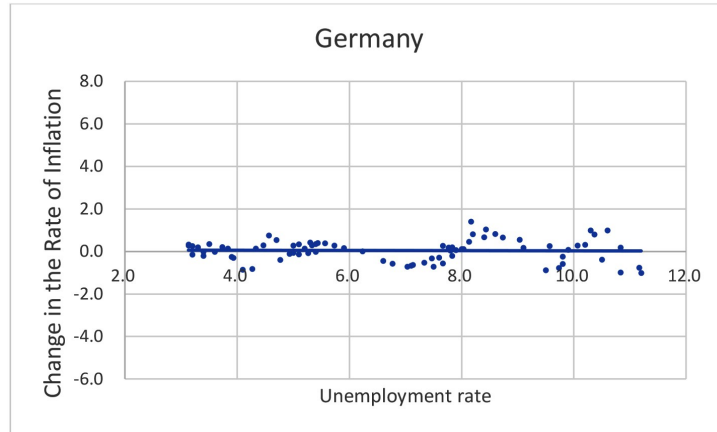


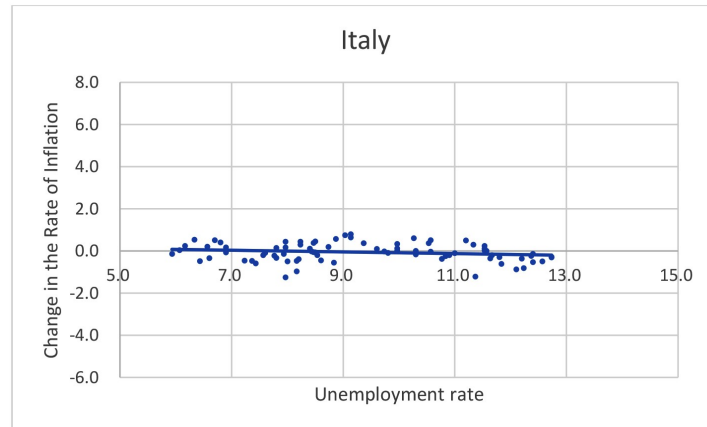


Source: Authors based on *OECD Stat* data.

Figure 2 Accelerationist Phillips Curve for Advanced economies







From Figures 1 and 2, we can see that the accelerationist Phillips curve is quite horizontal since the mid-80s²⁸. This result corroborates the evidence that the ‘accelerationist curse’ appears to be over. However, the mainstream macroeconomists do not discard the accelerationist Phillips curve framework to explain inflation dynamics, but amended it in order to fit these empirical findings into the model.

One way to keep accelerationist Phillips Curve alive empirically is to consider that the natural rate of unemployment (or the NAIRU) varies slowly over time. The concept of time-varying NAIRU (Gordon, 1997) can be seen as a smooth trend of the current unemployment rate and is economically interpreted as a weak hysteresis on labour market.²⁹

The hysteresis in NAIRU is the mainstream explanation of the accelerationist Phillips curve puzzle in Europe in the 1980s (Blanchard and Summers, 1986). This hysteresis can make an empirically observed stable inflation compatible with a potentially unstable accelerationist Phillips curve model. Empirically speaking, the practical effect is to keep the NAIRU closer to the movements of the current unemployment rate, not letting the difference between them become too high, dampening in this way the magnitude of the demand shocks.

Another strategy for keeping the accelerationist Phillips curve alive that ends up dampening the effect of demand shocks on inflation is to change the unemployment indicator to a short-run rate (Gordon, 2013). Ball and Mazumder (2018: p.116) show that the impact of demand shocks on the change in inflation are smaller if measured by a short-run rather than the total unemployment rate. This change in the indicator is somewhat arbitrary since the Phillips curve in its long tradition has always been

expressed in terms of the total unemployment rate. Moreover, even this effect is not consensual. Speigner (2014), for example, advocates that long-term unemployment has a significant negative influence on wage inflation.³⁰

