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ABSTRACT

Most economists maintain that the labor market in the United States is 'tight' because unemployment rates are low. They infer from this that there is potential for wage-push inflation. However, real wages are falling rapidly at present and, prior to that, real wages had been stagnant for some time. We show that unemployment is not key to understanding wage formation in the USA and hasn't been since the Great Recession. Instead, we show rates of under-employment (the percentage of workers with part-time hours who would prefer more hours) and the rate of non-employment which includes both the unemployed and those out of the labor force who are not working significantly reduce wage pressures in the United States. This finding holds in panel data with state and year fixed effects and is supportive of a wage curve which fits the data much better than a Phillips Curve. We find no role for vacancies; the V:U ratio is negatively not positively associated with wage growth since 2020. The implication is that the reserve army of labor which acts as a break on wage growth extends beyond the unemployed and operates from within and outside the firm.

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1. Introduction

In the middle of the 19th century Friedrich Engels (1845) described the unemployed as a "reserve army" whose purpose was to keep wages down. Subsequently Karl Marx famously argued that that army was maintained by capitalists to keep wages down.

"Big industry constantly requires a reserve army of unemployed workers for times of overproduction. The main purpose of the bourgeois in relation to the worker is, of course, to have the commodity labour as cheaply as possible' (Marx, 1847).

Ever since, economists have plugged unemployment rates into wage equations of various forms expecting to see a negative partial correlation. For over a century the unemployment rate was negatively correlated with wage growth but since the Great Recession things have changed. Today that unemployment rate is at historically low levels both in the United States and elsewhere. Furthermore, it no longer tells us much of anything about the state of the labor market: it is now uncorrelated with wage growth. The V:U ratio, which rose between 2020 and 2022, turns out to be negatively correlated with wage growth.

The unemployment rate no longer enters Phillips Curve or wage curve equations for reasons that remain unclear. In the years before the Great Recession, it was the only labor market variable you needed to summarize what was happening in the labor market, but no longer. For example, movements in the unemployment rate were essentially mirror images of the employment rate. Why this change has occurred is a matter of conjecture that we discuss below. One possibility is that workers became more fearful of losing their jobs, and perhaps their houses, than in the past.

There was a seismic shift in the labor market with the onset of the Great Recession. It was a major financial crisis that involved a big rise in the unemployment rate in the United States and a collapse of the housing market - especially the subprime mortgage market. This involved loan defaults, especially of sub-prime mortgages, foreclosures, negative equity and even jingle mail.[1] Much economic dislocation resulted, which, we argue, appears to have scared workers. As a result, the basic relations in the labor market changed and it appears that the non-accelerating inflationary rate of unemployment (the NAIRU) fell sharply. At any given unemployment rate, wage pressure was less than it had been in the years before 2008.

In addition, the unemployment rate is no longer associated with wage growth, as it had been in the past, so there is no longer a wage curve in wage-unemployment space. We go on to show that there is also no wage Phillips curve, which is simply a mis-specified wage curve. What we show is that the wage curve now has to be rewritten in underemployment and non-employment space.

[1] Jingle mail was where homeowners who were unable to pay their e mortgage loans sent the keys in an envelope to the lender before they had chance to foreclose. This also occurred in states that had no recourse loans the lender cannot go after the borrower's other assets. Non-recourse loans exist in 12 states: Alaska, Arizona, California, Connecticut, Idaho, Minnesota, North Carolina, North Dakota, Oregon, Texas, Utah and Washington, see Mary McMahon, 'What is Jingle Mail?, *Wisegeek*, July 20, 2022, https://www.wise-geek.com/what-is-jingle-mail.htm and Kiah Treece, Recourse loans Vs. Non-recourse loans' *Forbes Adviser*, August 12th 2020, https://www.forbes.com/advisor/loans/recourse-loans-vs-non-recourse-loans/

2. Unemployment, non-employment, underemployment and vacancies

There is a sense that the US labor market is close to full employment. The minutes of the FOMC meeting of the Federal Reserve on June 14-15th noted that "*the labor market remained very tight*."[2] Despite these claims there is evidence of slowing in the US as predicted by collapsing consumer confidence. Blanchflower and Bryson (2021, 2022a) suggest this is predictive of recession. GDP growth was negative in the first quarter of 2022 and expected to be negative in the second quarter.

The traditional measure of labor market slack used by economists has been the unemployment rate – defined as the number of unemployed divided by the labor force which adds the unemployed to the employed. Throughout the twentieth century there was a very high correlation between the unemployment rate and other measures of labor market slack we examine below. Since the Great recession these correlations have broken down.

Since Layard, Nickell and Jackman (1990) it has been assumed that non-employment rates (NER) - measured as employment divided by population for those aged 16+ - should not enter wage equations because those who are not actively seeking work are unlikely to compete for waged employment, and thus will not lower wages. However, Marx and Engels made no such distinction between the unemployed and the NER in their discussions of the 'reserve army of labor'. Whether the NER acts as a break on wage growth is an empirical question. If it does, then the labor market has greater amounts of slack in the United States than previously believed. Furthermore, the NER constitute an ever-growing percentage of the non-employed in the US, unlike elsewhere. The two series moved closely together before the Great Recession but seem to have parted ways since. Since 2000 the NER in the US has risen steadily, in contrast to the picture in the UK and other countries.

Marked differences by country are shown in Table 1 which presents the NER for those aged 15+ in the US and in twenty other OECD countries between 2005 and 2021. The NER rose 3 points in the United States between 2005 and 2021. Patterns were very different elsewhere. Out of the other twenty major OECD countries including the UK, the NER fell between 2005 and 2021 in eighteen and only rose in Greece and Spain, with unemployment rates in double digits (column 10) and was flat in Italy. An obvious question is why? It seems unlikely that it has to do with demographics or technology given that these are common across countries and welfare benefits for non-work tend to be less generous in the United States.

Table 2 shows the NER by age groups in the US from 2000 to 2022. Across the whole population it rises over the period from 35% to 40%. This is true for all age groups under 55 but is most notable among those aged under-25 years.

Below we also examine the inactivity rate. Although similar to the non-employment rate (which is #jobless/population) itt adds the number of unemployed to the numerator (Unemployed + employed)/population. The inactivity rate is thus impacted directly by movements in unemployment as it is counted in the numerator in a way that the non-employment rate is not. That is why we prefer to focus on the NER.

[2] On July 8th, 2022, the BLS reported that on the household account employment fell by 315,000 and the nonemployment rate rose by 0.2 percentage points.

We now move on to look at the underemployment rate, which we define for workers only as an expressed desire for more hours. In the United States which does not contain questions in the Current Population Survey to identify full-timers who want different hours or workers who want fewer hours. It is possible though to calculate an underemployment measure which is the number of part-time workers who say they are part-time for economic reasons. We simply express this as a proportion of the employed and call it U7, as defined in Bell and Blanchflower (2021). There is a growing literature on the underemployed including Sum and Khatiwada (2010); Cajner, Mawhirter, Nekarda, and Ratner (2014); Veliziotis, Matsaganis, and Karakitsios (2015); Golden (2016); Borowczyk-Martins and Lalé (2016, 2018) and Glauber (2017).

