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# How Prevalent Is Downward Rigidity in Nominal Wages? International Evidence from Payroll Records and Pay Slips

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# ABSTRACT

## How Prevalent Is Downward Rigidity in Nominal Wages? International Evidence from Payroll Records and Pay Slips*

In Chapter 2 of The General Theory of Employment, Interest, and Money (1936), John Maynard Keynes put forward an assumption of downward rigidity in nominal wages as the cornerstone of his analysis of what happens in the labor market over the business cycle. According to his analysis, if the real value of the existing nominal wage exceeds the market-clearing level, downward nominal rigidity prevents arbitrage towards that level. Instead, employment is determined by the short side of the market (the labor demand side), and the excess supply of labor at that wage manifests as high unemployment. Keynes's brief theoretical account of why workers refuse to accept a nominal wage reduction, even when unemployment is the consequence, involved workers' concern about their wages relative to their reference group. Keynes did not directly address why workers would be so preoccupied with their relative wage that they would prefer job loss, even during a recession, to accepting a wage cut. Keynes's empirical basis for his assumption was that, "whether logical or illogical, experience shows that this is how labour in fact behaves." He did not provide any quantitative evidence to support this observation.

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In the 80-plus years since publication of *The General Theory*, Keynes's premise of downward nominal wage rigidity has continued to be highly influential. This has much to do with its potential to address some of the most enduring macroeconomic questions: To the extent that it prevents the real value of nominal wages from adjusting downward sufficiently in times of recession, it offers a potential account for cyclical unemployment fluctuations. And, by implying that higher inflation might ease reductions in real labor costs that would otherwise be frustrated, it provides a potential foundation for a Phillips curve trade-off between inflation and unemployment. A quintessential implication, noted prominently in Tobin's (1972) presidential address to the American Economic Association, and extended in Akerlof, Dickens, and Perry's influential 1996 paper, is that positive inflation can "grease the wheels of the labor market."

As rates of inflation have subsided in recent decades, and with the onset of the Great Recession, interest in Keynes's hypothesis of downward nominal wage rigidity has naturally revived, inspiring an array of modern applications. Formal theories of the Phillips curve in the short and long run have been developed, and extended to analyze the persistent rise in U.S. unemployment that accompanied the Great Recession (Benigno and Ricci 2011; Daly and Hobijn 2014). In international macroeconomics, the adverse interaction of downward nominal wage rigidity with currency pegs has been advanced as a key determinant of recent rises in unemployment in the Eurozone and its periphery (Schmitt-Grohé and Uribe 2016). Most recently, the asymmetric nature of downward nominal wage rigidity has been invoked to provide a potential explanation for asymmetries in unemployment fluctuations over the business cycle (Dupraz, Nakamura and Steinsson 2017).

But the durability of Keynes's hypothesis also owes much to its empirical immediacy. An economy subject to a binding downward constraint on nominal wage changes should bear two hallmarks: a scarcity of nominal wage cuts, and a consequent abundance of nominal wage freezes. Accordingly, a large empirical literature has sought to provide measures of the frequencies of nominal wage cuts and freezes, aided by increasing availability of the requisite longitudinal data on individual wages.

Until recently, most such evidence had been based on reports of job stayers obtained from *household* surveys. Defying simple conclusions, that evidence seemed to suggest not only that nominal wage cuts are quite common—indicating a degree of downward flexibility in

nominal wages—but also that nominal wage freezes are similarly common—indicating a degree of nominal rigidity. To complicate matters further, both results reasonably have been discounted on the ground that they could be artifacts of the considerable response error in household surveys. Thus, despite the seeming immediacy of Keynes's hypothesis, a clear assessment of the empirical basis for downward nominal rigidity has proved elusive due to the difficulty of obtaining reliable estimates of the incidence of nominal wage changes.

The main point of the present article is to draw attention to a more recent literature that, cumulatively, has made considerable progress on these challenges. Our motivation is that the most compelling way to address a concern over measurement error is to seek more accurate data. The literature we survey does so by focusing on wage data taken from employers' payroll records and pay slips. We believe this growing body of evidence has been under-noticed, perhaps because the studies have been scattered across many countries and across journals in multiple fields in economics, but also because several sources of such data have become available only recently.

