Why did we think wages are so rigid for all those years?

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May 13, 2026

Abstract

The large spike at zero in the distribution of year-to-year nominal wage changes in household surveys has long been seen as evidence of nominal wage rigidity. But more recent estimates from administrative data find much less rigidity. We show that measurement error in household surveys likely exaggerates estimates of wage rigidity due to workers rounding their reported wages. Using U.S. Current Population Survey data, we adjust for potential rounding behavior and find that the zero-change spike falls from 15–20 percent to 7–14 percent, aligning closely with estimates from administrative data.

Keywords: Downward nominal wage rigidity; Nominal wage change distribution; Measurement error; Household survey data

JEL Classification: E24, E32, J31.

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1 Introduction

Sticky prices and wages are a core microfoundation in modern macroeconomic models linking inflation and unemployment.[1] A large literature has examined downward nominal wage rigidity (DNWR) using microdata. Classic studies find a prominent spike at zero in the distribution of year-to-year nominal wage changes in household survey data—indicating a high degree of nominal wage rigidity (Kahn, 1997; McLaughlin, 1994; Card and Hyslop, 1996; Gottschalk, 2005).[2] For example, Card and Hyslop (1996) report that about 15 percent of job stayers in the 1980s saw no nominal wage change.

Since household surveys are prone to reporting errors (Elsby et al., 2016), the recent literature has shifted to employers' payroll records and payslips in administrative data for more accurate estimations. These results show much lower rates of zero nominal wage changes—2.5-7.7 percent of workers in Washington State unemployment insurance records (Jardim et al., 2019); and about 7 percent before the Great Recession and a higher 15 percent after the recession using data from Longitudinal Employer Household Dynamics (Kurmann and McEntarfer, 2019).[3]

This paper quantifies the extent to which rounding in self-reported wages overstates survey estimates of DNWR, and asks whether this measurement error ac-

[1] Nominal rigidity is a key feature in the New Keynesian framework as discussed in Galí (2015). It remains the core element in many recent developments of macroeconomic theory. Some examples include Schmitt-Grohé and Uribe (2016); Blanco et al. (2024); Auclert et al. (2024); Dupraz et al. (2025).

[2] Apart from estimating the degree of DNWR, many studies examine the empirical behavior of wage rigidity along the business cycle. These include Card and Hyslop (1996); Daly and Hobijn (2014); Jo (2025).

[3] Another important recent paper, Grigsby et al. (2021), uses administrative data from ADP, a major payroll processing company in the U.S., to study the cyclical characteristics of nominal wage adjustments. While Grigsby et al. (2021) focuses on the changes in base wage, our results after accounting for potential rounding behaviors are also in line with their reported wage rigidity using total hourly wages (base wage plus overtime and bonuses).

counts for the discrepancy with estimates from administrative data. Using U.S. Current Population Survey (CPS) data from 1979 to 2022, we construct the standard distribution of year-to-year wage changes, as in Card and Hyslop (1996), then exclude respondents who likely rounded their hourly wages to whole or half dollars in consecutive years.[4] This adjustment reduces the share of zero nominal wage changes by about one third—from 15 percent to under 10 percent for whole-dollar rounding, and further reduction when half-dollar rounding is excluded. These adjusted estimates align closely with the estimates from U.S. administrative data (Grigsby et al., 2021; Jardim et al., 2019; Kurmann and McEntarfer, 2019).

Previous studies, such as Gottschalk (2005), have addressed some measurement errors in household surveys, but few have specifically examined how rounding in reported wages affects estimates of DNWR. Despite our common goal of addressing measurement errors in survey data, our approach focuses on a different aspect of measurement errors than Gottschalk (2005). In Gottschalk (2005), measurement error introduces more noise to recorded wages and reduces DNWR, and it is addressed by identifying the structural breaks in the wage series. In this paper, we focus on the recall errors that are more likely to artificially inflate survey estimates of DNWR.

This paper proceeds as follows. Section 2 describes the data and empirical strategy. Section 3 presents results. Section 4 concludes.

[4] Schwabish (2007) examines the likelihood of rounding of reported earnings in the CPS. The author classifies a reported earning as rounded when the value is an integer after divided by 5,000. Here, we define rounding more restrictively as consecutive reporting of wages and earnings in integers.

2 Data and empirical strategy

2.1 Data

To connect recent administrative evidence on wage rigidity with earlier survey-based studies, we use the Current Population Survey (CPS), the same source as Card and Hyslop (1996). Respondents are interviewed for four consecutive months, with earnings information collected in the final month. Roughly half are reinterviewed twelve months later, allowing us to construct year-to-year wage changes. Each monthly survey contains information from about 65,000 households. Our sample spans 1979–2022, extending the original period of Card and Hyslop (1996) (1979–1993).

We follow Card and Hyslop (1996) in their definition of job stayers, defined as workers reporting the same two-digit industry and occupation across years. Since 1994, the CPS identifies same-employer status only month-to-month, so this definition remains necessary. We extend our analysis from hourly-paid workers as in Card and Hyslop (1996) to include non-hourly-paid workers, for whom hourly wages are computed as weekly earnings divided by usual weekly hours. We drop all proxy respondents. Given our definition of hourly wage, our results are directly comparable to Jardim et al. (2019) and Kurmann and McEntarfer (2019), which share the same definition.

2.2 Correcting for rounding errors

The spike in the zero nominal wage change is the central measure of DNWR. However, because respondents self-report their earnings in household surveys, rounding can artificially inflate this spike and overstate the degree of wage rigidity. For instance, a worker earning \$9.80 in year $t-1$ and \$10.30 in year t might report

$10 in both years, masking a true 5 percent wage increase.

To account for potential rounding behavior, we classify workers as potential rounders if they report their wages in full dollars in consecutive years. For those reporting weekly earnings, we apply the same rule to full-dollar values. We then re-estimate the distribution of wage changes after excluding these cases. We also repeat the exercise allowing for rounding to half-dollars.

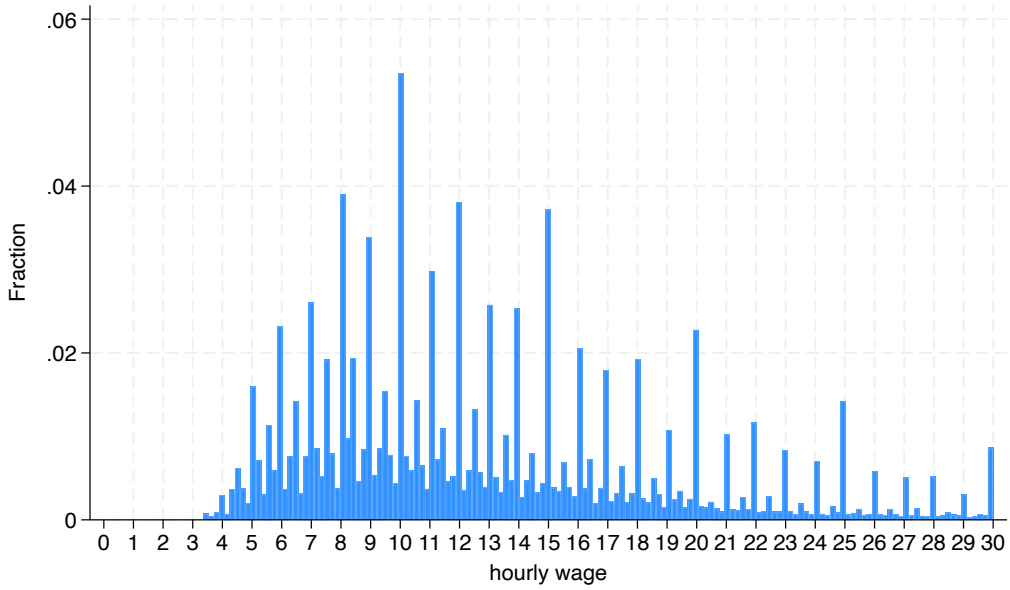
In fact, reporting hourly wages in full and half dollars is very common in the CPS and widely spread across all levels of wages, as shown by the bunching patterns in the hourly wage distribution in Figure 1. Comparing the wage distributions with our definition of potential rounding behavior (Figure A1), we see that rounding behaviors are not confined within a small range of wages but a general feature. The wage distribution of non-rounders also keeps a similar shape as Figure 1. In our sample, 29.5 percent of workers report consecutive full-dollar wages, and 43.3 percent report either full- or half-dollar values. While some of these reflect true wages, the prevalence suggests widespread rounding. Comparing the wage change distributions with and without rounding allows us to assess the extent to which rounding behavior drives the observed spike at zero nominal wage change.