Besides introducing a time-varying NAIRU, many authors opt to widen the variety and the impact of supply shocks other than the traditional “food and energy” in the model³¹. Changes in the trend growth of labour productivity is added in a few articles improving the forecast performance of the model for the US (Ball and Moffit, 2001; Ball and Mankiw, 2002; Gordon, 2013). In this case, there is always the assumption that the impact is restricted to the short (or medium) run and will eventually be reversed, keeping the assumption of the accelerationist model that long-run inflation is a demand-pull phenomenon.³² The increase in the rate of productivity growth associated with the ‘New Economy’ in the 1990s is also used a partial explanation of low inflation with low unemployment for the US economy. Implicit is the idea that nominal wage growth did not keep pace with the higher growth rate of productivity, and this helped to avoid the acceleration of inflation despite the unemployment rate being below the NAIRU.³³

While some of the mainstream macroeconomists reinforce the idea of mitigating the effect of demand shocks and introducing supply shocks, others have preferred to include the possibility of a downward rigidity of the nominal wage level and anchored expectations³⁴. The anchored expectations hypothesis became the most common way to explain the missing deflation of the 2000s, implying that the Phillips curve has gone back to the old shape (Gordon, 2018; Solow, 2018; Blanchard, 2018). Blanchard et al. (2015) and Blanchard (2016) test the anchored expectations hypothesis by estimating the magnitude of the parameter associate with an average lagged inflation, dynamically using a Kalman Filter procedure. They argue that the coefficient became close to zero in the 2000s because expectations became anchored to credible central bank targets for inflation, instead of being linked to past inflation. This coefficient is explicitly estimated in Blanchard et al. (2015); for a great part of the countries, the estimated coefficients are smaller than one from 2000-14, which is in line with the old type Phillips curve. However, since the empirical exercise does not use expectations data, it is based merely in the detection of a lower weight of the past inflation being passed on to current inflation, which could also be interpreted by the conflict-augmented perspective as a result of $\alpha < 1$, as a consequence of workers having little bargaining power to incorporate fully their expected inflation into wages.

The strategy of estimating the coefficient related to past inflation instead of imposing it as equal to one was disseminated in empirical studies on the Phillips curve in the 1960s and beginning of the 1970s, estimates of this coefficient smaller than one were commonly found in that period (Perry, 1970). This kind of procedure was abandoned at the beginning of the 70s when the coefficient started being imposed to be equal to one in the estimated accelerationist Phillips reduced form equation (Gordon, 2011, p.18-19).

There are empirical papers more identified with the conflict-augmented Phillips curve view that follow the way proposed by Perry (1970) and estimate explicitly this coefficient related to past inflation, for example, Pollin (2003), Setterfield (2005) and Setterfield and Lovejoy (2006) for the US economy, Screpanti (2000) for some European countries and Stirati and Meloni (2018) for OECD countries. According to this approach, there is no reason to impose that this coefficient is equal to one. An interesting finding occurs when variables that capture the bargaining power of workers are also introduced as explanatory variables– for example, a degree of autonomous militancy variable in Screpanti (2000) or a bargaining index in Setterfield (2005) and Setterfield and Lovejoy (2006). The result is that the estimated coefficient α decreases and becomes smaller than one.

We can interpret the empirical findings discussed until here based on the conflict-augmented Phillips curve presented in the the last section. We should recall that from equation (13), the magnitude of the parameter but α also c_0 and ψ depends on the workers' relative bargaining power. This would help to explain by the conflict-augmented perspective why the inflation presented an accelerationist behavior in the 1960s and 1970s but became flattered and more similar to the old type Phillips curve since the mid-1980s, as a result of the change in the workers' relative bargaining power as a result of changing political and institutional factors.

The interpretation of the wage explosion and the rising inflation due to strengthened workers' relative bargaining power and other cost-push pressures at the end of the Golden Age of capitalism in advanced economies was presented in Cavalieri, Garegnani and Lucii (2008), Kaldor (1976). The change in workers' bargaining position in the advanced economies can be traced back to the 1980s. This decade inaugurates a period of institutional changes in the labour market that led to: 1) the reduction of the unionization of workers; 2) the fall of the real value of the federal minimum wage (in the US); 3) the end of income policies; 4) the increase of immigration; 5) the rapid increase in non-traditional, part-time or temporary jobs partly associated with increasing sector participation and services at the expense

of the industry - 6) the increase of flexible forms of remuneration, rather than a formal salary and 7) a process of increasing lack of stability at work (Glyn 2006). Additionally, there has been a process of industrial deregulation (downsizing) and transfer of labour-intensive production units using less qualified work to developing countries ('delocalization' and 'relocalization') more recently, especially to China³⁵. All these changes have diminished workers' bargaining power and their ability to obtain large wage increases³⁶.

