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The Post-Crisis Phillips Curve:

A New Empirical Relationship between Wage and Inflation*

Liviu Voinea^a

Abstract

In this paper we test a new empirical relationship between wage and inflation. We introduce the concept of a cumulative wage gap, meaning the cumulative gap between the current wage and a maximum peak wage value in the past. In a crisis, people relate to their peak gains in the immediate past. We assume that people judge their consumption decisions based on the relation between their current wages and their past wages, adjusted for inflation. We call this the post-crisis Phillips Curve. The shape of the post-crisis Phillips Curve expresses the theoretical assumption that the inflation rate stays below its target until the cumulative real wage gap closes, and that it increases above its target when the cumulative real wage gap becomes positive. We test our hypothesis using data for 35 OECD countries for the period 1990-2017. We are able to confirm our hypothesis, as the coefficients have the expected sign and are statistically significant for the OECD panel as well as for most of the individual countries. We also find a break in the slope of the curve, as the coefficients are higher after the cumulative wage gap closes.

Keywords: wage, cumulative wage gap, inflation, Phillips Curve, monetary policy

JEL Codes: E21, E24, E31

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1. Introduction: adjusting the Phillips Curve

Inflation has been subdued in the post-crisis years, and the Phillips Curve has failed to explain it. It is probably the greatest mystery of the economic science in the last decade: where has the Phillips Curve gone? There are multiple references to the fact that the Phillips Curve has flattened over the last decade, if not earlier (Forder (2014), Leduc and Wilson (2017), Borio (2017), Carney (2017), Cunliffe (2017), Praet (2016, 2018), Spencer (2017), Murphy (2018), Bullard (2018)). The flattened Phillips Curve and the lesser link between inflation and unemployment, inflation and output gaps, or inflation and wages, have multiple explanations. As presented in international literature, some of these explanations are: deanchoring inflationary expectations regarding the real pay growth, the decoupling between growth and inflation, the role of global value chains in keeping prices down, the role of migration in keeping wages down in the countries of destination, and others. While there is some truth in each and every of them, no alternative has been successfully suggested so far.

This is not the first time when the Phillips Curve is challenged. The surprising high inflation of 1971-1976 and then the persistent high unemployment in the 80s' were two of the previous episodes when the relationship between unemployment and inflation was questioned. Standard economic theory found an explanation in both cases without departing from the Phillips Curve. Gordon (1977) emphasized the short-term role of supply shocks. Blanchard and Summers (1986) highlighted the hysteresis of unemployment, in particular in Europe, where actual unemployment is linked to past unemployment. More recently, Gordon (2013) insisted that the Phillips Curve is alive and well, the only issue being the underestimation of NAIRU. However, trying to fit reality to match the Phillips Curve is not the proper way to address it: rather, the Phillips Curve needs a reality-check.

The main point of this paper is that, if we want to explain inflation, we need to make some adjustments to the Phillips curve. This paper builds on an idea presented in an earlier work by Voinea (2018) and develops it by improving the theoretical foundations, the empirical relationship, adding a data log-normalization, and testing it for robustness.

First, we work with observable variables only. The problem with econometric models which use non-observable variables is built-in: they tend to under-perform in bad times. These models need a reality check, and non-observable variables are not fit for that purpose. Potential GDP is revised retroactively. The output gap depends on potential GDP. Plus, an economy can grow above its potential without being at its full employment (this happens in particular, but not exclusively, in catching-up economies).

Any measure of unemployment is controversial, due to the impact of insufficiently accounted factors such as the underground economy, migration, inactivity, part-time employment. A non-observable measure of unemployment, like NAIRU, is even more debatable. If Central Banks rest their decisions solely on such non-observable variables, they are at risk of getting them wrong. True, any non-observable variable becomes visible at some point in the form of a disequilibrium in other observable variables, among which the twin deficits (budget deficit and current account deficit). Yet, when this happens, it is usually too late for monetary policy.

Therefore, we drop the non-observable variables such as output gap, inflationary expectations and NAIRU – at least when the task at stake is to explain inflation in a postcrisis environment. Instead, we choose to use observable variables only. Since wage is a measurable, reliable, accounted for, and comparable indicator, we focus on a Phillips Curve where consumer prices inflation rate is explained by the cumulative wage gap.

As for the wage Phillips Curve, a number of recent studies also came to the conclusion that the wage Phillips Curve, relatively similar to the original one as developed by Phillips (1958), is more reliable when particular attention is devoted to create a new reference measure for unemployment (Gali 2011, IMF 2017). Recently, an unemployment gap has been discussed (Alichi 2015, IMF 2018).

Second, we make a fundamental change of paradigm from flow to stock. To understand the consumption behavior, which in turn influences inflation, we introduce the concept of a cumulative wage gap – meaning the cumulative gap between current wage and a peak reference wage value in the past. The permanent income hypothesis is fundamentally flawed in times of crisis, because of uncertainty of future income. The only certain reference value lies in the past, not in the future: and that is why current consumption is influenced by past income. We also introduce the concept of an inflation gap – meaning the deviation of present inflation from the target inflation or, in the absence of such, from its long-time average.

Third, we allow for the Phillips Curve to be non-stationary: it moves over time, and it is absolutely normal to do so. Reference wage values, social preferences, jobs' characteristics, skills' endowments and even Central Banks' targets, they all change over time – hence, the impact of cumulative wage gaps on inflation cannot be the same in different time periods. In fact, even Phillips (1958) mentioned that he ignored years in which import prices rise rapidly enough to initiate a wage-price spiral. He stated that his hypothesis that the rate of change of money wage rates can be explained by the level of unemployment is supported except in or immediately after those years. In doing that, he effectively acknowledged the non-stationarity of his curve. He referred to those years as events that occur very rarely except as a result of a war. Our approach embraces these events, except that in modern times it is not war that makes the difference, but recessions; and recessions happen more often than wars. We try to explain what happens during and after recessions – which is exactly what is omitted by the original Phillips curve.

In this paper we test a new empirical relationship between wage and inflation. In order to do so, we refer to cumulative wage gaps and inflation gaps, rather than wage and inflation as nominal variables. We find that inflation does not increase close to or above its target level until the cumulative wage gap closes. In other words, for Phillips Curve to work, the loss of welfare from a negative cumulative wage gap has to be fully compensated first – as a stock measure, not as a flow. The relationship between cumulative wage gap and inflation gap explains the unexplained: its explanatory power is statistically significant in countries which experienced a wage shock, and it is stronger after a crisis.

The rest of the paper is structured as follows. Section 2 presents the theoretical background of the proposed empirical relation between wage and inflation. Section 3 introduces the concepts of cumulative real wage gap and inflation gap, as the two variables describe the Post-crisis Phillips curve. Section 4 presents the methodology and Section 5 provides the empirical evidence. Section 6 tests for the robustness of the proposed empirical relation between wage and inflation and Section 7 concludes.

