

**How Prevalent Is Downward Rigidity in Nominal Wages?  
Evidence from Payroll Records in Washington State**

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## A Little History of Thought

In chapter 2 of his The General Theory of Employment, Interest, and Money (1936), John Maynard Keynes set out the labor-market premise of his macroeconomic model – that the reason the labor market does not clear in a recession, but instead exhibits high unemployment, is that workers refuse to accept reductions in their nominal wages.

Why? Chapter 2 does sketch out a story about workers caring about their *relative* wages, and hence objecting to a nominal wage cut because it sets them back relative to whoever is their comparison group. It does not address why workers find nominal cuts *so* objectionable that they would prefer instead to lose their jobs and be unemployed, quite possibly for a long time.

In any case, Keynes said, “whether logical or illogical, experience shows that this is how labour behaves.”

For over 80 years, Keynes's premise of downward nominal wage rigidity has been very influential in macroeconomic analysis. Just a few examples ...

Jim Tobin devoted his 1971 presidential address to the American Economic Association (published as "Inflation and Unemployment," the lead article in the March 1972 AER) to restating the analysis in Keynes's chapter 2.

An influential 1996 Brookings Paper by Akerlof, Dickens, and Perry ("The Macroeconomics of Low Inflation") also restated and extended the Keynes analysis.

Both Tobin and Akerlof et al. recommended using positive inflation as a device to "grease the wheels of the labor market."

Quite understandably, attention to the Keynes analysis increased during the Great Recession. A few examples...

Schmitt-Grohe and Uribe, “Downward Nominal Wage Rigidity and the Case for Temporary Inflation in the Eurozone,” Journal of Economic Perspectives, 2013: “downward nominal wage rigidity played an important role in the current unemployment crisis in the euro area.”

A widely noticed 2012 San Francisco Fed note by Daly, Hobijn, and Lucking reached a parallel conclusion for the United States.

Based partly on this work by Daly et al., Paul Krugman repeatedly blogged about the crucial role of downward rigidity of nominal wages. His July 22, 2012, entry (“Sticky Wages and the Macro Story”) said that “downward nominal wage rigidity ... is a glaringly obvious feature of the real world.... It’s simply a fact that actual cuts in nominal wages happen only rarely and under great pressure.”

In the aftermath of the Great Recession, the idea of downward rigidity in nominal wages continues to be highly influential in macroeconomic thinking.

Some examples:

- Daly and Hobijn, “Nominal Wage Rigidities Bend the Phillips Curve,” JMCB, 2014.
- Schmitt-Grohe and Uribe, “Downward Nominal Wage Rigidity, Currency Pegs, and Involuntary Unemployment,” JPE, 2016.
- The recent working paper “A Plucking Model of Business Cycles” by Dupraz, Nakamura, and Steinsson, which says, “The key ingredient ... in our model is downward nominal wage rigidity.”

The question my collaborators and I are asking is:  
What *is* the evidence for the proposition that downward nominal wage rigidity is a binding constraint, so much so that it can account for major allocative inefficiencies in real quantities such as employment and unemployment?

To be clear, I want to emphasize we are not denying the existence of any nominal wage stickiness. Probably almost everyone at this seminar has her/his salary set in nominal terms and usually sees it adjusted only once a year. Similarly for our friends and families in more typical jobs...

But does it follow that nominal wages *cannot* be cut, even when layoffs into unemployment are the alternative?

A couple of preliminary reasons to question the Keynes assumption that nominal wage stickiness is so binding that it forces inefficient employment outcomes:

Thanks to classic analyses such as Becker (1962) and Barro (1977), we have long understood that, in the large part of the labor market with long-term employment relationships (which is the part that departs the *most* from a flexible-wage spot market), current wages need not be allocative, and short-run wage stickiness need not prevent efficient employment allocations.

The interviews of managers by Bewley (1999) support this point. In his overview in chapter 1, Bewley explains that his “mistaken” prior view had been that “an individual firm could save a significant number of jobs by reducing pay. This is seldom true, and the firms for which it is true are precisely the ones most likely to cut pay.”

Bewley’s detailed evidence appears in his section 11.3, which begins, “I was surprised to learn that most managers did not believe that pay cuts would prevent many layoffs.” A typical manager response: “Wage cuts are not an alternative to layoffs. You can’t have a lot of people standing around doing nothing.”

## Quantitative Evidence

Until very recently, practically all the U.S. evidence came from longitudinal analysis of workers' year-to-year wage changes as measured in household surveys such as the Panel Study of Income Dynamics and the Current Population Survey (CPS). Some of the most influential examples are McLaughlin (1994), Kahn (1997), and Card and Hyslop (1996), all of whom studied wage changes of workers staying with the same employer.

I can give you a quick sense of this literature by showing you the results from the CPS-based replication and update of this literature that Elsby, Shin, and I did in our 2016 Journal of Labor Economics article.