Chart 1 shows movements in the US underemployment rate U7 as well as the non-employment rate and the unemployment rate (called U3 by the BLS). It is notable that the unemployment rate in 2022 is the lowest it has been since the late 1960s. In contrast the non-employment rate is 4.5 percentage points above its level in 2000 and above 2008 and 2020 levels. The underemployment rate remained elevated through the post Great Recession period although fell sharply in the June 2022 data release to 2.3% comparable to its level in 2000.

We examine below the impact on wage changes of all three measures of labor market slack – the unemployment, the underemployment and non-employment rates. We also examine the role of the inactivity rate.

3. Wage changes

Bell and Blanchflower (2021) examined the role of underemployment – that is, the percentage of employees working part-time who wanted full-time employment – in their wage equations, thinking of it as an indication of weak bargaining power on the part of insiders. They confirmed that underemployment was a brake on wage growth both in the US, the UK and internationally confirming work from Hong, Kóczán, Lian, and Nabar (2018) from the IMF that found similarly.

Even though the US non-employment and underemployment rates were still showing large amounts of labor market slack from 2015-2018 the low unemployment rate led policy makers into believing that full employment had been reached as the unemployment rate fell below 6%, and then below 5% and finally below 4% as they expected wage growth to pick up. The Federal Open Market Committee at the Federal Reserve in the United States that sets interest rates used that as justification for rate rises in 2015-2018, on fears of rising inflation, and exploding wage growth, neither of which appeared.[3] They failed to focus on the non-employment rate and underemployment rates, which as we will show below were much more appropriate measure of labor market slack. The major macro-economic issue from 2010 to 2019 was why was wage growth so weak for given levels of the unemployment rate? The answer was that there was much more slack in the labor market than was indicated by the unemployment rate which post Great Recession understated the amount of downward wage pressure both inside and outside firms. Blanchflower, Oswald and Garrett (1990) noted that wages are set by a blend of insider and outsider forces.

[3] The FOMC raised rates by 25bp at nine of its meetings from 0.25-0.5 to 2-2.25 in 2018 at the following meetings - December 15-16, 2015; December 13-14, 2016; March 14-15, 2017; June 13-14, 2017; March 20-21, 2018; June 12-13, 2018; September 25-26, 2018, and December 18-19, 2018.

A major puzzle in the period 2010-2019 in the US and the UK was that despite low and falling levels of the unemployment rate, wage growth remained low, at around 2% and well below pre-recession levels of around 4%. Chart 2 shows weekly wage growth among private sector production and non-supervisory workers in the United States since 1990. These workers constitute three quarters of private sector workers, and this is the longest wage series available. Wage growth was around 4% at the start of the Great Recession when the unemployment rate was 5%. It averaged 2.2% between 2011 and 2017. Wage growth is currently 5.8%. Wage growth closely tracks the non-employment and underemployment rates which are also presented in the chart.

Here we do not focus on the inactivity rate which has also fallen more in the US than elsewhere. We focus on the non-employment rate (NER) which is the numbers out of the labor force divided by population.[4] The inactivity rate is similar to the NER but adds the unemployment rate to the numerator so is (U+O)/population. We will show that the NER works better in wage equations than the inactivity rated does, in the sense that it is more robustly and significantly associated with wage growth.

Chart 3 shows the relationship between annual median weekly wage growth using data on usual weekly earnings from the Current Population Survey that we use in the empirical section of this paper and the non-employment rate. Data are published quarterly by the Bureau of Labor Statistics (BLS) and we show that earnings growth tracks the NER. The NER had also not returned to pre-recession levels by 2015 or so and the reason for weekly wage growth turns out to be because of the high levels of the non-employment rate. We explore that issue further below.

Blanchard, Domash and Summers (2022) argued that "*the US labor market is very tight. Not only is unemployment very low, but vacancies are exceptionally high*." It is certainly the case that the Beveridge relation between the number of unemployed and the number of vacancies has risen recently but it is unclear that tells us much of anything about labor market tightness. Chart 4 illustrates and shows that the V:U ratio rose from 2004, dropped in the Great Recession and then rose steadily from the middle of 2009 through the start of 2020. The graph also includes weekly wage growth of PNSW which did peak around 2010 and fell sharply and remained more or less steady at 2% from 2013-2018 as the V:U ratio rose.

There are a number of reasons why the V:U series may well tell us little about slack in the labor market. First advertised vacancies tell us little about number of hours under offer in the jobs, where they are and in what occupations. Second no information is available on the pay under offer in any vacancy. Third, we have no idea where they are and in which occupations and how much of a mismatch there is with the unemployed: jobs for software engineers in Seattle, WA are not much value for people looking for jobs in hairdressing in Miami, FL. We have no data by state by year and so it is perfectly possible that a vacancy that is reported is three thousand miles away from the unemployed person wanting the job. Fourth it is increasingly easy to advertise almost

[4] Our underemployment variable also excludes unemployment from both the numerator and denominator. Part-time for economic reasons (PTER) is a large part of the difference between the unemployment rate U3 and U6. The U6 variable starts with U3 and adds successively = the number of marginal and disadvantaged to the numerator and denominator to get to U5 and then PTER is added to the numerator. With U6 unemployment is included in both numerator and denominator and just as with the inactivity rate is directly impacted by movements in unemployment whereas U7 and NER are not.

costlessly, so it is unclear there is any information in these data. Fifth, there is no evidence that the gap between U and V enters into wage equations, especially as the unemployment rate does not (as we show below). Sixth, a paper by two St Louis Fed economists Andolfatto and Birinci (2022) shows that adjusting the ratio of vacancies to also include employed workers who move to a new job shows a much less tight labor market. They note that "*it is not entirely clear how this adjustment to measuring labor market tightness can be reconciled with what appears to be relatively sluggish real wage growth*."

Governor Chris Waller of the Federal Reserve (2022) went as far as to suggest that the relationship between U and V suggested a 'soft-landing' for the US for the rate rises the Fed had been implementing.

"Of course, we can't be very certain about the path of the economy more than a few months in the future, but this medium-term view of a soft landing is very plausible. I say this based on the optimistic view I expressed earlier about the strength of the labor market and on my analysis of the relationship between job vacancies and the unemployment rate. In a recent speech, I noted that we have an historically high number of job vacancies compared to the number of unemployed people. Some people have argued that past experience indicates we cannot reduce this large number of vacancies without a big increase in the unemployment rate. But I have showed that past experience actually indicates that a reduction in vacancies can take place without a big loss of employment, and this is the kind of soft landing anticipated by FOMC participants. So, while some data measures suggest the chances of recession have increased, I believe it can be avoided."

This seems highly speculative given the evidence from Chart 4. We can find no empirical evidence that the vacancy rate minus the unemployment rate, explains weak wage growth or whether or not rate rises will raise the unemployment rate, the underemployment rate or the non-employment rate by a little or a lot. It does not seem to reflect slack in the US labor market.

Table 3 shows the recent path of the V:U ratio and private sector weekly wage growth for the two establishment series the BLS publishes, for production and non-supervisory workers and all employees. A couple of things stand out. First wage growth jumped in March 2020 as the V:U ratio dropped from 0.8 to 0.2 percent. From then the V:U ratio rose as wage growth in both series fell and especially so for all employees which reached 2.7% in March 2021. Second, between June 2021 and April 2022, the V:U ratio doubled from 1.0 to 2.0 and wage growth for all employees was the same at 4.6%. Third, the two wage growth series are *negatively correlated with the V:U ratio* over the period January 2020 to May 2022. For private sector production and non-supervisory workers the correlation is -0.346 and for all employees is -0.46. As the V:U ratio rises wage growth slows. This is not consistent with the claims of Blanchard, Domash and Summers (2022) or Waller (2022).