3 Results

3.1 Nominal wage rigidity in the full sample

Figure 2 replicates Card and Hyslop (1996) and extends it to more recent years, showing the distributions of year-to-year nominal wage changes in selected years. The vertical line at π indicates the level of zero real wage change of that year, where π is the CPI inflation rate. For clarity, we restrict the x-axis to -0.35 to 0.35.

Figure 1: Nominal hourly wage reported in the CPS (1989-2022)

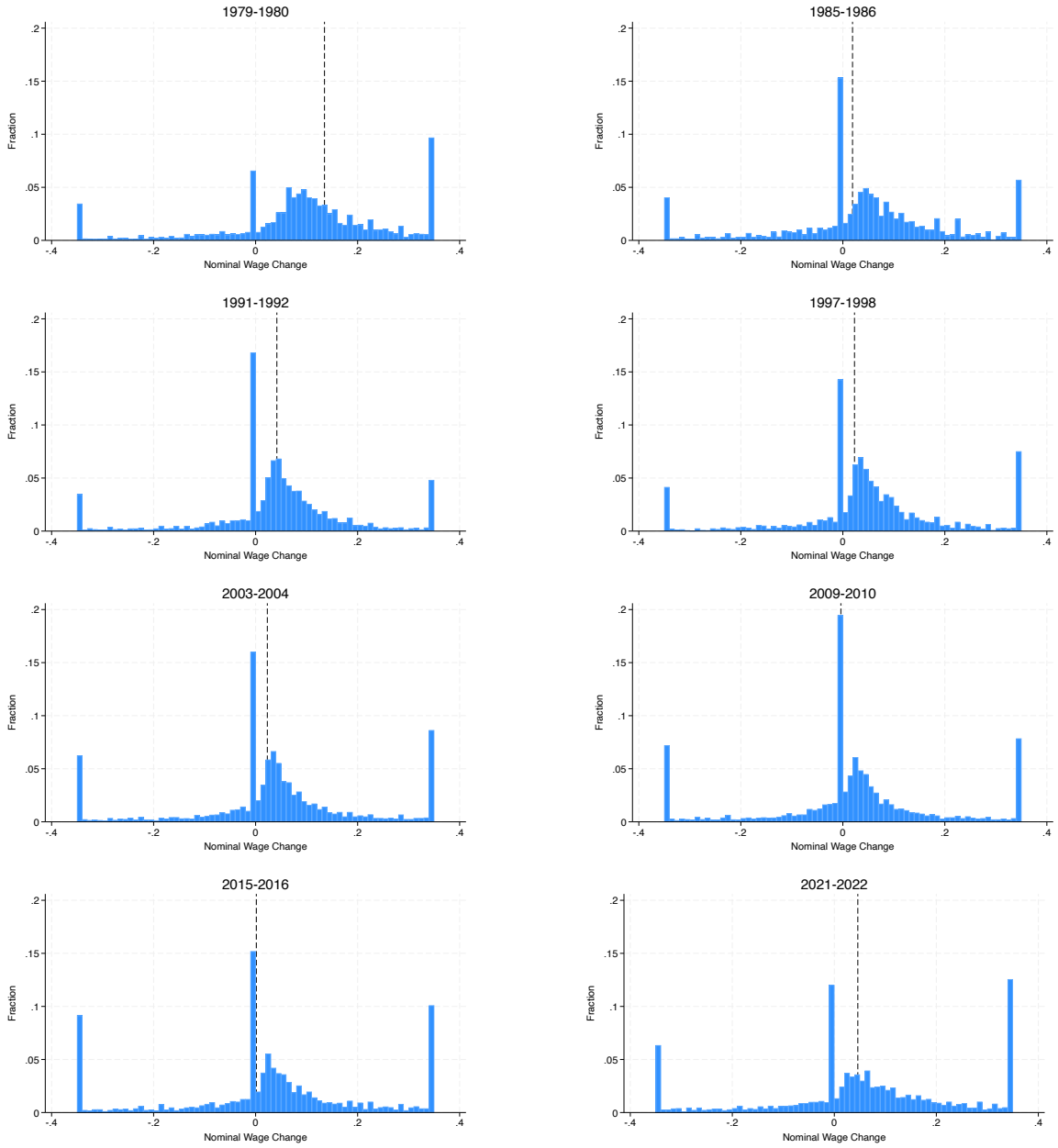


Two observations stand out from the distributions across all years. First, there is a large spike at zero in the nominal wage change distribution. Specifically, about 15 to 20 percent of workers reported zero nominal wage changes each year. Second, the lower mass to the left of the spike at zero indicates that fewer workers received a cut in their nominal wages. Previous studies have interpreted these observations as empirical support for substantial DNWR.