2. Theoretical foundations

Wages, as the most important source of income for most households around the globe, stand at the basis of any consumption theory. The main problem with the prevailing consumption theories (Keynes' consumption function (1936), Modigliani's life-cycle hypothesis (1966) and Friedman's permanent income hypothesis (1957)) is their long-term approach. This puts them at odds with our rather short and medium-term perspective on inflation, especially in times of crisis.

Our approach is closer to Duesenberry (1952), who introduced relative income instead of the rate of change of income as the explanation of the differences in saving at the same level of income. He referred to the influence of past living standard on current consumption. Saving depends, he wrote, on the level of current income relative to higher incomes in previous years. However, he stopped short of calling a wage gap or of considering the influence his consumption and saving theory may have on inflation.

What matters most for consumption during and after a crisis is not the unit change of income, the savings for retirement, or the future income. A recession is a game – changer. In a recession, the transitory component of income becomes negative not only for one person or for a small group, but for the national or global economy. This makes it very difficult to predict future income. When nothing is steady anymore, the only valid reference remains the past income.

In a crisis, the reference is not ahead of us, but rather is in the past. Retirement savings and linear employment prospects are uncertain. People relate to their peak gains in the not so distant past rather than to uncertain future gains.

Consumption does not depend only on current income and future expectations, but also on past income.

Stock is more relevant than flow, because people have a strong reference which is their previous income levels. People do not spend as much as before when their wage drops, and they spend more if they have higher wages. While this is intuitive and apparently well theorized, everything is related to wage flows and to wage dynamics. We hold that we should account the stock as well, meaning the cumulative gap between current levels and past reference levels of income.

Cumulative wage gap is a better predictor of inflation than output gap because it is observable and it refers to past consumption and price levels; while output gap is nonobservable and it makes conservative assumptions for the future.

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Past wages are the minimum potential wages for the wage earners. We assume that people judge their consumption decisions based on the relation between their current wages and their past wages, adjusted for inflation. I call this difference real wage gap.

The cumulative real wage gap, instead of nominal wage, is the explanatory variable in our new Phillips Curve. The dependent variable is the inflation gap, which refers to the gap between inflation and the inflation target (or, in the absence of a target, an average value of inflation over a longer time-span).

Inflation gap is a more relevant variable for policy makers than the inflation rate because it puts inflation in relation to a desired level. A negative inflation gap means more demand-side measures are needed. A positive inflation gap means that the risk of overshooting is already present and policy tightening is required.

For inflation, the reference point is not in the past – but it is rather a normative value, commonly agreed to be desirable for a given society at a given point in time.

3. The cumulative wage gap model

3.1. Cumulative wage gap

This study uses cumulative real wage gap instead of wages or unemployment rate in the Phillips Curve. We start by defining the wage gap:

$$W_{gap T_n} = W_{T_n} - W_{T_0} \tag{1}$$

where $W_{gap T_n}$ is the real wage gap at time T_n , W_{T_n} is the real wage at time T_n , and W_{T_0} is the real wage at time T_0 , the peak value of real wage in the reference period.

The cumulative real wage gap at time T_n is defined as:

$$cW_{gap T_N} = \sum_{n=1}^{N} W_{gap T_n} = \sum_{n=1}^{N} (W_{T_n} - W_{T_0})$$
⁽²⁾

A theoretical graphical representation of the real wage and the cumulative real wage gap for a six-period model can be observed in the Figure I, respectively Figure II. At time T_0 real wage is at peak. Of course, wage earners are not aware of this peak until the next year, when real wage drops.

Area A is the cumulative real wage gap between T_1 and T_0 , area B is the cumulative real wage gap between T_2 and T_1 , area C is the cumulative real wage gap between T_3 and T_2 , area D is the cumulative real wage gap between T_4 and T_3 , area E is the cumulative real wage gap between T_5 and T_4 and area F is the cumulative real wage gap between T_6 and T_5 .

At time T_1 , when real wage W_1 drops relative to the peak value W_0 , the cumulative real wage gap is the area A (equal to the real wage gap). At time T_2 , when real wage drops even further, the cumulative real wage gap is the sum of areas A and B. At time T_3 , the real wage starts to increase, but as it remains below the peak value, the cumulative real wage gap further deepens (A+B+C). At time T_4 , when the real wage increases above the peak reference value, the cumulative real wage gap starts to shrink (A+B+C+D). The growth of real wage makes the cumulative real wage gap to close at time T_5 (A+B+C+D+E) and to enter into the positive territory at time T_6 (A+B+C+D+E+F).

The cumulative real wage gap for the above 6-period model is described below:

$$cW_{gap T_1} = A = \int_{T_0}^{T_1} cW_{gap}(t)dt < 0$$
(3)

$$cW_{gap T_2} = A + B = \int_{T_0}^{T_1} cW_{gap}(t)dt + \int_{T_1}^{T_2} cW_{gap}(t)dt = \int_{T_0}^{T_2} cW_{gap}(t)dt < 0$$
(4)

$$cW_{gap T_{3}} = A + B + C = \int_{T_{0}}^{T_{1}} cW_{gap}(t)dt + \int_{T_{1}}^{T_{2}} cW_{gap}(t)dt + \int_{T_{2}}^{T_{3}} cW_{gap}(t)dt = \int_{T_{0}}^{T_{3}} cW_{gap}(t)dt < 0$$
(5)

$$cW_{gap T_4} = A + B + C + D = \int_{T_0}^{T_1} cW_{gap}(t)dt +$$

$$\int_{T_1}^{T_2} cW_{gap}(t)dt + \int_{T_2}^{T_3} cW_{gap}(t)dt + \int_{T_3}^{T_4} cW_{gap}(t)dt = \int_{T_0}^{T_4} cW_{gap}(t)dt < 0$$
and $cW_{gap T_4} > cW_{gap T_3}$
(6)
$$cW_{gap T_5} = A + B + C + D + E = \int_{T_0}^{T_1} cW_{gap}(t)dt +$$

 $\int_{T_1}^{T_2} cW_{gap}(t)dt + \int_{T_2}^{T_3} cW_{gap}(t)dt + \int_{T_3}^{T_4} cW_{gap}(t)dt + \int_{T_4}^{T_5} cW_{gap}(t)dt = \int_{T_0}^{T_5} cW_{gap}(t)dt = 0 \quad (7)$

$$cW_{gap T_{6}} = A + B + C + D + E + F =$$

$$\int_{T_{0}}^{T_{1}} cW_{gap}(t)dt \int_{T_{1}}^{T_{2}} cW_{gap}(t)dt + \int_{T_{2}}^{T_{3}} cW_{gap}(t)dt + \int_{T_{3}}^{T_{4}} cW_{gap}(t)dt + \int_{T_{4}}^{T_{5}} cW_{gap}(t)dt + \int_{T_{5}}^{T_{6}} cW_{gap}(t)dt = \int_{T_{0}}^{T_{6}} cW_{gap}(t)dt > 0$$
(8)

[Figure 1 about here]

[Figure 2 about here]

Therefore, equation (2) can be written as follows:

$$cW_{gap T_N} = \sum_{n=1}^{N} (W_{T_n} - W_{T_0}) = \sum_{n=1}^{N} A_n$$
(9)

where A_n is the real wage gap between T_n and T_{n-1} , expressed as area.