Here we gather together studies for Great Britain, the United States, West Germany, Austria, Italy, Spain, Mexico, Ireland, South Korea, Portugal, and Sweden. Collectively they make an important point: 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. And, consistent with this picture of downward flexibility, nominal wage freezes are found to be much less frequent, typically affecting fewer than 8 percent of job stayers, and with weak evidence for large accumulations of wage freezes in times of low inflation.

None of this denies the existence of some nominal wage stickiness. We ourselves, like most of our readers, have our salaries set in nominal terms and typically see them adjusted only once a year. But does it follow from such apparent wage stickiness that nominal wages *cannot* be cut, even when inefficient layoffs or hiring decisions are the alternative? In light of the emerging evidence from more accurate wage data, we will conclude that Keynes's assumption that nominal wages *cannot* be cut needs to be reconsidered.

## The Economic Consequences of (Downward Nominal) Wage Rigidity

To give a sense of what's at stake, we first provide some context for the potential effects of downward nominal wage rigidity viewed from the perspective of modern theories of the labor market. The interpretation of Keynes summarized in the opening paragraph of this paper provides a particularly simple "spot market" view of the labor market. But a distinctive characteristic of employment relationships is that they are frequently *long-term* in nature: Employees often work for the same employer for extended periods of time.

This simple observation has important implications for the economics of wage rigidity, and thereby for the place of downward nominal rigidity within it. As noted since the seminal work of Becker (1962), the effective price of labor ceases simply to be the flow wage, but rather is the expected present discounted value of the stream of wages anticipated over the course of the employment relationship. In addition, the seeming paradox of Keynes's theory—that workers will refuse nominal wage cuts, even when unemployment is the alternative—is thrown into sharper relief once the durability of employment relationships is acknowledged: It implies that an existing gainful exchange of labor is forfeit by a refusal to countenance a wage cut, even when it is mutually advantageous for firm and worker to do so (Barro 1977). A corollary of these implications is that all that is required to obviate such inefficient layoffs is that (the present value of) wages be sufficiently flexible *at the point when separation is potentially at issue*. Subject to this requirement, flow wages can otherwise be arbitrarily rigid, and indeed can accommodate many of the outward signs of downward nominal wage rigidity: Nominal wages can remain constant for periods of time if neither firm nor worker wishes to separate; and, when nominal wages are adjusted, they naturally will rise more often than they fall due, for example, to the presence of inflation (Malcomson 1997).

Thus, there are plausible theoretical arguments that caution against positing a strong link between ostensibly rigid wages and unemployment consequences through excess layoffs. These arguments have cast a long legacy, informing the majority of modern theoretical analyses of labor markets. But, even in the light of these arguments, there remain potential channels through which rigid wages in general, and downwardly rigid nominal wages in particular, may have allocative effects on labor market quantities. Here we highlight three such channels.

The first shifts its focus away from layoffs, and considers instead potential effects on *hiring*. An implication of Becker's insight is that a firm's incentive to hire will be shaped by the present value of wages it must offer to newly hired workers. Hires will fall more precipitously during recessions if firms perceive such present values to be inflexible. A sufficient condition for the latter, noted prominently in modern accounts of unemployment fluctuations, is inflexibility in *both* the wages of newly hired *and* incumbent workers (Shimer 2004; Hall 2005). Clearly, by contributing to rigidity in the path of incumbent wages, any evidence of downward nominal wage rigidity among job stayers could thus provide a partial empirical basis for declines in hiring in recession.

Second, there is evidence to suggest that the wages of newly hired and incumbent workers are not set in isolation. Bewley's (1999) interviews highlighted the role of the internal wage structure within firms in linking the wages of new hires to those of job stayers. If new hires are paid according to existing wage structures, perhaps for reasons of equal treatment, then any rigidity in incumbent wages is then propagated onto the wages of new hires (Gertler and Trigari 2009; Snell and Thomas 2010). An implication of this view, then, is that any downward rigidity in nominal wages of job stayers will additionally contribute to downward nominal rigidity among new hires' wages, further depressing hiring incentives in times of recession.