Figure 4. Distributions of Year-to-Year Change in Log Nominal Hourly Wages for U.S. Hourly Workers

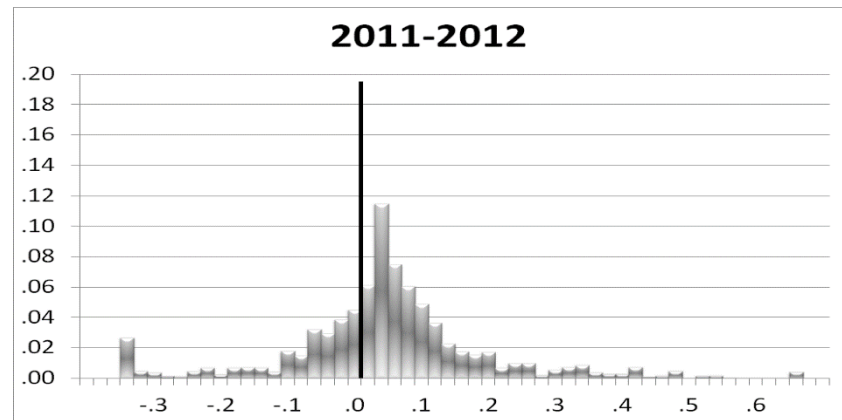
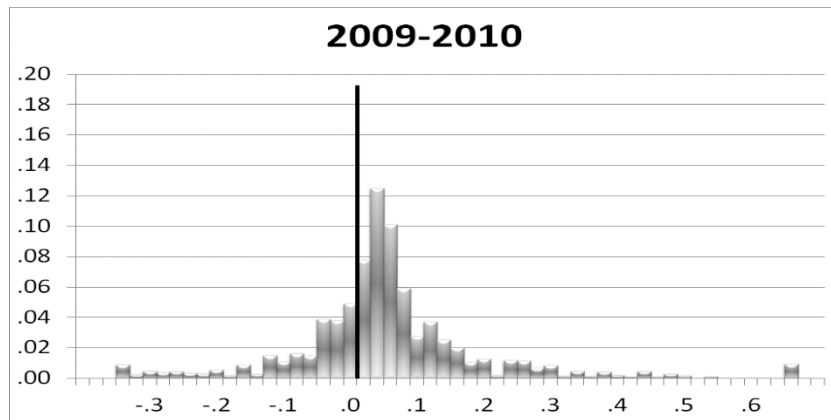
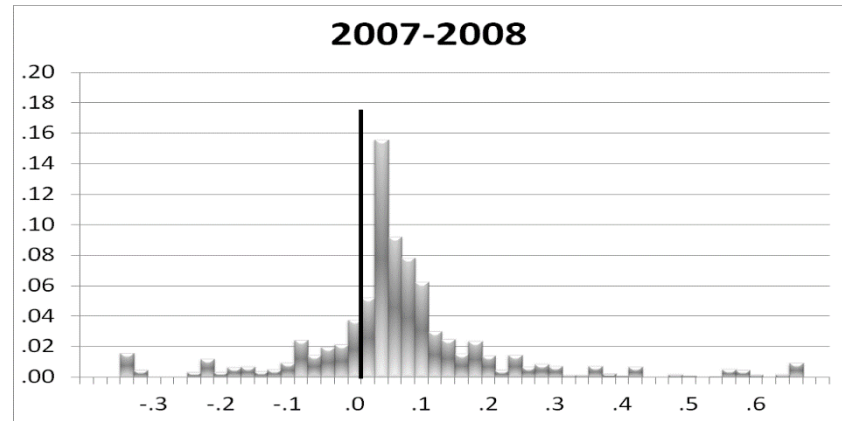
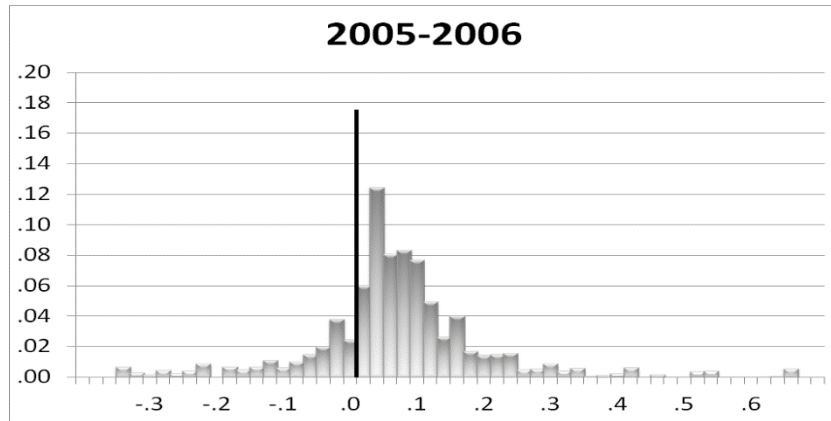


Table 5. Nominal Wage Rigidity in the United States

Years	Annual Unemployment Rate in Year t-1	Survey-to-Survey Change in Log PCE Deflator	Percentage of Hourly Workers with:		Percentage of Non-Hourly Workers with:	
			Zero Nominal Wage Change	Negative Nominal Wage Change	Zero Nominal Wage Change	Negative Nominal Wage Change
1980-1981	7.1	0.099	6.2	11.2	11.0	21.5
1982-1983	9.7	0.046	14.4	16.6	12.4	23.5
1986-1987	7.0	0.023	15.2	17.9	11.8	27.9
1990-1991	5.6	0.047	12.4	19.9	11.1	30.1
1997-1998	4.9	0.009	14.6	17.7	9.3	26.8
1999-2000	4.2	0.025	14.7	15.9	8.9	26.0
2001-2002	4.7	0.007	16.2	14.2	11.9	26.5
2003-2004	6.0	0.021	17.6	19.5	12.9	30.2
2005-2006	5.1	0.032	17.6	17.0	12.0	26.6
2007-2008	4.6	0.035	17.7	18.7	9.4	37.1
2009-2010	9.3	0.024	19.3	23.4	14.9	33.7
2011-2012	8.9	0.024	19.5	25.5	13.9	33.1

The finding of a spike at zero nominal change suggests nominal wage rigidity, while the finding of frequent nominal wage cuts suggests the opposite. Both findings could be distorted by reporting error...