The V:U relationship does not seem to be related to wage growth, which we believe is central to any analysis of tightness in the labor market. There is no evidence that the V:U ratio enters wage equations, It is up to those who suggest that the V:U relationship is important for policy making to demonstrate that it has an impact on wages. We have seen no evidence that it does.

4. The Phillips Curve and the Wage Curve

In his original *Economica* paper Phillips (1958) examined the relationship between unemployment and the **rate of change of money wage rates** in the UK from 1861–1957. He found wage growth fell as the unemployment rate rose, with the rate of change flattening out at higher rates of unemployment. He argued this pattern was consistent with the proposition that, as with commodities other than labor, its price would fall in circumstances where demand was exceeded by supply.

Chart 5 revisits this issue plotting weekly wage growth against the unemployment rate in the United States since 1965. The chart provides a scatter plot between the annual growth in weekly earnings of private sector production and non-supervisory workers by month between January 1965 and May 2022 (n=659). As noted earlier, these workers constitute four fifths of the private sector workforce and excludes of the top-end of the wage distribution. It is the longest wage series available in the United States. It shows that there is no evidence whatever of a Phillips Curve in wage changes.

Chart 6 restricts the data to the post Great Recession period, 2008-2022, to establish whether there is evidence of a Phillips Curve since the Great Recession. There is no significant relation between wage growth and the unemployment rate. We examine this econometrically below.

Some consensus emerged that the relationship between wage growth and unemployment was better explained by a wage curve which estimates wages as a function of lagged wages and unemployment using data at the state and year cell level. Studies have examined the wage curve (Blanchflower and Oswald, 1990, 1994a, 1994b, 1995) estimating US log wage equations using data from the Current Population Survey from 1963-1988 as well as for eleven other countries – Australia, Austria, Canada, Germany, Ireland, Italy, Netherlands, Norway, South Korea, Switzerland and the UK. Back in 1995 Card (1995) concluded that the wage curve was close to an 'empirical law of economics.'

Further evidence appeared to support this contention when estimates were updated in Blanchflower and Oswald (2005) using data through 2001. Subsequent to the publication of the Blanchflower-Oswald book that paper showed, with references, that wage curves had been reported in a further thirty countries - Argentina, Belarus, Belgium, Brazil, Bulgaria, Burkina Faso, Chile, China, Côte d'Ivoire, Czech Republic, Denmark, Estonia, Finland, France, Hungary, India, Japan, Latvia, New Zealand, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Taiwan and Turkey. That paper also showed that the evidence of a wage curve was robust to instrumenting wages along with the inclusion of benefits and union density rates. Evidence of a wage curve was especially strong in non-union Right-To-Work states.

These various papers suggested that the unemployment elasticity of pay was -0.1, implying that a doubling of the unemployment rate raised wages by ten percent. The conclusion appeared to be that the United States had a wage curve rather than a Phillips Curve.[5] In their meta-analysis study Nijkamp and Poot (2005) found consistent evidence of a wage curve across numerous studies concluding:

[5] For an attempt to reconcile Phillips curves and the wage curve see Montuenga-Gómez and Ramos-Parreño (2005).

"the wage curve is a robust empirical phenomenon ... but there is ... evidence of publication bias. There is indeed an uncorrected mean estimate of about -0.1 for the elasticity. After controlling for publication bias by means of two different methods, we estimate that the 'true' wage curve elasticity at the means of study characteristics is about -0.07".

Robicki, Blien, Hewings and Hang Von (2021) concluded in a recent study for Poland and the United States that the wage curve exists even when accounting for regional price differentials. Jokinen (2020) provides recent evidence of a wage curve in Finland. Baltaji and Baskaya (2022) provide support for a wage curve for formal and informal workers in Turkey while Faryna, Pham, Talavera and Tsapin (2022) estimate a wage curve for Ukraine and Iacono, and Ranaldi (2020) and Johansen, Egging and Johansen. (2019) report Norwegian wage curves. Shilov and Möller (2009) found a Russian wage curve and Cholezas and Kanellopoulos (2015) for Greece, Park and Shin (2007) for Korea and Inagaki (2015), for Japan and Holmes and Otero (2022), for US states, and Kosfeld and Dreger, (2018) for Germany.

Blanchflower and Oswald (1995) were at pains to point to the differences between a Phillips Curve and a wage curve. First, Phillips's construction is claimed to be a locus linking the rate of change of wages to the level of unemployment. The Phillips Curve was proposed as a disequilibrium adjustment mechanism. The wage curve is instead to be thought of as an equilibrium locus that is not, in a useful sense, a description of inherently temporary phenomena or of transitory dynamics. Second, the Phillips Curve links the rate of change of pay to the aggregate unemployment rate. The wage curve links the level of pay to the local unemployment rate. Third, the Phillips Curve is traditionally estimated on time-series macroeconomic data. The wage curve is estimated on pooled microeconomic data.

4. Estimating Wage Equations in the United States

A major issue over the last five years in the United States has been how close the labor market is and has been, to full employment. As an economy approaches full employment one would expect wage growth to rise; as the amount of labor market slack declines one would expect that wage growth would rise. The question is how to measure such slack?

William Beveridge in 1944 argued that a 3% unemployment rate was "a conservative rather than unduly hopeful aim for the average unemployment rate of the future under conditions of full-employment". In a new preface written in 1960, Beveridge noted that Keynes had written to him suggesting that he saw no harm in aiming for 3 per cent but that he would be surprised if it could go so low in practice. In the prologue Beveridge notes that for the period 1948-1959 the unemployment rate averaged 1.55%.

Beveridge noted that "full employment means that unemployment is reduced to short intervals of standing by, with the certainty that very soon one will be wanted in one's old job again or will be wanted in a new job that is within one's powers. . . . It means that the jobs are at fair wages, of such a kind, and so located that the unemployed men can reasonably be expected to take them: it means, by consequence, that the normal lag between losing one job and finding another will be short" ([1944] 1960, 18).

He also noted that "*full employment means having more vacancies for workers than there are workers seeking vacancies*," but "*it does not mean having no unemployment at all*" ([1944] 1960, 1).

In this section we estimate wage growth in the United States building on earlier work by Blanchflower and Posen (2014) that looked at the impact of inactivity rates on wages and Blanchflower and Levin (2015) who examined underemployment and the role of long-term unemployment. It uses the same data used in Bell and Blanchflower (2021) updated from 2017 through 2020.

We undertake an econometric analysis of the impact of rises in non-employment on wages in the US economy. To the degree that the rise in unemployment in the United States is structural, movements in non-employment, unemployment and participation should have no impact on the wages of those employed; by definition, such individuals are unemployed because they cannot or do not want to compete for jobs. If anything, in a world where there is a sudden sharp rise in structural unemployment, wages should increase because of the negative shock to labor supply, all else equal. In contrast, if the rise in joblessness is largely cyclical, labor markets will see downward pressure on wages, because of the possibility of reentry by these idled workers.

Our data are the Merged Outgoing Rotation Groups (MORG) files of the Current Population Survey (CPS) from 1979-2020. We aggregate the micro data to the state*year cell. We construct a lagged dependent variable so that leaves us with an overall sample size of 2091 (50 states and the District of Columbia across 41 years=2091 observations).