This relation between workers' bargaining power, institutions, and wage and price inflation, is also recognized by important policymakers and policy-oriented mainstream macroeconomists. Nelson (2005) shows that many of them used to believe that inflation in the 1970s was due to distributive conflicts and cost-push factors, such as the oil shock. In the US at the beginning of the 1980s, Volcker and Greenspan agree that the defeating of unions' power was very important to control trend inflation.³⁷ The lower degree of worker bargaining power was recognized as being important to prevent (wage and price) inflation pressures with low unemployment rates in the 1990s by Yellen and Greenspan, the latter having classified workers as 'traumatized' (FOMC, 1996). Finally, even Phelps (2017), one of the fathers of the accelerationist curve, seems to have adopted the traumatized workers' argument to explain why inflation is not accelerating as a result of low unemployment in the US economy after 2017. A similar explanation can be found in Summers (2017) about the effect of weak unions in explaining the recent low growth of nominal wage even with low unemployment rates.

The recent speech by FED's Chairman Jerome Powell (2020) point in this same direction by raising some doubts about the assumption of the natural rate of unemployment and the accelerationist character of the Phillips curve in the U.S. and by showing that a strong labour market is much less related with wage inflation pressures than in the past. The recent statement of "muted responsiveness of inflation to labor market tightness" (Powell, 2020: p.7) was interpreted as a result of the fact that "workers have little bargaining power to force wage increases" (Posen, 2020: p.1).

FINAL REMARKS

In this paper, we compared two routes back to the old Phillips curve, as the empirical evidence points to the end of the "accelerationist curse". The neoclassical route depends on introducing various amendments in terms of labour market imperfections or changes in the form inflation expectations are formed as their basic expectation-augmented Phillips curve is intrinsically

accelerationist. The other route, represented by the conflict-augmented Phillips curve, has the advantage of not being constrained by either of the two basic neoclassical assumptions on labour scarcity and full incorporation of inflation expectations to wage increases and, therefore, to be more directly compatible with both the old and the accelerationist Phillips curve. In this view, the shifts in the inflation-unemployment relation are explained by changes in workers' bargaining power due to economic, political, and institutional aspects. We think the story – often mentioned within policy-making but not in mainstream academic circles - of low inflation in advanced economies since the mid-1980s being due to “traumatized workers” and also the heterodox story of the ‘wage explosion’ by “confident workers” leading to the high and accelerating inflation in the last years of the ‘Golden Age’ are evidence of the empirical relevance of the conflict-augmented Phillips curve.

Blanchard recently stated that Central Banks should maintain the natural rate assumption as a baseline but keep an open mind and put some weight on the alternatives (Blanchard, 2018a, p. 100). However, we know that Blanchard (2018b) considers as valid alternatives only those within a set of neoclassical models. We hope that the important recent speech by FED's Chairman Powell (2020), recognizing, in practice, that there was no clear evidence of either labour scarcity in the last decades (even at record low unemployment rates in the U.S.) or of an accelerationist trend in inflation, will put some pressure on researchers to drop the unique NAIRU assumption and opens more space to the heterodox interpretation of the Phillips curve based on cost-push and conflict inflation.

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NOTES

1. The term ‘accelerationist Phillips curve’ is commonly used in the literature (Williams, 2006; Blanchard, 2016; Ball and Mazumber, 2018) to mean that a single positive demand (or negative supply) shock causes an increase in the

rate of inflation.