## More Reliable Evidence from Great Britain

The best solution to measurement error is to get more accurate data. That's exactly the strategy of two seminal British studies in the Economic Journal: Smith (2000) and Nickell & Quintini (2003)...

Some key features of the New Earnings Survey (NES) data:

- Longitudinal data from 1975 on for a 1% sample of income tax-paying workers
- The survey is administered annually to *employers*, who are legally required to report the sampled workers' earnings and hours data from payroll records for a reference week in April.
- The data separate out information on overtime earnings and hours.

For every year from 1975-1999, Nickell and Quintini documented the distribution of April-to-April changes in nominal average hourly earnings (exclusive of overtime) for workers staying in the same job with the same employer.

In our 2016 JOLE paper, Elsby, Shin, and I replicated Nickell & Quintini's analysis, and extended it to 2012.

Figure 7. Distributions of Year-to-Year Change in Log Nominal Hourly Wages for British Job Stayers

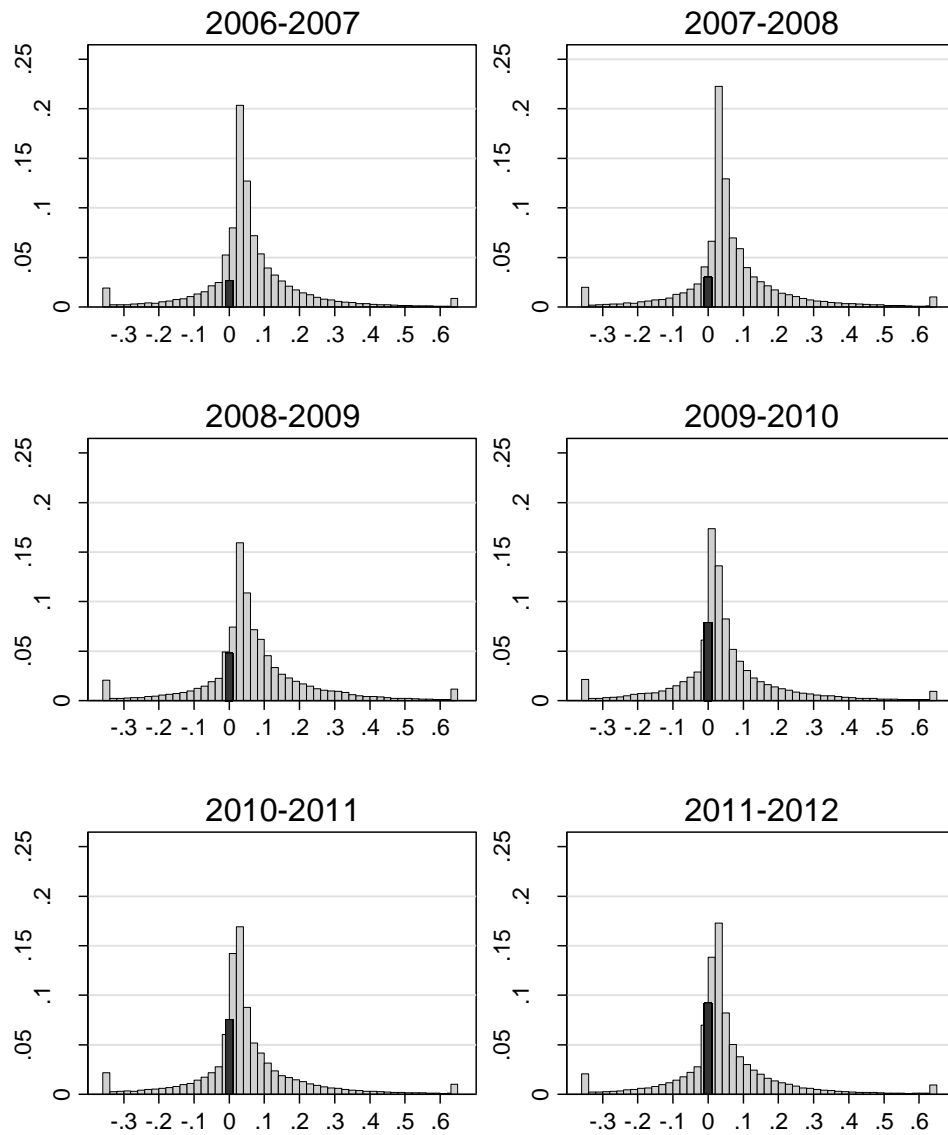


Table 6. Nominal Wage Rigidity in Great Britain

Years	Start-of-Period Unemployment Rate	April-to-April Change in Log RPIX	Percentage of Log Nominal Wage Changes by Interval:			
			Exactly 0	[-0.01,0)	(0,0.01]	Less than 0
1975-1976	4.2	0.175	0.6	0.4	0.4	5.2
1976-1977	5.4	0.160	1.1	0.8	1.0	9.1
1977-1978	5.5	0.083	1.7	0.9	1.1	8.9
1978-1979	5.6	0.087	1.8	0.7	0.9	8.4
1979-1980	5.3	0.188	0.4	0.3	0.4	4.9
1980-1981	6.1	0.117	2.0	0.7	0.8	8.6
1981-1982	9.4	0.087	2.3	0.8	1.0	9.2
1982-1983	10.5	0.048	1.8	0.9	1.2	10.5
1983-1984	11.3	0.048	4.1	1.2	1.7	12.8
1984-1985	11.9	0.052	1.4	1.0	1.3	11.9
1985-1986	11.4	0.033	1.2	1.6	1.2	12.2
1986-1987	11.3	0.035	2.1	1.2	1.3	12.2
1987-1988	10.9	0.041	1.3	0.9	1.2	11.6
1988-1989	8.9	0.057	1.8	1.0	1.1	11.0
1989-1990	7.3	0.076	2.1	1.0	1.2	11.0
1990-1991	6.9	0.066	2.3	0.9	1.0	11.4
1991-1992	8.5	0.055	4.2	1.3	1.6	13.7
1992-1993	9.8	0.029	6.0	1.8	2.8	16.7
1993-1994	10.5	0.023	5.5	2.4	3.0	19.9
1994-1995	9.7	0.026	4.9	1.9	2.6	20.9
1995-1996	8.8	0.029	1.4	1.8	4.4	19.8
1996-1997	8.3	0.025	1.6	4.8	2.8	22.8
1997-1998	7.2	0.030	3.4	1.8	2.0	20.2
1998-1999	6.3	0.024	3.8	1.6	2.0	18.1
1999-2000	6.1	0.019	3.8	2.0	2.4	18.7
2000-2001	5.6	0.020	3.4	1.6	3.4	15.2
2001-2002	4.9	0.023	1.2	3.4	3.8	19.5
2002-2003	5.2	0.030	1.3	2.6	4.2	20.7
2003-2004	5.0	0.020	1.5	4.4	4.1	22.9
2004-2005	4.8	0.023	1.3	3.1	2.4	18.4
2005-2006	4.8	0.024	1.9	3.3	3.8	21.4
2006-2007	5.4	0.035	2.3	3.5	3.8	20.2
2007-2008	5.4	0.039	2.9	2.5	2.9	18.3
2008-2009	5.2	0.017	4.6	3.3	3.3	19.4