We then estimated a series of wage equations reported in Tables 4-9 below which are variants of wage curves. We finally report wage Phillips curves in Table 10 and show they do not perform as well as the wage curve specification as they omit an important variable, the lagged wage level.

In Tables 4-9, following Blanchflower and Oswald (1990, 1994, 2005) and Bell and Blanchflower (2021) we estimate an equation with the log wage in period t as a function of a lagged wage in period t-1, along with one or more labor market variables, and full sets of state and year fixed effects. We report log weekly wage equations for the period 1980-2020 and then separately for 1980-1993, 1994-2007, and then for 1990-2007 and 2008-2020.

Table 4 estimates a traditional wage curve as reported in Blanchflower and Oswald (1994). The coefficient on the lagged dependent variable varies between .87 and .57. The unemployment rate is negative and statistically significant in all five columns. If we estimate the long-run elasticity of pay which Blanchflower and Oswald showed averaged out at -0.1, in column 5 for the period post-Great Recession we get -.05. If unemployment doubles the real wage falls by 5%. But there is no such effect recently. In the later period it is -.04.[6]

Table 5 replaces the log unemployment rate with the log underemployment rate which is also always significantly negative.

Table 6 now includes the inactivity rate alone which is significantly negative in columns 1- 4 but not in the fifth for the recent period.

[6] Found by setting the lagged dependent variable in t-1 to t so the equation to solve in column 4 is W_t-.5707W^t= .0192U. So .4293Wt=-.0192=-.0192/.4293=-.0445

Table 7 replaces the inactivity rate with the non-employment rate. It is significantly negative in every column including the fifth for the recent period.

Table 8 now includes the unemployment and the under-employment rate. The latter is significantly negative in all five columns while the unemployment rate is significantly negative in the first four but not the last. The addition of the underemployment rate in the years since the Great Recession drives the unemployment rate to insignificance such that the unemployment rate coefficient is essentially zero.

Table 9 includes unemployment, underemployment and non-employment rates. The unemployment rate is only significant in columns 3 and 4; while the underemployment rate is significant and negative in all five columns. The lagged non-employment rate is significant and negative in column 1, 3 and 5.

We now move to estimating Phillips curves. We should note that, for example, equation 1 in Table 10 is simply a wage change equation with a lagged wage term on the right-hand side. If that equation is estimated in wage changes, taking W_{t-1} from both sides all is the same but the lagged dependent variable has a coefficient of 1-.8745=.1255. The Phillips Curve imposes a coefficient of one on the lagged dependent variable, so deducting wt-1 from both sides results in no lagged wage term on the RHS. A test of whether it is a Phillips Curve, or a wage curve is whether the coefficient on the lagged dependent variable, W_{t-1} is statistically different from zero. It is.

Part a) of Table 10 covers the years 1980-2020 and includes an unemployment rate (but no lagged dependent variable) which is significantly negative in all five cases. Adding the underemployment rate in part b) drives it to insignificance in the later period. In part c) the unemployment rate is also insignificant as is the lagged non-employment term. But we should note that these equations are clearly mis-specified as they omit the highly significant lagged wage term. For example, if we compare the fifth column of Table 9 for 2008-2020 with the fifth column of part c) of Table 10 we see the lagged wage term in the former case has a coefficient of .53 and a t-statistic of 16 with an Adjusted R^2 of .98 versus one of .19 in the latter case. The first equation is preferred to the second in terms of best fit.

5. Conclusion and Implications

Erceg and Levin (2013) argued that "*labor market slack may not be well summarized by the unemployment rate and consequently the monetary policy rule developed for the Great Moderation may have to be adapted to account for broader measures of slack*." That seems right. They suggested that the participation rate should enter into a wage equation, meaning the higher the participation rate the higher are wages, but did so without any empirical evidence. We present supporting evidence here that the non-employment rate rather than the activity is marginally preferred.

We find evidence of a statistically significant negative effect of non-employment and underemployment on wages post the Great Recession. These non-employed exert additional downward pressure on wages over and above the unemployment rate. This pattern holds across recent decades in the US data, and the relationship strengthens in recent years when variation in

participation increases. Our analysis is based on observations by state and year and therefore is robust to the local impact on employment of, say, fracking in North Dakota or ongoing real estate overhang in Nevada.

There is no wage Phillips curve in wage growth and unemployment space in the years since the Great Recession, but there is one in wage underemployment space. There is no wage curve in wage/unemployment space in the years after the Great Recession but there is one in wage/underemployment and non-employment combined space. The wage curve specification fits the data better, as there is an important role for the lagged wage term.

We find no evidence that the relationship between vacancies and the unemployment rate gives an appropriate measure of labor market slack. Since the start of 2020 the vacancy rate is negatively correlated with wage growth, which is the wrong sign.

Claims were also made about the possibility that the long-term unemployed (LTU) were on the margins of the labor market (Krueger, Cramer and Cho, 2014). The implication here is that if they were having little or no impact on wages that implied that what mattered was the short-term unemployment rate. Then the unemployment rate would be much lower, suggesting sharply rising wage growth which is not what happened. The LTU rate does not enter wage equations that contain state and year effects. High long-term unemployment is correlated with high unemployment and state level fixed effects with some states (and countries for that matter) permanently having higher LTU rates than others. There is no evidence that long-term unemployment has a separate impact on wage growth from short-term unemployment. As Blanchflower and Oswald (1990) noted that long-term unemployment is not "an important element in the wage determination process".

The implication for policymakers is that high non-employment and high underemployment *are* indeed additional measures of labor market slack, pushing down on US wages. A substantial portion of those American workers who became inactive should not be treated as gone forever but should be expected to spring back into the labor market if demand rises to create jobs. The underemployment rate reflects wage pressure from within organizations. Labor market slack in the US economy remains substantial in our view especially as indicated by the non-employment rate which at the time of writing is 40.1% in June 2022 compared with 38.9% in January 2020; 37.1% in January 2008 and 35.4% in January 2000. Analogously the seasonally adjusted labor force participation rate for men in June 2022 is 67.8 versus 75.1 in January 2000 while for women it was 60.1 and 56,8 respectively. This looks like large amounts of slack to us.

There are strong grounds for arguing that the US is not close to full-employment and there are grounds for believing that workers have been frightened by the rise in unemployment during the Great Recession. The fear of unemployment is an important predictor of unemployment as shown by Blanchflower and Bryson (2022b) and Blanchflower (1991).

In 1968 in his presidential address to the American Economic Association Milton Friedman (1968) famously explained that "*the natural rate of unemployment, in other words," is the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets,*

including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the costs of mobility, and so on"

He went further though arguing that the rate could change in either direction

"I do not mean to suggest that it is immutable and unchangeable. On the contrary, many of the market characteristics that determine its level are man-made and policy-made. In the United States, for example, legal minimum wage rates, the Walsh-Healy and Davis-Bacon Acts, and the strength of labor unions all make the natural rate of unemployment higher than it would otherwise be. Improvements in employment exchanges, in availability of information about job vacancies and labor supply, and so on, would tend to lower the natural rate of unemployment.

It is perfectly possible, and indeed likely that the Great Recession scared workers and non-workers, reducing their bargaining power, hence lowering the NAIRU.

