The Cost of Job Loss, Long-Term Unemployment, and Wage Growth

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Abstract: Since the end of the Great Recession in June 2009, wage growth has been substantially slower than in previous recoveries. Unemployment has fallen to a level consistent with what many economists consider to be full employment. However, a stronger labor market as measured by conventional measures of slack has not produced significant nominal wage growth. This paper uses four estimates of the cost of job loss—the one year income loss associated with job loss—in addition to other labor market slack variables, including comprehensive multi-variable indexes developed by Federal Reserve economists, in a wage Phillips curve for three sample periods and finds that the cost of job loss better explains and forecasts wage growth, especially since 2009. The findings suggest that policy makers must consider broader measures of workers' bargaining power and labor market slack, including political dimensions such as social insurance and those relating to unemployment duration and long-term unemployment, to better understand recent labor market dynamics.

Keywords: cost of job loss, long-term unemployment, wage growth, Great Recession

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Since the end of the Great Recession in June 2009, wage growth has been substantially slower than in previous recoveries. Unemployment has fallen to a level consistent with what many economists consider to be full employment. However, a stronger labor market as measured by conventional slack measures has not produced significant nominal wage growth. From 2010-2014, wage growth has remained mired, averaging 1.8 percent per year.[1] Indeed, as shown in Figure 1, wage growth during the recovery from the most recent recession is the lowest of any post-World War II recovery.[2]

<<FIGURE 1 HERE>>

What accounts for the disparity between strong employment gains and weak wage growth since 2009? This paper argues that conventional measures of labor market slack—the unemployment rate, the unemployment gap, the underemployment rate, the quit rate, and other measures documented in section 2—do not fully capture the multiple dimensions that shape workers' bargaining power and thus wage growth. Using a wage Phillips curve for three sample periods, the cost of job loss—the one year income loss associated with job loss weighted by the expected duration of unemployment—best captures these dimensions and provides a fuller picture of labor market performance, offering increased explanatory and predictive power relative to conventional measures of labor market slack, in addition to comprehensive Federal Reserve labor market condition indexes.[3]

[1] Wage growth has begun to accelerate in early 2016, but due to data limitations, this analysis ends in 2014.
[2] Figure 1, which uses a weighted average of five wage and compensation series further described in section 2, begins with the recovery from the 1981-82 recession due to data availability.
[3] This paper provides an aggregate analysis of labor market slack and wage growth and, as such, provides a novel macroeconomic stylized fact. Future research, which requires different and more detailed data, will examine the cost of job loss, long-term unemployment, and wage growth by industry.

When Janet Yellen served as a member of the Board of Governors of the Federal Reserve in the 1990s, a similar labor market anomaly emerged. While the U.S. economy was growing rapidly and the unemployment rate fell below 4 percent, wage growth remained subdued. Workers were not seeing the wage gains commensurate with the strength of the labor market. Yellen noted:

> There are several aspects of labor market behavior that are puzzling. Increases in compensation are running significantly below what our models would predict. Core inflation still exceeds the pace consistent with the apparent trend in unit labor costs, and profit margins have widened. In my estimation, the entire pattern of surprises that we are seeing is exactly consistent with what one would expect to see as a result of a structural change that has a negative impact on the bargaining power of workers. Such a shift might result from an increased sense of job insecurity related to technological change or corporate restructuring as the Chairman has emphasized. It could be due to factors raising workers' perceptions of *the likely cost of job loss*. It could be due to improvements in the ability of firms to outsource either domestically or internationally because this poses a threat to the bargaining power of workers. (1996, 37–38, emphasis added).

Yellen's hypothesis has equal, if not more, importance today because the cost of job loss has only recently begun to decline from its record high—twice its historical average—of approximately 50 percent of a worker's previous earnings. This suggests that workers are fearful of losing their job because they understand that job loss will be associated with a substantial income loss due to near-record high unemployment duration and near-record low reemployment duration. Even in the face of falling unemployment and a rising quit rate, workers appear unwilling to demand higher wages for fear of being laid off and experiencing the associated costs.

The novelty and power of the cost of job loss, which is fully explained in section 2, comes from merging into one parsimonious measure data on wages, unemployment and reemployment duration, the generosity of social insurance programs, reemployment wages, and the unemployment and layoff rate. By combining these variables into a single measure, one can more accurately measure

the strength of workers' bargaining power (Pacitti 2015, 2011; Pacitti and Fichera 2015), and better explain and predict wage growth.

1. Slow Wage Growth

The historical relationship between wage growth and unemployment suggests that wage growth since 2009 should have averaged 3.4 percent, almost double its actual average during the recovery. The slope of recovery Phillips curve has flattened substantially, as can be seen in Figure 2.

<<FIGURE 2 HERE>>

Why has wage growth been so slow during this period despite a steadily decreasing and low level of unemployment? One hypothesis is downward nominal wage rigidity during the recession and the subsequent release of pent-up demand for wage cuts during the recovery (Daly and Hobijn 2015; Fallick, Lettau, and Wascher 2015; Daly, Hobijn, and Ni 2013; Freeman 2013). The sharp rise in unemployment during the recession should have caused firms to lower wages in the face of reduced aggregate demand. But since workers are likely to resist nominal wage cuts, many firms kept wage increases at 0 percent, despite the rise in unemployment, "bending the Phillips curve" (Daly and Hobijn 2014). Furthermore, employers are resistant to cut nominal wages because of adverse affects on employee morale and effort (Solow 1979; Akerlof 1982; Yellen 1984; Shapiro and Stiglitz 1985). During the recovery, when unemployment rates fell, firms responded by only slowly raising wages to compensate for previous pent-up wage cut pressure.

Another channel through which wage growth could remain depressed is a composition effect of employment (Rothstein 2012). The National Employment Law Project (2014a; 2014b) found that mid-wage industries accounted for 37 percent of job losses in the recession, but only 26

percent of employment growth in the recovery. For high-wage industries, the figures are 41 percent and 30 percent, respectively. But low-wage industries only lost 22 percent of jobs in the recession, but account for an astonishing 44 percent of employment growth in the recovery. With such rapid growth at the bottom of the wage distribution, coupled with rising involuntary part-time employment (Valetta and Bengali 2013), and relatively lower growth at the top, aggregate wage growth with mechanically fall.[4]

Broadening the scope of the recovery beyond wage growth, there are numerous arguments for why growth, in general, has been slow. The bursting of the housing bubble depressed residential investment, normally an engine of growth during recoveries. Since the Great Recession was not caused by contractionary monetary policy, a recovery could not begin by having the Federal Reserve lower interest rates since they were at the zero lower bound (Hall 2007). Adverse demand shocks during recoveries since 1990—lower investment spending, and less expansionary fiscal and monetary policy—have also slowed recoveries (Galí, Smets, and Wouters 2012; Smets and Wouters 2007). Increased credit provision during expansions and the subsequent deleveraging during downturns, in addition to credit constraints for many borrowers, will slow recoveries (Mian and Sufi 2012; Jordà, Schularick, and Taylor 2011). Low aggregate demand might lead to firm's lowering their recruiting intensity, slowing employment growth (Davis, Faberman, and Haltiwanger 2012). The increasing share of service employment and production can further slow recoveries (Olney and Pacitti 2016).

Policy changes, such as the extension of unemployment insurance benefit duration (Rothstein 2011), the rise of government transfers (Mulligan 2012), uncertainty of policy direction

[4] Unemployed workers might be willing to accept positions that do not fully utilize their skills and pay less than their previous job due to economic need. During a slow recovery with depressed labor demand, workers could remain in these positions for an extended period of time, further depressing wage growth deep into a recovery (Mazerolle and Singh 2004).

(Baker, Bloom, and Davis 2015), and arguably most important, weak fiscal policy and austerity (Bernanke 2012) are also argued to have slowed employment, and thus wage growth, since 2009.

Most closely related to the argument in this paper are analyses of increased unemployment duration and long-term unemployment. Farber (2015) found record rates of job loss, coupled with exceptionally low rates of reemployment and the difficulty in finding full-time employment following job loss, which lowers reemployment hours and wages. Furthermore, job losers are likely to remain unemployed for a longer duration during the most recent recovery, relative to those in the past.

