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Are the Long-Run Unemployed on the Margins of the Dutch Labor Market?

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1 Introduction

Since the Great Recessions many countries have seen an increase in the number of long-run unemployed. As workers become discouraged and their skills erode during long lasting spells of unemployment, this makes the dilemma of how best to help the long-run unemployed find work harder to solve. This is reflected in recent studies demonstrating that the long-run unemployed become divorced from the labor market.

In this study we examine the question of whether either the long-run unemployed or discouraged workers in The Netherlands exert influence on the labor market. We reproduce the study of Kruger et al. (2014) in which the authors address this question for the US. In particular, in their final conference draft, Krueger et. al. obtain estimates for the Phillips and Beveridge Curves specified as functions of both the short-run and long-run unemployment rates. They find the expected negative relationships for short-run unemployment with wages, inflation, and vacancies, but no significant relationships for the long-run rate. Our estimates for The Netherlands corroborate these findings. We extend their study by also looking for a possible effect of the discourage worker rate on wages, inflation and vacancies, but are unable to find any significant effects. Our results therefore suggest that neither the long-run unemployed nor discouraged workers exert any significant influence on aggregate labor market outcomes. In particular, we obtain our clearest results with wages based on the real wage Phillips Curve.

In Kruger et al. (2014) the authors work with the short-run unemployment rate defined as the rate for those unemployed for less than a half year. The Dutch data enables us to investigate the sensitivity to this arbitrary cutoff, as it allows us to determine short-run unemployment rates for durations of less than a half, one, two and three years. In same manner our long-run measures of the unemployment rate consist of durations of greater than a half, one, two, and three years. The pattern of our results is robust to the various short-run and long-run measures of unemployment we use. As a further check of robustness we also obtain estimates based on our original quarterly data aggregated to annual series.

We estimate a price Phillips Curve, a real wage Phillips Curve, and the Beveridge Curve. The results from the real wage Phillips Curve and Beveridge Curve produce the clearest indication that only short-run unemployment is relevant in the estimated relationships. We discuss the real wage Phillips Curve estimates in section 3. The presentation of the Beveridge Curve estimates follows in section 4. Thereafter we present the estimates for the price Phillips Curve in section 5 and draw some conclusions in the final section 6. In the next section we first begin with a discussion of the models.

2 The Models

Traditionally the Phillips Curves, both the price and the real wage curves, as well as the Beveridge Curve are taken to be linear functions of the unemployment rate. The coefficient on the unemployment rate is negative in all three of these functions. Recently Llaudes (2005), Gordon (2013), Watson (2014) have argued that the price Phillips Curve can be better fit using the short-run unemployment rate, and Ghayad and Dickens (2012) make the same argument in the case of the Beveridge Curve. Both results can be theoretically explained by the fact that the longer workers remain unemployed the weaker their ties to the labor market become. The theory has both supply side and demand side components to it.

On the demand side, Kroft et al. (2013) and Ghayad (2013) argue that employers are likely to discriminate against the long-term unemployed, believing that long-run employment may well be the result of the worker's own lower productivity that has caused the longer spell of unemployment. On the supply side Krueger and Mueller (2011) argue that longer spells of unemployment increase the probability that a worker will become discouraged and less actively search for work.

The central question we ask here is whether we can still find evidence that the long-run unemployed exert pressure on the labor market after we control from the effect of short-run unemployment in the Phillips and Beveridge Curves. Our answer is no: in general we do not find significant negative relationships between long-run unemployment and either wages, inflation, or vacancies. As economic theory would lead us to expect, our estimates typically do demonstrate a negative relationship between short-run unemployment and wages, inflation, and vacancies.

Regardless of the measure of unemployment used, these functions represent reduced form outcomes of supply and demand forces. In this sense we cannot claim that unemployment causes prices, real wage, or vacancies to change. The reverse is of course also the case. For example, an increase in the number of job vacancies will tend to cause the unemployment rate to fall, a drop in real wages will likewise tend to result in a drop in the unemployment rate, and a fall in prices will increase the real wage, which in turn will generally result in a rise in the unemployment rate. But a finding of no significant relationships in the case of long-run unemployment indicates that long-run unemployment neither causes changes in wages, prices, or vacancies, nor do wages, prices or vacancies have any influence on long-run unemployment. Our results therefore support the idea that the long-run unemployed become divorced from the labor market.