Third, it is important to remember that the theoretical contention that wages ought to be flexible at the point of potential separation is just a hypothesis, albeit perhaps a compelling one. Moreover, it is a hypothesis that is devilishly difficult to test, requiring as it does a counterfactual judgment on whether observed job losses could, and should, have been prevented by wage cuts. In the absence of strong evidence on that, it is reasonable to entertain alternative accounts that might restore such channels. One such account is again suggested by Bewley's interviews, which noted that employers were reluctant to cut wages because of adverse effects on workers' productivity due to lower morale. While formal economic theories of this phenomenon remain in their infancy, it is natural to wonder if the prospect of any such productivity losses might provide a potential motive for excess layoffs that, in the words of one of Bewley's interviewees, "get the misery out the door."[1] And the anticipation of such productivity losses in the future might in turn

[1] On the other hand, immediately after that quotation on page 16, 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

further retard firms' incentives to hire. Both of these forces might be expected to contribute to unemployment in times of recession.

To summarize, much of our understanding of labor market fluctuations thus invokes some form of wage rigidity, with downward nominal rigidity being a theoretically and empirically salient variety. If available evidence were to suggest that nominal wages are indeed rarely cut, and consequently often frozen, it would provide a *prima facie* empirical grounding for a host of potential accounts of unemployment fluctuations, on both hiring and layoff margins. Thus, much is at stake if, as the evidence we survey will suggest, nominal wage cuts are in fact quite common.

## Evidence from Employer Payroll Records and Pay Slips

Most evidence on nominal wage rigidity has sought to provide measures of year-to-year changes in individual workers' nominal wages from longitudinal microdata. Moreover, because much evidence shows—and the economic theories reviewed in the preceding section would predict—that those changing employers often realize wage changes, these studies have sought to focus on the subsample of individuals that are job stayers.[2]

For a long time, the majority of such measures were based on longitudinal analyses of household surveys, inspired by influential early studies of the Panel Study of Income Dynamics and the Current Population Survey (CPS) in the United States (McLaughlin 1994; Card and Hyslop 1996; Kahn 1997). As we have noted, such studies typically have measured not only a substantial fraction of nominal wage cuts among job stayers, but also a similarly common incidence of nominal wage freezes. For example, our own 2016 *Journal of Labor Economics*

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the firms for which it is true are precisely the ones most likely to cut pay." His detailed evidence appears in his Section 11.3, "Reasons for Laying Off Workers Rather than Cutting Pay," which begins, "I was surprised to learn that most managers did not believe that pay cuts would prevent many layoffs." This finding is altogether consistent with the Becker-Barro-Malcomson point that short-term wage stickiness need not induce inefficient allocation decisions.

[2] As foreshadowed by our theoretical discussion, an important example of what these studies have *not* attempted to measure is the rigidity or otherwise of the wages of newly hired workers. Addressing this question empirically is surprisingly difficult because it calls for hiring wage data over time for the same jobs within the same firms, and such data are hard to come by. The effort by Martins, Solon, and Thomas (2012) uses the same Portuguese census of employers we cite later in this survey and finds that real hiring wages in Portugal were highly procyclical over the period 1982-2008.

paper with Donggyun Shin, which tracked job stayers from one January to the next in the CPS, found that the fraction measured as receiving a nominal wage cut was regularly between 15 and 25 percent. Nonetheless, in the same data, the fraction recorded with zero nominal wage change frequently was in the region of 10 to 20 percent.

Household survey reports of wages are notoriously subject to response error, however. And, as many authors have noted, such errors plausibly could bias both results. On one hand, differences in individual response errors across survey years may exaggerate the appearance of wage flexibility: Someone whose nominal wage did not really decrease could still be measured as receiving a wage cut; and cases in which nominal wages truly did not change will be recorded as wage changes. Such concerns have motivated some authors, such as Akerlof et al. (1996) and Altonji and Devereux (1999), to suggest that the appearance of frequent nominal wage cuts in household surveys is just an artifact of measurement error. On the other hand, if wage reports are subject to rounding errors, modest wage changes will be recorded as wage freezes, exaggerating the appearance of wage rigidity. The upshot, of course, is that the nature of the bias depends on the presumed structure of response errors.[3]

The studies we review take a more direct, and we think more persuasive, approach to addressing concerns over measurement error, namely to seek more accurate data. Returning to the measurement goals posed by the literature on nominal wage rigidity, this requires access to longitudinal data that allow one to track individual workers, and the jobs they do, across years, and that contain accurate information on wages.

Our survey has identified 12 such sources of data for 11 countries. We distill relevant information from these in Table 1. For each study, the table summarizes the source of data used, the measure of wages employed,[4] and the percentages of job stayers recorded as receiving nominal wage cuts, and zero change in their nominal wages. In the remainder of this section, we

[3] Relatedly, an approach taken in a portion of the literature, exemplified by some of the work in Dickens et al. (2007), has been to attempt to correct for measurement error by imposing assumptions about the measurement error process.