Kroft, Lange, and Notowidigdo (2013) and Kroft et al. (2014) conclude that job finding rates exponentially decrease as unemployment duration increases, especially after the first month of unemployment. This leads to "duration dependence," where increases in unemployment duration lead to future increases in unemployment duration. Employers might negatively brand and screen the long-term unemployed because of perceptions regarding human capital depreciation or work-related traits, in addition to lower search intensity among the long-term unemployed. This dependence will result in a higher share of long-term unemployment among the unemployed, creating a negative feedback cycle that could create a permanent class of unemployable and discouraged workers.[5]

However, some analyses (Krueger 2015; Watson 2014; Gordon 2013; Llaudes 2005) found that the long-term unemployed—those unemployed 27 weeks or more—exert less wage and inflationary pressure than the short-term unemployed—those unemployed 26 weeks or less—because they are on the fringe of the labor market and on the verge of dropping out of the labor force. However, these studies ignore the possibility that the increasing share of the long-term

[5] Kroft et. al (2014) found that short-term unemployment rates returned to their average level in 2013, while long-term unemployment rates continue to hover above their pre-recession average. This will lead to a composition effect where the reduction in short-term unemployment will increase average unemployment duration and the share of the long-term unemployed (Valetta 2013).

unemployed (see Figure 6) could create insecurity among both the employed and short-term unemployed, causing them to temper their wage demands, precisely the issue raised by Yellen (1996).

The analysis in this paper suggests the opposite is true: rising costs of job loss, which captures record high unemployment duration, and the increasing share of the long-term unemployed have significant and robust negative effects on wage growth, not only during the recovery from the Great Recession, but since the 1960s.

2. Data and Variables

The empirical analysis uses novel measurements of wage growth and labor market slack, and argues that these variables have more explanatory and predictive power than more conventional ones. This section explains the methodology, composition, and construction of the core variables.

2.1 Wage Growth

The primary measure of wage growth used in this analysis is a weighted average of year-over-year wage growth for five wage and compensation series. It is a modified version of that developed by Bernstein (2014).[6] All variables are nominal to ensure that the index measures only wage growth generated by labor market strength, and not movements in inflation. Seasonally adjusted data for the index are available from the St. Louis Federal Reserve FRED website.

The component variables can be classified into three groups, providing a comprehensive and varied index of wage and compensation growth. The first group uses hourly compensation—wages and benefits—and includes the employment cost index for hourly compensation for private workers

[6] The weighting program for EViews was generously provided by Ben Spielberg, research assistant at the Center for Budget and Policy Priorities. Whereas the original index uses real compensation per hour, this analysis uses nominal compensation per hour for consistency with other data.

and compensation per hour in the non-farm business sector. The second group uses hourly wages, which include the employment cost index for hourly wages for private workers and average hourly earnings for private production and non-supervisory employees. The final group includes weekly earnings, using median usual weekly earnings for full-time wage and salary workers 16 years and older.

To derive the weighted index, a principal component analysis is run on the year-over-year growth of each series. This allows the index to capture and accurately weigh movements that contain the most information and variation for each wage growth series. Using the first principal component, each coefficient is divided by the standard deviation of that series. The weights are calculated by taking this quotient for each series and dividing it by the sum of all quotients. Each of the original series is then multiplied by the vector weights above to give the final wage index, which is shown, along with the five component series, in Figure 3.[7]

<<FIGURE 3 HERE>>

The wage index shows wide variation during the expansionary part of each business cycle, but the secular trend is clearly downward, and at a record low during the recovery from the Great Recession.

2.2 Labor Market Slack

Cost of Job Loss

[7] The index in Figure 3 is for the annual sample 1982-2014. As will be discussed in Section 3, two additional indexes are calculated for different sample periods: quarterly for 1998.4-2014.4 and annually for 1967-2014. For the latter sample, only two measures of wage growth are available, average hourly earnings and compensation per hour.

The cost of job loss is defined as the total income loss for the one-year period following job loss, expressed as weekly amount.[8] The cost of job loss is argued to be a better measure of labor market slack than other measures, including the unemployment rate, because of its broad scope that includes different dimensions of unemployment and reemployment, such as "alternate income sources available to the unemployed worker,…means-tested social welfare benefits,…the expected duration of unemployment,…[and] the pre- or post-job loss wage level" (Schor and Bowles 1987, 584–585).

After job loss, a worker loses his pre-displacement income. For a fraction of the following year, an unemployed worker will collect unemployment insurance and social welfare benefits. The sum of these incomes is total unemployment income. Assuming the worker finds reemployment for the remainder of the year, he will earn some fraction of his pre-displacement income, called reemployment income.

Following Bowles (1985), the cost of job loss (cjl) in constant 2014 dollars is calculated by subtracting the sum of a worker's weekly unemployment and reemployment income, each adjusted for the expected length of unemployment and reemployment, from their weekly pre-displacement income. Mathematically,

$$cjl = w - [(UD)w_u + (1 - UD)w_r], \tag{1}$$

[8] Because of the one-year estimation of the cost of job loss, the measure presented in this paper is a conservative estimate. Additional analyses of income losses due to job loss, using different data sets and methodologies, find substantial income losses well after initial displacement. Couch and Placzek (2010) found earnings losses of 15 percent for six years; Rothstein (2014), Davis and von Wachter (2011), and von Wachter, Song, and Manchester (2009) found losses of approximately 20 percent for as long as 20 years, with losses higher for displacement that occurs during a recession; and Jacobson, Lalaonde, and Sullivan (1993) find losses averaging 25 percent per year.

where w is pre-displacement income; UD is the average duration of unemployment in weeks, expressed as a percentage of one year; w_u is the total sum of unemployment income; $(1 - UD)$ is the average duration of reemployment in weeks, expressed as a percentage of one year; and w_r is reemployment income, or the income a worker can expect to receive if he is rehired by another firm.[9, 10] The appendix lists definitions and sources for these variables.

The cost of job loss in equation (1) is adjusted in three other ways, providing a total of four estimates. The normalized cost of job loss expresses the cost of job loss as a percentage of a worker's pre-displacement income, controlling for the possibility of a rising cost of job loss when pre-displacement wages increase *ceteris paribus*. These two measures of the cost of job loss, however, lose contact with the incidence of unemployment. To incorporate the likelihood of job loss, expected costs of job loss are estimated by multiplying the real weekly cost of job loss in equation (1) by the unemployment rate and the layoff rate. Including rough proxies for the probability of experiencing job loss and interacting them with the cost of job loss can be a better barometer of labor market conditions and provide increased empirical accuracy because each estimate captures not only the income loss associated with job loss, but also the likelihood that a worker will experience this income loss. Figures 4 and 5 show the four measures of the cost of job loss.

<<FIGURE 4 HERE>>

<<FIGURE 5 HERE>>

[9] This formulation of the cost of job loss assumes that unemployment duration cannot exceed one year and that job loss results in an inflow into unemployment, despite the possibility of a worker voluntarily quitting and experiencing an employer-to-employer transition.

[10] Despite unemployment duration reaching a record high during the recent recovery, it might actually understate the true depth of long-term unemployment because workers who drop out of the labor force are no longer counted as unemployed, despite being jobless.

The record increase in all measures have been driven by the rise in unemployment duration and, by definition, the fall in reemployment duration, in addition to the fall in reemployment earnings due to lower reemployment wages and fewer hours worked (Pacitti and Fichera 2015). The longer a worker is unemployed, the longer he must rely on unemployment income and the less time he can expect to receive a higher reemployment income.[11]

The cost of job loss originated in Weisskopf, Bowles, and Gordon (1983), who used it theoretically and empirically, to explain changes in the rate of productivity growth. Bowles (1985) developed the most frequently used specification, where it is used as a determinant of employees' work intensity and employers' optimal level of supervision. Schor and Bowles (1987) found that it could accurately explain the variability in strike activity in the United States and thus represents a significant determinant of worker militancy. Matthews and Kandilov (2002) and Pacitti (2015) use the cost of job loss in a Phillips curve model and find that it better explains and forecasts inflation relative to the unemployment rate. Pacitti (2011) and Pacitti and Fichera (2015) argued that a rising cost of job loss has broad negative macroeconomic effects.

The common theme in all of these analyses is that the cost of job loss can outperform standard measures of labor market behavior in a variety of models. The current analysis uses the most updated measures of the cost of job loss to explain wage growth since 2009, the first attempt to do so.

