Work Variability and Unionization in the Great Recession

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Abstract *Millions of workers experienced increased variability in the regularity and predictability of their working hours in the Great Recession. This volatility brings negative consequences for their economic security and family lives, which can be as profound as job loss. The growth of work variability was facilitated by the decline of labor market institutions protecting workers from such volatility, particularly the profound decline of labor unions. This paper analyzes the relationship between unionization and multiple measures of work variability using data on hourly workers from the 2001, 2004, and 2008 panels of the Survey of Income and Program Participation. The results show union members were significantly less likely to report varying hours from week to week or mixed full-time/part-time/no work within the same month, but more likely to report irregular schedules. The difference between union members and non-members is also moderated by state-level union density. Finally, we find the negative association between work variability and total monthly earnings is significantly weaker among union members than non-members. Altogether, the paper's results demonstrates some of the continued benefits of unionization for workers, and some of its limitations.*

Unpredictable work schedules and unstable hours create significant costs in time and money for millions of workers and their families. Workers with non-standard hours or schedules are also more likely to have "bad jobs" characterized by low pay and no benefits (Kalleberg, Reskin, and Hudson 2000). Particularly for hourly workers, variable weekly hours lead to reduced and volatile incomes, complicating long-term budgeting and even meeting basic expenses (Lambert 2008; Western et al. 2012). Conversely, more working hours than expected makes planning for non-work obligations, or even rest and relaxation, more difficult. Irregular work schedules also severely complicate caregiving responsibilities for families with young children or other dependents (Enchautegui, Johnson, and Gelatt 2015; Henly and Lambert 2014; Presser 2005).

Various forms of work variability have increased steadily in recent decades, reflecting fundamental changes in employment relationships (Hacker 2006; Kalleberg 2011). A growing

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number of temporary and contract workers experience profound insecurity and irregularity (Bernhardt 2014; Katz and Krueger 2016; Smith and Neuwirth 2008). Even among more traditionally employed service workers, management practices to reduce labor costs leaves workers' hours highly variable and uncertain (Alexander and Haley-Lock 2015; Halpin 2015; Lambert 2008). The shift of power from workers to employers is also starkly evident in the profound decline of labor unions. Ample evidence demonstrates the resulting economic damage, including higher working poverty and wage inequality (Brady, Baker, and Finnigan 2013; Rosenfeld 2014; Western and Rosenfeld 2011). However, the potential benefits of unionization for less work volatility specifically, particularly in the Great Recession, remains an open question.

This study examines differences work variability between union members and non-members, and between contexts of state-level unionization. We analyze three measures of work variability using individual-level data on prime-age hourly workers from the 2001, 2004, and 2008 panels of the Survey of Income and Program Participation (SIPP), and incorporate state-level data from various sources. Our results show union members are significantly less likely than non-members to report varying hours from week to week, but only in highly unionized states. In contrast, union members are significantly more likely than non-members to report rotating, split, or irregular shifts, but only in states with low unionization. Finally, total monthly earnings are significantly lower for workers experiencing work variability, but the difference is smaller among union members. Union membership appears to help workers avoid work variability to some extent, and to avoid some of the associated earnings penalties. At the same time, the benefits of unionization may very likely have been more comprehensive when labor unions were stronger.

Theoretical Background

Work Variability

A major focus of the sociology of work in recent years, and to some extent broader studies of inequality, has been on the growth of precarious work over time. Kalleberg (Kalleberg 2009) broadly defines precarious work as "uncertain, unpredictable, and risky from the point of

view of the worker" (p.2). This growing literature often focuses on the risk of unemployment, potential declines in job tenure (Hollister 2011; Hollister and Smith 2014), growth in contingent or temporary work (Bernhardt 2014; Smith and Neuwirth 2008), or perceived job insecurity (Fullerton and Wallace 2007; Pedulla 2013). Similarly, research on deteriorating job quality for precarious workers often focuses on pay, the provision of benefits, or job autonomy (Kalleberg 2011; Kalleberg et al. 2000).