[4] In most instances, the measure does not include non-wage compensation. In the United States, where fringe benefits such as employer-provided health insurance loom large, this is a potentially significant omission. Lebow, Saks, and Wilson (2003) have argued that fringe benefits are an additional dimension for adjustment in compensation, so overlooking them is likely to make total compensation seem less flexible than it actually is. A similar point applies to variation in work effort.

provide some wider context for the contents of Table 1, paying particular attention to how each study addresses the measurement challenges noted above, and their implications for the incidence of nominal wage changes and, thereby, the prevalence of downward nominal wage rigidity.

**Great Britain**

The first steps in the quest for more accurate wage data were taken in part of the British literature, and so we will begin there. The first row of our Table 1 summarizes the pioneering study by Smith (2000), who analyzed the 1991-1996 waves of the British Household Panel Study (BHPS). In many respects, the BHPS is a longitudinal household survey that resembles the PSID for the United States. And, indeed, Smith's initial results based on these data resembled those based on U.S. household surveys, measuring nontrivial minorities of respondents as receiving both wage cuts and wage freezes.

Smith's key discovery, however, was that the BHPS survey incorporated a feature that was, at the time, unique: respondents were allowed to check their pay slips when reporting their wages, and the survey recorded who did so. Smith's results thus provided a first glimpse of the implications of more accurate wage data for the prevalence of downward nominal wage rigidity.

The results were striking: Even among the subsample of respondents that consulted their pay slips, the incidence of nominal wage cuts remained considerable; the proportion with negative nominal wage change was 18 percent. By contrast, a much smaller fraction of the pay slip-seen subsample, just 5.6 percent, reported zero nominal wage change. Set in a context of low inflation rates—which averaged around 3 percent in Britain over Smith's sample period—the abundance of wage cuts and paucity of wage freezes is especially notable.

At the time, Smith was at pains to acknowledge surprise at her results: "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." Since then, however, evidence has amassed from a diverse range of sources that has served to vindicate Smith's early findings.

The first signs of this emerged from another British study. Inspired by Smith's results, Nickell and Quintini (2003) identified a further source of accurate wage data in the New Earnings Survey (NES) for Great Britain. The NES comprises a 1 percent sample of income tax-paying workers, defined by those whose National Insurance numbers end in a given pair of digits. Because the same pair of digits has been used since the survey's inception, the NES naturally allows one to track the same individuals over time. In the spirit of Smith's use of reports from pay slips, the NES data are also thought to provide unusually accurate information on individual earnings because the survey is administered to employers, who are legally required to report such information from their payroll records for a reference week each April.

But the NES data also come with additional methodological advantages over the BHPS. Accompanying the data on weekly earnings are employer-reported payroll data on employee work hours for the survey reference week, thereby permitting an analysis of hourly wages. Moreover, the NES records separate measures of components of earnings and hours, most notably those attributable to overtime. Since it is not obvious that, for example, reductions in hourly earnings associated with reductions in overtime should be interpreted as wage cuts, an advantage of the NES is that it allows one to focus on hourly wages exclusive of overtime. Finally, because the NES is based on a 1 percent sample of income tax-paying workers in Britain, the sample sizes it offers are large.

Nickell and Quintini's results dovetail reassuringly well with Smith's earlier findings. For the 1991-1996 period over which the two studies overlap, the NES data produce results that mirror closely those for the BHPS respondents that checked their pay slips. Moreover, widening their analysis to their full 1975-1999 sample period, Nickell and Quintini continued to find substantial numbers of nominal wage cuts, and a relative scarcity of nominal wage freezes.

Motivated by the onset and aftermath of the global financial crisis, our 2016 paper with Donggyun Shin replicated Nickell and Quintini's analysis, and provided an update through the Great Recession to the year 2012. As summarized here in the second row of Table 1, our measured percentages with nominal wage cuts ranged from a low of 4.9 in 1979-1980 (when inflation was around 20 percent) to a high of 23.5 in the wake of the Great Recession in both 2009-2010 and 2011-2012. Strikingly, the latter is by no means an aberration: over the last 20

years of the sample period, when the inflation rate in Britain hovered around 3 percent, the percentage of job stayers receiving nominal wage cuts was regularly close to 20 percent.