2009-2010	7.6	0.053	7.5	4.2	7.4	23.5
2010-2011	7.9	0.052	7.3	4.2	6.7	22.8
2011-2012	7.8	0.034	9.1	5.0	6.7	23.5

As reported in footnote 16 of our JOLE paper, “these nominal wage cuts are remarkably pervasive across subgroups of workers/jobs. For example, in 2011-12, when the overall proportion of job stayers experiencing cuts was 23.5%, the proportions were 22% in the private sector and 26% in the public sector; 27% for union workers and 22% for nonunion workers; at least 20% for every single-digit occupation; and 32% for workers who received incentive pay in either 2011 or 2012 and 22% for workers who did not.”

## What about the United States?

What would payroll-based evidence for the United States show?

For a long time, it seemed that this question could not be answered for lack of requisite data. Although most state unemployment insurance programs in the United States routinely collect quarterly earnings data by worker from employers, the hours-of-work data needed to convert quarterly earnings into an hourly wage are not collected in most states.

But thanks to a study of Longitudinal Employer-Household Dynamics data by Kurmann, McEntarfer, and Spletzer (2016), we now know that a few states do collect quarterly hours data from employers. In those states, dividing quarterly hours into quarterly earnings can produce a quarterly measure of average hourly earnings.

In a preliminary analysis of data pooled from Washington State, Minnesota, and Rhode Island, Kurmann et al. got results a lot like the British results from the payroll-based NES. In particular, tracking workers that stayed with the same employer from a quarter in 2010 to the same quarter in 2011, Kurmann et al. found that more than 20 percent of those workers received reductions in their nominal average hourly earnings.

Like most striking empirical findings, this one raises a lot more questions, such as:

- Do these results hold when the sample is restricted to only Washington State, which is more careful about its hours data?
- Would these results for 2010-11 carry over to other periods – in particular, periods *not* during the Great Recession?
- How do the patterns vary across industrial sectors and employers of different sizes?
- When an employer cuts *some* workers' wages, does it cut *all* its workers' wages, or is it common for an employer to target only a portion of its workers for wage cuts?

In collaboration with Katya Jardim and Jake Vigdor, I have pursued these questions with data from Washington State (and Kurmann and McEntarfer concurrently have done related work).