If a new recession comes at T_7 (not shown in the figures), the new peak value for the real wage is the one recorded at T_6 .

3.2. Inflation gap

The inflation gap is defined as the deviation from the central banks' target:

$$\Pi_{gap T_n} = \Pi_{T_n} - \Pi_{T_n}^* \tag{10}$$

where $\Pi_{gap T_n}$ is the inflation gap at time T_n , Π_{T_n} is the inflation rate at time T_n , and $\Pi_{T_n}^*$ is the central banks' target at time T_n , or, in the absence of that, an average of long-time inflation.

A theoretical graphical representation of the inflation gap for a six-period model can be observed in Figure III.

[Figure 3 about here]

The inflation gap for the above six-period model fulfils the following relations:

$$\Pi_{gap T_0} = \Pi_{T_0} - \Pi_{T_0}^* > 0 \tag{11}$$

$$\Pi_{gap T_1} = \Pi_{T_1} - \Pi_{T_1}^* < 0 \tag{12}$$

$$\Pi_{gap T_2} = \Pi_{T_2} - \Pi_{T_2}^* < 0 \tag{13}$$

$$\Pi_{gap T_3} = \Pi_{T_3} - \Pi_{T_3}^* < 0 \text{ and } \Pi_{gap T_3} < \Pi_{gap T_2}$$
(14)

$$\Pi_{gap T_4} = \Pi_{T_4} - \Pi_{T_4}^* < 0 \text{ and } \Pi_{gap T_4} > \Pi_{gap T_3}$$
(15)

$$\Pi_{gap T_5} = \Pi_{T_5} - \Pi_{T_5}^* = 0 \tag{16}$$

$$\Pi_{gap T_6} = \Pi_{T_6} - \Pi_{T_6}^* > 0 \tag{17}$$

At time T_0 , at the peak value of real wage, we assume that inflation rate is above the central bank's inflation target, given the inflationary pressures caused by high wages. Therefore, inflation gap at time T_0 is positive. However, the relationship is valid even when this assumption does not hold. As wages enter an adjustment phase, inflationary pressures fade away and inflation rate declines. Inflation gap turns negative and reaches a minimum at time T_3 , the same as the cumulative real wage gap. In the next stage, as wages resume growth, inflation rate starts rising, but it remains subdued, below the central bank's inflation target, until time T_5 , when the cumulative real wage gap is closed. Afterwards, wages continue to increase and the wage gap widens in the positive territory. Consequently, inflationary pressures strengthen, pushing up the inflation rate above the central bank's inflation target at time T_6 .

3.3. Post-Crisis Phillips Curve: cumulative real wage gap vs. inflation gap

The relationship between cumulative real wage gap and inflation gap is presented in Figure IV. The equation of the post-crisis Phillips Curve is written as follows:

$$[\Pi_{gap T_n}]_N = f([cW_{gap T_n}]_N) + [\varepsilon_{T_n}]_N$$
(18)

By introducing the equations for inflation gap and cumulative real wage gap into relation (18), the post-crisis Phillips Curve becomes:

$$[\Pi_{T_n} - \Pi_{T_n}^*]_N = f([\sum_{n=1}^N (W_{T_n} - W_{T_0})]_N) + [\varepsilon_{T_n}]_N$$
(19)

where *N* is the period of time for which the Phillips Curve is evaluated and ε_{T_n} is the residual, which accounts for other variables influencing the inflation gap.

[Figure 4 about here]

At time T_0 , cumulative real wage gap is considered zero, while inflation gap is considered positive. This is one of the reasons why the curve does not cross exactly at the intersection of the two axes. The other reason relates to the dynamic (non-stationary) feature of the curve, expressing its different expected coefficients during different time periods.

The shape of the post-crisis Phillips Curve expresses the theoretical assumption that the inflation rate stays below its target until the cumulative real wage gap closes, and that it increases above its target when the cumulative real wage gap becomes positive.

The graphical representation assumes different slopes before and after closing the cumulative real wage gap. A sharper slope after closing the cumulative real wage gap means that the same amount of a cumulative real wage gap leads to less inflation as the cumulative gap is negative, and to more inflation as the cumulative gap turns positive. We will test separately these two assumptions: the shape of the curve and the break in the slopes.

4. Methodology

4.1. Data collection

The analysis covers the OECD countries over the period 1990-2017, except for the United States where the data covers the period 1989 – 2017. Data sources for wages and inflation are the OECD and the FRED databases (for US), annual data. The reason for this selection is the availability of long-time data series on wages at OECD (they are only available since 1990), while for US the FRED database allows us to start from a known peak year, which was 1989. We used the following date: the average annual wage in 2017 constant prices at 2017 USD PPPs, exchange rate (national currency units/US dollar) and inflation (CPI) – annual growth rate, from the OECD database, and the real median household income in the United States, 2017 CPI-U-RS adjusted dollars, from the FRED database. We transformed the average

annual wage into local currency for ensuring comparability with the inflation rate, which reflects changes in local prices.

Data sources for the inflation target of central banks are from the respective central banks' websites. If a central bank targets a corridor rather than a level of the inflation rate, then the mid-point of the target band is considered.

Reliable data was unavailable for Turkey. Therefore, the total number of countries in our panel is 35, with annual observations for each of them.

4.2. Sample selection

The year T_0 is the peak year. We define a wage adjustment episode the adjustment in real wages that follows after the peak year. For each wage adjustment episode in a country, the data sample starts at year T_0 (the peak year) and it ends when a new peak is detected (at year T_0 _{new} – 1). We apply this only if the cumulative real wage gap has been closed before reaching the new peak. If the cumulative wage gap has not been closed, then we continue to consider the new peak as part of the same adjustment episode. A wage adjustment episode within a larger wage adjustment episode is not considered. This approach prevents data overlapping and it secures research consistency and integrity.