Mirroring this impression of downward flexibility, the incidence of zero nominal wage change is much smaller, varying from a low 0.4 percent in the high-inflation period of 1979-1980 to a high of 9.1 percent in 2011-2012, and remaining below 3 percent in most years of the sample.

Like Smith, we were intrigued by these findings, and they motivated us to question whether similar studies might be feasible for other countries. As the remaining rows of Table 1 attest, it turns out that a large body of such studies now exists, albeit one that has accumulated sporadically over a variety of journals spanning a range of fields of economics and that, in some cases, has become available only very recently.

**United States**

Of particular interest has been whether a similar study might be feasible for the United States. For a long time, this ambition seemed futile: Although it is possible to access individual earnings data from a few administrative sources in the United States, until recently it seemed that none contained the requisite data on individual hours to permit an analysis of hourly wages.

Thanks to the research of Kurmann, McEntarfer, and Spletzer (2016), however, considerable progress has been made on this seeming impasse. Their starting point was that employers are obliged to report payroll data to state unemployment insurance (UI) agencies in order to determine their employees' benefit entitlements in the event that they become unemployed and file a UI claim. In most states, this requires employers to report the quarterly earnings of their employees. The key discovery by Kurmann et al., however, was that a few states—Minnesota, Rhode Island, and Washington—also require employer reports on their employees' quarterly hours of work. Among these, the case of Washington is especially useful because UI benefit entitlement in that state depends on quarterly hours as well as quarterly earnings, so the reports of both variables are thought to be especially accurate. And because these data are a near-complete census of employees in the state, they allow a researcher to track over time the wages of employees who remain with the same employer.

Two research teams – Kurmann and McEntarfer (2017) and Jardim, Solon, and Vigdor (2018) – have used the Washington data to study job stayers' year-to-year changes in quarterly average hourly earnings, and both have obtained results similar to those in the British studies. The third row of Table 1 summarizes the results from Jardim et al., which are for the period 2005-2015. This period contains years before, during, and after the Great Recession, so although inflation was moderate throughout the period, business cycle conditions were wildly variable.

Even in the expansion periods, the percentage receiving nominal wage cuts was over 20 percent, with a minimum of 20.6 percent between the first quarters of 2006 and 2007. The percentage rose even higher during the Great Recession, with a high of 33.1 percent between the fourth quarters of 2008 and 2009. Mirroring this, the percentage receiving no nominal wage change is regularly below 4 percent, and otherwise varies from a low of 2.5 percent between the fourth quarters of 2006 and 2007, to a maximum of just 7.7 percent at the height of the recession between the second quarters of 2009 and 2010. Once again, we are struck by the extent to which these echo the British results summarized above.

A contrast with the British NES studies, however, is that the NES studies were able to adopt a wage measure that explicitly excludes overtime pay and hours. Since overtime cannot be separated out in the Washington data, it is possible that some of the wage cuts measured for Washington could reflect reductions in overtime. As we noted above, these arguably should not be interpreted economically as wage reductions. Jardim et al. therefore redid their analysis for a sub-sample that appeared to work 40 hours a week every week in each quarter. Even in this sub-sample, the frequency of nominal wage cuts was striking, ranging from a low of 14.5 percent between the third quarters of 2006 and 2007 to a high of 31.8 percent between the fourth quarters of 2008 and 2009.

**International Evidence from Other Countries**

The United States is somewhat of a latecomer to this type of research. As shown in the remainder of Table 1, payroll records or pay slips have been used to study job stayers' nominal wage changes in many other countries. An Irish study included evidence similar to Smith's pay-slip-based evidence for Great Britain. In Portugal and South Korea, the data were generated by government surveys of employers; and in Sweden, the employer surveys were conducted by an

employer association. As Table 1 documents, all of these studies allow an analysis of hourly wages similar to those we have summarized above for Great Britain and the United States.

In West Germany, Austria, Italy, Spain and Mexico, however, the data are taken from employers' reports to their countries' social security systems. Since social security provisions typically do not require information on hours worked, most of these studies instead have focused on measurement of a *daily* wage. In the German, Austrian, and Italian cases, this is computed as the ratio of annual earnings to days worked at a given employer. For Mexico, the daily wage is that measured on the last day of each quarter. Similarly, in the Spanish case, the wage measure is based on monthly earnings for individuals who worked for the entire month. To allay concerns that changes in measured daily wages reflect changes in hours worked per day, all but one of these studies (the Mexican case) additionally focuses on individuals recorded as working full-time in the administrative data.