We also look for evidence that discouraged workers exert influence on the labor market by estimating the price and real wage Phillips Curves as well as the Beveridge Curve where the unemployment rate as well as the discourage worker rate are specified as explanatory variables. We are, however, unable to find any evidence for a significant effect of the discouraged worker rate on any of these three aggregate labor market variables.

In our analysis we control for the influence of the short-run rate in our specifications of all three equations by including both the short-run as well as the long-run unemployment rates as explanatory variables. This will become clear in the following sections in which we introduce the Phillips and Beveridge Curves.

3 The Real Wage Phillips Curve

A fairly general and yet simple version of the real wage Phillips Curve is

$$w_t = \bar{w}_t + f(u_t - u_t^*) + \lambda \pi_t^e + \epsilon_t. \tag{3.1}$$

Here we take w_t to be the growth rate of the nominal wage, $\bar{w}_t$ is the trend growth rate in nominal wage, u_t is the unemployment rate, u_t^* is the natural rate of unemployment, or NAIRU, π_t^e is the expected inflation rate, and ϵ_t is the disturbance term. The parameter λ indicates the extend to which the nominal wage follows the development of inflationary expectations. In general $\lambda = 1$ is assumed in the long-run, and we impose this condition here. $f(\cdot)$ is taken to be some general function, where $u_t > u_t^*$ results in a drop in w_t and $u_t < u_t^*$ in an increase. We will simply assume $f(\cdot)$ to be a linear function, as is standard.

Given our assumptions of linearity and $\lambda = 1$ we can rewrite (3.1) as follows.

$$w_t - \pi_t^e = \bar{w}_t + a^* + \beta(u_t - u_t^*) + \epsilon_t, \tag{3.2}$$

where $\beta < 0$ ensures that $u_t > u_t^*$ results in a drop in w_t and $u_t < u_t^*$ in an increase. We also further impose the simplifying assumptions that the trend growth of the wage rate $\bar{w}_t$ is constant as is the NAIRU, and that inflationary expectations are adaptive such that $\pi_t^e = \pi_{t-1}$, then we can define $a = \bar{w} + a^* - \beta\, u^*$, which allows us to further rewrite (3.2) as follows.

$$w_t - \pi_{t-1} = a + \beta\, u_t + \epsilon_t \tag{3.3}$$

This is the specification of the Phillips Curves used in Krueger et al. (2014).

We begin our analysis of the Dutch data by estimating this version of the real wage Phillips Curve, where u_t is the total unemployment rate. To check for any influence on the wage due to discouraged workers, we also estimate a version of the real wage Phillips Curve which also includes the discouraged worker rate, n_t as an explanatory variable:

$$w_t - \pi_{t-1} = a + \beta\, u_t + \beta^*\, n_t + \epsilon_t. \tag{3.4}$$

We then estimate a more general specification that includes measure of both the short-run and long-run unemployment rates.[1] This specification, also employed in Krueger et al. (2014), is as follows

$$w_t - \pi_{t-1} = a + \beta_1 u_t^{duration<d} + \beta_2 u_t^{duration>d} + \epsilon_t, \qquad (3.5)$$

where $u_t^{duration<d}$ is a measure of the unemployment rate for those workers who were unemployed for less than d years, $u_t^{duration>d}$ is a measure of the unemployment rate for those workers who were unemployed for more than d years. Here we also expect $\beta_i < 0$ for $i = 1, \ldots, 2$.

Our estimates are based on two nominal wage rates: wages and labor costs, both divided by the number of worked hours. We use the CBS, Statistics Netherlands data series for all economic activities minus the government and health sectors. This then corresponds to two series for the market sector. The data used is the original seasonally unadjusted data. We therefore employ the X12 seasonal filter to obtain seasonally adjusted data which we then use to obtain our estimates based on the quarterly data.

We adopt the approach taken in Kruger et al. (2014) and use a core inflation series to measure inflation. This monthly series is produced by Eurostat and it excludes energy, food, alcohol, tobacco. We also have seasonally unadjusted data on unemployment and employment from the CBS, Statistics Netherlands. The number of unemployed is based on the international definition and is available by duration. The number of discouraged workers is also from CBS, Statistics Netherlands.[2] For this labor market data we also use the X12 seasonal filter to obtain seasonally adjusted series which we use to obtain our estimates based on quarterly data.