A slow recovery will cause a rapid rise and sustained elevation in the cost of job loss, as seen in Figures 4-5. Weak recoveries will not necessarily lead to lower employment incomes due to nominal wage rigidity, but slow growth and fiscal austerity will temper the decrease in

[11] It is possible that the increase in the cost of job loss—and its effect on wage growth—is concentrated within a few particularly affected industries. In future research, I intend to examine the cost of job loss and wage growth by sector, but that is beyond the scope of the aggregate analysis used in this paper, which simply seeks to identify broad trends in this relationship.

unemployment duration, lower the provision of income-assistance programs, and lower reemployment duration and wages. These dynamics will increase the cost of job loss.

Other Slack Variables

There are numerous measures of labor market slack, and this analysis selects a variety of them based on previous studies. Due to data restrictions, not all variables are available for all sample periods.

The first set of slack variables are based on the unemployment rate. In addition to the unemployment rate itself, the underemployment rate is used. Frequently called U-6, it includes not only the unemployed, but also marginally attached and involuntary part-time workers. The next measure is the unemployment gap, which is calculated by subtracting the Congressional Budget Office's estimate of the natural rate of unemployment from the unemployment rate.

The long-term share of unemployment is the next slack variable. This share can be thought of as a conditional probability for an expected duration of joblessness. That is, if one were to lose their job, this shows how likely they are to be unemployed for a given duration. Figure 6 suggests that the likelihood of experiencing medium- to long-term unemployment (all categories except less than 5 weeks) has increased from approximately 50 percent to nearly 75 percent since 1967. The largest increase occurred during the Great Recession and has not returned to its previous business cycle average.

<<FIGURE 6 HERE>>

The share of the long-term unemployed has been rising since the 1960s, but particularly acute during the Great Recession. The trend in unemployment shares can be best seen at the poles: a falling share of unemployed workers experience short-term unemployment (less than 5 weeks), while

a greater share experience long-term unemployment (27 weeks or more). The middle categories remain relatively unchanged over the sample. The more recent rise should have significant negative effects on wage growth.[12]

Other measures of labor market slack include the quit rate and the involuntary part-time employment rate.

Most comprehensively, the Board of Governors of the Federal Reserve System (Chung et al. 2014) and the Federal Reserve Bank of Kansas City (Hakkio and Willis 2014) have created weighted average indexes using a principal component analysis of labor market activity that use a wide array of data to parsimoniously capture the condition of the labor market. The former method uses 19 variables to develop a labor market conditions index and the latter use 24 variables to show the deviation in current labor market conditions from past performance, in addition to a momentum index that captures the speed of change in labor market conditions. These indexes help avoid the cumbersome issue of having to individually use every permutation of labor market variables to estimate their effect on wage growth.

Many of the individual slack variables—the unemployment rate, U-6, involuntary part-time employment, and the quit rate—are used in the above indexes. They are chosen because they represent the variables that have the largest impact on the labor market conditions index (Hakkio and Willis 2014) and are tested in the next section to highlight how their explanatory and predictive power compares to the cost of job loss.

3. Empirical Analysis

[12] The rise in long-term unemployment also only accounts for those classified as unemployed, by definition those actively looking for work. Schmitt and Jones (2012) documented that "long-term hardship" in the labor market, which they measure as long-term unemployment plus discouraged and marginally-attached workers. Their findings show that long-term hardship is twice the level of the official long-term unemployment rates since marginally attached and discouraged workers are likely to have been classified as long-term unemployed prior to slowing their job search or dropping out of the labor force altogether.

The hypothesis that elevated levels of the cost of job loss and long-term unemployment better capture the relationship between labor market slack and wage growth is tested using a wage Phillips curve. The wage growth index is the dependent variable, regressed against a one-year lag of itself as a control for wage growth inertia (Stiglitz 1997; L. Ball and Moffitt 2001), a first differenced measure of labor market slack, and productivity growth. The estimating equation takes the form:

$$w_t = \beta_0 + \beta_1 w_{t-1} - \beta_2 \Delta SLACK + \beta_3 PROD + e \quad (2)$$

Three sample periods are used: quarterly data for 2000.4-2014.4, and annual data for 1983-2014 and 1969-2014. Quarterly data for the cost of job loss are available from 1998.4-2014.4. The wage index is constructed using year-over-year growth rates, eliminating one year at the beginning of the sample. Accounting for the lag of the wage index and differencing of non-stationary variables, another year is truncated from the sample start date. Data for the wage index begin in 1981, thus the next sample period starts in 1983. Since annual estimates of the cost of job loss can be constructed beginning in 1967, the final sample period begins in 1969. However, of the five variables in the wage index, only two are available for the longest sample (average hourly earnings of production and non-supervisory workers and compensation per hour). To control for autocorrelation, Newey-West standard errors are used.

3.1 Regression Analysis

The main hypothesis—that cost of job loss and long-term unemployment have more explanatory and predictive power for wage growth—is confirmed for nearly all regressions and forecasts, and is

robust to the use of different sample and forecast periods. Tables 1-3 show the estimation results for the 2000.4-2014.4, 1983-2014, and 1969-2014 samples respectively.[13]

<<TABLE 1 HERE>>

<<TABLE 2 HERE>>

<<TABLE 3 HERE>>

The regression results confirm the central hypothesis for all sample periods. For the 2000.4-2014.4, the layoff rate expected cost of job loss explains the most variation in wage growth, followed by the long-term share of unemployment, and the unemployment rate. In the 1983-2014 sample, the long-term share of unemployment explains the most variation in wage growth, followed by the normalized cost of job loss and the unemployment rate expected cost of job loss. For the longest sample period, 1969-2014, the involuntary part-time employment rate explains the most variation in wage growth, followed by the long-term share of unemployment and the normalized cost of job loss. As a whole, a measure of the cost of job and the long-term share of unemployment loss appear as one of the most explanatory measures of labor market slack for all samples. Contrary to findings in Kruger (2015), this suggests long-term unemployment and its associated costs have significant negative effects on wage growth. Indeed, these measures outperform standard measures of labor market slack, in addition to the comprehensive Federal Reserve Bank indexes.

3.2 Forecasts for the Great Recession and Recovery

[13] The underemployment rate U-6 and the two Federal Reserve Bank of Kansas City labor market indexes are not available for the latter two samples, and the Federal Reserve Bank's labor market condition index is not available for the longest sample.

Since policy makers need to forecast future wage growth to make informed decisions regarding current policy, do these same cost of job loss and long-term unemployment measures provide superior forecasting accuracy relative to other variables? To assess forecasting power, dynamic pseudo out-of-sample forecasts are estimated for all samples.[14] The forecast samples are further divided into two periods: from the start of the Great Recession (2007.3-2014.4 and 2008-2014 for quarterly and annual samples) and from the start of the recovery from the recession (2009.3-2014.4 and 2010-2014). This division is used to separate the negative shock to the labor market from the bursting of the housing bubble and subsequent financial crisis for the recovery period. Forecasting accuracy is assessed using root mean squared errors (RMSE) for each estimating equation.

Tables 4-6 show the RMSEs for the forecasted equations from the start of the Great Recession (2007.4-2014.4), and tables 7-9 show the RMSEs for the forecasts during the recovery from the recession (2009.3-2014.4). The bolded rows in each table indicate the three most accurate forecasts—those with the lowest RMSE—for each period.

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<<TABLE 9 HERE>>

For quarterly forecasts that begin with the Great Recession, none of the cost of job loss measures are in the top three most accurate forecasts for the quarterly sample. However, the long-

[14] A dynamic forecast uses forecasted values of lagged variables.

term share of unemployment ranks second, just below the Kansas City Fed's level of activity index. But when the sample period is extended to 1983 and 1969, the three most accurate forecasts include the normalized cost of job loss, the cost of job loss, and the long-term share of unemployment.

When forecasting wage growth for the recovery from the Great Recession—the period in which wage growth has not been tracking decreases in the unemployment rate—the normalized cost of job loss is in the top three most accurate forecasts for all sample periods. This measure also forecasts wage growth better than the Fed's labor market conditions index for the 1983 sample.

Figures 7-9 show actual wage growth against forecasted wage growth for the three most accurate slack variables for forecasts that include the Great Recession, and Figures 10-12 do the same for the forecasts for the recovery years. In all cases, forecasts overestimate wage growth suggesting there are other forces restraining wage growth, indicating a need for future research.