2. To focus on the relation between unemployment and inflation, we will consider the usual effects of monetary and fiscal policy on aggregate demand as materialized in the actual unemployment rate, without entering in details about the discussion of reaction function and the mechanisms of transmission from monetary and fiscal policies to output and employment, that would be beyond the limited scope of this paper.
3. Demand shocks are the leading cause of inflation in the accelerationist curve because a significant part of the economists that use the accelerationist Phillips curve consider that supply shocks are random with mean zero (white noise). Gordon (2011) prefers to include explicitly supply shocks in his 'triangle' Phillips curve (which is an accelerationist curve with lags and explicit supply shocks). For him, supply shocks are a result of changes in relative prices, but they must be neutral to the level of inflation since "in the long-run inflation is 'always and everywhere an excess nominal GNP phenomenon' (Gordon, 1990: p.4).
4. There is some controversy on the interpretation of the Phillips seminal paper (1958) within mainstream economists. Some authors, such as Tobin (1972), believe that Phillips presents only empirical evidence on the relationship between wage inflation and the unemployment rate, without a theory, while others, like Gordon (2011) and Solow (Solow et al., 2009), disagree and say that you can find a theoretical basis on Phillips' work. Solow also believed that Phillips has the idea of wage change as a situation of disequilibrium in the neoclassical labour market.
5. The passage from wage inflation to price inflation can be made by abstracting from changes in labour productivity and the mark-ups. Samuelson and Solow (1960) were aware that this systematic relation between unemployment and inflation was valid in the short run, but the action of policymakers could shift the Phillips curve. For a detailed discussion on Samuelson and Solow, see Hoover (2015).
6. Some economists prefer to use the non-accelerating inflation rate of unemployment (NAIRU) instead of the natural rate of unemployment. In the definition of the natural rate Friedman (1968) said that is was compatible with imperfections in the neoclassical goods and labour markets. Nevertheless, the developments of the new classical macroeconomics made the natural rate more associated with the competitive labour market (Tobin, 1995). New Keynesians developed models with imperfections in the goods and labour market, and they are more associated with the concept of the NAIRU (Ball and Mankiw, 2002). However, for Blanchard (2018a), the concept of the natural rate is compatible with imperfections.
7. In the mainstream view, institutions and imperfections matter and are incorporated in the neoclassical labour market (Solow, 1990). Nevertheless, they change only the real variables, like the equilibrium levels of unemployment and real wages, with no consequences to nominal wage and price changes.

This equilibrium level of unemployment in the imperfect labour (and goods) market will be higher than the competitive one. The difference between the two is called Involuntary or Structural Unemployment by the New Keynesians. Notice that in this situation there is no scarcity in the labour market. However, there is scarcity in the goods market since the potential output will be associated with the equilibrium level of unemployment in the imperfect labour market – or the NAIRU. The cause of Involuntary Unemployment in the New Keynesian view is much different from the old Keynesian view, which was due to the lack of effective demand.

8. There are different interpretations by mainstream economists for the causes of the presence of hysteresis (Ball and Mankiw, 2002). The most common one says that a temporary rise in unemployment can decrease the ‘human capital’ by workers who went out of the labour market. There is a decrease in labour’s marginal product, leading to a permanent rise in the unemployment rate. This interpretation is based on the new-Keynesian model of structural unemployment with real wage rigidity (Mankiw, 1995). In this model, potential output is given by the stock of capital, whose growth depends on potential savings, so it is not determined by the same factors of current output that is demand driven. In this interpretation, the level of employment, in the long run, is determined by supply-side forces, as the capital stock, human capital, the productivity of labour and the level of rigid real wages. There is also a more applied literature on unemployment scarring devoted to checking at the micro-level data the long-run effects of an individual’s unemployment now on the future risk of being unemployed (and on his future earnings after re-engagement), see Arulampalam et al. (2001). See Blanchard (2018a) for a survey on the persistent effects of unemployment on workers’ employability and the size of the labour force.
9. Gordon (2013) divides these two subgroups of the unemployed at a duration of 6 months.
10. Note that Ball and Moffit (2001) use assumptions, such as fairness considerations affecting the bargained wage, which are incompatible with a competitive neoclassical labour market and the use of terms such as wage aspiration directly derived from the heterodox conflict inflation literature (Rowthorn, 1977). However, the model of Ball and Moffit includes the restriction that, in the long run, the wage share is constant, the rate of growth of the real wage is equal to the rate of growth of labour productivity, and so the wage aspiration becomes constant over time. In opposite to this set of arbitrary assumptions, in the models of distributive conflict inflation, distribution of income can change permanently, and aspirations have permanent effects on the rate of inflation.
11. However, this kind of model is compatible with long-lasting deflation if demand shocks are permanent and productivity growth is positive, as nominal wage growth is equal to zero.
12. The theoretical microfoundations for this version of the Phillips curve are the Calvo Model, a staggered price model in which only a random fraction of firms