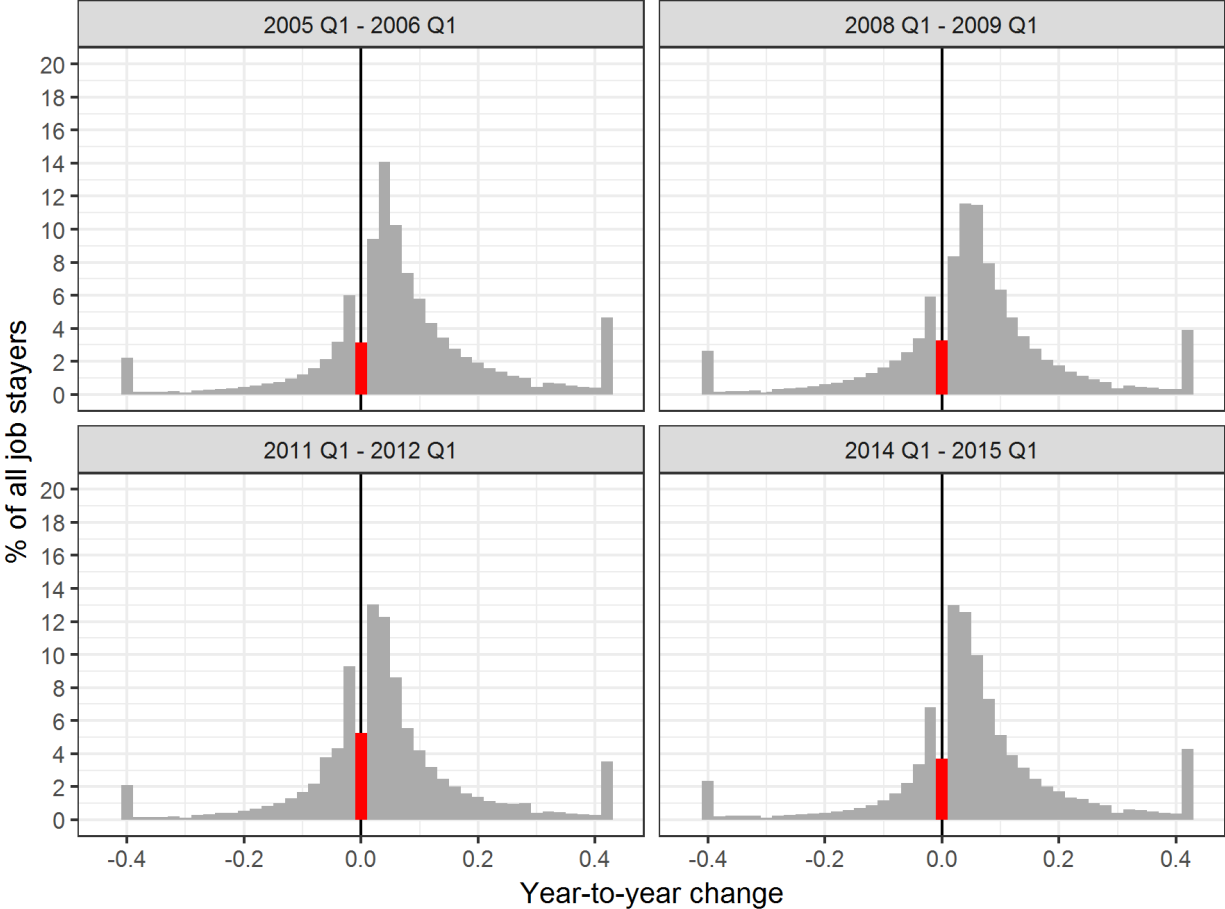


The heart of our analysis is the plotting of histograms for job stayers' four-quarters-apart nominal wage growth for each of our 40 sample periods:

2005:1-2006:1, 2005:2-2006:2, ..., 2014:4-2015:4.

The sample size for each of the 40 periods is about two million job stayers.

Figure 2. Distributions of Year-to-Year Change in Log Nominal Hourly Wages for Job Stayers in Washington State



Source: Authors' calculations based on unemployment insurance records from the Washington Employment Security Department.

Table 1. Percentages of Washington State Job Stayers in Various Categories for Year-to-Year Change in Log Nominal Wages

Period	Wage Cut	Wage Freeze	[-0.01, 0)	(0, 0.01]	
2005-2006	Q1	21.86	3.14	3.68	4.54
	Q2	20.59	3.16	3.32	4.11
	Q3	20.99	2.99	3.17	3.87
	Q4	21.56	2.67	3.16	3.87
2006-2007	Q1	20.36	3.05	3.24	4.00
	Q2	20.60	3.09	3.25	4.01
	Q3	20.77	2.86	3.03	3.58
	Q4	22.65	2.49	3.20	3.88
2007-2008	Q1	20.85	2.99	3.13	3.93
	Q2	20.83	3.04	3.26	4.02
	Q3	25.41	3.10	3.62	4.24
	Q4	24.48	2.94	3.45	4.04
2008-2009	Q1	25.45	3.26	3.61	4.21
	Q2	26.70	4.16	4.47	6.02
	Q3	29.26	4.78	4.87	6.01
	Q4	33.09	5.22	6.18	6.40
2009-2010	Q1	32.43	6.74	6.66	8.06
	Q2	29.61	7.73	7.13	8.05
	Q3	29.45	7.15	6.62	7.27
	Q4	27.66	6.48	6.33	7.44
2010-2011	Q1	27.78	6.59	6.20	7.58
	Q2	26.98	6.99	6.30	7.85
	Q3	28.53	6.56	5.36	6.94
	Q4	29.77	5.74	5.31	6.66
2011-2012	Q1	30.11	5.26	5.15	6.47
	Q2	25.54	6.17	5.15	6.58
	Q3	23.73	5.21	4.66	6.25
	Q4	27.95	5.56	5.36	6.77
2012-2013	Q1	24.30	5.92	5.13	6.83
	Q2	23.20	5.46	5.09	6.74
	Q3	24.88	4.48	4.68	6.15
	Q4	24.29	3.73	4.48	5.69
2013-2014	Q1	22.46	3.90	4.33	5.85
	Q2	21.65	4.11	4.51	6.08
	Q3	23.88	3.81	4.69	5.75
	Q4	22.79	3.47	4.41	5.64
2014-2015	Q1	23.07	3.71	4.29	5.53
	Q2	21.75	3.84	4.30	5.52
	Q3	21.57	3.42	3.82	4.96
	Q4	21.24	2.89	3.67	4.55