<<FIGURE 7 HERE>>

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<<FIGURE 11 HERE>>

<<FIGURE 12 HERE>>

This forecasting exercise highlights the predictive power of the cost of job loss and long-term unemployment. In nearly all cases, the cost of job loss and the long-term share of unemployment generate more accurate forecasts of wage growth relative to traditional measures of labor market slack, including Federal Reserve indexes, indicating that the elevated cost of job loss

and likelihood of remaining unemployed for an extended period of time create insecurity and anxiety among employed workers, moderating wage growth.

These findings suggest that policy makers must consider broader measures of labor market strength and workers' bargaining power when making monetary and fiscal policy decisions. The political environment in which the labor market is couched has adversely affected wage growth by failing to provide appropriate stimulus to speed the transition from unemployment to employment, thus lengthening, on average, unemployment duration and lowering reemployment duration.

4. Conclusion and Normative Policy Considerations

The cost of job loss better explains and predicts wage growth during the recovery from the Great Recession relative to standard measures of labor market slack and Federal Reserve Bank labor market condition indexes. Indeed, these findings are consistent with Yellen's (1996) statement.

The rise of long-term unemployment creates the possibility of hysteresis, where cyclical unemployment turns into structural unemployment, weakening aggregate demand and lowering potential output (Fatás and Summers 2015). In addition to the loss of output and lower investment, a class of unemployable workers can lower the productive capacity of the U.S. economy in the long-run (Ball 2014). Indeed, the Congressional Budget Office has already lowered their estimates of potential GDP in 2017 by 7 percent (2014).

Yet the Federal Reserve appears to be on a path to gradually raise interest rates, despite little evidence of wage and inflationary pressure and ample of evidence of a protracted demand shortfall. Although there are dissenters from this view (Brainard 2015), given the pace of wage growth and elevated levels of the cost of job loss, this policy should be reconsidered to provide maximum

stimulus for the economy. Aggressive stimulative fiscal policy is also needed to lower unemployment duration and speed the flows from unemployment into employment, in addition to raising reemployment wages.

Appendix

Table 10 details the data used in estimating the cost of job loss.

<<TABLE 10 HERE>>

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Figure 1. Average Annual Weighted Wage Growth during Recovery Years, 1982-2014