We estimate the real wage Phillips Curve based on the quarterly data for the latest sample period available: from the first quarter of 2003 until the last quarter of 2014. Unfortunately there is no break down of unemployment by duration before 2003 based on the international definition. The results can be found in Table 3.1.

We also re-estimate this Phillips Curve using annual data. We obtain annual data by aggregating the quarterly data. This gives us an indication of how robust our estimates are. Annual data has no issues with seasonality and allows us to abstract from some of the noise inherent in the quarterly data. The disadvantage is that we only have a relatively limited number of annual observations. These annual estimates are shown in Table 3.2. In these two tables, and in all remaining tables, we adopt the convention of using asterisks to indicate that an estimate is significantly different from zero: one asterisk at the 5% significance level, two

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[1] We also estimate a version which includes the rate of those unemployed for which no duration information is available, u_t^{nr}: $w_t - \pi_{t-1} = a + \beta_1 u_t^{duration<d} + \beta_2 u_t^{duration>d} + \beta_3 u_t^{nr} + \epsilon_t$.The coefficient β_3 on this last variable is never significant. We therefore do not report these estimates.

[2] These labor market series are for all sectors.

at the 1% level and three at the 0.1% level. Note that we employ one-sided tests, because theory tells us that the coefficients should be negative.[3]

From the two tables we can see that all of the estimated values for β_1 with $d = 0.5, 1$ and 2 years are significant. In the case of $d = 3$ years, the estimated value for β_1 is only significant in one of the four specifications. In the case of the estimated coefficients on the long-run unemployment rate, β_2, none are significant. Both measures of the wage rate result in similar sets of estimates. The same is true for the quarterly and annual estimates. This indicates that these results are robust.

The Wald test rejects the Null hypothesis that $\beta_1 = \beta_2$, with the exception of $d = 3$. The estimated coefficient on the total unemployment rate for β in (3.3) is indicated in the table by $d = \infty$. The tables do not include any estimated coefficients for the discouraged worker rate based on (3.4). This is due to the fact that we were unable to obtain significant estimates for this variable and have therefore opted to not present these estimates.

It is interesting to note that the estimates from (3.5) for β_1, the coefficient on the measure of the short-run measure of the unemployment rate, follow a consistent pattern. The estimates become more negative as the value for d gets smaller, that is as the duration becomes shorter. This is consistent the with idea that worker who are only unemployed for short spells remain more closely tied to the labor market, and as workers remain unemployed for longer periods the influence they exert on the labor market becomes weaker.[4] The estimates we obtain in the next section for the Beveridge Curve also follow this pattern.

[3]The tests of the intercept α is two-sided.
[4]We are however unable to test the significance of this pattern in the estimates of β_1.

Table 3.1 Real Wage Phillips Curve, quarterly data

	d=∞	d=0.5	d=1	d=2	d=3
Wages					
a	0.40	1.90*	1.30	0.66	0.41
t-value	0.47	2.54	1.75	0.94	0.52
p-value	0.64	0.015	0.09	0.35	0.61
β_1	-0.25	-1.52***	-0.88**	-0.60**	-0.37*
t-value	-1.49	-3.47	-2.90	-3.14	-1.83
p-value	0.07	0.0006	0.003	0.002	0.04
β_2		0.35	0.53	1.16	0.67
t-value		1.23	1.34	1.70	0.46
p-value		0.89	0.91	0.95	0.67
Wald ($\beta_1=\beta_2$)		-1.87**	-1.42*	-1.76*	-1.04
t-value		-2.77	-2.18	-2.22	-0.66
p-value		0.004	0.02	0.02	0.26
Annual data					
a	0.35	1.95*	1.45	0.66	0.34
t-value	0.32	2.23	1.80	0.79	0.20
p-value	0.75	0.03	0.08	0.43	0.84
β_1	-0.23	-1.58**	-1.01**	-0.67**	-0.41*
t-value	-1.04	-3.29	-3.23	-3.13	-1.88
p-value	0.15	0.0010	0.0012	0.002	0.03
β_2		0.42	0.75	1.61	1.33
t-value		1.25	1.64	1.97	0.54
p-value		0.89	0.95	0.97	0.70
Wald ($\beta_1=\beta_2$)		-2.00**	-1.76**	-2.28**	-1.74
t-value		-2.68	-2.52	-2.47	-0.73
p-value		0.005	0.008	0.009	0.24

The t-values and p-values are based on Newey-West standard errors with the lag length determined by AIC.