Though less prominent, research has also focused on growing instability and unpredictability of working hours within traditional employment relations, i.e., neither temporary employment nor independent contracting. Depending on the operationalization, anywhere from 10 to 40 percent of workers experience some form of work variability (Golden 2005; Presser 2005).[2] This conceptualization of work variability stands in contrast to work flexibility, which implies workers can fit their work around their personal schedules, rather than the reverse (Henly, Shaefer, and Waxman 2006). Surveys of workers with variable hours, part-time hours, and non-standard schedules reveal substantial fractions of them would prefer not only greater regularity, but also a greater number of hours each week (Alexander and Haley-Lock 2015). Moreover, work variability is experienced disproportionately by already disadvantaged groups in the labor market. Women, particularly mothers, low-wage workers, and those in service occupations are more likely to work irregular or non-standard hours (Enchautegui 2013; Presser 2005).

Much like unemployment, variable working hours from week-to-week reduce total earnings and income, especially among hourly workers. Even with relatively high wage rates, workers will struggle to make ends meet with few hours. Indeed, studies have often documented that many low-wage workers are more concerned about their numbers of hours than their hourly wage rates (Halpin 2015; Smith 2001). Unpredictable and limited numbers of hours from week to week translate to unpredictable and limited earnings. Increases in variable hours over time then contribute to increasing income volatility over time above and beyond employment disruptions like job loss (Western et al. 2012).

[2] We use "work variability" to refer to hours that change in either amount or scheduling from week to week.

Work variability creates burdens for workers and their families beyond reduced and unstable earnings. Henly and Lambert (2014) found significantly greater work-life conflict among retail workers experiencing work variability. Workers who received little advanced notice about their upcoming schedule or experienced last-minute schedule changes reported greater interference from work in meeting personal or family obligations like attending children's school events, scheduling doctors appointments, etc. Even with regular numbers of hours each week, non-standard work schedules disrupt personal and family rhythms. Retail food workers with non-standard schedules experience significant sleep disruption, particularly among women (Maume, Sebastian, and Bardo 2009). Non-standard schedules have also been described as "non-social work" (Alexander and Haley-Lock 2015). Workers with night, evening, and weekend shifts also have lower community involvement than those with standard weekday day shifts (Cornwell and Warburton 2014). For families with children, irregular and variable hours make childcare arrangements vastly more complicated, forcing dual earner parents and single parents in particular to construct an ever changing patchwork of multiple forms of formal and informal childcare arrangements (Enchautegui et al. 2015; Presser 2005).

A major contributor to growth in work variability is the proliferation of management practices to reduce firms' labor costs. Centralized management exerts significant pressure on front-line managers in service industries like food service, retail, and hospitality to minimize work hours among employees (Bernhardt, Dresser, and Hatton 2003; Lambert 2008). Computerized systems like "just-in-time" scheduling predict the numbers of workers needed down to the hour based on previous patterns of sales or customer traffic. Meanwhile, managers attempt to cut short or completely employees' shifts on the spot when demand is lower than expected (Alexander and Haley-Lock 2015). In many cases, managers even deliberately manipulate workers' supply and regularity of working hours as a system of punishment or reward (Halpin 2015). Schedule manipulations ultimately provide managers with greater compliance by workers, and obscures their degree of precarity (Alexander and Haley-Lock 2015; Halpin 2015).

Firms' attempts to reduce labor costs through variable scheduling are part of a much broader shift of risk from employers to employees (Hacker 2006; Kalleberg 2011; Lambert

2008). The mediation of employment relations by government policies or other labor market institutions has in many ways been replaced by the market (Kalleberg 2009, 2011). A number of perspectives with varying foci describe the growth of corporate power and incentives to reduce labor costs, enabled by political deregulation (Appelbaum, Bernhardt, and Murnane 2003; Fligstein 2001; Hacker 2006; Harvey 2005; Kalleberg 2011). This article focuses on labor unions as a key institution within this broader shift, with potential implications for work variability. Next we describe reasons why unionization at both the individual and state levels may be associated with significantly less work variability, as well as strong reasons for skepticism.