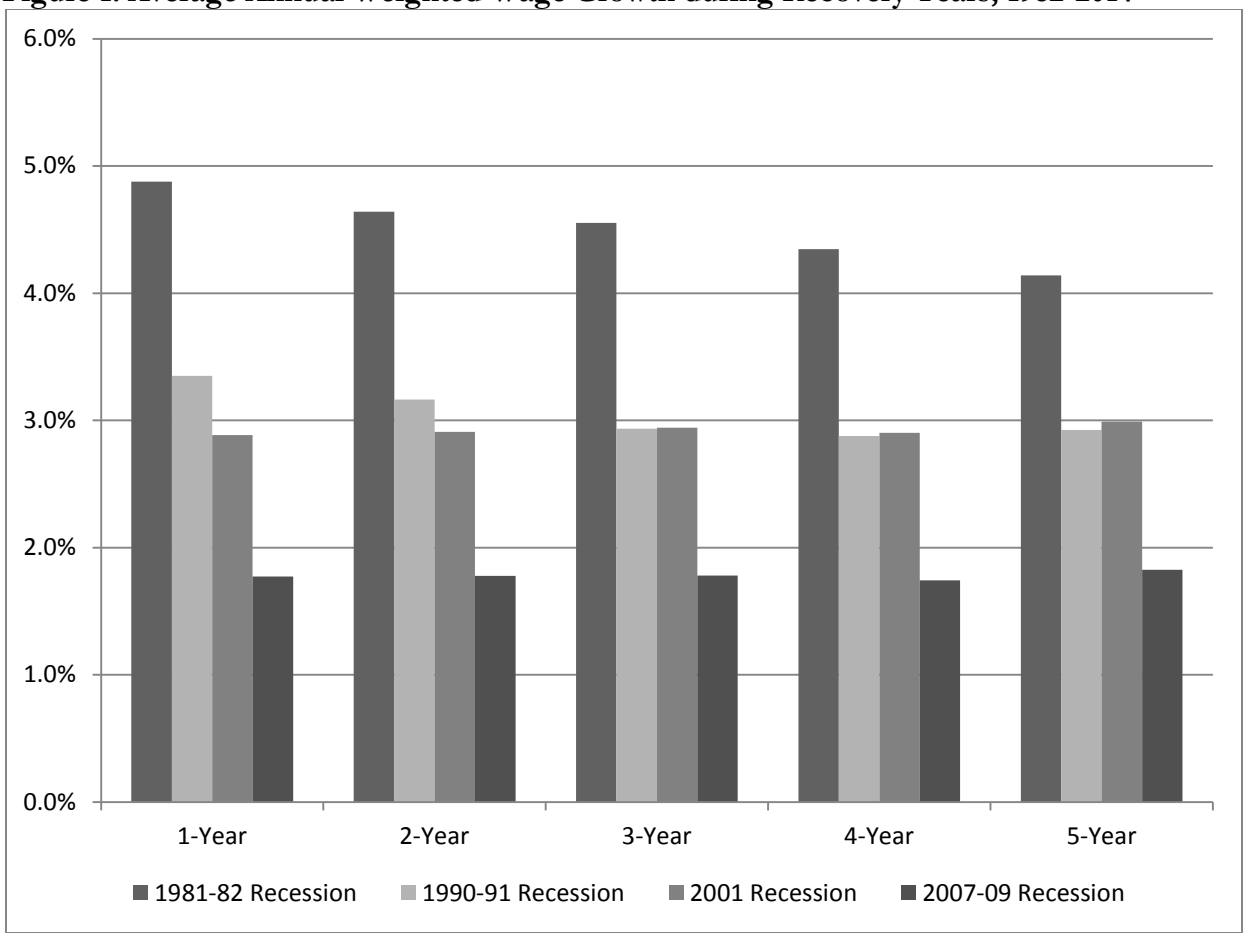

Figure 2. Weighted Wage Growth against Unemployment Rate, 1999.4-2014.4

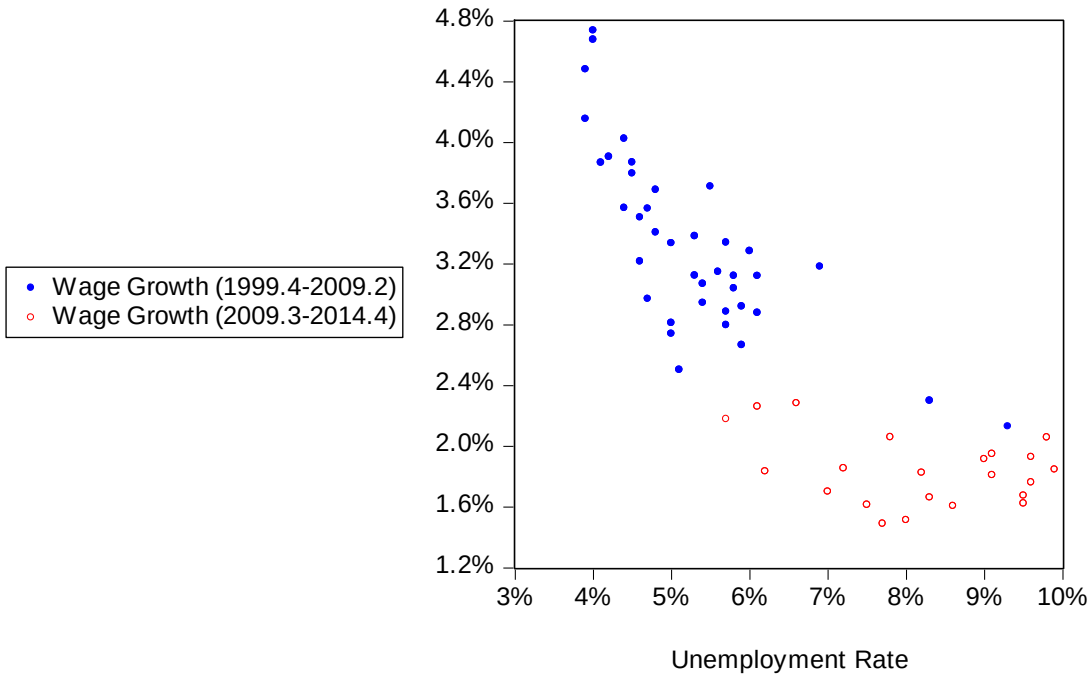

Figure 3. Annual Wage Growth, 1982-2014

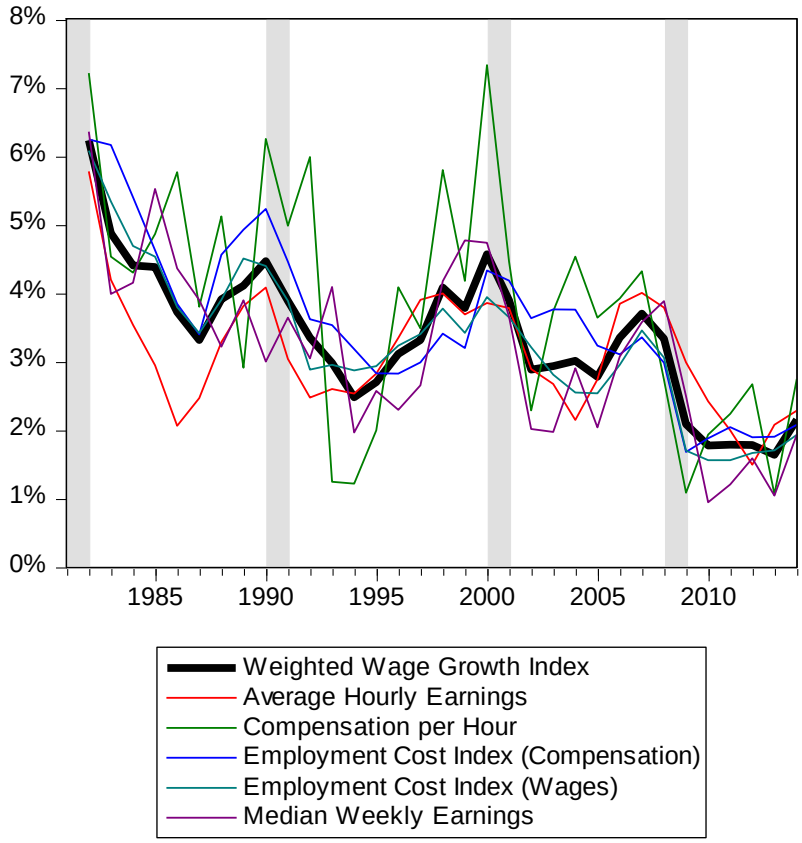

Figure 4. Real Weekly and Normalized Costs of Job Loss, 1967-2014

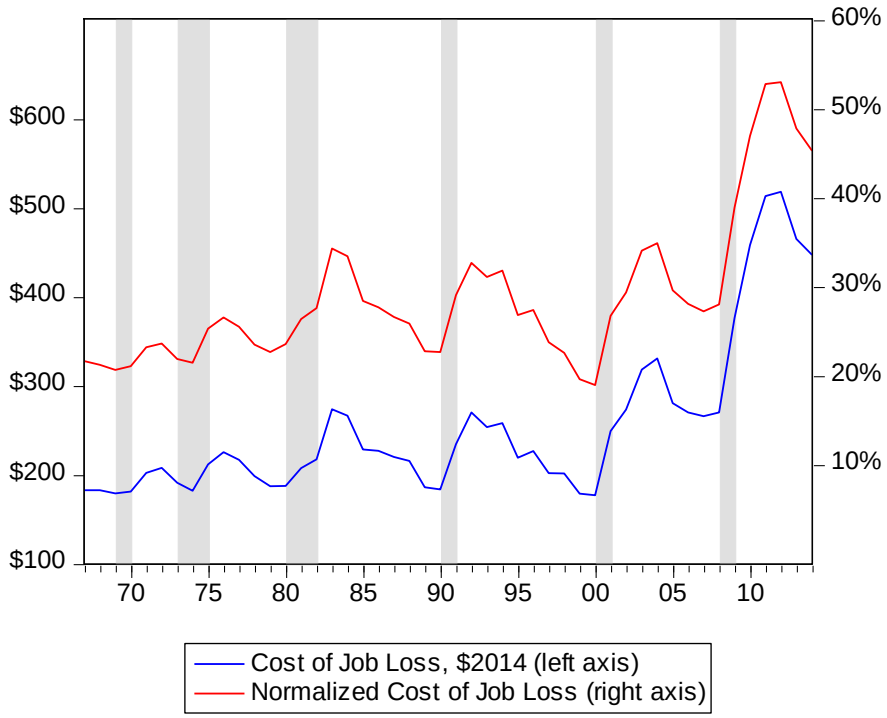

Figure 5. Expected Costs of Job Loss, 1967-2014

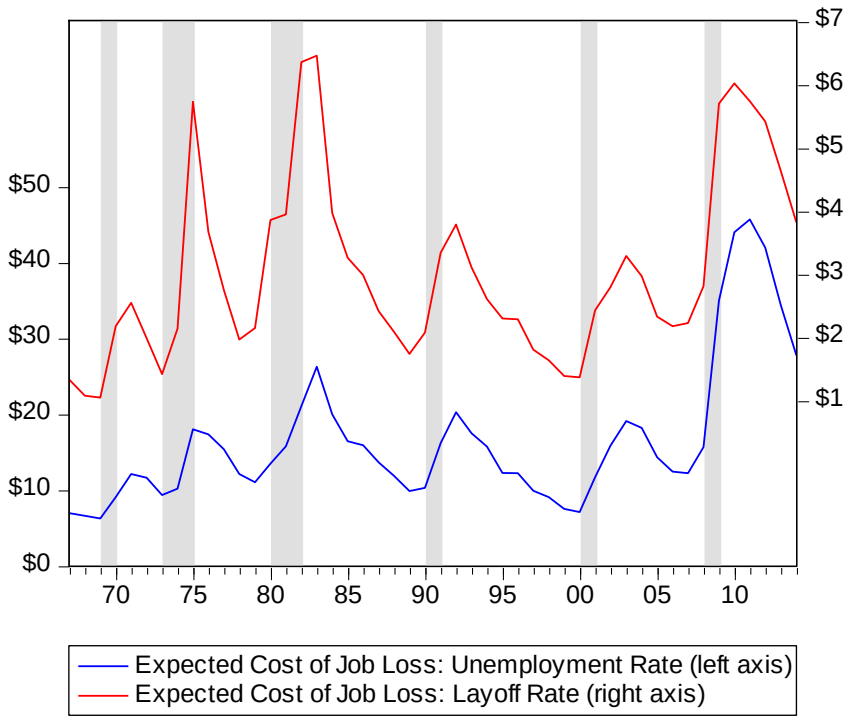

Figure 6. Share of Total Unemployed by Duration, 1967-2015

Figure 7. Quarterly Wage Phillips Curve (1999.4 Sample) Great Recession Forecast Comparison, 2007.4-2014.4

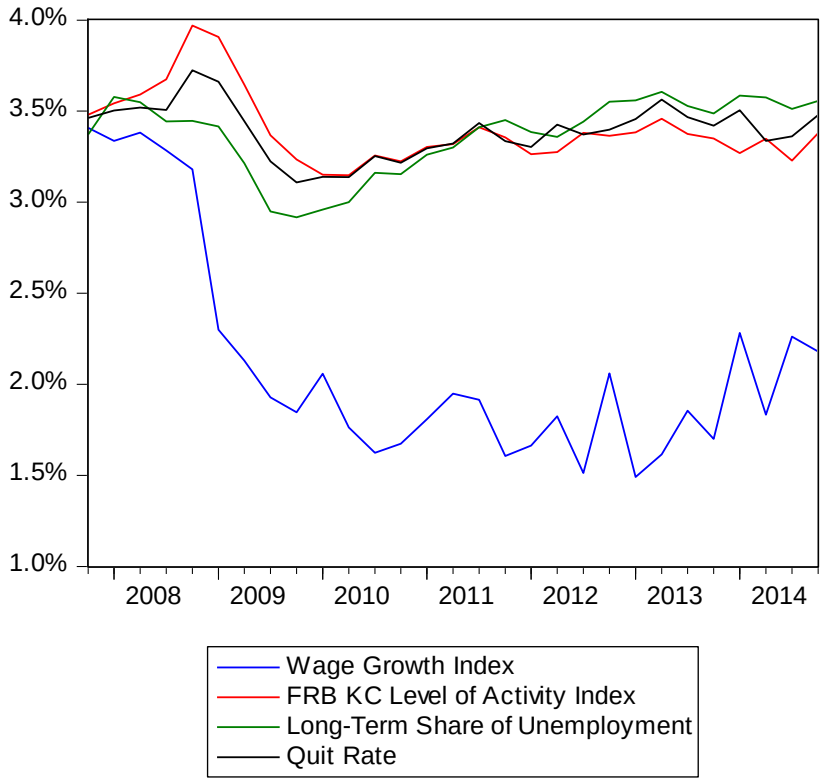

Figure 8. Annual Wage Phillips Curve (1983 Sample) Great Recession Forecast Comparison, 2008-2014