3.2 Nominal wage rigidity after excluding potential rounders

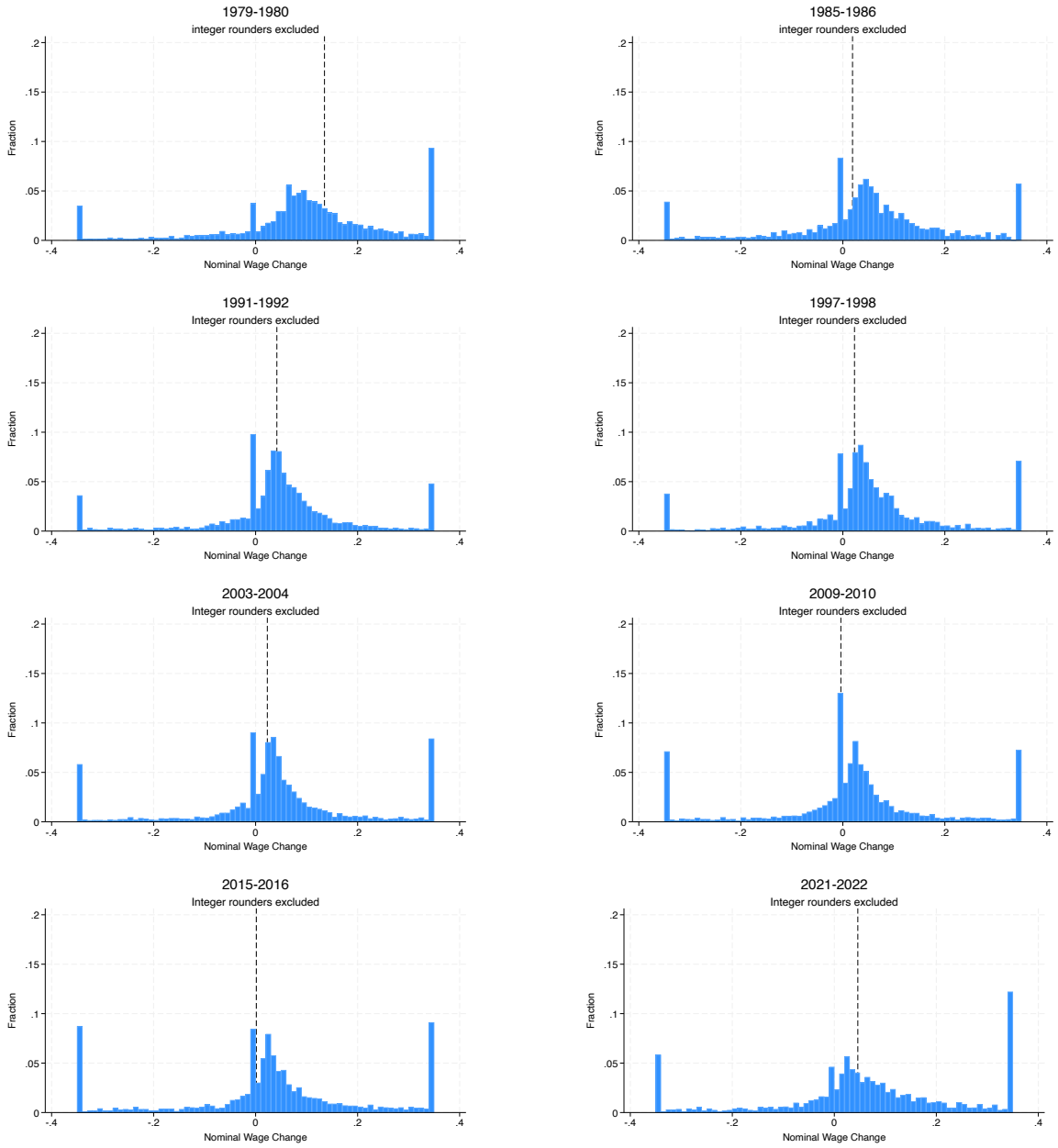
Figure 3 shows the nominal wage change distributions after excluding workers who reported full-dollar wages in consecutive years. Compared to Figure 2, the spike at zero falls by about one-third: from 15-20 percent to 7-14 percent. Accounting also for half-dollar rounding lowers the spike further to 4-11 percent, as presented in Figure A2. In some years, the spike nearly disappears, suggesting a low degree of nominal wage rigidity. The result is robust when extended to

Figure 2: Year-to-year wage change with full sample



Note: Figures show the year-to-year log difference in nominal wage with the full sample of job stayers, defined as workers employed in the same industry and occupations. The vertical dash line indicates the inflation rate on the x-axis of that year.

Figure 3: Year-to-year wage change with rounding to integers removed



Note: Figures show the year-to-year log difference in nominal wage after accounting for individuals who reported wages in full dollars in consecutive years. The vertical dash line indicates the inflation rate on the x-axis of that year.

Table 1: Comparing with results using U.S. data in the literature

Study	Data source	Wage measure	Percentage receiving wage cuts	Percentage receiving wage freezes
This paper	CPS with rounding correction, 1979–2022	Reported hourly wages	15–31	8-10 (1980s) 8-11 (1990s) 7-10 (2000s) 9-14 (2010s)
Jardim, Solon, and Vigdor (2019)	Washington State unemployment insurance records, 2005–2015	Quarterly earnings/hours	20.4–33.1	2.5–7.7
Kurmann and McEntarfer (2019)	Longitudinal Employer Household Dynamics (Washington State), 1998–2014	Quarterly earnings/hours	20–30	7-8 (pre-2009) 11-16 (post-2009)
Grigsby, Hurst, and Yildirmaz (2021)	ADP Payroll Data, 2008-2016	Base hourly earnings, Average total hourly earnings	3.9 (Base earnings) 17.2 (Average earnings)	35 (Base earnings) 10-15 (Average earnings)

non-hourly-paid workers, as shown in Figure A7 in the Appendix. Based on these results, we conclude that without accounting for the potential rounding behaviors, the degree of nominal wage rigidity as measured by the spike using household survey data is significantly overstated.

The degree of rigidity that we find after correcting for potential rounding behaviors is consistent with the estimates reported in Grigsby et al. (2021) (using base wage plus bonus and overtime), Jardim et al. (2019), and Kurmann and McEntarfer (2019) using U.S. administrative data, as we summarize in Table 1. In addition, our estimates closely replicate the increase in nominal wage rigidity after the Great Recession reported in Kurmann and McEntarfer (2019). After adjusting for potential rounding behaviors, around 7-10 percent of workers had zero nominal wage change from 2000 to 2008. This share increased to above 14 percent after the Great Recession in 2010.

Although rounding behaviors lead to overstating the number of zero nominal wage changes (the spike), it does not change the asymmetric nature of the wage

change distribution. The drop in the density to the left of zero nominal wage changes remains after we account for the potential rounding behaviors. Specifically, the share of workers receiving nominal wage cuts since 1990 only increased mildly after accounting for potential rounding behaviors, as presented in Figure A3. Our estimates show the share of workers receiving nominal wage cuts ranges between 15 and 31 percent in most years since 1990, consistent with the range reported in Jardim et al. (2019) and Kurmann and McEntarfer (2019).

3.3 Characteristics of rounders and non-rounders

The key assumption of the exercise hinges on the reported wages in integers (or .5) differing from the actual wages. The drivers behind the rounding behavior are irrelevant to our results. Nonetheless, we compare the observed characteristics of rounders and non-rounders in Table 2. The two groups of workers have similar ages, shares from white ethnic groups, and shares of married individuals. Under our classification criteria of rounding behavior, we see that rounders are more likely to be men, workers with college degrees, and earn higher hourly wages. It would be a concern if these workers sort into jobs that pay in full dollars and are indeed more rigid in their wages. This is consistent with the findings of Schwabish (2007) about the characteristics of rounding behavior in the CPS.

Rigidity can come from industry or occupational practices that always pay workers in full dollars. In Figure A4, we compare the share of rounders and non-rounders across 1-digit industry and occupational distribution. Despite the similar industry and occupation distributions between rounders and non-rounders, rounders are more present in construction, while non-rounders are more concentrated in manufacturing and wholesale and retail sectors. In addition, rounders are more likely to be in managerial and professional occupations.

Table 2: Summary statistics of workers with potential rounding behaviors

	Not Rounded		Rounded		Full Sample	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Female	0.64	0.48	0.55	0.50	0.61	0.49
Age	44.07	12.73	44.69	12.85	44.25	12.77
White	0.81	0.39	0.79	0.41	0.80	0.40
College degree	0.15	0.36	0.23	0.42	0.18	0.38
Married	0.47	0.50	0.48	0.50	0.48	0.50
Hourly wage	14.91	8.50	18.58	11.07	15.99	9.49
Observations	216,956		83,723		300,679	

Note: This table presents workers' characteristics in CPS data from 1990 to 2022. Only individuals who report wages for consecutive years are included in the full sample. A worker is classified as exhibiting potential rounding behaviors when the individual reports hourly wages in full dollars for consecutive years.

To address the concern that our result is driven by removing more rigid wages in some industries or occupations that also pay wages in full dollars, we examine the nominal wage change distribution with and without rounders by industries and occupations in Figure A5 and A6, pooling the year-to-year changes from 1989 to 2022. Across all industries and occupation categories, we see a general reduction in zero nominal wage change when rounders are excluded. This indicates our results are not driven by removing observations from sectors or occupations with higher wage rigidity that commonly pay in full dollars. Nonetheless, our estimates after accounting for rounding behaviors provide a reasonable lower bound of the wage rigidity.