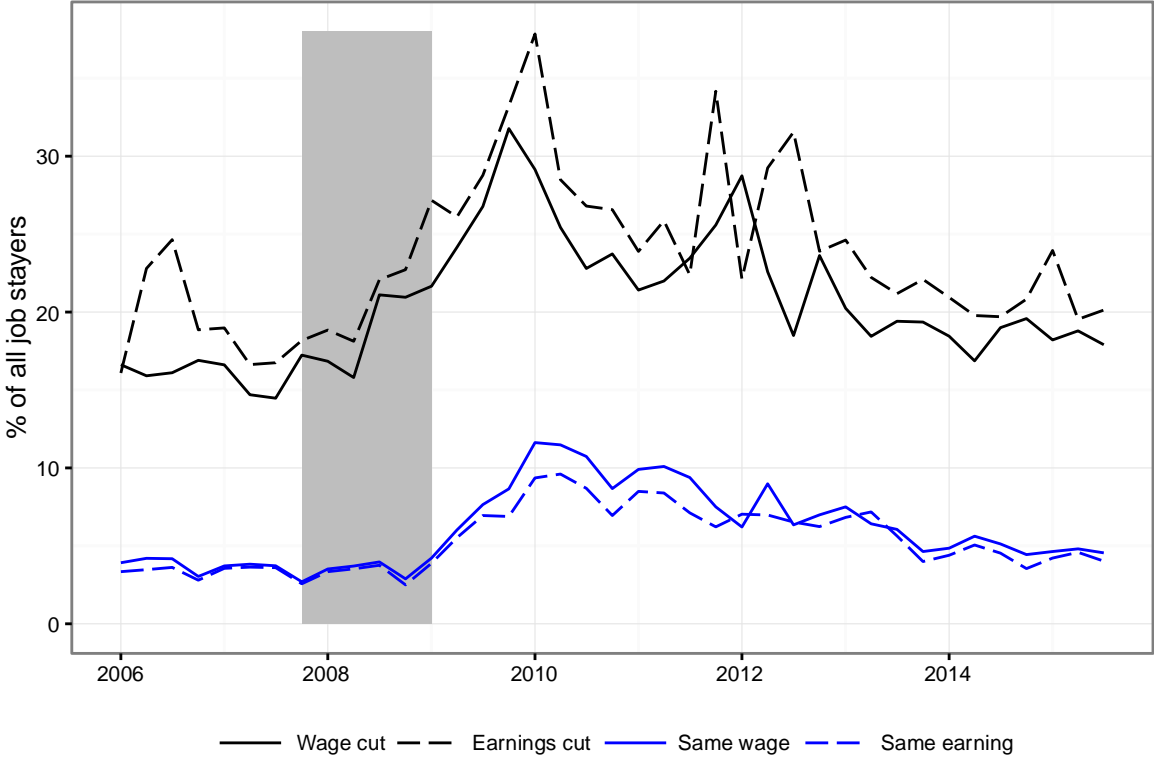
Source: Authors' calculations based on unemployment insurance records from the Washington Employment Security Department.

Table 2. Percentages Receiving Nominal Wage Cuts and Freezes among Washington State Job Stayers with 480-560 Quarterly Hours of Work

Period	Wage Cut	Wage Freeze
2005-2006 Q1	16.62	3.91
Q2	15.91	4.20
Q3	16.11	4.17
Q4	16.90	3.03
2006-2007 Q1	16.61	3.71
Q2	14.69	3.82
Q3	14.47	3.72
Q4	17.24	2.69
2007-2008 Q1	16.85	3.51
Q2	15.80	3.70
Q3	21.10	3.97
Q4	20.95	2.88
2008-2009 Q1	21.66	4.22
Q2	24.16	6.02
Q3	26.78	7.65
Q4	31.77	8.66
2009-2010 Q1	29.14	11.62
Q2	25.43	11.48
Q3	22.79	10.73
Q4	23.73	8.67
2010-2011 Q1	21.41	9.90
Q2	21.99	10.09
Q3	23.45	9.38
Q4	25.58	7.50
2011-2012 Q1	28.74	6.21
Q2	22.59	8.98
Q3	18.49	6.35
Q4	23.62	6.99
2012-2013 Q1	20.24	7.50
Q2	18.44	6.41
Q3	19.41	6.06
Q4	19.35	4.64
2013-2014 Q1	18.45	4.85
Q2	16.87	5.62
Q3	19.00	5.12
Q4	19.58	4.44
2014-2015 Q1	18.21	4.63
Q2	18.79	4.80
Q3	17.90	4.55
Q4	21.24	2.89

Source: Authors' calculations based on unemployment insurance records from the Washington Employment Security Department.