The selection of peak years for each country is detailed in Table A.1 in the Appendix. In the analysed period, there were three historical episodes of wage adjustments. Data shows that the cumulative real wage gap was closed in all countries which experienced the first wage adjustment episode, with the exception of two countries (Japan and Korea). In the case of the second wage adjustment episode, the cumulative real wage gap has not yet been closed, with the exception of other two countries (Mexico and Latvia). These latter two countries entered a new wage adjustment episode, the third one.

For simplicity reasons, the wage adjustment episodes are numbered with reference to the time periods and not to the country-specific episodes. We considered as the first wage adjustment episode any episode which started in the last decade of last century (1990-1999) and the second wage adjustment episode any episode which started after the year 2000. For example, Canada did not have a wage adjustment during the first historical period, but it experienced one during the second period. We refer to the latter as the second episode of wage adjustment in Canada.

Peak years are country-specific; hence they are not the same in all countries. This means that the first wage adjustment episode, including the peak years, may have lasted, for example, 7 years in Italy, 8 years in Germany and France, 9 years in US, 20 years in Korea or 28 years (and counting) in Japan.

Of the 35 countries analysed, 21 countries experienced the first historical episode of wage adjustments, 33 countries experienced the second historical episode of wage adjustments and only 2 countries experienced the third historical episode of wage adjustments.

This is why the total number of observations is much higher for the second wage adjustment episode, compared against the first wage adjustment episode. In the case of the third wage adjustment episode, the total number of observations is much lower.

4.3. Data log-normalization

Alternatively, we compute log-normalization of the data set in order to make the distributions more symmetrical. The resulted data samples for cumulative wage gap contain negative data due to its calculation methodology. In order to log-normalize the data, the following transformation is performed for each data sample of cumulative wage gap:

$$cW_{gap \ trans \ T_n} = cW_{gap \ T_n} + 1 - \min_{n=0,N} cW_{gap \ T_n}$$
(20)

The same transformation is carried out for each data sample of inflation gap:

$$\Pi_{gap \ trans \ T_t} = \Pi_{gap \ T_n} + 1 - \min_{n=0,N} \Pi_{gap \ T_n}$$
(21)

where $\min_{n=0,N} cW_{gap T_n}$ and $\min_{n=0,N} \Pi_{gap T_n}$ are the minimum cumulative wage gap and the

minimum inflation gap in each data sample. The transformed data series are further lognormalized.

The parameters of the post-crisis Phillips Curve are estimated using a regression, in which the inflation gap is the dependent variable and the cumulative wage gap is the explanatory variable. Panel estimation with fixed-effects is considered when grouping countries.

5. Empirical evidence

We tested our hypothesis for all OECD countries. In Figure V we present the graphical representation of our results for all OECD countries which experienced wage adjustments (21 countries for the first wage adjustment episode and 33 countries for the second wage adjustment episode).

[Figure 5 about here]

These results are statistically significant and with the expected sign for the first two adjustment episodes. For the third adjustment episode, the sign of the relationship is as predicted, but the number of observations is too limited to have statistical significance.

The theoretical model is confirmed: the cumulative wage gap explains a significant part of the deviation of inflation from its target: more a third of the inflation gap in the first wage adjustment episode and more than a fifth of it in the second adjustment episode (which has not been closed yet).

In the Figures A.1, A.2 and A.3 in the Appendix we present the graphical representations for selected countries which have statistically significant coefficients.

For the first wage adjustment episode the cumulative wage gap explains more than 80% of the inflation gap in Iceland, about two thirds of the inflation gap in the US and Ireland, more than half the inflation gap in Finland and Switzerland, close to half of the inflation gap in Netherlands. It even explains almost one quarter of the inflation gap in Korea, despite the fact that this country has not closed the first wage adjustment episode yet.

For the second wage adjustment episode, the cumulative wage gap, which in most cases has not been closed yet, explains more than 60% of the inflation gap in Slovenia and Slovak Republic, between 40% and 60% of the inflation gap in Greece, Italy, Portugal, and Spain, and between 20% and 40% of the inflation gap in Australia, Canada, Denmark, France, Hungary, Ireland, Netherlands, New Zeeland, Switzerland and United States.

6. Robustness check

6.1. The entire data sample

We checked the robustness of our results separately, in the standard method, as well as the log-normalized method. The results confirm the strong relation between cumulative real wage gap and inflation gap in the OECD countries (Table 1 and Table 2). Cumulative real wage gap explains a large share of the inflation gap, in particular in the countries which experienced severe economic recessions and subsequent material wage adjustments.

There are only two countries that closed the cumulative real wage gap after the second wage adjustment episode, which narrows down the size of the data sample and makes the results for the third episode of wage adjustment less robust.

[Table 1 about here]

When aggregated for all OECD countries, having a large number of observations (197 for the first wage adjustment and 525 for the second one), the estimated slopes of the post-crisis Phillips Curve are statistically significant at the 5% level, in case of the first wage adjustment episode, and at the 1% level, in case of the second wage adjustment episode. The coefficients' sign is positive, in line with the theoretical assumptions. An increase/decrease of cumulative real wage gap by 10 percentage points made inflation gap to rise/deepen by 0.028 percentage points during the first wage adjustment episode, by 0.045 percentage points during the second wage adjustment episode and by 0.099 percentage points during the third wage adjustment episode (see Table 1).

The individual results also confirm the strong and positive relation between cumulative real wage gap and inflation gap. In the case of the first wage adjustment episode, out of 21 countries, 8 of them have positive and statistically significant coefficients; other 7 countries have positive but not statistically significant coefficients, while the remaining 6 countries have negative but not statistically significant coefficients. In the case of the second wage adjustment episode, out of 33 countries, 16 of them have positive and statistically significant coefficients; other 9 countries have negative but not statistically coefficients, out of which only 2 are statistically significant. Regarding the third wage adjustment episode, out of 2 countries, one has positive and statistically significant slopes.

The negative or not statistically significant coefficients could be attributed to the low number of observations, as well as to various specific factors that temporarily interrupted the positive and strong relation between cumulative real wage gap and inflation gap.

[Table 2 about here]

Similarly, the estimated coefficients of cumulative real wage gap using the log-normalized data point to robust results. When aggregating for all OECD countries, results reveal that an increase/decrease of cumulative real wage gap by 10% led inflation gap to rise/deepen by 0.561% during the first wage adjustment episode, by 0.846% during the second wage adjustment episode and by 0.454% during the third wage adjustment episode (see Table 2). At country level, in terms of the sign and significance of the coefficients, the results are similar for the second wage adjustment episode and wage adjustment episode and weaker for the first and for the third ones.

Therefore, we were able to test and validate our hypothesis that the cumulative wage gap matters for inflation. The predicted shape of the curve has also been confirmed.