3.4 Discussion

A shortcoming of using the CPS to estimate wage rigidity is the difficulty of directly identifying job stayers. In this paper, we follow Card and Hyslop (1996) and identify people with the same industry and occupation code in consecutive years as job stayers. Since job movers are more flexible in their wages, our es-

timates can be biased downward due to the inability to exactly identifying job stayers. Nonetheless, our estimates can still serve as a lower bound of wage rigidity. Carrillo-Tudela et al. (2025) points out that the CPS records of occupations are often incorrectly reported due to its survey method, and thus substantially increases the observed occupational mobility in the CPS. The miscoding is the most apparent in samples collected before the 1994 survey redesign, after which the CPS asked respondents to report their occupations dependent on their previous answers.

We believe this misassignment of occupation codes has limited effect on our results. First, since the miscoding of occupation codes overstates occupational mobility instead of underreporting it, most job stayers under our definition are not miscoded. Unless miscoded stayers both had more rigid wages and were more likely to avoid rounding than the observed job stayers, it would not affect our main estimates. Second, as the CPS redesigned its survey method to dependent reporting after 1994, the miscoding of occupation in the CPS samples since 1994 has been substantially mitigated.

Since April 2023, the CPS no longer releases actual wages of respondents, instead providing new rounded variables (hourwage2, earnweek2) for compliance with privacy requirements.[5] Since the CPS also constructs these new variables for pre-2023 data, we validate our results with these new rounded variables. Although the share of identified rounders increases from 25 percent to 47 percent, our main estimates of wage rigidity remain robust, see Figure A8 and A9 in the appendix. In addition, the wage change distributions of workers who are only classified as rounders because of the CPS adjustments look similar to those of the full sample,

[5]CPS creates a new variable ("hourwage2") that sets hourly earnings between \$0.01 and \$0.07 to \$0.05; hourly earnings between \$0.08 and \$29.99 to the nearest \$0.05; those between \$30.00 and \$49.99 to the nearest \$0.25; \$50.00 or higher are rounded to the nearest \$0.50.

as shown in Figure A10 in the Appendix. Hence, our method remains applicable to future samples when applied to the new rounded earnings variables in the CPS.

4 Conclusion

One of the most important pieces of empirical evidence for nominal wage rigidity is the tall spike at zero nominal wage change in the distribution of year-to-year wage changes. In this paper, we propose a simple adjustment to the CPS data to account for rounding in reported wages. Following Card and Hyslop (1996), we construct distributions of year-to-year wage change, then exclude individuals whose reported wages suggest rounding.

After excluding rounders, the shares of workers with zero nominal wage changes reduce from 15-20 percent to 7-14 percent, and to as little as 4-11 percent when rounding to half dollars (.5) is also accounted for. These corrected estimates align closely with the results reported in Grigsby et al. (2021) (using base wage plus bonus and overtime), Jardim et al. (2019), and Kurmann and McEntarfer (2019) using U.S. administrative data.

We conclude that rounding is a major source of measurement error in household surveys. Once rounding is accounted for, household surveys remain a useful and accessible data source for measuring nominal wage rigidity. However, without appropriately correcting for rounding, these data overstate the degree of nominal wage rigidity, which may have contributed to overly firm beliefs in rigid wages.

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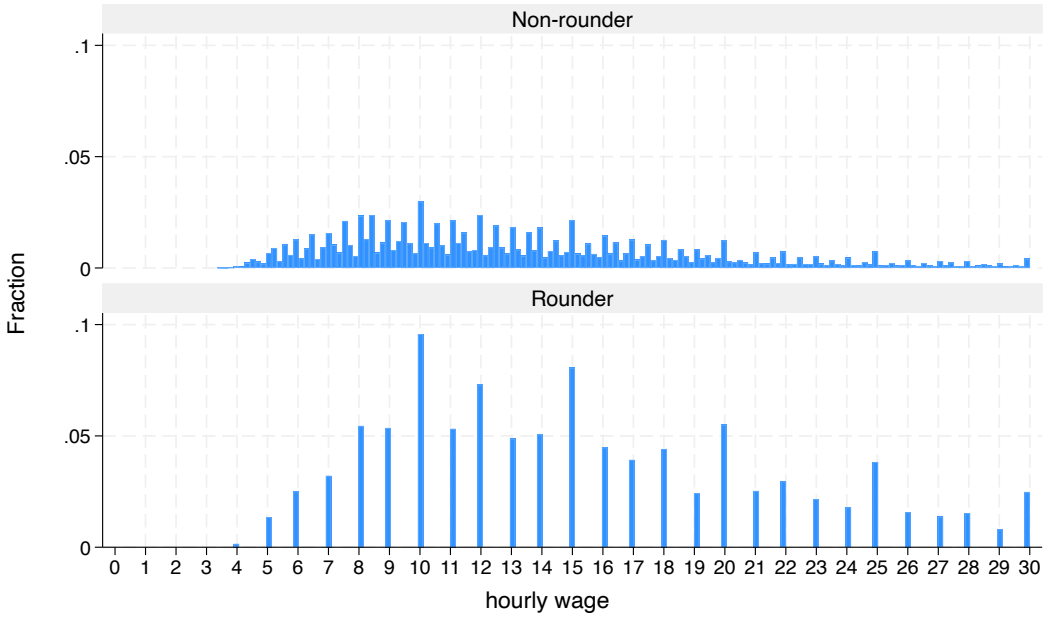
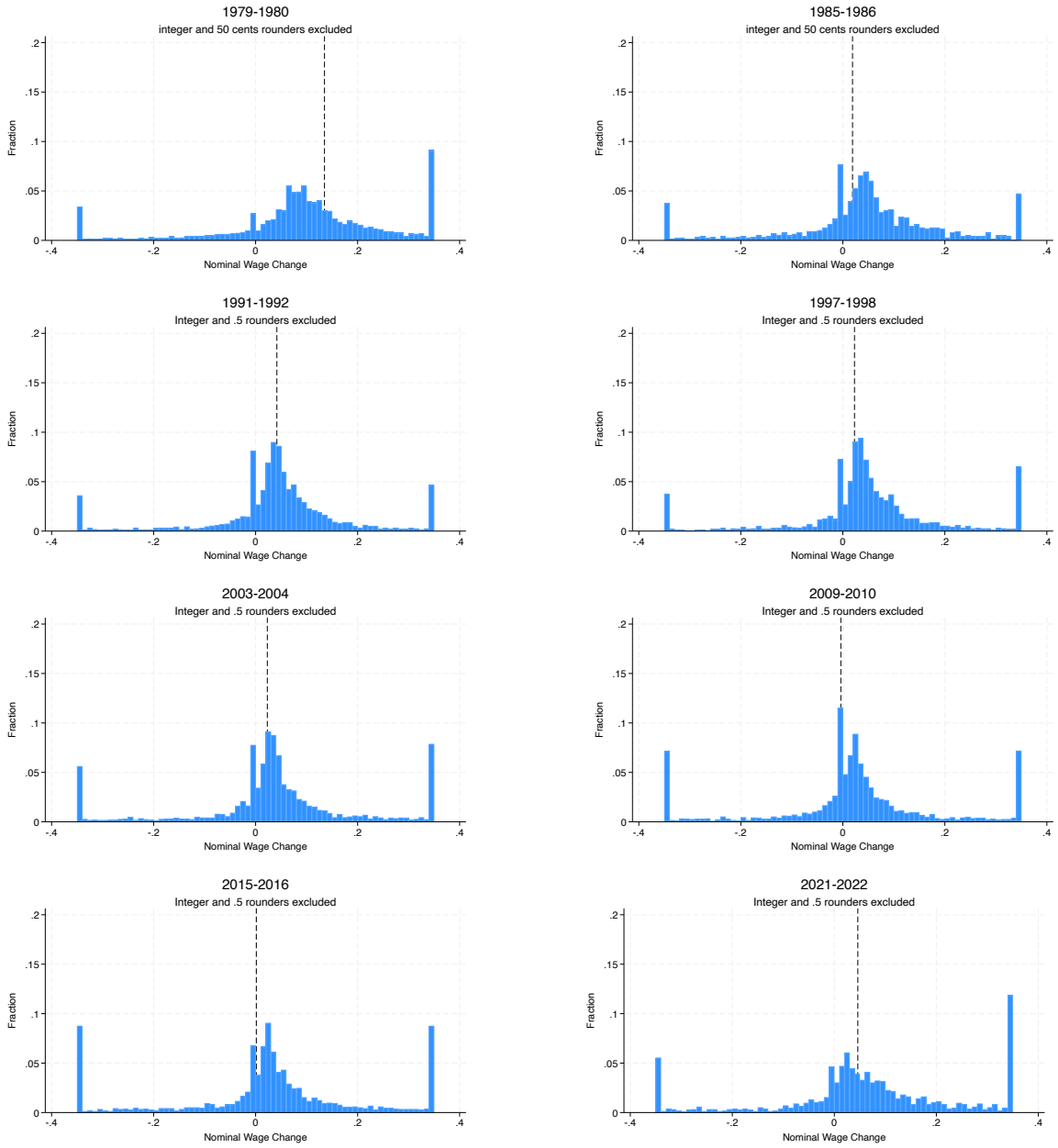
A Additional Figures and Tables