can adjust their price in each period. The firms who can adjust prices will do that based on their present rational expectations about future prices and the deviations from the optimum level. In general, this new Keynesian version of the Phillips curve takes into account a mark-up gap (the difference between current and optimal mark-up) as a source of demand pressures. The markup's optimum level is defined by a constant demand elasticity faced by each firm operating on imperfectly competitive markets (Goodfriend, 2004). Nevertheless, the optimal mark-up is associated with a unique level of employment (and unemployment). In this way, here we present the New Keynesian Phillips curve with the unemployment gap as a proxy of the mark-up gap in order to compare it with the tradition of the Phillips curves. It is important to notice that the labour market in this kind of model is always in equilibrium (even if current mark-up is different from the optimal mark-up) since aggregate demand fluctuations are associated with shifts in the labour demand schedule' while workers are always in their labour supply schedule (Stirati, 2015).

13. For more explicit criticisms to the New Keynesian Phillips curve, see Mankiw (2001), Gordon (2011, 2013) and Carlin and Soskice (2014).
14. Sraffa and his followers have criticized the idea of a mechanism of substitution between production factors as a response to their relative prices ensuring the full employment level of those factors during the well-known Cambridge Capital Controversies (Petri, 2004). This is why we do not classify as part of the conflict augmented Phillips curve tradition the literature that assumes that capital and labour are substitutes and some real wage rigidity prevents aggregate supply to fully employ both factors, causing persistent unemployment. For an example of a model with persistent unemployment in the presence of factor substitutability, see Rose (1966). The author does introduce wage bargaining; however, it is a real rigidity that affects only the level of employment and not inflation directly, which is supposed to be determined only by an excess of aggregate demand and not by conflict or cost-push inflation.
15. Carlin and Soskice (1990) assume that real mark-up is given, and ultimately firms will determine the real wage, and workers can only shift the heterodox NAIRU. With this scheme, shifts in the desired real mark-up can also shift the heterodox NAIRU.
16. Isaac (1991) proposes some extensions of his model, and one possibility introduced in the model is exogenously fixed inflation expectations - remarkably similar to Blanchard (2016) - which helps to stabilize his accelerationist model. In Isaac (2009), these exogenous expectations will be equal to the expected inflation target. Another interesting extension of the model is made in Isaac (1993) by proposing a hysteresis effect on the Heterodox NAIRU; hence the level of the heterodox NAIRU will thus be influenced by the macroeconomic policy.
17. As we discussed in footnote 13, a shift in the real mark-up as a consequence of a change in nominal interest rate managed by monetary authority will shift

the heterodox NAIRU (assuming a relationship between the interest rate and the profit rate).

18. Rosenberg and Weisskopf (1981), with a similar argument, reach an essential distinction between workers' aspirations and their ability to act upon their aspirations. The latter is understood as the effectiveness of workers in boosting money wages to meet their aspirations, which will depend upon their strength as well as the ability and desire of capitalists to resist their demands (Rosenberg and Weisskopf, 1981: p.44).
19. In Flaschel and Kruger (1984), the degree of incorporation of wage aspirations into wages is called 'aspiration factor' and is modeled as a parameter depending on the rate of capital accumulation. They assume that the aspiration factor will be equal to one when the actual capital accumulation rate is equal to the normal rate of accumulation (defined as the growth of labour force plus productivity).
20. As discussed in the last section, Akerlof et al. (2000) obtain the same result of an old-type Phillips curve, but by supposing that agents have near rational expectations, so this makes expected inflation underestimate actual inflation, when inflation is low. We think that the problem lies not on the lack of rationality in the inflation forecasts of workers but because workers often do not have the power to fully incorporate their inflation forecasts, even when correct, on their bargained nominal wages.
21. Fontanari, Palumbo and Salvatori (2019) propose a few ways of evaluating the utilization of the labour force, such as an index that incorporates marginally attached workers and part-time workers and also by an index of hours worked divided by the prime working-age population.
22. This view is shared by Alogoskoufis and Smith (1991), Pollin (2003) and Gordon (2011).
23. It is important to recall that Phillips (1958) proposed a non-linear Phillips curve, relating extremely low unemployment with strong nominal wage pressure, but a much flatter curve for high unemployment.
24. A less significant difference is that in equation 8, based on Blanchard (2016), productivity growth is not explicit in the reduced form.
25. But notice that in Blanchard (2016), in the case where expectations are anchored, there will be multiple natural unemployment rates compatible with stable inflation.
26. It is important to recall that Phillips (1958) proposed a non-linear Phillips curve, relating extremely low unemployment with strong nominal wage pressure, but a much flatter curve for a considerable unemployment range.
27. Inflation is measured by variation of the 'consumer price index except food and energy', unemployment rate is 'harmonized unemployment rate', both from OCDE statistical website.
28. We also ran Bai-Perron break test, which showed that the level coefficient changed in 1973 for the US economy, after the first oil crises, while the slope