The bigger the non-employment and underemployment rates, the larger is the pool of available labor. The question is whether the non-employed are ready to spring back into the labor market when jobs present themselves. It seems they are, as they are impacting wage growth and there is no sign the vacancy rate is. The obvious conclusion is they are discouraged workers when offer wages exceeded their reservation wages.

It also seems that the fact that the underemployed have been unable to find sufficient hours, has kept the wages of other workers down, presumably within their own firms. It may well be that what we are seeing is wages used to be kept down by the unemployed workers didn't know. Now they are being kept down by work colleagues, potentially within the same organization.

Demand deficiency appears to be a reasonable explanation for underemployment, which implies that workers are off their labor supply curves, which explains in part why they are discontented (Bell and Blanchflower, 2020). There are obvious opportunities for the underemployed to adjust their hours upwards given that they could take second jobs. Of note is that the multiple jobholding rate, with the numbers expressed as a percent of employment has declined over time. The multiple jobholding rate was 5.8% in 2000, 5.2% in January 2008 and January 2020 and is 4.8% in June 2022.

Of interest though is that in the USA there has been little evidence of any rise in nominal wage growth. In the US is seems that non-employment and underemployment have replaced the unemployment rate as a measures of labor market slack. The unemployment rate is no longer a useful guide to what is happening in the US labor market. Claims that the US labor market in 2022 is tight appear misplaced.

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Table 1. Non-employment rates by major country age 15+, 2005-2021

Location	2005	2008	2012	2016	2017	2018	2019	2020	2021	U3 2022
Australia	28	27	28	28	27	26	26	27	25	3.9
Austria	33	29	29	28	28	27	26	28	28	4.8
Belgium	39	38	38	38	37	36	35	36	35	5.5
Canada	28	27	28	28	27	26	26	30	27	5.1
Finland	32	29	32	32	31	29	28	29	27	6.2
France	36	35	36	35	34	34	34	34	33	7.2
Germany	35	30	28	26	26	25	24	24	24	2.8
Greece	40	39	50	48	47	45	44	46	43	12.7
Israel	43	40	34	31	31	31	31	33	33	3.7
Italy	42	41	44	43	42	42	41	43	42	8.1
Japan	31	29	29	25	25	23	22	22	22	2.6
Korea	36	36	36	34	33	33	33	34	33	2.8
Netherlands	29	25	24	24	23	21	20	21	20	3.3
New Zealand	26	25	28	24	23	23	23	23	22	3.2
Norway	25	22	24	26	26	25	25	25	24	3.6
Portugal	33	32	41	36	33	31	30	31	30	6.1
Spain	36	36	44	40	39	38	37	39	37	13.1
Sweden	28	26	27	24	24	23	23	25	25	7.8
Switzerland	23	21	22	20	20	20	20	20	21	4.7
United Kingdom	27	27	29	26	25	24	24	25	25	3.8
United States	28	29	33	31	30	29	29	33	31	3.6

Source: OECD U3 is the unemployment rate

Table 2. Non-employment rates by age group (seasonally adjusted).

USA	16+	16-19	20-24	25-34	35-44	45-54	55+
January 2000	35	54	27	18	17	19	69
January 2008	37	64	32	20	19	21	62
January 2020	39	68	32	19	19	20	61
June 2022	40	67	34	19	19	21	62

Source: BLS

Table 3. V:U ratio and private sector wage growth, January 2020-June 2022

	V:U ration	PNSW	All employees
Jan-20	1.2	2.7	2.4
Feb-20	1.2	3.8	3.1
Mar-20	0.8	2.9	2.4
Apr-20	0.2	7.4	7.4
May-20	0.3	8.4	7.6
Jun-20	0.3	6.9	5.7
Jul-20	0.4	6.2	5.5
Aug-20	0.5	6.9	5.7
Sep-20	0.5	6.6	6.1
Oct-20	0.6	6.8	6.1
Nov-20	0.6	7.2	6.1
Dec-20	0.6	7.8	6.7
Jan-21	0.7	7.8	7.4
Feb-21	0.8	6.4	5.8
Mar-21	0.9	7.9	6.9
Apr-21	1.0	4.2	2.7
May-21	1.0	3.4	2.8
Jun-21	1.0	5.0	4.6
Jul-21	1.2	6.0	4.9
Aug-21	1.3	5.2	4.3
Sep-21	1.4	6.2	4.8
Oct-21	1.5	6.1	5.0
Nov-21	1.6	6.2	5.3
Dec-21	1.8	5.9	5.2
Jan-22	1.7	5.5	4.2
Feb-22	1.8	7.0	5.5
Mar-22	2.0	5.8	4.7
Apr-22	2.0	5.7	4.6
May-22	1.9	5.5 (P)	4.1(P)
Jun-22		5.4 (P)	4.2(P)

Source: BLS; PNSW is production and non-supervisory workers
(P) means provisional

Table 4. Weekly wage equations and the unemployment rate

	1980-2020	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Lagged wages	.8745 (86.16)	.8647 (47.00)	.5826 (19.17)	.8625 (69.89)	.5707 (16.78)
Unemployment rate	-.0264 (9.00)	-.0344 (7.97)	-.0362 (6.16)	-.0308 (9.22)	-.0192 (2.52)
Adjusted R^2	.9977	.9929	.9894	.9967	.9806
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

Table 5. Weekly wage equations including the underemployment rate

	1980-2020	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Lagged wages	.8622 (85.74)	.8280 (46.55)	.5691 (18.64)	.8461 (69.60)	.5488 (16.27)
Underemployment rate	-.0229 (10.82)	-.0361 (10.48)	-.0272 (6.21)	-.0269 (10.63)	-.0312 (5.32)
Adjusted R^2	.9977	.9934	.9894	.9897	.9813
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

Table 6. Weekly wage equations including the inactivity rate

	1980-2020	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Lagged wages	.8498 (79.11)	.8384 (42.57)	.5751 (18.28)	.8451 (66.62)	.5733 (16.72)
Inactivity rate	-.0721 (5.74)	-.0493 (1.77)	-.0887 (2.64)	-.0539 (3.41)	-.0118 (0.28)
Adjusted R^2	.9976	.9934	.9889	.9897	.9805
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

Table 7 Weekly wage equations including the non-employment rate

	1980-2020	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Lagged wages	.8460 (80.90)	.8171 (42.48)	.5596 (18.02)	.8423 (67.33)	.5553 (16.29)
Non-employment rate$_{t-1}$	-.1059 (8.73)	-.1501 (6.12)	-.1775 (5.34)	-.0981 (6.56)	-.1544 (3.95)
Adjusted R^2	.9976	.9927	.9892	.9966	.9809
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

Table 8. Weekly wage equations including the underemployment and unemployment rates rate

	1980-2020	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Lagged wages	.8656 (85.30)	.8280 (44.25)	.5725 (18.88)	.8522 (69.17)	.5488 (16.24)
Unemployment rate	-.0099 (2.36)	-.0000 (0.01)	-.0228 (3.22)	-.0126 (2.79)	.0001 (0.01)
Underemployment rate	-.0182 (6.34)	-.0361 (6.49)	-.0175 (3.30)	-.0203 (5.85)	-.0312 (4.62)
Adjusted R^2	.9977	.9929	.9896	.9967	.9812
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