6.2. Breaking the slope: before and after closing the gap

Further on, we deepen the robustness check analysis and test if the inflation gap accelerates after the cumulative real wage gap closes. In that respect, we estimated the slope of the postcrisis Phillips Curve before and after the cumulative real wage gap was closed. The results in the standard method, as well as the log-normalized method are presented below.

[Table 3 about here]

Most of the countries included in the analysis closed the cumulative real wage gap after the first wage adjustment episode, whilst only two countries closed the cumulative real wage gap after the second and the third wage adjustment episodes. Therefore, the low number of observations alters the statistical relevance of the estimated coefficients for the second wage adjustment episode (after closing the gap) and the third wage adjustment episode (before and after closing the gap).

The results show that when the cumulative real wage gap drops by 10 percentage points, the inflation gap declines by 0.025 percentage points. Inflation rate faced idiosyncratic shocks and temporary deviated from its trend; still, the medium-term inflationary pressures remained subdued as long as the cumulative real wage gap stayed negative. In many cases, inflation rate was below the central bank's target. However, inflation rate accelerated after the cumulative real wage gap had been closed. A 10 percentage points increase of the cumulative real wage gap corresponds to a higher inflation gap by 0.373 percentage points. The relation between the two variables becomes stronger after the cumulative real wage gap had been closed (see Table 3).

[Table 4 about here]

The conclusions are also confirmed by the estimation results using log-normalized data. A fall of the cumulative real wage gap by 10% corresponds to a decline of the inflation gap by 0.9%. On the other hand, a 10% increase of the cumulative real wage gap after closes leads to an increased inflation gap by 2.2% (see Table 4).

This confirms the theoretical prediction that there a break in the slope of the curve, as the coefficients are higher after the cumulative wage gap closes than before this happens.

7. Concluding remarks and policy implications

In this paper we test a new empirical relationship between wage and inflation. In order to do so, we introduce the concept of cumulative wage gap, meaning the cumulative gap between the current wage and a maximum peak wage value in the past. We also introduce the concept of an inflation gap – meaning the deviation of present inflation from the target inflation or, in the absence of such, from its long-time average. Our hypothesis is that inflation depends on the cumulative wage gap. We call this the post-crisis Philips Curve. Cumulative wage gap is a better predictor of inflation than output gap, unemployment or inflationary expectations because it is observable, measurable and reliable. Inflation gap is a more relevant variable for policy makers than the inflation rate because it puts inflation in relation to a desired level.

At the core of our theoretical foundation lays the assumption that the permanent income hypothesis is fundamentally flawed in times of crisis, because of uncertainty of future income. What matters most for consumption during and after a crisis is not the unit change of income, the savings for retirement, or the future income. A recession is a game – changer. In a recession, the transitory component of income becomes negative not only for one person or for a small group, but for the national or global economy. This makes it very difficult to predict future income. When nothing is steady anymore, the only valid reference remains the past income.

In a crisis, the reference is not ahead of us, but rather is in the past. People relate to their peak gains in the not so distant past rather than to uncertain future gains.

We allow for the post-crisis wage Phillips Curve to be non-stationary: it moves over time, and it is absolutely normal to do so. Reference wage values, social preferences, jobs' characteristics, skill endowments and even Central Banks' targets, they all change over time – hence, the impact of wage gaps on inflation cannot be the same in different time periods. Past wages are the minimum potential wages for the wage earners. Hence, people judge their consumption decisions based on the relation between their current wages and their past wages, adjusted for inflation.

The shape of the post-crisis Phillips Curve expresses the theoretical assumption that the inflation rate stays below its target until the cumulative real wage gap closes, and that it increases above its target when the cumulative real wage gap becomes positive.

The graphical representation assumes different slopes before and after closing the cumulative real wage gap. A sharper slope after closing the cumulative real wage gap means that the same amount of a cumulative real wage gap leads to less inflation when the cumulative gap is negative and to more inflation when the cumulative gap is positive.

The analysis covers the OECD countries over the period 1990-2017, except for the United States where the data covers the period 1989 – 2017. We consider three wage adjustment episodes over this period. We define a wage adjustment episode the adjustment in real wages that follows after the peak year. For each wage adjustment episode in a country, the data sample starts at year the peak year and it ends when a new peak is detected, unless the cumulative wage gap has not been closed before reaching the new peak.

Out of the 35 countries analyzed, 21 countries experienced the first historical episode of wage adjustments, 33 countries experienced the second historical episode of wage

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adjustments and only 2 countries experienced the third historical episode of wage adjustments.

These results are statistically significant and they have the expected sign for the first two adjustment episodes. For the third adjustment episode, the sign of the relationship is as predicted, but the number of observations is too limited to have statistical significance.

Our hypothesis is empirically confirmed: the cumulative wage gap explains a significant part of the deviation of inflation from its target for all OECD countries (aggregated data): more a third of the inflation gap in the first wage adjustment episode and more than a fifth of it in the second adjustment episode. The coefficients of the post-crisis Phillips Curve are statistically significant at the 5% level, in case of the first wage adjustment episode, and at the 1% level, in case of the second wage adjustment episode. The coefficients' sign is positive, in line with the theoretical assumptions. An increase/decrease of cumulative real wage gap by 10 percentage points made inflation gap to rise/deepen by 0.028 percentage points during the first wage adjustment episode, by 0.045 percentage points during the second wage adjustment episode. Similarly, the estimated coefficients of cumulative real wage gap using the log-normalized data point to robust results. When aggregating for all OECD countries, results reveal that an increase/decrease of cumulative real wage adjustment episode, by 0.561% during the first wage adjustment episode, by 0.454% during the third wage adjustment episode.

For the first wage adjustment episode the cumulative wage gap explains more than 80% of the inflation gap in Iceland, about two thirds of the inflation gap in the US and Ireland, more than half the inflation gap in Finland and Switzerland, close to half of the inflation gap in Netherlands. It even explains almost one quarter of the inflation gap in Korea, despite the fact that this country has not closed the first wage adjustment episode yet. For the second wage adjustment episode, the cumulative wage gap, which in most cases has not been closed yet, explains more than 60% of the inflation gap in Slovenia and Slovak Republic, between 40% and 60% of the inflation gap in Greece, Italy, Portugal, and Spain, and between 20% and 40% of the inflation gap in Australia, Canada, Denmark, France, Hungary, Ireland, Netherlands, New Zeeland, Switzerland and United States.

Therefore, we were able to test and validate our hypothesis that the cumulative wage gap matters for inflation. The predicted shape of the curve has also been confirmed.

The results also show that the relation between the two variables becomes stronger after the cumulative real wage gap had been closed. For example, using the log-normalized data, a fall of the cumulative real wage gap by 10% corresponds to a decline of the inflation gap by 0.9%. On the other hand, a 10% increase of the cumulative real wage gap after closes leads to an increased inflation gap by 2.2%.