of the curve changed in 1984. It is possible to observe the same pattern of change to Canadian economy while Japanese economy experience the flattening earlier, in 1976, as estimated by Bai-Perron procedure. The Bai-Perron test for the breaks was not performed for European countries because of the lack of data availability for the earlier decades in the OCDE statistical website. Unit root tests reject the null hypothesis of unit root so that Bai-Perron tests are valid. The method is to test breaks in all recursively determined partitions. Standard error and covariance matrix are estimated by Ney West procedure. The breaks are determined in $t+1$: in the first quarter of 1974 and the first quarter of 1985.

29. The TV-NAIRU can be estimated as a stochastic filter like the Hodrick-Prescott filter, as in Ball e Mankiw (2002) or a frequency filter as in Staiger, Stock e Watson (1996). A criticism to the idea of estimating the NAIRU with statistical filters, which in the end is a kind of moving average of the actual unemployment rate data, can be found in Palumbo (2013, 2015).
30. Speigner (2014) estimates a non-linear Phillips curve. Notice that for Pollin (2003) long-run unemployment - understood as something more related to structural unemployment and the size of 'reserve army of labour' - is more important to wage and price inflation than short-run changes in the unemployment rate.
31. Positive supply shocks (meaning lower prices) were the cause of a low inflation associate with low unemployment in the US economy in the 1990s for Blinder and Yellen (2001). Gordon (1998) add new supply shocks in the accelerationist Phillips curve, such as the price of medical care and computers.
32. Gordon (2013) introduces also a 'productivity trend acceleration variable' in his accelerationist Phillips curve. There is a permanent negative shock arising from this productivity index, avoiding a decreasing inflation since 2000. The same model (even with short-term unemployment and TV-NAIRU) estimated without this productivity shock shows a forecasted out-of-sample increasing deflation in Ball and Mazumder (2018).
33. In Ball and Moffit, the value of the NAIRU is calculated also under the assumption of the steady state constant wage share. In this way, the movements of the difference between wage growth and productivity are treated as supply shocks, with temporary effects on inflation and do not change the NAIRU. Ball and Mankiw (2002) consider the idea that this temporary productivity shock not followed by aspirations in the short run can shift temporarily the NAIRU.
34. The empirical problem with the idea of nominal wage rigidity to explain US missing deflation is related to the difficulty in reconciling it with the fact of a stable and low but positive inflation in the US economy after the 2008 crisis. If nominal wage growth would be equal to zero due to nominal rigidity, a (stable) positive productivity growth would generate a (stable) deflation). And as noticed by Hall (2013), wage inflation was also positive in the US since the crisis.

35. Pollin (2003) emphasizes the role of ‘globalization’ in the 1990s in diminishing the workers’ bargaining power. The possibility of relocating companies toward countries with low wage costs makes credible the threat of firms firing their workers if they want, for example, to unionize. The reserve industrial army increases in potential conditions when unemployed or poorly paid workers from other countries are inserted (mainly if they can produce sophisticated industrial goods, as it is the case of China). See also Serrano (2004).
36. See Perry and Cline (2016) for empirical evidence in this perspective for the US economy during the great moderation.
37. For Volcker (Glyn, 2006) and Greenspan (FOMC, 1996), defeating the air traffic controllers’ strike had very important anti-inflation consequences by suppressing the power of unions.

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