Table 9. Weekly wage equations adding the underemployment rate

	1980-2020	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Lagged wages	.8538 (80.76)	.8200 (41.47)	.5588 (18.26)	.8503 (68.30)	.5353 (15.83)
Unemployment rate	-.0049 (1.20)	.0027 (0.38)	-.0161 (2.16)	-.0112 (2.39)	+.0072 (0.83)
Underemployment rate	-.0161 (5.49)	-.0350 (6.26)	-.0161 (3.04)	-.0195 (5.48)	-.0302 (4.51)
Non-employment rate$_{t-1}$	-.0536 (3.82)	-.0357 (1.25)	-.0979 (2.68)	-.0178 (1.03)	-.1272 (3.13)
Adjusted R^2	.9977	.9934	.9897	.9967	.9815
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

Table 10. Weekly wage change Phillips Curve equations minus the lagged dependent variable

a)	*1980-2020*	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Unemployment rate	-.0288 (9.49)	-.0382 (8.58)	-.0340 (5.10)	-.0348 (10.04)	-.0156 (1.87)
Adjusted R^2	.3505	.5075	.1126	.3638	.1901
N	2091	714	714	1428	663

b)	*1980-2020*	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Unemployment rate	-.0168 (4.11)	-.0191 (2.80)	-.0264 (3.26)	-.0222 (4.74)	-.0041 (0.43)
Underemployment rate	-.0130 (4.37)	-.0207 (6.26)	-.0099 (5.54)	-.0143 (3.97)	-.0185 (2.43)
Adjusted R^2	.3564	.5168	.1150	.3707	.1901
N	2091	714	714	1428	663

c)	*1980-2020*	*1980-1993*	*1994-2008*	*1980-2007*	*2008-2020*
Unemployment rate	-.0170 (4.04)	-.0216 (3.11)	-.0257 (3.01)	-.0231 (4.75)	-.0010 (0.10)
Underemployment rate	-.0131 (4.30)	-.0230 (3.98)	-.0097 (1.61)	-.0150 (4.02)	-.0179 (2.35)
Non-employment rate $_{t-1}$	+.0029 (0.21)	+.0489 (1.70)	-.0103 (0.25)	+.0124 (0.68)	-.0565 (1.22)
Adjusted R^2	.3564	.5168	.1150	.3707	.1901
N	2091	714	714	1428	663

T-statistics in parentheses. All variables in logs. Equations include full sets of state and year controls

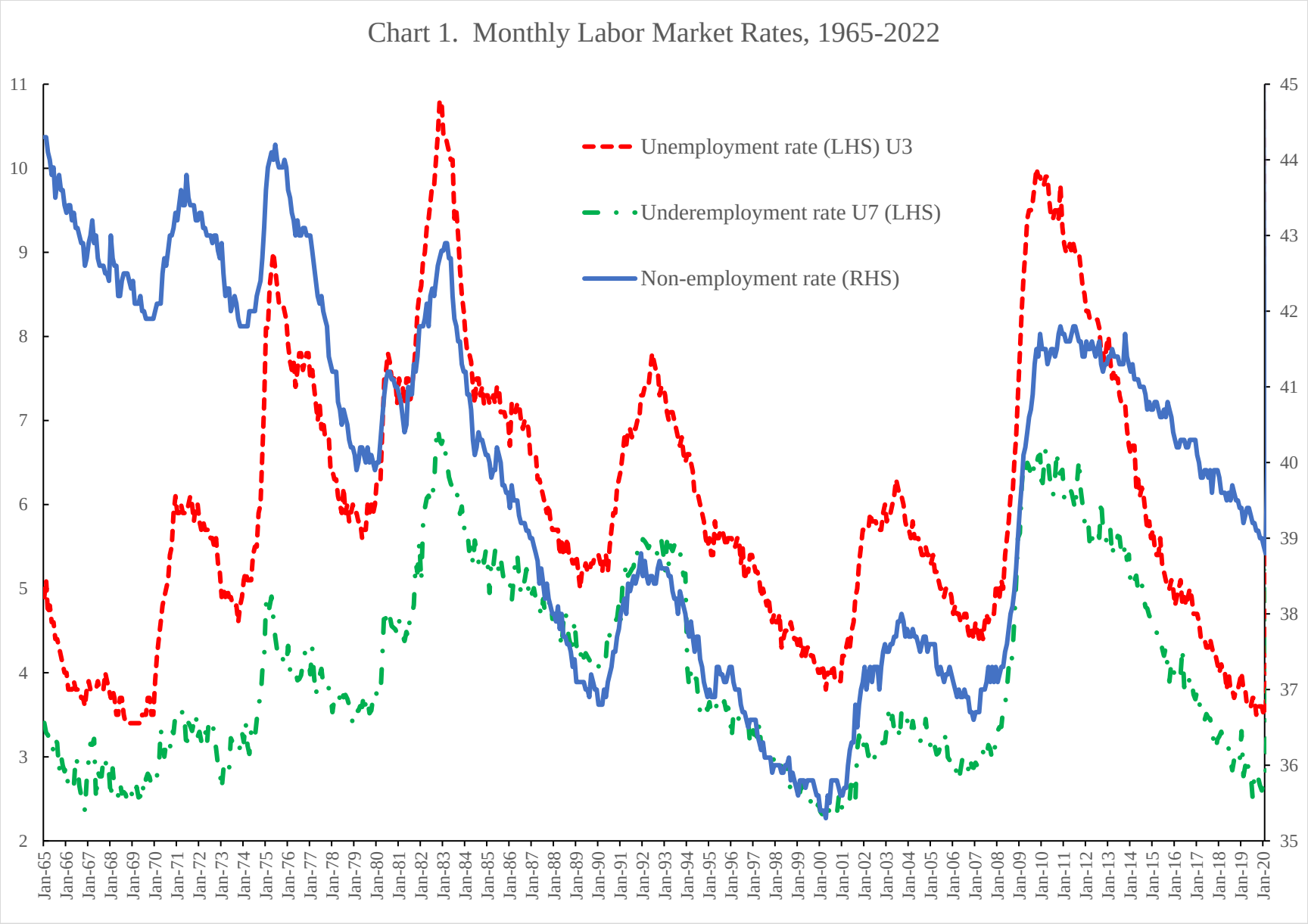
Chart 1. Monthly Labor Market Rates, 1965-2022
Unemployment rate (LHS) U3
Underemployment rate U7 (LHS)
Non-employment rate (RHS)
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Chart 2. Underemployment, non-employment and weekly wage growth of PNSW