This confirms the theoretical prediction that there is a break in the slope of the curve, as the coefficients are higher after the cumulative wage gap closes than before it happens. The main finding of our paper is that inflation depends on the cumulative wage gap: it does not increase close to or above its target level until the cumulative real wage gap is closed.

For Phillips Curve to work, the loss of welfare from a negative cumulative real wage gap has to be fully compensated first – as a stock measure, not as a flow. The policy implication from our finding is that countries which closed their cumulative real wage gap should be much more prudent in further wage increases – because they will be seen in inflation much faster and larger than in the recent past. For countries which have not closed their cumulative real wage gap the implication is that inflation will remain subdued until they close their cumulative wage gap.

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Figure 2. Cumulative Real Wage Gap (Six-Period Model)

Source: the author.





Source: the author.

Figure 4. Post-Crisis Phillips Curve: Cumulative Real Wage Gap vs. Inflation Gap (Six-Period Model)



Source: the author.

Figure 5. Post-Crisis Phillips Curve for all OECD Countries

All OECD countries (first wage adjustment ¹)

All OECD countries (second wage adjustment²)



Notes: ¹Period 1993-2000 for AUS, AUT, BEL, DNK, FIN, FRA, DEU, IRL, LUX, NLD, NZL, CHE, GBR; 1994-2000 for ISL, ITA, NOR, ESP, SWE; 1990-2017 for JPN; 1998-2017 for KOR, 1989-1998 for USA.

²Period 2001-2017 for AUS, AUT, BEL, CZE, DNK, FIN, FRA, DEU, HUN, ISL, IRL, ITA, LUX, LTU, NLD, NOR, NZL, PRT, SVK, SVN, ESP, SWE, CHE, GBR; 2002-2017 for CAN, EST, GRC, ISR, POL; 2003-2017 for CHL; 2001-2006 for LTV; 2004-2008 for MEX; 1999-2017 for USA.

Annual data; average wage; the starting year is the peak reference wage value in the past. R-squared for the all OECD countries resulted from panel estimation with country fixed effects.

Source: OECD, FRED, author's calculations.

Country	Period	No. of observations	Coefficient	R-squared
Australia	1993-2000	8	0.0325	0.195
	2001-2017	17	0.0034**	0.348
		-	-	-
Austria	1993-2000	8	0.0045	0.009
Austria	2001-2017	17	0.0045	0.005
	2001-2017	17	0.0011	0.055
Palgium	1002 2000	- 0	0.0116	0.142
Deigiuili	1995-2000	0	0.0110	0.142
	2001-2017	17	0.0015	0.039
	-	-	-	-
Canada	-	-	-	-
	2002-2017	16	0.0039*	0.224
	-	-	-	-
Chile	-	-	-	-
	2003-2017	15	-0.0035	0.011
	-	-	-	-
Czech Republic	-	-	-	-
	2001-2017	17	0.0017	0.019
	-	-	-	-
Denmark	1993-2000	8	0.0092	0.115
	2001-2017	17	0.0043**	0.245
	-	-	-	-
Estonia	_	-	-	-
	2002-2017	16	-0.0522	0.233
	-	_	-	-
Finland	1993-2000	8	0.0332**	0.602
1 mund	2001-2017	17	0.00016	0.002
	2001 2017	-	0.0010	0.020
Franca	1003 2000	8	0.0020	0.011
France	2001 2017	8 17	-0.0029	0.011
	2001-2017	17	0.0045	0.501
	-	-	-	-
Germany	1993-2000	8	-0.0103	0.037
	2001-2017	17	0.0015	0.099
	-	-	-	-
Greece	-	-	-	-
	2002-2017	16	0.0120***	0.598
	-	-	-	-
Hungary	-	-	-	-
	2001-2017	17	0.0342**	0.350
	-	-	-	-
Iceland	1994-2000	7	0.0279***	0.848
	2001-2017	17	0.0286	0.266
	-	-	-	-
Ireland	1993-2000	8	0.0283**	0.661
	2001-2017	17	0.0180***	0.390
		-	-	-
Israel	_	-	-	-
istudi	2002-2017	16	0.0083	0.177
	2002 2017	-	-	0.177
Italy	100/ 2000	7	0.0272	0.220
Italy	2001 2017	17	-0.0272	0.220
	2001-2017	17	-0.0047	0.416
	-	-	-	-
Japan	1990-2017	28	0.0018	0.077
	-	-	-	-
	-	-	-	-
Korea	1998-2017	20	0.0215**	0.238
	-	-	-	-
	-	-	-	-
Luxembourg	1993-2000	8	0.0216	0.268
	2001-2017	17	0.0038*	0.225
	-	-	-	-

Table 1. Estimated Slopes (Coefficients of Cumulative Wage Gap) Using the Standard Method

Latvia
2001-2006 6 0.0591 0.202 2007-2017 11 0.0090 0.005 Lithuania - - - - 2001-2017 17 -0.0056 0.041 - - - - - Mexico - - - - 2004-2008 5 -0.0143 0.008 2009-2017 9 0.0297* 0.432 Netherlands 1993-2000 8 0.0147* 0.458 2001-2017 17 0.00218 0.333 2001-2017 17 - 0.0010 0.009 - - - - - - Norway 1994-2000 7 0.0218 0.333 - New Zeeland 1993-2000 8 0.0173* 0.0097 2001-2017 17 0.0038** 0.308 - - - - - - - 2001-2017
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2001-2017 17 0.0044 0.134
Switzerland 1993-2000 8 0.0461** 0.512
2001-2017 17 0.0031** 0.355
UK 1993-2000 6 -0.0394 0.225
2001-2017 17 -0.0186**** 0.754
USA 1989-1998 10 0.1160*** 0.644
1999-2017 19 0.0204** 0.233
All OECD countries, panel 1 st wage adjustment ¹ 197 0.0028** 0.362
estimation with country fixed 2 nd wage adjustment ² 525 0.0045*** 0.255
effects 3^{rd} wage adjustment ³ 18 0.0099 0.477

 Table 1. Continued

Notes: ¹Period 1993-2000 for AUS, AUT, BEL, DNK, FIN, FRA, DEU, IRL, LUX, NLD, NZL, CHE, GBR; 1994-2000 for

 ISL, ITA, NOR, ESP, SWE; 1990-2017 for JPN; 1998-2017 for KOR, 1989-1998 for USA.
 ²Period 2001-2017 for AUS, AUT, BEL, CZE, DNK, FIN, FRA, DEU, HUN, ISL, IRL, ITA, LUX, LTU, NLD, NOR, NZL, PRT, SVK, SVN, ESP, SWE, CHE, GBR; 2002-2017 for CAN, EST, GRC, ISR, POL; 2003-2017 for CHL; 2001-2006 for LTV; 2004-2008 for MEX; 1999-2017 for USA.