Figure A1: Nominal hourly wage by potential rounding behavior (1989-2022)



Note: These figures compare the nominal wage distribution of the CPS from 1989-2022 by the potential rounding behaviors. A person is classified as a rounder if the person reported hourly wages in full dollar in consecutive years. The upper panel shows the wage distribution of non-rounders; the lower panel shows the wage distribution of rounders.

Figure A2: Year-to-year wage change with rounding to integers and .5 removed

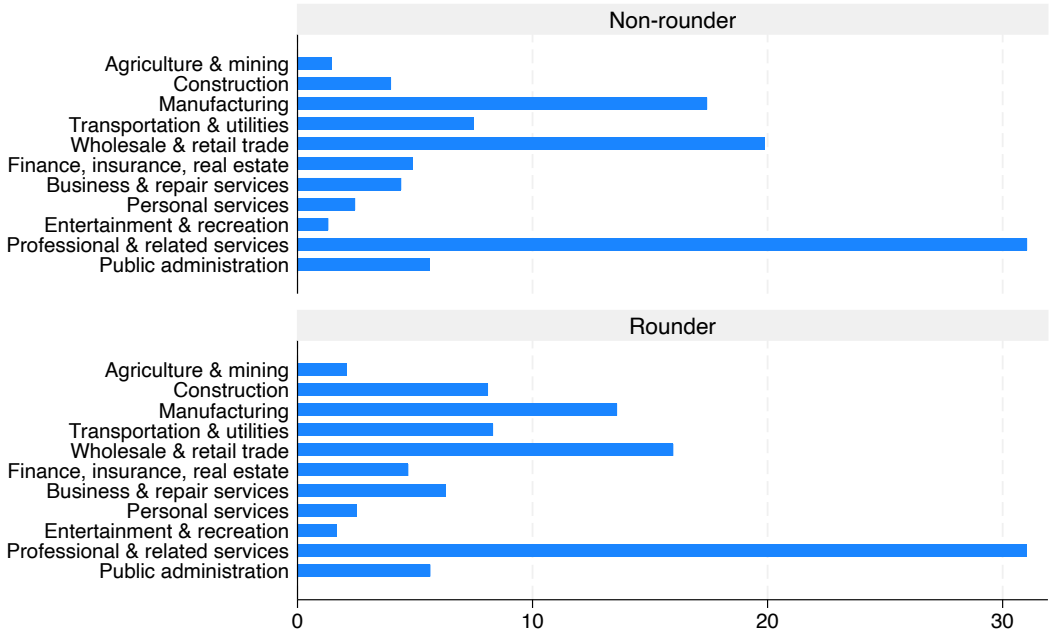


Note: Figures show the year-to-year log difference in nominal wage after accounting for individuals who reported wages in full and half dollars in consecutive years. The vertical dash line indicates the inflation rate on the x-axis of that year.

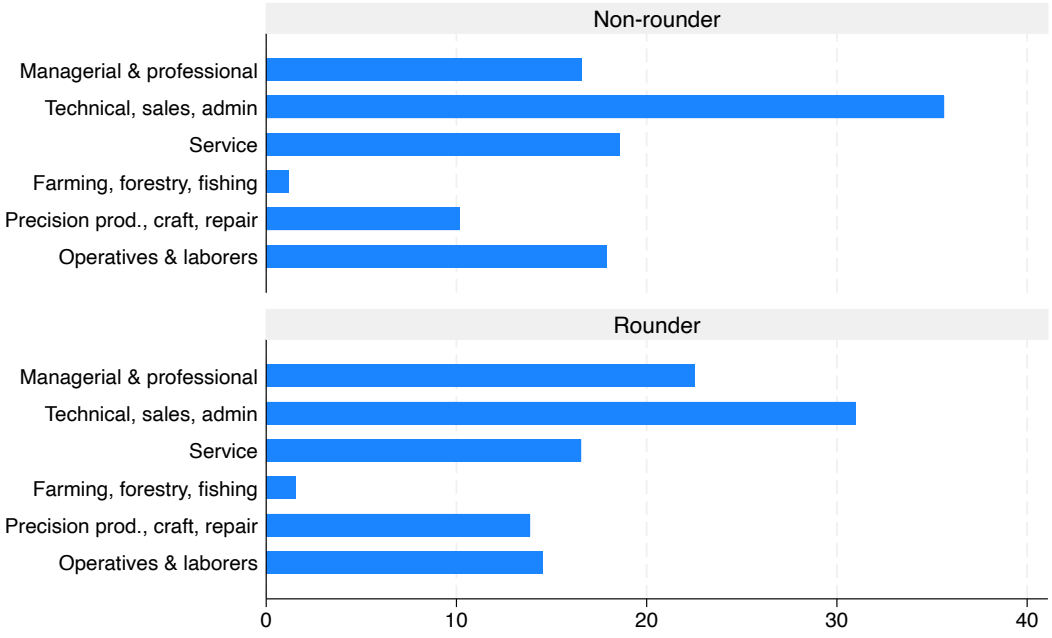
Figure A3: Share of workers receiving nominal wage cut

Note: The figure shows the share of workers receiving nominal wage cut in the CPS sample. The full sample consists of all individuals with wage recorded in consecutive years. The solid line represents share receiving nominal wage cut in the full sample. The dash line represents the share when workers with potential rounding behaviors to full dollar are removed from full sample. The short dash line represents the share when those with rounding to full and half dollars are removed from the full sample.