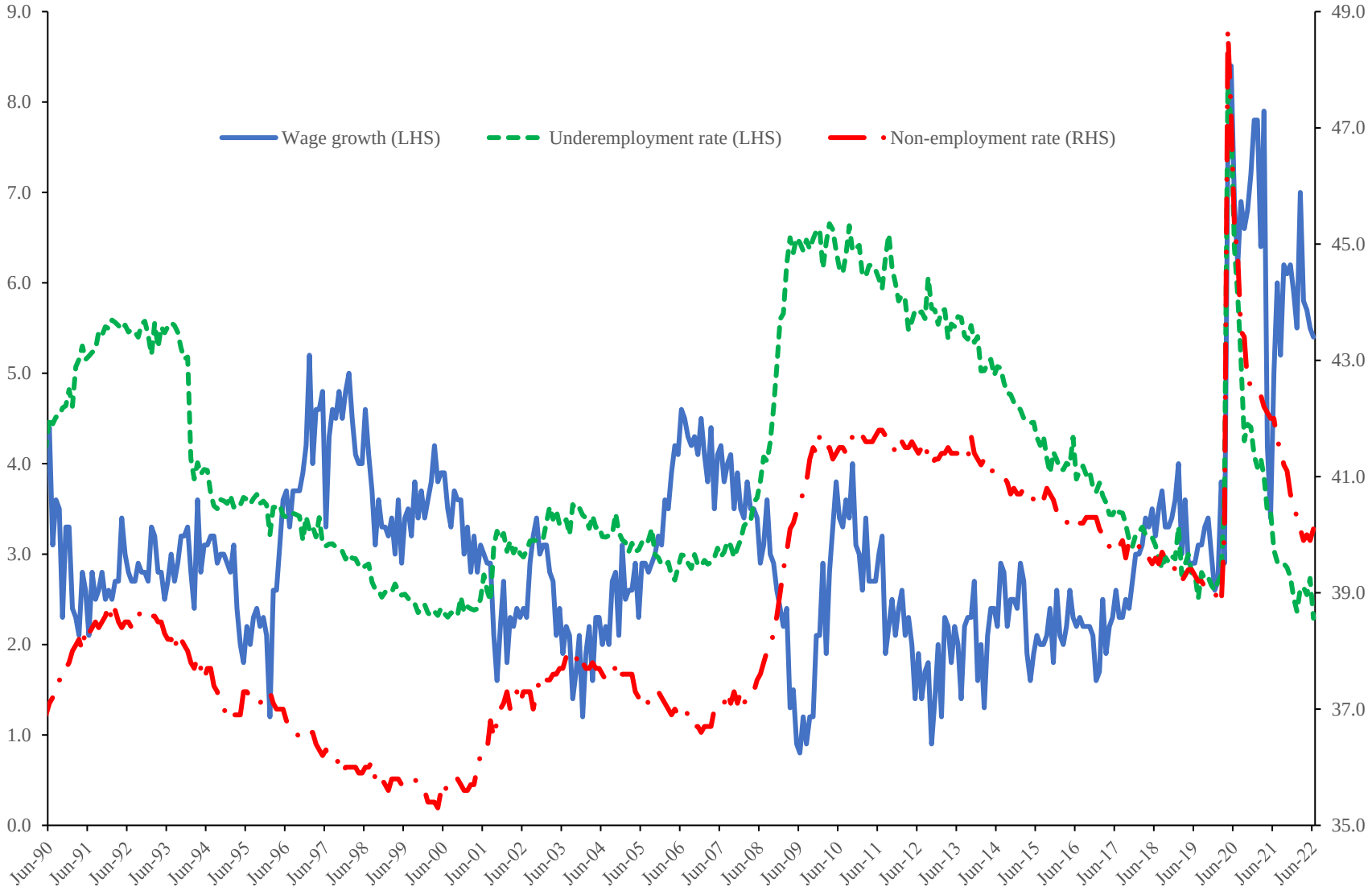

Chart 3. US Quarterly household usual annual median weekly earnings and the non-employment and underemployment rates rate

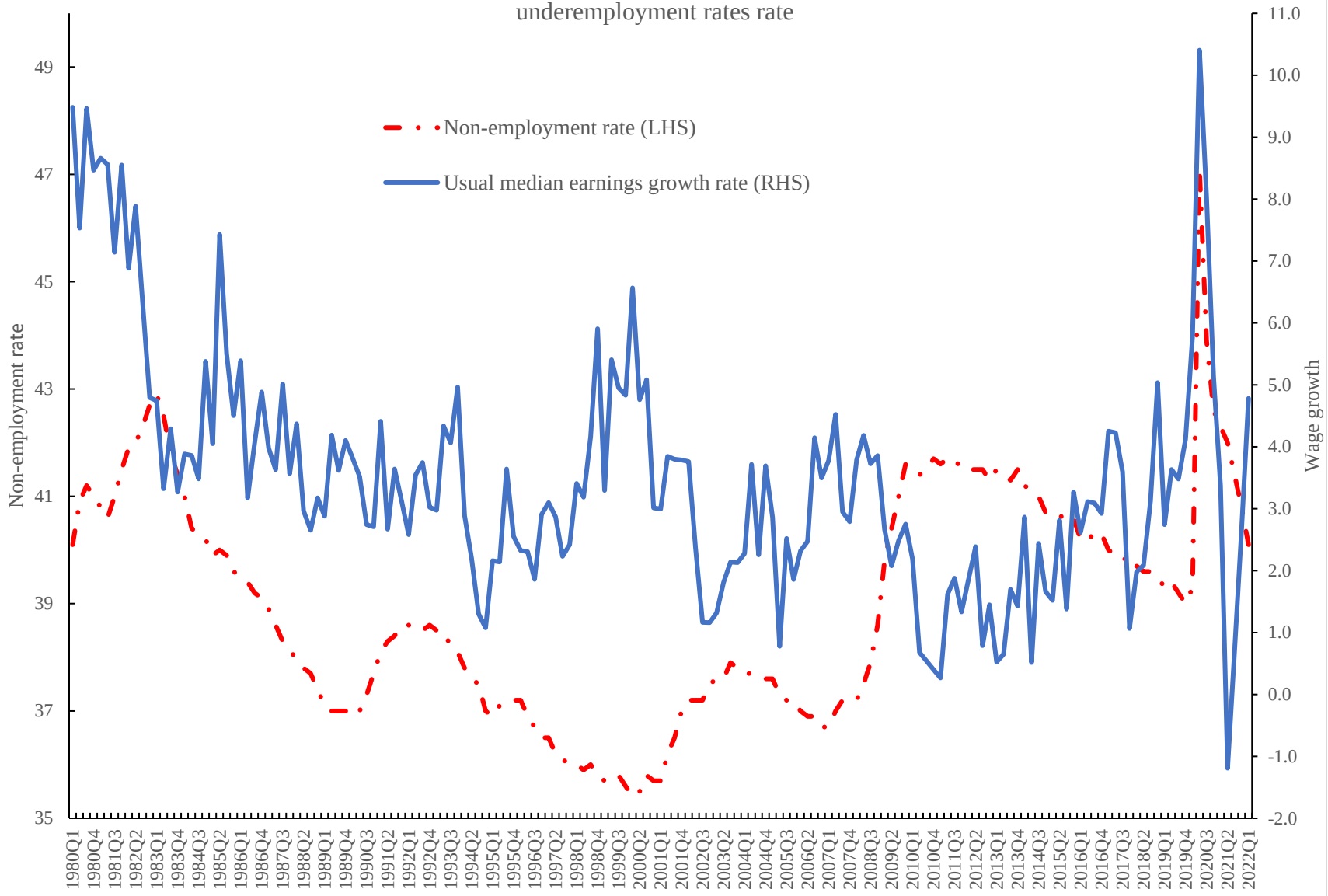

Chart 4. V/U Ratio and Weekly Wage Growth Production and Non-Supervisory Workers, 2001-2020