Table 3.2 Real Wage Phillips Curve, annual data

	d=∞	d=0.5	d=1	d=2	d=3
Wages					
a	4.13**	5.78**	5.44***	4.67***	4.09***
t-value	4.60	4.52	5.29	12.52	13.14
p-value	0.0010	0.0014	0.0005	0.0000	0.0000
β_1	-0.70 ***	-2.03*	-1.56 **	-1.37***	-1.14***
t-value	-6.05	-2.54	-2.94	-4.39	-25.69
p-value	0.0001	0.02	0.008	0.0009	0.0000
β_2		-0.12	0.28	1.89	3.07
t-value		-0.41	0.50	1.50	3.14
p-value		0.34	0.68	0.92	0.99
Wald (β_1=β_2)		-1.91	-1.84	-3.26*	-4.20**
t-value		-1.75	-1.68	-2.08	-4.30
p-value		0.06	0.06	0.03	0.0010
Annual data					
a	3.78*	5.02*	5.24*	4.44***	3.77
t-value	2.48	2.27	3.22	7.78	0.46
p-value	0.03	0.049	0.011	0.0000	0.66
β_1	-0.60*	1.55	-1.53*	-1.36***	-1.17
t-value	-2.34	-1.41	-2.31	-6.04	-1.48
p-value	0.02	0.19	0.02	0.0001	0.09
β_2		-0.21	0.45	2.34	4.40
t-value		-0.63	0.74	4.11	0.15
p-value		0.27	0.76	0.999	0.56
Wald (β_1=β_2)		-1.34	-1.98	-3.70***	-5.57
t-value		-1.00	-1.67	-4.70	-0.19
p-value		0.17	0.06	0.0006	0.43

The t-values and p-values are based on Newey-West standard errors with the lag length determined by AIC, or when AIC fails, the lag length is set to one

4 The Beveridge Curve

The Beveridge Curve used in Krueger et al. (2014) with monthly data is as follows.

$$v_t = a + \beta_1\, u_t^{duration<d} + \beta_2\, u_t^{duration>d} + \epsilon_t, \qquad (4.1)$$

where v_t is the fraction of vacancies relative to the sum of vacancies plus employment. We also estimate this Beveridge Curve with Dutch data.[5] However, Dutch unemployment data broken down by duration is only available on a quarterly basis. Our sample period is accordingly from the first quarter of 2003 until the fourth quarter of 2014. We obtained the

[5] We have also estimated a version of the Beveridge Curve which includes the unemployment rate, u_t^{nr}: $v_t = a + \beta_1\, u_t^{duration<d} + \beta_2\, u_t^{duration>d} + \beta_3\, u_t^{nr} + \epsilon_t$. In no case was the estimated value of β_3 significantly different from zero. We have therefore opted not to present these estimates.

number of vacancies from the CBS, Statistics Netherlands and it is for all sectors and is seasonally adjusted.

Our estimation results are provided in Table 4.1 based on both the quarterly as well as the annualized data. For $d = \infty$ we obtain the standard Beveridge Curve when we also impose the restriction $\beta_2 = 0$. The estimates for this standard version of the model are also provided in the table. We have also estimated a version of the Beveridge Curve with both the unemployment rate and the discouraged worker rate as explanatory variables analogous to (3.4). As was the case with the wage, we find no significant estimates of the coefficient on the discouraged worker rate, and therefore opt not to report these results.

We can see from the table that all but one of the 8 estimates of β_1 are significantly different from zero. The pattern of declining negative values for β_1 as d increases seen in the results for the real wage Phillips Curve is also present here. A similar pattern holds for the estimates of β_2 where the estimates become larger with increased values of d. None of the estimates of β_2, however, are significantly different from zero.[6] All of the 8 Wald tests of the Null hypothesis that $\beta_1 = \beta_2$ are significant, except one.