Not surprisingly, the patterns vary considerably across countries. We think it is a fair summary, though, to say that, outside of conditions of very high price inflation, most of the countries continue to show substantial minorities of job stayers receiving nominal wage cuts, and much smaller minorities experiencing zero wage change.

According to the Italian study by Devicienti, Maida, and Sestito (2007), for example, in 1988-89, when inflation was a relatively high 6.5 percent, the percentage receiving nominal wage cuts was "only" 8 percent. In 1998-1999, when inflation was under 2 percent, the percentage receiving wage cuts was 18 percent. Qualitatively similar results are reported for West Germany by Bauer et al. (2007), and for Spain by OECD (2014), except that the percentage receiving wage cuts runs somewhat higher, peaking at 25 percent in 1995-1996 for West Germany, and at 31 percent in 2009-2010 in the aftermath of the especially severe Great Recession in Spain. For all three countries, the percentage of job stayers recorded with no wage change never rises much above 10 percent.

The Austrian evidence, kindly prepared for this survey by Andreas Steinhauer and Josef Zweimuller, again points to considerable prevalence of nominal wage cuts. Over a 2002-2012 sample period that rarely saw inflation rise above 3 percent, the percentage receiving nominal wage cuts ranged from 13 to 19 percent. Strikingly, nominal wage freezes are exceedingly rare in the Austrian data, affecting fewer than 2 percent of job stayers.

Inflation plays a particularly important role in the Mexican results reported by Castellanos, Garcia-Verdu, and Kaplan (2004). In the early part of their 1985-2001 sample period, when inflation was astronomical (going as high as almost 160 percent!), nominal wage cuts were extremely rare. At the end, when inflation was just starting to moderate to single digits, the percentage receiving wage cuts had risen to 11 percent. At the same time, aside from a few periods in which rises in the nominal minimum wage were delayed, no more than 17 percent of job stayers experienced no change in their nominal wage.

The outliers in Table 1 are especially instructive. At one extreme are the results reported by Doris, O'Neill, and Sweetman (2015) for Ireland, where the Great Recession hit especially hard and involved a price deflation. In 2009-2010, the percentage of job stayers receiving nominal wage cuts reached 50 percent! And, even in the depths of the crisis in Ireland, the incidence of nominal wage freezes rose no higher than 15 percent.

Park and Shin (2017) report a similarly extreme frequency of wage cuts in their results for South Korea, which affected as much as 56 percent of job stayers in 2008-2009, when both output growth and inflation were close to zero. An equally striking aspect of the South Korean data, however, is that the fraction of job stayers experiencing zero change in their nominal wage is negligible. The data for South Korea thus exhibit none of the empirical hallmarks of downward nominal wage rigidity, in precisely the macroeconomic context in which one would anticipate to find them.

At the other extreme is Portugal, where Carneiro, Portugal, and Varejao (2014) report that nominal wage cuts were "virtually non-existent" throughout the 1987-2009 period, affecting no more than 6 percent of job stayers. This makes a lot of sense because Portugal has a national law that explicitly prohibits such cuts. And, consistent with this, the incidence of nominal wage freezes in Portugal rises to unparalleled levels in Portugal during the Great Recession, with as many as three-quarters of job stayers recorded with zero change in their hourly pay.

At first blush, the situation seems somewhat similar in Sweden. For blue-collar workers, Ekberg (2004) reports that between 0.3 and 3.8 percent received hourly base wage cuts. He explains that, "given the framework of the terms of employment, it is impossible for the employers to cut wages unilaterally. Hence, a wage cut can only be achieved under mutual consent," and even then it cannot violate applicable collective bargaining agreements.

In stark contrast to the Portuguese case, however, almost none of these Swedish job stayers experiences a nominal pay freeze. Moreover, turning to white-collar Swedish workers, although Ekberg reports very low percentages with wage cuts at the beginning of his sample period (when inflation was in double digits and very few white-collar workers received any supplementary pay), by the end inflation was much lower, a majority of white-collar workers received some supplementary pay, and the percentage receiving pay cuts rose as high as 10 percent.