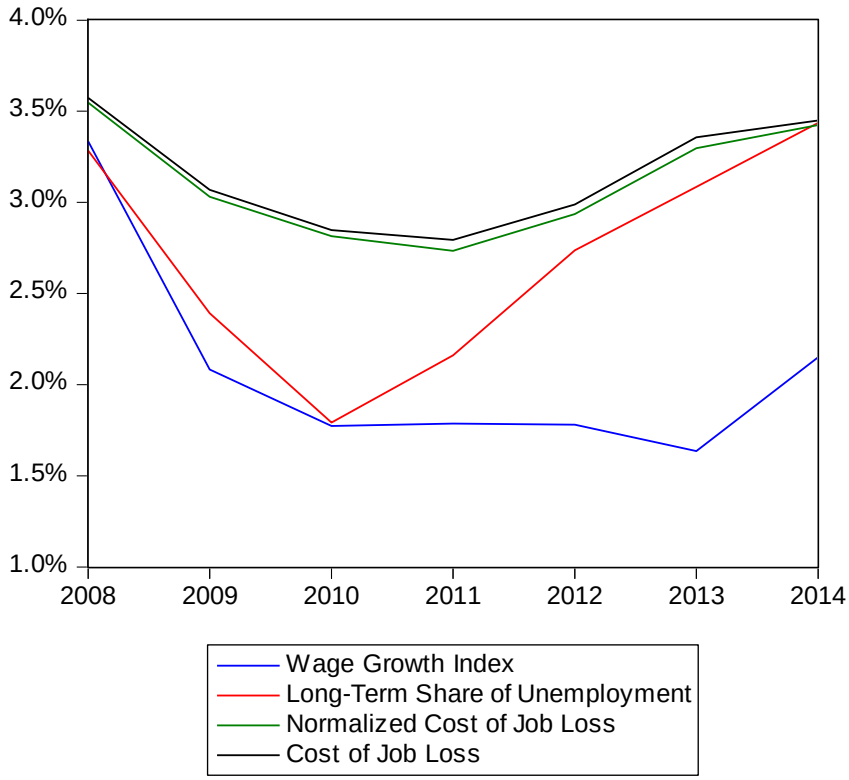

Figure 9. Annual Wage Phillips Curve (1969 Sample) Great Recession Forecast Comparison, 2008-2014

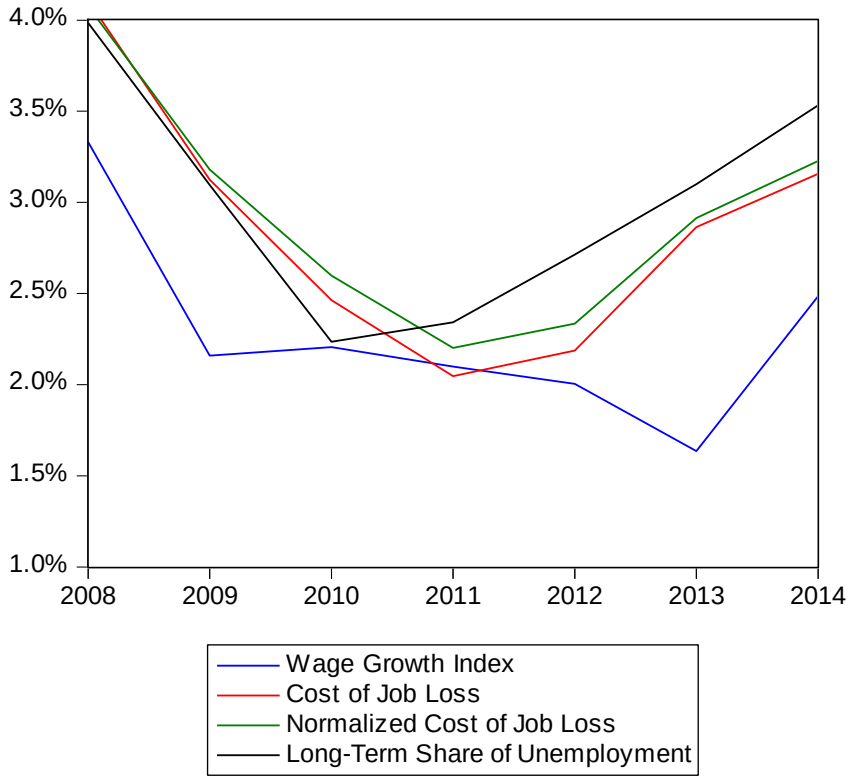

Figure 10. Quarterly Wage Phillips Curve (1999.4 Sample) Recovery Forecast Comparison, 2009.3-2014.4

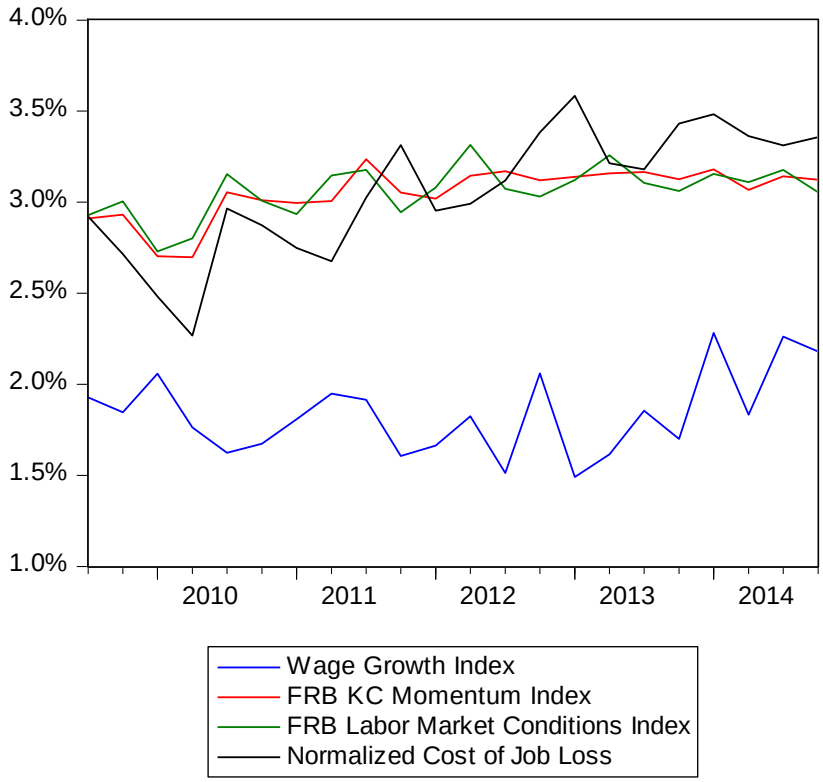

Figure 11. Annual Wage Phillips Curve (1983 Sample) Recovery Forecast Comparison, 2010-2014