Figure 1. Comparison of year-to-year changes in hourly wage rates and year-to-year changes in earnings, full-quarter jobs with 480 to 560 quarterly hours worked, % of job stayers with hours between 480 and 560 in  $t - 4$  and in  $t$ .



Compared to household survey data, the payroll-based data from Washington State (like those from Britain) show much smaller spikes at exactly zero nominal wage change, but still show surprisingly large fractions of job stayers receiving nominal wage cuts.

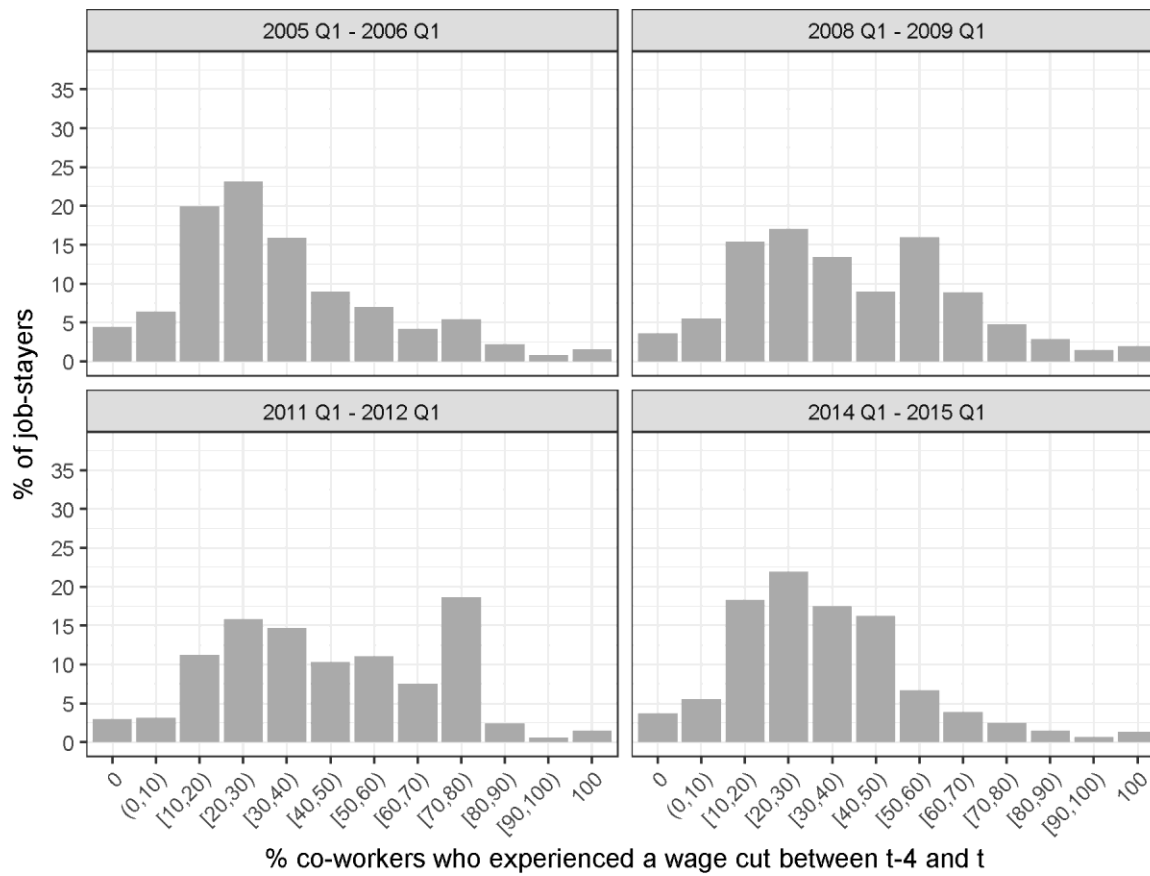
Also like the British data, the Washington State data show:

- The prevalence of wage cuts is pervasive across industries and firm sizes.
- It is quite common for an employer to target only a fraction of its employees for wage cuts. The majority of workers receiving wage cuts work for firms that cut the wages of between 10 and 50 percent of their other stayers.
- These selective wage cuts are somewhat concentrated in the upper half of within-firm wage distributions.

Table 3. Percentages Receiving Nominal Wage Cuts among Washington State Job Stayers in Selected Industries

Period	Utilities	Mining and Oil and Gas Extraction
2005-2006	Q1	13.80
	Q2	24.97
	Q3	15.79
	Q4	16.01
2006-2007	Q1	19.51
	Q2	18.14
	Q3	22.51
	Q4	27.90
2007-2008	Q1	29.32
	Q2	20.89
	Q3	14.44
	Q4	18.64
2008-2009	Q1	18.28
	Q2	19.43
	Q3	20.12
	Q4	16.80
2009-2010	Q1	28.08
	Q2	23.43
	Q3	21.95
	Q4	22.10
2010-2011	Q1	17.94
	Q2	21.30
	Q3	17.54
	Q4	22.60
2011-2012	Q1	23.10
	Q2	16.70
	Q3	18.65
	Q4	18.81
2012-2013	Q1	25.18
	Q2	15.71
	Q3	15.34
	Q4	18.23
2013-2014	Q1	26.18
	Q2	19.04
	Q3	24.52
	Q4	18.85
2014-2015	Q1	18.47
	Q2	17.24
	Q3	18.74
	Q4	16.92

Figure 3. Distributions of Percentage of Co-Workers with a Wage Cut for Washington Job Stayers Who Themselves Experienced Wage Cuts



Source: Authors' calculations based on unemployment insurance records from the Washington Employment Security Department.