³Period 2007-2017 for LVA; 2009-2017 for MEX.

Wage adjustment episodes were included in the analysis only if the previous wage gaps were closed. Significance level of 1% (***), 5% (**) and 10% (*).

Source: author's calculations.

Country	Period	No. of observations	Coefficient	R-squared
Australia	1993-2000	8	0.2068	0.261
Tubtullu	2001-2017	17	0.1376**	0.201
	2001 2017	-	-	0.272
Austria	1002 2000	 0	0.0028	0.001
Ausula	2001 2017	0	0.0038	0.001
	2001-2017	17	0.0432	0.036
	-	-	-	-
Belgium	1993-2000	8	0.0219	0.005
	2001-2017	17	0.0343	0.015
	-	-	-	-
Canada	-	-	-	-
	2002-2017	16	0.0578	0.090
	-	-	-	-
Chile	_	_	_	_
Clinic	2003-2017	15	-0.0304	0.008
	2005-2017	15	-0.0304	0.000
<u> </u>	-	-	-	-
Czech Republic	-	-	-	-
	2001-2017	17	0.0323	0.014
	-	-	-	-
Denmark	1993-2000	8	-0.0007	0.001
	2001-2017	17	0.1610***	0.506
	-	-	-	-
Estonia	_	_	-	-
Estoma	2002-2017	16	-0 2347*	0.226
	2002-2017	10	-0.2347	0.220
	1002 2000	-	-	- 0.200
Finland	1993-2000	8	0.1557	0.300
	2001-2017	17	0.0941**	0.098
	-	-	-	-
France	1993-2000	8	-0.0894	0.098
	2001-2017	17	0.1469**	0.348
	-	-	-	-
Germany	1993-2000	8	-0.0374	0.010
Somming	2001-2017	17	0.0628	0.079
	2001-2017	17	0.0020	0.077
Carros	_	-	-	-
Greece		-	-	-
	2002-2017	16	0.1863*	0.200
	-	-	-	-
Hungary	-	-	-	-
	2001-2017	17	0.3233***	0.418
	-	-	-	-
Iceland	1994-2000	7	0.2458	0.368
	2001-2017	17	-0.9462***	0.379
		_	-	-
Ireland	1003 2000	8	0.2717	0.382
Iteratio	2001 2017	8	0.2717	0.382
	2001-2017	17	0.0874	0.004
	-	-	-	-
Israel	-	-	-	-
	2002-2017	16	0.1895*	0.200
	-	-	-	-
Italy	1994-2000	7	-0.2611	0.373
2	2001-2017	17	0.1613**	0.290
		-	-	-
Ianan	1000_2017	28	0 0030	0.001
Japan	1770-2017	20	0.0037	0.001
	-	-	-	-
	-	-	-	-
Korea	1998-2017	20	0.1829**	0.205
	-	-	-	-
	-		-	
Luxembourg	1993-2000	8	0.1624	0.184
	2001-2017	17	0.1443**	0.256
		-	-	-

Table 2. Estimated Slopes (Coefficients of Cumulative Wage Gap) Using the Lognormalized Method

Latvia	-	-	-	-
	2001-2006	6	0.0306	0.003
	2007-2017	11	0.1331	0.055
Lithuania		-	_	-
Dititutiiu	2001-2017	7	-0 1943	0.140
	2001-2017	,	-0.1745	0.140
Maxico	_	-	-	-
Wexico	2004 2008	-	0 1280	- 0.100
	2004-2008	5	-0.1280	0.109
NT 1 1 1	2009-2017	9	0.0828	0.051
Netherlands	1993-2000	8	0.1038	0.328
	2001-2017	17	0.1224*	0.222
	-	-	-	-
Norway	1994-2000	7	0.1776	0.344
	2001-2017	17	-0.0379	0.017
	-	-	-	-
New Zeeland	1993-2000	8	0.4170	0.146
	2001-2017	17	0.1066	0.136
	-	-	-	-
Poland	-	-	-	-
	2002-2017	16	-0.1501	0.120
	-	-	-	-
Portugal	-	_	-	-
8	2001-2017	17	0 1270**	0 249
		-	-	-
Slovak Republic	-	_	_	_
Slovak Republic	2001-2017	17	0 2726***	0 398
	2001-2017	17	0.2720	0.570
Slovenia		_		_
Slovenia	2001 2017	-	-	-
	2001-2017	17	0.55/5****	0.540
	-	-	-	-
Spain	1994-2000	/	-0.1332	0.114
	2001-2017	17	0.1743*	0.211
	-	-	-	-
Sweden	1994-2000	7	-0.0219	0.005
	2001-2017	17	0.1327*	0.229
	-	-	-	-
Switzerland	1993-2000	8	0.1967	0.357
	2001-2017	17	0.0675	0.078
	-	-	-	-
UK	1993-2000	8	-0.0775	0.056
	2001-2017	17	-0.0015	0.001
		-	_	-
USA	1989-1998	10	0 1772	0.207
05/1	1999-2017	10	0.1277*	0.207
	1777-2017	17	0.1527	0.204
All OECD countries data in	1st wage adjustment 1	-	-	- 0.217
An OECD coultines, data In	2 nd wage adjustment ²	17/	0.0301	0.217
logarithm, panel estimation	2^{rd} wage aujustment 2	525	0.0840***	0.265
with country fixed effects	5 rd wage adjustment ³	18	0.0454	0.126

Table 2. Continued

Notes: ¹Period 1993-2000 for AUS, AUT, BEL, DNK, FIN, FRA, DEU, IRL, LUX, NLD, NZL, CHE, GBR; 1994-2000 for ISL, ITA, NOR, ESP, SWE; 1990-2017 for JPN; 1998-2017 for KOR, 1989-1998 for USA.

²Period 2001-2017 for AUS, AUT, BEL, CZE, DNK, FIN, FRA, DEU, HUN, ISL, IRL, ITA, LUX, LTU, NLD, NOR, NZL, PRT, SVK, SVN, ESP, SWE, CHE, GBR; 2002-2017 for CAN, EST, GRC, ISR, POL; 2003-2017 for CHL; 2001-2006 for LTV; 2004-2008 for MEX; 1999-2017 for USA.

³Period 2007-2017 for LVA; 2009-2017 for MEX.

Wage adjustment episodes were included in the analysis only if the previous wage gaps were closed. Significance level of 1% (***), 5% (**) and 10% (*).

Source: author's calculations.