Thus, uniquely among the studies we survey, Portugal appears to be the canonical example of Keynes's premise that nominal wages cannot be cut. While nominal wage cuts also appear to be rare in Sweden, there is little evidence there for an associated buildup of wage freezes. Otherwise, the evidence accumulated from payroll records and pay slips suggests that nominal wage cuts occur more commonly than most of us had thought.

**Some Interesting Nuances**

Having found that nominal wage decreases occur with surprising frequency, we can inquire further about how they are distributed throughout the labor market. Recent findings suggest that the overall flexibility we report is still more pervasive, in two senses.

First, Elsby, Shin, and Solon (2016) point out that the nominal wage cuts observed in the British NES data "are remarkably pervasive across sub-groups 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." The Washington State study by Jardim, Solon, and Vigdor (2018) also presents some disaggregated analyses, and it similarly finds that the common occurrence of nominal wage cuts is pervasive across both industries and firm sizes. For example, even in the utilities industry – the industry that tends to show the fewest nominal wage cuts – the percentage receiving cuts was almost always above 15 percent.

Second, recent studies with access to rich employer-employee matched data have begun to investigate whether firms cutting wages do so for nearly all their workers or target the cuts on

selected sub-groups. For example, if 20 percent of all the job stayers in a particular period show wage cuts, this could happen because 20 percent of the stayers in every firm receive wage cuts. Or it could happen because the cuts occur universally in firms that employ 20 percent of stayers, and not at all in other firms. Where between these extremes does the reality lie? To explore this question with the Washington State data, Jardim et al. created for each job stayer receiving a wage cut the following variable – the percentage of that worker's job-staying co-workers that also received a wage cut in the same period. In every period studied, it turned out that the majority of job stayers receiving nominal wage cuts worked for firms that cut the wages of between 10 and 50 percent of their job stayers. Jardim et al. also noted a tendency for these selective wage cuts to be more concentrated in the upper half of within-firm wage distributions.

Likewise, Park and Shin (2017) have reported similar findings for South Korea, noting that the prevalence of nominal wage cuts summarized in Table 1 stems from "a majority of employers cutting a fraction of their workers' wages fairly routinely."

We regard these details as promising points of departure for further research. They suggest that nominal wage cuts are not only surprisingly common, but also broadly distributed across sectors and firms.

## Summary and Discussion

For more than 80 years, many influential macroeconomic analyses of the labor market have been premised on the assumption that nominal wages cannot be cut. Some classic studies that used longitudinal household surveys to track job stayers from year to year measured a high incidence of nominal wage cuts, but this evidence reasonably was discounted on the ground that the measurement of frequent wage cuts could be an artifact of response error.

The main point of the present article has been to synthesize a more recent international collection of studies that have resorted to more accurate wage data from employers' payroll records and pay slips. Outside of circumstances where nominal wage cuts have been legally prohibited or rendered irrelevant by very high price inflation, most of this evidence has continued to show that nominal wage cuts occur more frequently than commonly has been supposed.

Most of us are surprised by this finding, not only because of the persistent influence of Keynes's contrary assumption in *The General Theory*, but also because introspection, casual empiricism, and Bewley's interviews tell us that workers really do dislike nominal wage cuts and employers therefore are reluctant to impose them. But is this obvious aversion to wage cuts so extreme as to bind even when inefficient layoffs into unemployment are the alternative? The accumulated international evidence showing that nominal wage cuts occur frequently should inspire a reconsideration of the commonly invoked assumption that nominal wages *cannot* be cut even when efficiency of allocation decisions is at stake.

Of course, because the evidence reviewed here is based on longitudinal tracking of job stayers, it pertains directly only to wage rigidity for incumbent workers. As discussed above, a related question is how flexible wages are for the hiring of new workers. Some recent models have assumed that wage rigidity for incumbents spills over into wage rigidity for new hires. In that light, the evidence reported here is indirectly pertinent for hiring wages. If nominal wage cuts are feasible for incumbent workers, why would they not be for hiring wages?

The development of theoretically coherent and empirically relevant accounts of what happens in the labor market over the business cycle remains a crucial mission for economic research. We hope to support that effort by providing a more accurate picture of the frequency and nature of nominal wage cuts.