## What about Other Countries?

Mike Elsbey and I have co-written a survey article in the Summer 2019 JEP that adds in evidence based on payrolls or pay slips in West Germany, Austria, Italy, Spain, Mexico, Ireland, South Korea, Portugal, Sweden, and Finland.

Our overall conclusion:

“Except in extreme circumstances (when nominal wage cuts are either legally prohibited or rendered beside the point by very high inflation), nominal wage cuts from one year to the next appear quite common, typically affecting 15-25 percent of job stayers in periods of low inflation.”

## Summary

Payroll-based longitudinal data on job stayers' wage changes are providing a new perspective on the conventional wisdom that, as Paul Krugman put it, "It's simply a fact that actual cuts in nominal wages happen only rarely and under great pressure."

Jennifer Smith said in her 2000 EJ paper, "Some of the results in this paper may seem difficult to believe – the quite common occurrence of nominal pay cuts, for example. It may well be that the difficulty in believing them stems not from the weight of contradictory evidence, but rather from conventional wisdom that has survived because of the previous lack of evidence either way."

The Dalai Lama (2006): "If, when we investigate something, we find there is reason and proof for it, we must acknowledge that as reality – even if it is in contradiction with a literal scriptural explanation that has held sway for many centuries or with a deeply held opinion or view. So one fundamental attitude shared by Buddhism and science is the commitment to keep searching for reality by empirical means and to be willing to disregard accepted or long-held positions if our search finds the truth is different."

## Grigsby, Hurst, and Yildirmaz

Thanks to the authors, we now have U.S. evidence besides the Washington State data. Relative to the Washington data, the ADP data have the obvious disadvantage of pertaining only to firms with more than 50 employees that hire ADP to do their payroll processing. They have the considerable advantages of (a) national scope and (b) information for distinguishing base pay from other pay (“residual earnings”).

Some of the key results pertaining to downward nominal wage rigidity:

- According to table 5, which averages over the study’s 2008-2016 period, only 2.4 percent of the year-to-year changes in job stayers’ *base* pay were negative. Figure 11 shows this percentage rose as high as 8 percent in manufacturing and 11 percent in construction during the worst of the Great Recession.
- Subsequent analyses go beyond base pay. The histogram in figure 8 pertains to “commission workers” (those with substantial residual earnings in at least 4 months of the year). The figure shows that a quite large minority of these workers experienced year-to-year reductions in their average hourly earnings.

- Table 7 pertains to the large majority of job stayers who are not “commission workers.” With the compensation measure broadened to include “bonuses” (residual earnings besides what the authors judged to be overtime pay), the percentage receiving wage cuts was 15.7. With the compensation measure further broadened to include fringe benefits, the percentage rises to 18.9.

Thus, once the authors go beyond base pay in their wage measurement, their percentages of job stayers showing wage cuts are qualitatively similar to most of the results in the previous literature.

The finding that compensation beyond base pay plays an important role in wage adjustment is familiar from the large literature on *real* wage cyclicalities (e.g., Devereux, 2001; Swanson, 2007; Shin and Solon, 2007).

The last two sentences from Shin and Solon: “Even among workers staying with the same employer..., real average hourly earnings appear to be substantially procyclical. An important portion of that procyclicality probably is due to compensation beyond base wages, such as overtime pay and bonuses.”

Kurmann & McEntarfer consider a broader range of topics, while we focus on more detailed documentation of year-to-year nominal wage changes, especially the frequency of nominal wage cuts. In particular:

- Our Table 1 displays key statistics for four-quarters-apart nominal wage change for all 40 such periods between 2005 and 2015. K&M show only a figure with histograms for the second quarters of 2005-6 and 2009-10. Our more thorough reporting gives readers a clear view of how the frequency of nominal wage cuts and freezes evolved before, during, and after the Great Recession.
- Our sample includes all job stayers. Motivated by their other analyses, K&M restrict their job sample to workers that stayed with the same employer for at least 10 quarters. As a result, our sample per period is about twice as large and less narrowly selected.
- K&M's "zero spike" lumps together exact zeroes with nominal wage changes of magnitude no greater than 0.5 percent. Our Table 1 separately reports exact zeroes and very small changes. This is of considerable economic interest because the previous household-survey-based literature claimed that "holes" in the distribution around zero supported "menu cost" theories of nominal wage rigidity. Our finding of frequent small changes suggests that the previous finding was an artifact of rounding error in household surveys.
- K&M's findings are confounded by changes in overtime hours. Our Table 2 attempts to filter out workers with overtime and still finds highly frequent nominal wage cuts.
- We provide somewhat more detailed disaggregate analyses. These show that the frequency of nominal wage cuts is pervasive across industries and firm sizes. We also find that the majority of job stayers receiving nominal wage cuts work for firms that cut the wages of between 10 and 50 percent of their job stayers.