Table 3. Estimated Slopes (Coefficients of Cumulative Wage Gap) Before and After the Wage Gap is Closed; Standard Method

Before closing the	gap			
	Period	No. of observations	Coefficient	R-squared
All OECD countries, panel	1 st wage adjustment ¹	159	0.0025**	0.450
estimation with country	2 nd wage adjustment ²	512	0.0052***	0.311
fixed effects	3 rd wage adjustment ³	15	0.0053	0.423
After closing the go	ıp			
	Period	No. of observations	Coefficient	R-squared
All OECD countries, panel	1 st wage adjustment ¹	38	0.0373***	0.769
estimation with country	2 nd wage adjustment ²	13	-0.0053	0.665
fixed effects	3 rd wage adjustment ³	3	-0.0303	0.136
	<u> </u>			

for ISL, ITA, NOR, ESP, SWE; 1990-2017 for JPN; 1998-2017 for KOR, 1989-1998 for USA.

²Period 2001-2017 for AUS, AUT, BEL, CZE, DNK, FIN, FRA, DEU, HUN, ISL, IRL, ITA, LUX, LTU, NLD, NOR, NZL, PRT, SVK, SVN, ESP, SWE, CHE, GBR; 2002-2017 for CAN, EST, GRC, ISR, POL; 2003-2017 for CHL; 2001-2006 for LTV; 2004-2008 for MEX; 1999-2017 for USA.

³Period 2007-2017 for LVA; 2009-2017 for MEX.

Wage adjustment episodes were included in the analysis only if the previous wage gaps were closed. Significance level of 1% (***), 5% (**) and 10% (*);

Source: author's calculations.

Table 4. Estimated Slopes (Coefficients of Cumulative Wage Gap) Before and Afterthe Wage Gap is Closed; Log-normalized Method

Before closing the	gap			
	Period	No. of observations	Coefficient	R-squared
All OECD countries, panel	1 st wage adjustment ¹	159	0.0854***	0.322
estimation with country	2 nd wage adjustment ²	512	0.0980***	0.307
fixed effects	3 rd wage adjustment ³	15	-0.0057	0.153

After closing the gap

	Period	No. of observations	Coefficient	R-squared
All OECD countries, panel	1 st wage adjustment ¹	38	0.2175***	0.778
estimation with country	2 nd wage adjustment ²	13	-0.1809**	0.555
fixed effects	3 rd wage adjustment ³	3	0.3453	-

Notes: ¹Period 1993-2000 for AUS, AUT, BEL, DNK, FIN, FRA, DEU, IRL, LUX, NLD, NZL, CHE, GBR; 1994-2000 for ISL, ITA, NOR, ESP, SWE; 1990-2017 for JPN; 1998-2017 for KOR, 1989-1998 for USA.

²Period 2001-2017 for AUS, AUT, BEL, CZE, DNK, FIN, FRA, DEU, HUN, ISL, IRL, ITA, LUX, LTU, NLD, NOR, NZL, PRT, SVK, SVN, ESP, SWE, CHE, GBR; 2002-2017 for CAN, EST, GRC, ISR, POL; 2003-2017 for CHL; 2001-2006 for LTV; 2004-2008 for MEX; 1999-2017 for USA.

³Period 2007-2017 for LVA; 2009-2017 for MEX.

Wage adjustment episodes were included in the analysis only if the previous wage gaps were closed. Significance level of 1% (***), 5% (**) and 10% (*).

Source: author's calculations.

				Ta	uble A.1	. Years	of Wag	e Adjus	tments	for the	OECD (Countri	es				
	AUS	AUT	BEL	CAN	CHL	CZE	DNK	EST	FIN	FRA	DEU	GRC	HUN	ISI	IRL	ISR	ITA
1989																	
1990																	
1991																	
1992																	
1993	PEAK	PEAK	PEAK				PEAK		PEAK	PEAK	PEAK				PEAK		
1994	1	1	1				1		1	1	1			PEAK	1		PEAK
1995														1			1
1996																	
1997																	
1998																	
1999																	
2000																	
2001	PEAK	PEAK	PEAK			PEAK	PEAK		PEAK	PEAK	PEAK		PEAK	PEAK	PEAK		PEAK
2002	7	2	7	PEAK		2	7	PEAK	7	2	2	PEAK	7	7	2	PEAK	2
2003				2	PEAK			2				2				2	
2004					2												
2005																	
2006																	
2007																	
2008																	
2009																	
2010																	
2011																	
2012																	
2013																	
2014																	
2015																	
2016																	
2017																	
Notes: 1 = Source: au	first hist thor's cal	orical epis	ode of wa	ge adjustn DECD and	nents; 2 = 1 FRED da	second his ta.	torical ep	isode of w	/age adjus	tments; 3	= third hi	storical ep	isode of w	/age adjus	stments; P	$\mathbf{EAK} = \mathbf{T}_{\mathbf{C}}$	

							۰. ۱	Fable A	\.1. Co	ntinued								
	Ndſ	KOR	LVA	LTU	TUX	MEX	NLD	NZL	NOR	POL	PRT	SVK	NVS	ESP	SWE	CHE	GBR	NSA
1989																		PEAK
1990	PEAK																	1
1991	1																	
1992																		
1993					PEAK		PEAK	PEAK								PEAK	PEAK	
1994					1		1	1	PEAK					PEAK	PEAK	1	1	
1995									1					1	1			
1996																		
1997																		
1998		PEAK																
1999		1																PEAK
2000																		2
2001			PEAK	PEAK	PEAK		PEAK	PEAK	PEAK		PEAK	PEAK	PEAK	PEAK	PEAK	PEAK	PEAK	
2002			7	2	2		7	7	7	PEAK	7	7	7	2	7	7	2	
2003										2								
2004						PEAK												
2005						2												
2006																		
2007			PEAK															
2008			ю															
2009						PEAK												
2010						ю												
2011																		
2012																		
2013																		
2014																		
2015																		
2016																		
2017																		
Notes: 1 = Source: au	= first his 1thor's ca	torical epi dculations	sode of wa	age adjustr OECD and	nents; 2 = 1 FRED d	second his ata	storical ep	isode of v	vage adjus	tments; 3	= third his	storical ep	isode of v	/age adjus	stments; P	$EAK = T_0$		



Figure A.1. Post-Crisis Phillips Curve for Selected OECD Countries. First Wage Adjustment





Notes: annual data; average wage; the starting year is the peak reference wage value in the past. Source: OECD, FRED, author's calculations.



Figure A.2. Post-Crisis Phillips Curve for Selected OECD Countries. Second Wage Adjustment



Figure A.2. Continued



Figure A.2. Continued

Notes: annual data; average wage; the starting year is the peak reference wage value in the past. Source: OECD, FRED, author's calculations.

Figure A.3. Post-Crisis Phillips Curve for Selected OECD Countries. Third Wage Adjustment



Notes: annual data; average wage; the starting year is the peak reference wage value in the past. Source: OECD, FRED, author's calculations.