[6]We note that some of the estimates for β_2 are large. It could be argued that the long-run unemployment measures lag behind the short-run measures because a change in the job separation rate will initially influence only the short-run unemployment rate, and a fraction of the change in the short-run unemployment measure will ultimately spill over into the long-run unemployment rate. Such a lag could in theory induce a spurious correlation with vacancies via the business cycle. This in turn could be responsible for the large positive estimates. But this is only half of the story. A change in the separation rate will typically correspond to a change in the job finding rate. As the job finding rate changes, the long-run unemployment rate will also be effected as more or fewer long-run unemployed are able to find a job as a result in the change in the job finding rate. As a result the long-run unemployment measures should also be immediately effected by the business cycle in the same manner as the short-run measures albeit less strongly so.

Table 4.1 Beveridge Curve

	d=∞	d=0.5	d=1	d=2	d=3
Quarterly data					
a	3.59***	4.74***	4.33***	3.79	3.54***
t-value	6.39	9.10	7.76	1.98	11.73
p-value	0.0000	0.0000	0.0000	0.054	0.0000
β_1	-0.34 ***	-1.32***	-0.88***	-0.66	-0.57***
t-value	-4.13	-5.66	-4.62	-0.84	-6.95
p-value	0.0001	0.0000	0.0000	0.20	0.0000
β_2		0.13	0.34	1.00	1.73
t-value		1.35	2.51	0.47	4.23
p-value		0.91	0.99	0.68	1.0000
Wald (β_1=β_2)		-1.44***	-1.22***	-1.66	-2.30***
t-value		-4.90	-3.84	-0.57	-4.81
p-value		0.0000	0.0002	0.29	0.0000
Annual data					
a	3.62**	5.35***	4.83***	3.98 ***	3.57***
t-value	3.50	30.11	11.47	19.63	13.25
p-value	0.006	0.0000	0.0000	0.0000	0.0000
β_1	-0.34*	-1.79***	-1.15***	-0.80***	-0.63***
t-value	-2.51	-16.73	-6.69	-10.51	-11.62
p-value	0.016	0.0000	0.0001	0.0000	0.0000
β_2		0.18	0.61	1.50	2.22
t-value		2.27	3.73	6.12	3.35
p-value		1.0000	0.998	0.9999	0.996
Wald (β_1=β_2)		-1.97***	-1.76***	-2.30***	-2.86**
t-value		-10.83	-5.27	-7.28	-4.10
p-value		0.0000	0.0003	0.0000	0.0014

The t-values and p-values are based on Newey-West standard errors with the lag length determined by AIC, or when AIC fails, the lag length is set to one.

5 The Price Phillips Curve

We can derive the following price Phillips Curve used in Kruger et al. (2014),

$$\pi_t - \pi_{t-1} = a + \beta_1 \, u_t^{duration<d} + \beta_2 \, u_t^{duration>d} + \epsilon_t, \qquad (5.1)$$

along the same lines as laid out above for the real wage Phillips Curve.[7] The estimates of the coefficients based on the quarterly and the annual data are shown in Table 5.1. Here too when $d = \infty$ we obtain the standard price Phillips Curve when we impose the additional restriction that $\beta_2 = 0$. The estimates for the standard model are also listed in the table.

[7]As is the case with the real wage Phillips Curve, we have also experimented with a version of the price Phillips Curve which includes the unemployment rate u_t^{nr}: $\pi_t - \pi_{t-1} = a + \beta_1 \, u_t^{duration<d} + \beta_2 \, u_t^{duration>d} + \beta_3 \, u_t^{nr} + \epsilon_t$. None of the estimated values for β_3 are significantly different from zero. We have therefore opted not to present these results.

Three of the 8 estimates for β_1 are significantly different from zero. None of the estimates of β_2 are, nor are any of the Wald tests of $\beta_1 = \beta_2$ significant. One of the two annual estimates for the standard Phillips Curve is significant. In general these results provide weaker evidence that the long-run unemployment rate is less tied to prices due to the general lack of a finding of significant estimates. This is perhaps due to the relatively short sample period. We have also estimated a version of the price Phillips Curve with both the unemployment rate and the discouraged worker rate as explanatory variables analogous to (3.4). As was the case with the wage, we find no significant estimates of the coefficient on the discouraged worker rate, and therefore opt not to report these results.