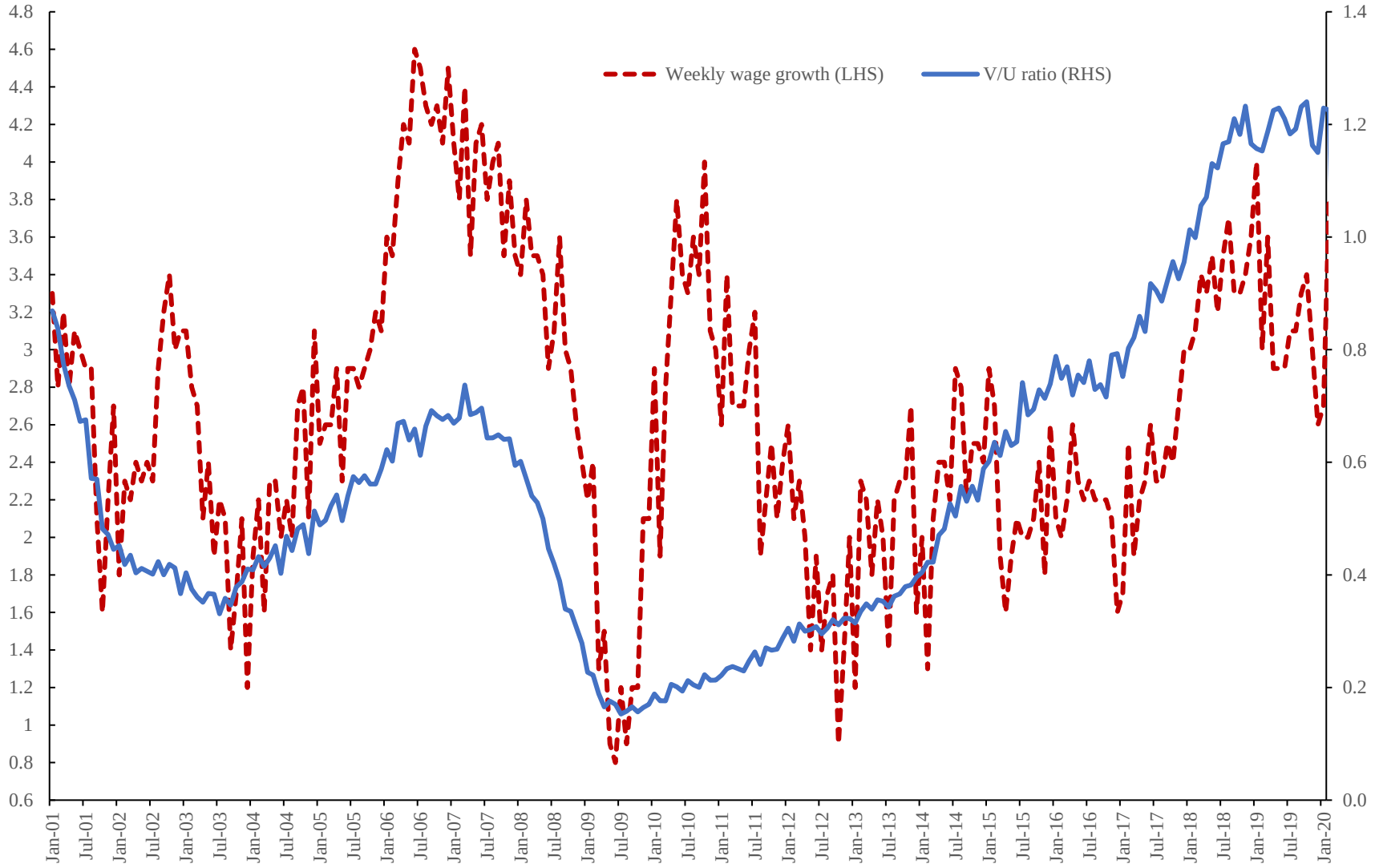

Chart 5. PNSW Weekly Earnings US Phillips Curve. 1965-2022

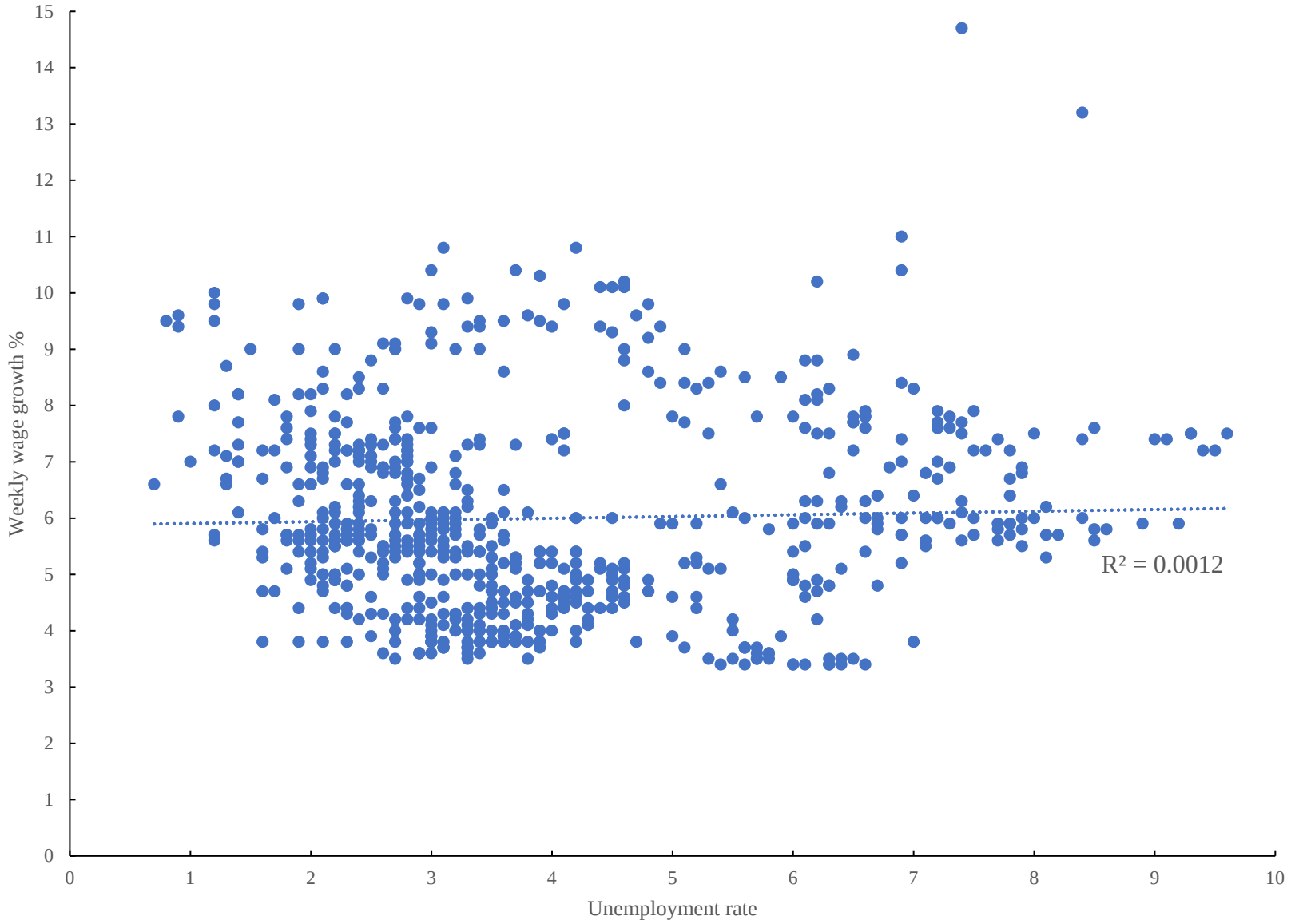

Chart 6. PNSW Weekly Earnings US Phillips Curve. 2008-2022