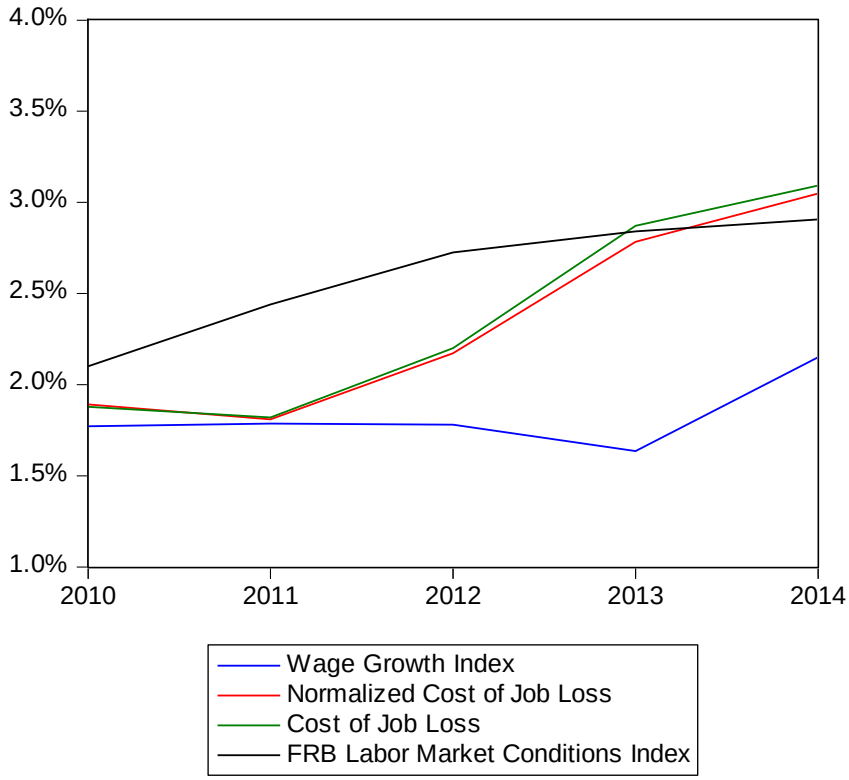

Figure 12. Annual Wage Phillips Curve (1969 Sample) Recovery Forecast Comparison, 2010-2014

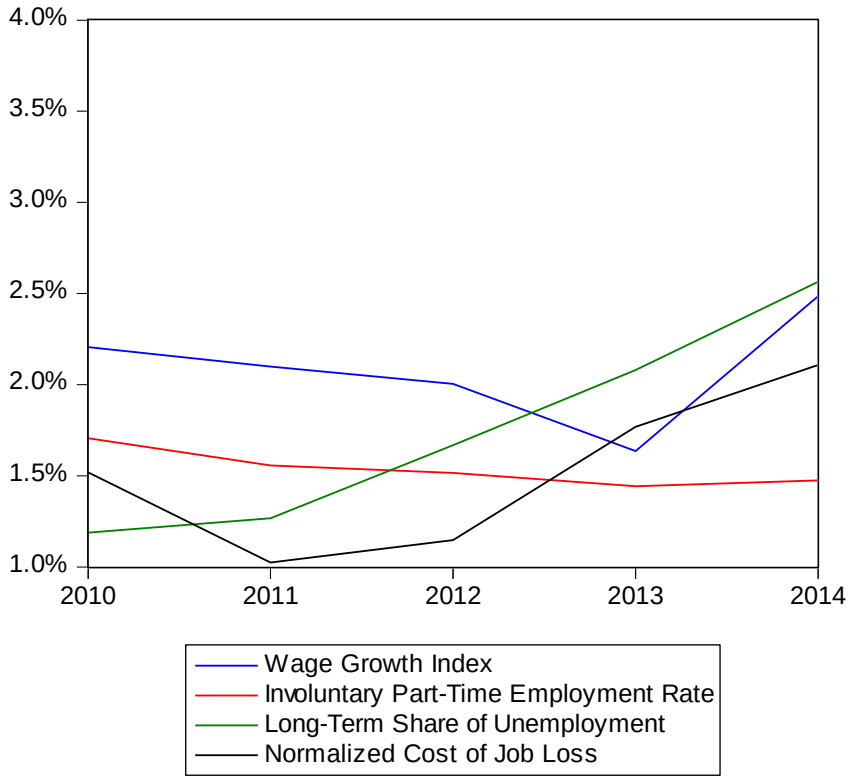

Table 1. Quarterly Wage Phillips Curve Regressions, 1999.4-2014.4

	Cost of Job Loss	Cost of Job Loss (Normalized)	Cost of Job Loss (Expected, UR)	Cost of Job Loss (Expected, LR)	Unemployment Rate	Underemployment Rate (U-6)	Long-Term Share of Unemployment
Constant	0.592688***	0.547295***	0.422981**	0.354995*	0.223218	0.322926	0.476748***
	(0.179341)	(0.173632)	(0.171632)	(0.19147)	(0.218689)	(0.215439)	(0.168928)
Wage Index (4-quarter lag)	0.794805***	0.812681***	0.854716***	0.898872***	0.943599***	0.913982***	0.811107***
	(0.076822)	(0.076169)	(0.076846)	(0.086898)	(0.102868)	(0.10496)	(0.069439)
ΔLabor Market Slack	-0.006214**	-0.083925**	-0.082507**	-0.627545***	-0.659224***	-0.349259***	-0.127929***
	(0.003007)	(0.0344)	(0.036306)	(0.159128)	(0.19435)	(0.12198)	(0.03497)
Productivity	-0.072803	-0.070845	-0.073945	-0.104136	-0.103320	-0.107537	-0.029353
	(0.062943)	(0.060302)	(0.059525)	(0.068061)	(0.065411)	(0.070318)	(0.056803)
Adjusted R-squared	0.661711	0.674457	0.683192	0.697248	0.688375	0.674775	0.695943
F Statistic	37.51297	39.67346	41.25433	43.98991	42.23434	39.72953	43.7254
Durbin-Watson Statistic	0.910449	0.939309	1.080353	0.963081	1.133129	1.076521	1.219794

	Unemployment Gap	Quit Rate	Involuntary Part-Time Employment Rate	FRB Labor Market Conditions Index	FRB KC Level of Activity Index	FRB KC Momentum Index
Constant	0.228403	0.510224**	0.607562***	0.701109***	0.250122	0.76327***
	(0.221183)	(0.201795)	(0.170406)	(0.203165)	(0.237611)	(0.215891)
Wage Index (4-quarter lag)	0.943069***	0.835257***	0.789772***	0.731068***	0.945541***	0.696629***
	(0.105036)	(0.085309)	(0.075402)	(0.095025)	(0.110792)	(0.110983)
ΔLabor Market Slack	-0.655905***	0.208217	-2.049215	-0.017836	1.259208***	-0.225248
	(0.200137)	(0.128243)	(1.279908)	(0.01111)	(0.446887)	(0.162941)
Productivity	-0.105631	-0.093911	-0.067553	-0.048733	-0.108106	-0.029993
	(0.06681)	(0.065491)	(0.062432)	(0.071721)	(0.066181)	(0.079445)
Adjusted R-squared	0.685756	0.645174	0.654804	0.648428	0.682706	0.647067
F Statistic	41.73522	34.94132	36.40885	35.42821	41.16412	35.2234
Durbin-Watson Statistic	1.123959	1.032623	1.088664	0.822034	1.113694	0.780473

Table 2. Annual Wage Phillips Curve Regressions, 1983-2014

	Cost of Job Loss	Cost of Job Loss (Normalized)	Cost of Job Loss (Expected, UR)	Cost of Job Loss (Expected, LR)	Unemployment Rate
Constant	0.652705***	0.606189***	0.54617*	0.671814*	0.574685
	(0.20934)	(0.199088)	(0.306794)	(0.363276)	(0.399842)
Wage Index (1-year lag)	0.755943***	0.769119***	0.774956***	0.768549***	0.78698***
	(0.066088)	(0.064836)	(0.089745)	(0.101756)	(0.112722)
ΔLabor Market Slack	-0.006964***	-0.065879***	-0.05329***	-0.186816	-0.219732**
	(0.002157)	(0.017203)	(0.012358)	(0.111842)	(0.087808)
Productivity	0.048031	0.042230	0.049519	-0.013999	-0.001589
	(0.070779)	(0.066678)	(0.0726)	(0.072901)	(0.073416)
Adjusted R-squared	0.760521	0.769678	0.762944	0.718012	0.739597
F Statistic	33.8159	35.53148	34.25696	27.31121	30.34871
Durbin-Watson Statistic	2.002241	2.022715	1.626667	1.496675	1.432046

	Long-Term Share of Unemployment	Unemployment Gap	Quit Rate	Involuntary Part-Time Employment Rate	FRB Labor Market Conditions Index
Constant	0.594437**	0.575227	0.64737*	0.62506**	0.663395***
	(0.255176)	(0.406026)	(0.364809)	(0.22946)	(0.224278)
Wage Index (1-year lag)	0.726067***	0.790629***	0.782289***	0.77142***	0.745621***
	(0.076153)	(0.115596)	(0.109017)	(0.067712)	(0.065989)
ΔLabor Market Slack	-0.086944***	-0.221048**	0.143283***	-0.648109	-0.027237***
	(0.01564)	(0.089633)	(0.051109)	(0.581939)	(0.007834)
Productivity	0.124143*	-0.004538	-0.019138	0.000860	0.043471
	(0.067491)	(0.07289)	(0.068552)	(0.064654)	(0.066326)
Adjusted R-squared	0.808003	0.738744	0.73685	0.725158	0.755989
F Statistic	44.48695	30.21916	29.9345	28.26396	33.0145
Durbin-Watson Statistic	1.851594	1.426874	1.611989	1.738773	1.649738