Table 5.1 Price Phillips Curve

	d=∞	d=0.5	d=1	d=2	d=3
quarterly data					
a	0.38	0.38	0.53	0.41	0.38
t-value	1.26	1.13	1.48	1.33	1.23
p-value	0.21	0.26	0.14	0.19	0.23
β_1	-0.08	-0.08	-0.19*	-0.13*	-0.09
t-value	-1.44	-0.58	-1.79	-2.03	-1.65
p-value	0.08	0.28	0.04	0.02	0.053
β_2		-0.09	0.05	0.13	-0.01
t-value		-1.11	0.75	0.94	-0.03
p-value		0.14	0.77	0.82	0.49
Wald (β_1=β_2)		0.01	-0.25*	-0.26*	-0.08
t-value		0.05	-1.70	-1.73	-0.24
p-value		0.52	0.048	0.04	0.41
Annual data					
a	1.01*	0.68	1.12	1.12*	1.07*
t-value	2.40	0.50	1.71	3.25	3.04
p-value	0.04	0.63	0.12	0.010	0.014
β_1	-0.24*	0.06	-0.29	-0.31	-0.33*
t-value	-2.62	0.07	-0.86	-1.56	-1.89
p-value	0.013	0.53	0.21	0.08	0.046
β_2		-0.42	-0.24	-0.06	0.31
t-value		-1.65	-0.92	-0.12	0.32
p-value		0.07	0.19	0.45	0.62
Wald (β_1=β_2)		0.48	-0.05	-0.25	-0.64
t-value		0.44	-0.08	-0.34	-0.56
p-value		0.67	0.47	0.37	0.30

The t-values and p-values are based on Newey-West standard errors with the lag length determined by AIC, or when AIC fails, the lag length is set to one.

6 Conclusions

The estimates we obtain for the real wage Phillips Curve provide strong indirect evidence in support of the idea that the long-run unemployed become divorced from the labor market and thereby have little or no influence on real wages. While we obtain significant, negative coefficients on those measures of the short-run unemployment rate we employ for the real wage Phillips Curve, none of the coefficients on the long-run unemployment rate are significant in any of our specifications. Furthermore, we also perform Wald tests which indicate that the coefficients on the short-run and long-run unemployment rates are different. The estimates based on the two wage rates we used, wages and labor costs both produce the same qualitative results. The same can be said for the quarterly and annual estimates. This suggests that these results are robust.

Our estimates for the coefficients for the Beveridge Curve follow a similar pattern. The similar pattern from the quarterly and annual estimates also suggests that these results are robust. The results for the price Phillips Curve also indicate that that long-run unemployment has less influence on the labor market, but these results are weaker, because some of the coefficients on the measures of the short-run unemployment rate are also not significant.

The data we use in this study represents a relatively short sample period. This is due to the fact that for our Dutch data we only have data on the unemployed broken down by duration starting in the first quarter of 2003. Despite this fact, we conclude that we are nonetheless able to find significant evidence in support of the notion that the long-run unemployed eventually become detached from the labor market. In particular we find substantial evidence that the real wage is strongly negatively correlated with the short-run unemployment rate, but find no significant correlation with the long-run unemployment rate. In this study we are also unable to find any significant correlation between the discouraged worker rate and any of the three variables the real wage, prices, or vacancies.

References

Ghayad, R., 2013, The jobless trap.

Ghayad, R. and W. Dickens, 2012, What can we learn by disaggregating the unemnployment-vacancy relationship?, *Federal Reserve Bank of Boston Public Policy Brief*, no. 12-3.

Gordon, R., 2013, The phillips curve is alive and well: Inflation and the nairu during the slow recovery, NBER Working Paper 19390.

Kroft, K., F. Lange and M.J. Notowidigdo, 2013, Duration dependence and labor market conditions, *Quarterly Journal of Economics*, vol. 128(3): 1123-1167.

Krueger, A.B., J. Cramer and D. Cho, 2014, Are the long-term unemployed on the margins of the labor market?, *Brookings Papers on Economic Activity*.

Krueger, A.B. and A. Mueller, 2011, Job search, emotional well-being, and job finding in a period of mass unemnployment: Evidence from high-frequency longitudinal data, *Brookings Papers on Economic Activity*, pp. 1-57.

Llaudes, R., 2005, The phillips curve and long-term unemnployment, European Central Bank Working Paper Series 441.

Watson, M.W., 2014, Inflation persistence, the nairu, and the great recession, *American Economic Review*, vol. 104(5): 31-36.

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