Figure A4: Employment Distribution by Rounder Status



(a) Employment share across industries



(b) Employment share across occupations

Figure A5: Year-to-year nominal wage change of selected industries (1989-2022)

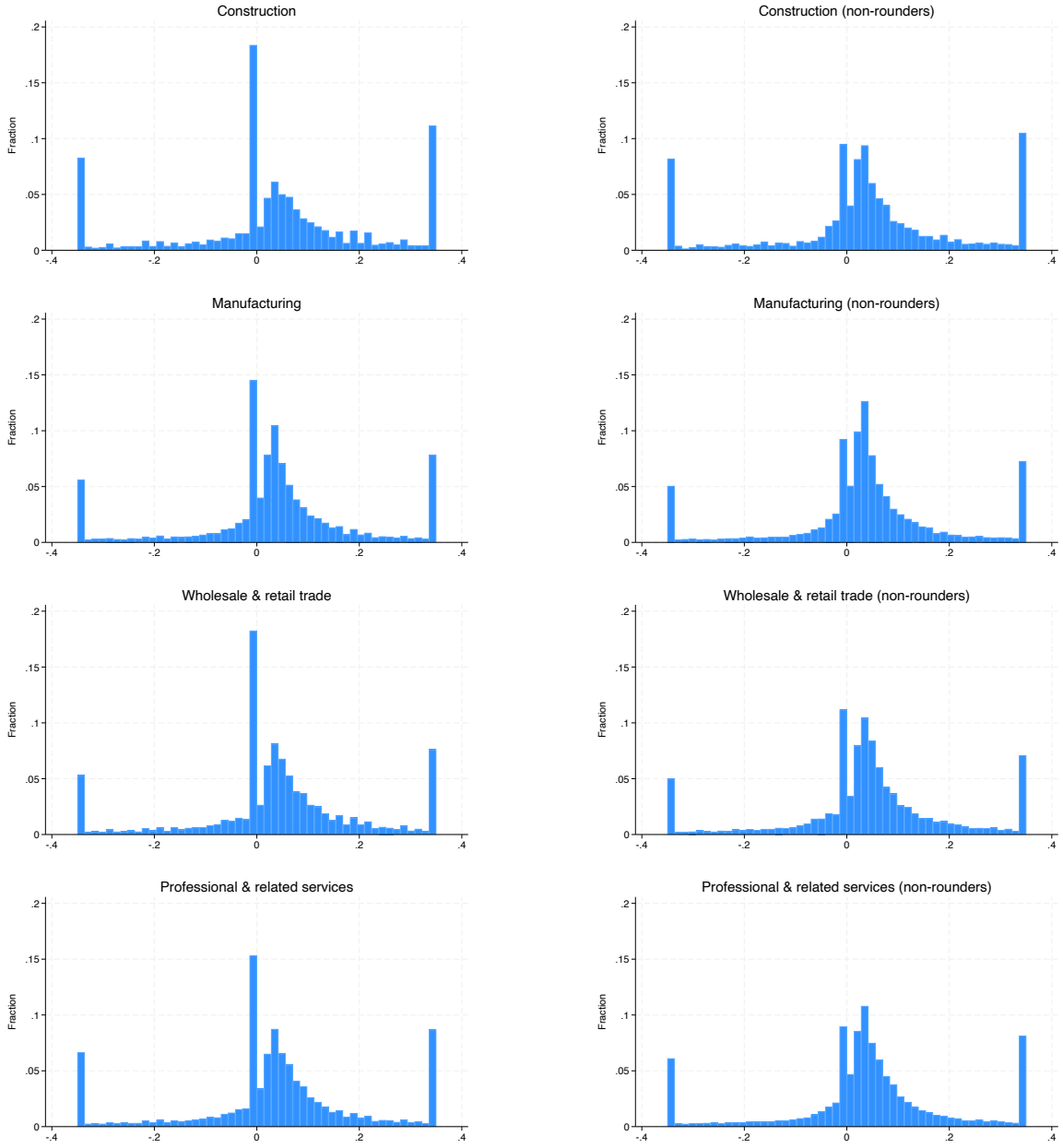


Figure A6: Year-to-year nominal wage change of main occupations (1989-2022)

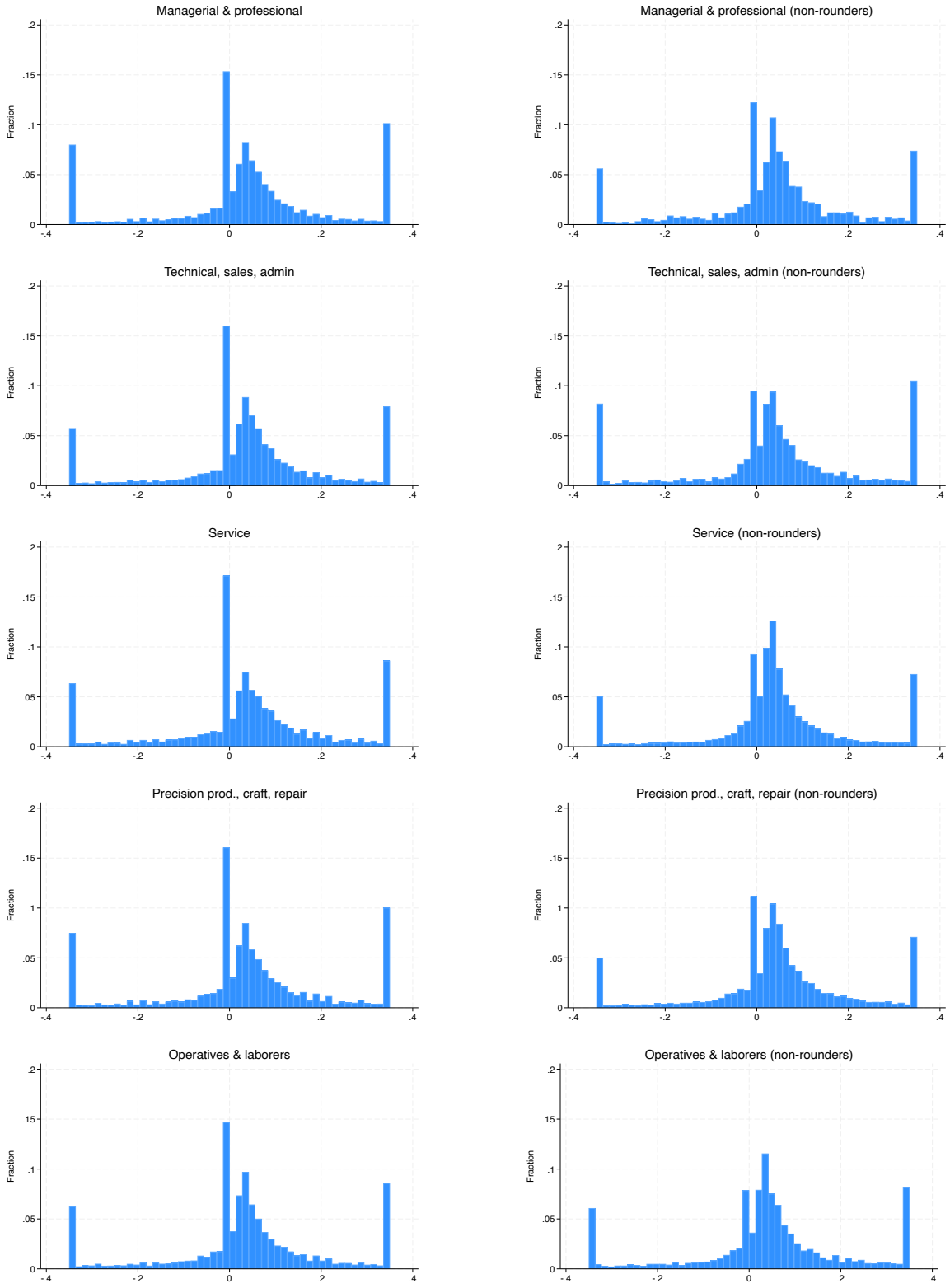
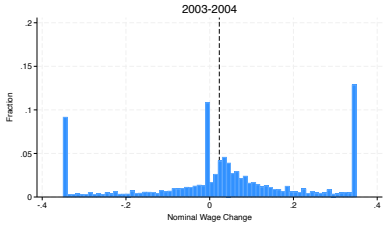
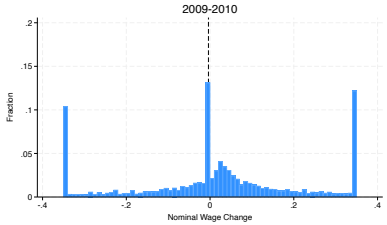