Note: Dependent variable is weighted index of 1-year wage growth. Newey-West standard errors in parentheses.
Significance levels: ***=1%, **=5%, *=10%

Table 3. Annual Wage Phillips Curve Regressions, 1969-2014

	Cost of Job Loss	Cost of Job Loss (Normalized)	Cost of Job Loss (Expected, UR)	Cost of Job Loss (Expected, LR)	Unemployment Rate
Constant	0.271479 (0.248026)	0.232153 (0.245008)	0.192763 (0.273109)	0.358590 (0.29619)	0.247997 (0.310842)
Wage Index (1-year lag)	0.919517*** (0.058741)	0.928127*** (0.05719)	0.938631*** (0.056049)	0.92433*** (0.063574)	0.942209*** (0.061996)
ΔLabor Market Slack	-0.008345*** (0.003048)	-0.078868*** (0.025767)	-0.058648*** (0.021012)	-0.105752 (0.120592)	-0.197256 (0.117342)
Productivity	0.036054 (0.104477)	0.031654 (0.103728)	0.018394 (0.105902)	-0.045681 (0.091659)	-0.029043 (0.097297)
Adjusted R-squared	0.831774	0.833293	0.831885	0.820997	0.826697
F Statistic	75.16594	75.97799	75.22468	69.79769	72.55363
Durbin-Watson Statistic	2.183304	2.197143	2.076806	1.985611	1.996857

	Long-Term Share of Unemployment	Unemployment Gap	Quit Rate	Involuntary Part-Time Employment Rate
Constant	0.180445 (0.255393)	0.253136 (0.308819)	0.342111 (0.288026)	0.077872 (0.279065)
Wage Index (1-year lag)	0.932283*** (0.054914)	0.942204*** (0.061227)	0.929408*** (0.061559)	0.970904*** (0.047974)
ΔLabor Market Slack	-0.075932** (0.028423)	-0.207227* (0.116233)	0.107800 (0.068036)	-1.122266* (0.626458)
Productivity	0.051534 (0.116268)	-0.029821 (0.09715)	-0.044553 (0.092015)	-0.005213 (0.097618)
Adjusted R-squared	0.833955	0.827522	0.82467	0.835552
F Statistic	76.33681	72.96785	71.5528	77.2142
Durbin-Watson Statistic	2.16702	2.005007	2.068262	2.143274

Note: Dependent variable is weighted index of 1-year wage growth. Newey-West standard errors in parentheses.
Significance levels: ***=1%, **=5%, *=10%

Table 4. Quarterly Wage Phillips Curve (2000.4-2007.3) Forecast Comparison, 2007.4-2014.4

	RMSE
Cost of Job Loss	1.395697
Cost of Job Loss (Normalized)	1.397218
Cost of Job Loss (Expected, UR)	1.408375
Cost of Job Loss (Expected, LR)	1.420557
Unemployment Rate	1.389515
Underemployment Rate (U-6)	1.394708
Long-Term Share of Unemployment	**1.376763**
Unemployment Gap	1.386896
Quit Rate	**1.378609**
Involuntary Part-Time Employment Rate	1.467819
FRB Labor Market Conditions Index	1.400921
FRB KC Level of Activity Index	**1.375216**
FRB KC Momentum Index	1.385083

Table 5. Annual Wage Phillips Curve (1983-2007) Forecast Comparison, 2008-2014

	RMSE
Cost of Job Loss	**1.153489**
Cost of Job Loss (Normalized)	**1.111063**
Cost of Job Loss (Expected, UR)	1.155770
Cost of Job Loss (Expected, LR)	1.531260
Unemployment Rate	1.407509
Long-Term Share of Unemployment	**0.837229**
Unemployment Gap	1.411324
Quit Rate	1.433758
Involuntary Part-Time Employment Rate	1.554952
FRB Labor Market Conditions Index	1.236815

Table 6. Annual Wage Phillips Curve (1969-2007) Forecast Comparison, 2008-2014

	RMSE
Cost of Job Loss	**0.716563**
Cost of Job Loss (Normalized)	**0.760737**
Cost of Job Loss (Expected, UR)	0.912944
Cost of Job Loss (Expected, LR)	2.131315
Unemployment Rate	1.884920
Long-Term Share of Unemployment	**0.854015**
Unemployment Gap	1.863995
Quit Rate	2.000423
Involuntary Part-Time Employment Rate	1.082075

Table 7. Quarterly Wage Phillips Curve (2000.4-2009.2) Forecast Comparison, 2009.3-2014.4

	RMSE
Cost of Job Loss	1.297350
Cost of Job Loss (Normalized)	**1.284358**
Cost of Job Loss (Expected, UR)	1.536956
Cost of Job Loss (Expected, LR)	1.559299
Unemployment Rate	1.608903
Underemployment Rate (U-6)	1.596087
Long-Term Share of Unemployment	1.320699
Unemployment Gap	1.608254
Quit Rate	1.426051
Involuntary Part-Time Employment Rate	1.349221
FRB Labor Market Conditions Index	**1.251705**
FRB KC Level of Activity Index	1.497389
FRB KC Momentum Index	**1.241941**

Table 8. Annual Wage Phillips Curve (1983-2009) Forecast Comparison, 2010-2014

	RMSE
Cost of Job Loss	**0.721330**
Cost of Job Loss (Normalized)	**0.676974**
Cost of Job Loss (Expected, UR)	1.182480
Cost of Job Loss (Expected, LR)	1.293363
Unemployment Rate	1.383327
Long-Term Share of Unemployment	0.898610
Unemployment Gap	1.419744
Quit Rate	1.315237
Involuntary Part-Time Employment Rate	0.929130
FRB Labor Market Conditions Index	**0.831001**

Table 9. Annual Wage Phillips Curve (1969-2009) Forecast Comparison, 2010-2014

	RMSE
Cost of Job Loss	0.753377
Cost of Job Loss (Normalized)	**0.710481**
Cost of Job Loss (Expected, UR)	0.740171
Cost of Job Loss (Expected, LR)	0.822426
Unemployment Rate	0.932310
Long-Term Share of Unemployment	**0.639942**
Unemployment Gap	0.989509
Quit Rate	0.887467
Involuntary Part-Time Employment Rate	**0.607095**

Table 10. Cost of Job Loss Data Description and Sources

Variable	Definition & Description	Source
Pre-Displacement Income (w)	Average weekly income in unemployment-insurance-covered employment	Bureau of Labor Statistics; Series ID ENUUS00030910, ENUUS00010910
Unemployment Duration (UD)	Average weeks unemployed, expressed as a percentage of one year	Bureau of Labor Statistics; Series ID LNS13008275
Unemployment Income (w_u)	Income from unemployment insurance and total family assistance	Author's calculations from UI and TFA
Unemployment Insurance (UI)	Average weekly benefit amount from unemployment insurance income	Department of Labor; Unemployment Insurance Data Summary
Total Family Assistance (TFA)	Weekly family assistance and social welfare income per person in poverty	Bureau of Economic Analysis; NIPA Table 2.1 Personal Income and Its Disposition (line 21). Census Bureau; Historical Poverty Tables, Table 2, col. 3
Reemployment Duration (1 – UD)	Average weeks reemployed following unemployment, expressed as a percentage of one year	Author's calculations, Bureau of Labor Statistics; Series ID LNS13008275
Reemployment Income (w_r)	Reemployment average weekly income; pre-displacement income times re-employment earnings percentage	Author's calculations, Farber (2015, p. 27). Bureau of Labor Statistics; Series ID ENUUS00030910, ENUUS00010910
Unemployment Rate	Civilian unemployment rate	Bureau of Labor Statistics; Series ID LNS14000000
Layoff Rate	Job losers on layoff divided by total private employment	Author's calculations. Bureau of Labor Statistics; Series ID LNS13023653, CES0500000001