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Table 1. Percentages of Job Stayers[a] Receiving Year-to-Year Nominal Wage Cuts and Freezes

| Study | Data Source | Wage Measure | Percentage Receiving Wage Cuts | Percentage Receiving Wage Freezes |
|---|---|---|---|---|
| Smith (2000) | British Household Panel Study, 1991-96 | Usual weekly pay from recent pay slip | 17.8 | 5.6 |
| Elsby, Shin, and Solon (2016) | British New Earnings Survey, 1975-2012 | Earnings/hours excluding overtime for reference week in April | 4.9[b] to 23.5 | 0.4[b] to 9.1 |
| Jardim, Solon, and Vigdor (2018) | Washington State unemployment insurance records, 2005-15 | Quarterly earnings/hours | 20.4 to 33.1 | 2.5 to 7.7 |
| Bauer et al. (2007) | W. German IABS-R from social security records, 1975-76, 1980-81, …, 2000-01 | Annual earnings/work days for full-time workers employed on July 1 | 9.4 to 24.9 | 3.9 to 11.2 |
| Courtesy of Steinhauer and Zweimuller (2018) | Austrian Social Security Database, 2002-12 | Annual earnings/work days for full-time workers employed on March 15 | 13.0 to 18.6 | 0.1 to 1.5 |
| Devicienti, Maida, and Sestito (2007) | Worker History Italian Panel from social security records, 1988-89 and 1998-99 | Annual earnings/work days for full-time workers | 7.7 and 18.3 | 4.0 and 8.5 |
| OECD (2014), courtesy of Jansen, Jimenez and Garcia Pérez | Spanish Muestra Continua de Vidas Laborales from social security records, 2007-10 | Monthly earnings for full-time full-month workers | 18.0 to 31.0 | 1.8 to 8.4 |
| Castellanos, Garcia-Verdu, and Kaplan (2004) | Mexican Social Security Institute records, 1985-2001 | Daily comprehensive[c] wage on last day of quarter | 0.2[b] to 10.7 | 3.9[b] to 16.5[d] |
| Doris, O'Neill, and Sweetman (2015) | Irish EU Survey of Income and Living Conditions, 2006-11 | Earnings/hours from recent pay slip for full-time full-year workers[e] | 24.5 to 50.1 | 3.3 to 14.2 |
| Park and Shin (2017) | S. Korean Survey of Labor Conditions by Type of Employment, 2008-13 | Monthly earnings/hours excluding overtime and incentive pay in June | 25.3 to 56.0 | 0.0 to 0.2 |
| Carneiro, Portugal, and Varejao (2014) | Portuguese Quadros de Pessoal, 1986-89, 1991-2000, 2002-16 | Monthly base wage/normal monthly hours for full-time workers in reference month[f] | 2.2 to 6.3 | 3.2 to 76.0 |

| | | | | |
|---|---|---|---|---|
| Ekberg (2004) | Employer surveys by Confederation of Swedish Enterprise, 1970-90 and 1995-99 | White-collar: comprehensive[g] earnings/hours in reference month; blue-collar: hourly base wage in second quarter | White-collar: 0.1[b] to 10.0<br><br>Blue-collar: 0.3[b] to 3.9 | White-collar: 0.2[b] to 6.0<br><br>Blue-collar: 0.0[b] to 0.3 |

[a] Job stayers are defined as workers staying with the same employer except that the British, Irish, Korean, and Swedish studies also require that the workers stay in the same job within the firm.

[b] These data points correspond to periods of high inflation. The highlighted figures relate to 1979-80 for the Great Britain, when the inflation rate reached 20 percent; a period of hyperinflation in Mexico in the 1980s; and a period from the mid-1970s to the early 1980s in Sweden, when the inflation rate regularly reached double digits.

[c] The Mexican wage measure "is a comprehensive measure of wages plus benefits, including payments made in cash, bonuses, premiums, room and board, commissions, benefits in kind and any other amount paid or benefit received."

[d] These exclude three outliers in 1991:4-1992:4, 1996:4-1997:4, and 1998:4-1999:4 when increases in nominal minimum wages were not synchronized with the reporting dates. In each of these cases, the incidence of wage freezes exceeded 30 percent, at the expense of similar declines in the incidence of wage increases.

[e] The results from pay slips on earnings per hour are not reported in the published paper, but were kindly provided to us by Aedin Doris.

[f] Additional results not reported in the published paper were kindly provided to us by Pedro Portugal.

[g] The wage measure we cite for Swedish white-collar workers includes overtime, bonuses, and fringe benefits. Our reported percentage receiving wage cuts is a weighted average of the percentages Ekberg reports for white-collar workers who do and do not receive such supplementary payments.