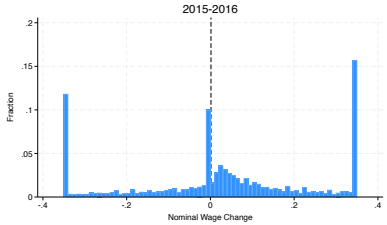
Figure A7: Year-to-year wage change including workers not paid by the hour



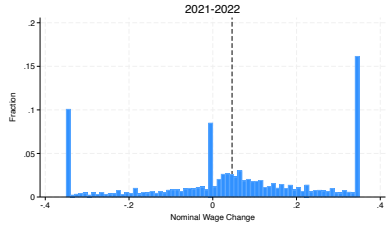
(a) 2003-2004 Full



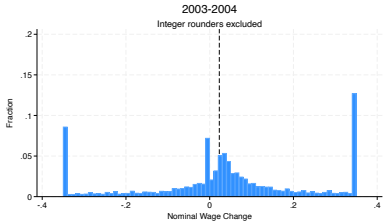
(b) 2009-2010 Full



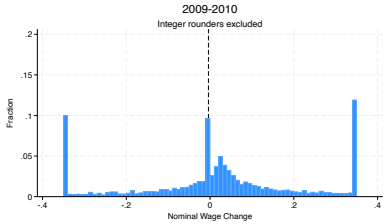
(c) 2015-2016 Full



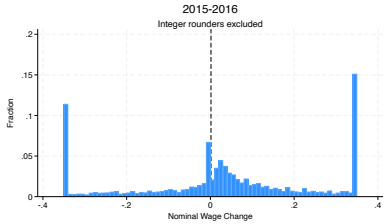
(d) 2021-2022 Full



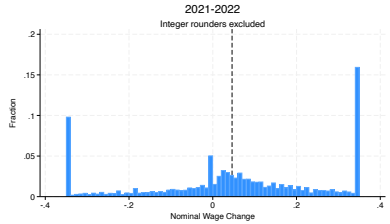
(e) 2003-04 w/o full dollar



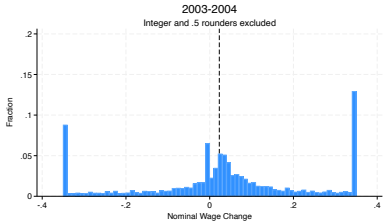
(f) 2009-10 w/o full dollar



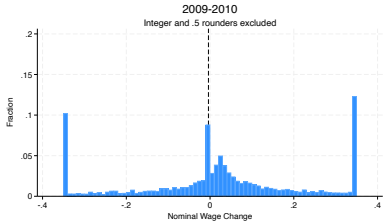
(g) 2015-16 w/o full dollar



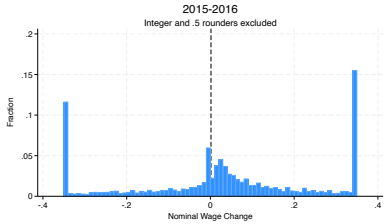
(h) 2021-22 w/o full dollar



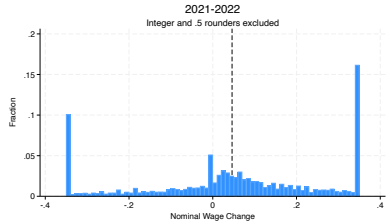
(i) 2003-04 w/o full & 0.5



(j) 2009-10 w/o full & 0.5

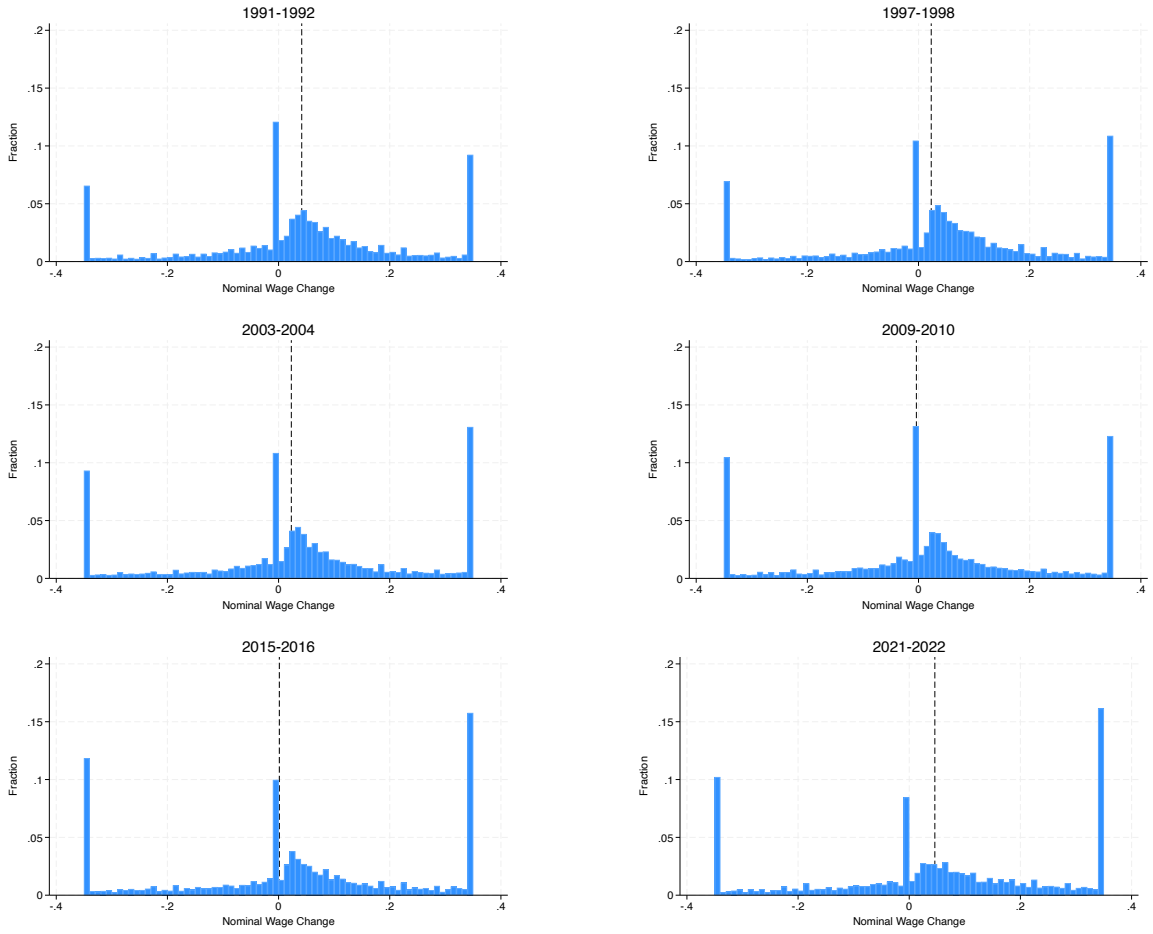


(k) 2015-16 w/o full & 0.5



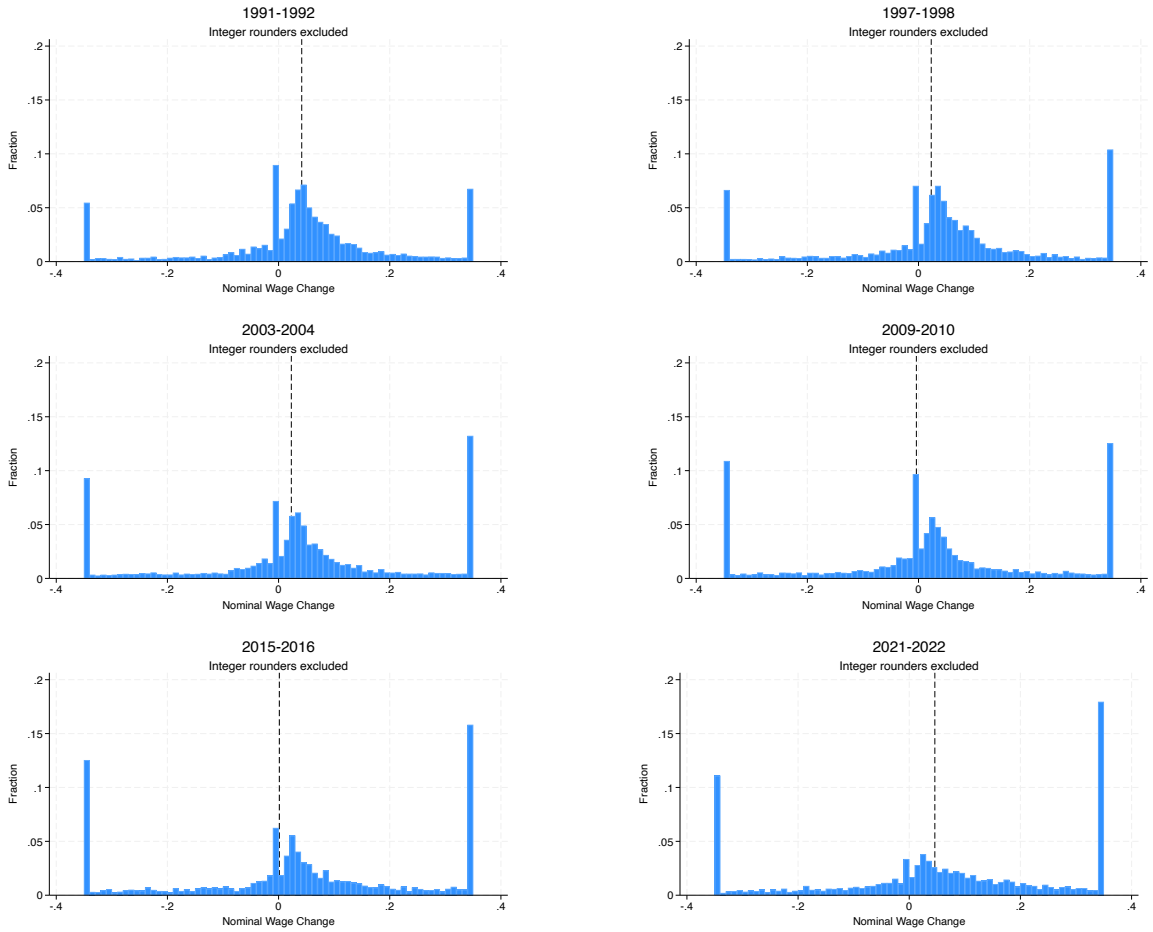
(l) 2021-22 w/o full & 0.5

Figure A8: Year-to-year wage change with rounded earnings variable by CPS



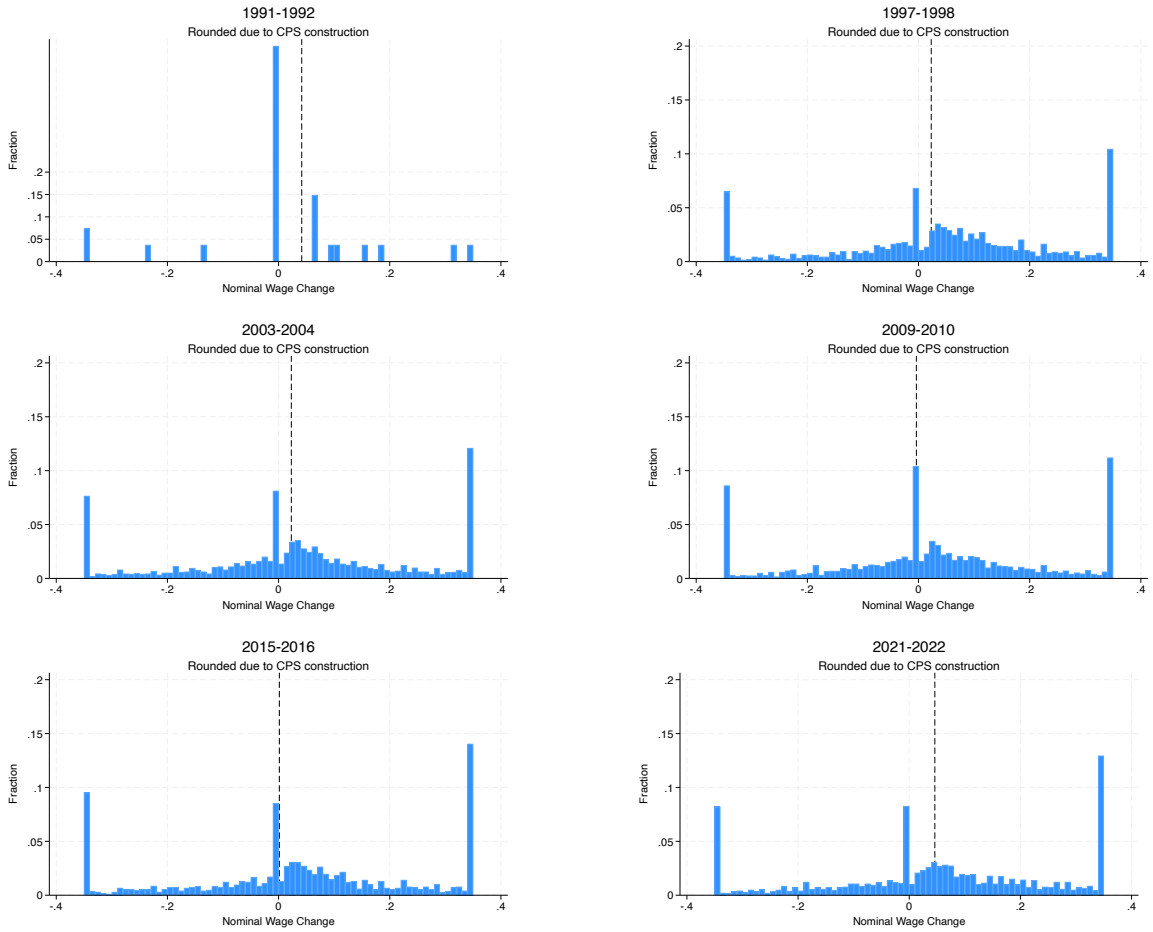
Note: Figures show the year-to-year log difference in nominal wage using the rounded earnings variable constructed by the CPS with the full sample. The vertical dash line indicates the inflation rate on the x-axis of that year.

Figure A9: Wage change distribution without rounding to integers using the rounded earnings variable by the CPS



Note: Figures show the year-to-year log difference in nominal wage using the rounded earnings variable constructed by the CPS after accounting for rounding to full dollars. The vertical dash line indicates the inflation rate on the x-axis of that year.

Figure A10: Wage change of workers with potential rounding behaviors only because of the new rounded earnings variable constructed by the CPS



Note: Figures show the year-to-year log difference in nominal wage of individuals who are classified as rounders due to rounded earnings variable constructed by the CPS. The vertical dash line indicates the inflation rate on the x-axis of that year.