Why Unionization May Reduce Work Variability

Particularly since the New Deal in the 1930s, labor unions have historically been one of the key labor market institutions providing safety and stability for workers in the United States, and the most prominent manifestation of labor power (Freeman and Medoff 1984; Milkman 1997; Rosenfeld 2014). Among unions' many functions, a primary strategy for benefiting workers is collective bargaining with employers at various levels of centralization. Unions bargain for a variety conditions, including higher wage rates and work safety. Unions also provide an institutional recourse for workers in disputes with management.

Through these functions, labor union members may experience significantly less work variability than comparable non-members. Work-hour protections are very common components of unions collective bargaining with employers, and prevent employers from sending workers home early or otherwise establish minimum guaranteed work hours (Alexander and Haley-Lock 2015). Unions often push to convert part-time work to full-time positions in their negotiations, as well (Bernhardt et al. 2003; Rosenfeld and Kleykamp 2009).

Though the vast majority of empirical research focuses on unions' benefits for wage rates (Hirsch 2004; Neumark and Wachter 1995; Rosenfeld 2014; Western and Rosenfeld 2011), some work also documents unions' benefits for employment security, particularly in the face of economic or structural change. Factory workers' unions actively worked against widespread job loss during deindustrialization and the adoption of greater automation (Fernandez 2001; Milkman 1997). Even during and after the Great Recession, union members were less likely than non-members to transition from employment to unemployment (Catron 2013).

Unions' abilities to collectively bargain with employers also depend crucially upon their size. As a result, local union density may be significantly associated with lower work variability above and beyond individual-level union membership. Studies repeatedly find local unionization rates have statistically significant positive associations with wages in addition to the positive association with individual union membership. These wage benefits also extend to non-union members (Brady et al. 2013; Western and Rosenfeld 2011). First, highly centralized bargaining between unions and employers covering large industries essentially covers all workers, whether they are part of the union or not. Second, non-members can benefit from what is classically referred to as the "union threat effect." Employers of non-union workers must offer comparable pay in order to keep them from forming a union themselves, or leaving for unionized jobs (Freeman and Medoff 1984; Hirsch 2004). Third, Western and Rosenfeld (2011) argue high union density traditionally maintained wage equality through spreading egalitarian cultural norms, political mobilization for redistributive policy, and through institutionally protecting workers in the labor market.

This study focuses on union density at the state level, following (Brady et al. 2013). Particularly in recent decades, states have become increasingly relevant for social and economic policy relative to the federal government (Cancian and Danziger 2009). As a result, states have become key battlegrounds for struggles between business and labor for shaping labor market regulation (Brady et al. 2013; Tope and Jacobs 2009).

Based on the literature described above, we argue unionization at both the individual and state levels may be associated with significantly less work variability. However, there is also good reason to expect these relationships interact. Union members may experience less variability than non-members, and the difference may be larger in states with greater union density. The union wage premium has declined in magnitude over time alongside national unionization rates, suggesting unions were more able to secure higher wage rates when they were larger and more powerful (Rosenfeld 2014). More directly relevant, Bernhardt et al. (2003) found that hospitality workers' unions were able to secure more regular hours most effectively in cities with high union densities. The authors quote a pithy hotel executive to that effect, "In a

union town, you pay if you're non-union. In a non-union town, you pay if you're union" (Bernhardt et al. 2003:57).

Why Unionization May Fail to Reduce Work Variability

Though extensive literature documents the benefits of labor unions for workers, a significant relationship between unionization and work variability in recent years is by no means certain. There are several compelling reasons to be skeptical that unions successfully prevent work variability. First, regularity in hours and shifts may simply be outside the scope of many labor union negotiations. Many jobs include variable hours and schedules as a fundamental requirement, particularly hourly jobs. Though strong unions may be able to bargain for more higher wage rates or more hospitable work conditions, work regularity may be beyond their scope. Indeed, higher wages have traditionally been unions' primary goals, in part because wage rates are one of the specific outcomes benefiting all members (Bernhardt et al. 2003).

Second, unionization is relatively uncommon in service industries where work variability is most common (Alexander and Haley-Lock 2015). Moreover, temporary workers and independent contractors, often considered the most precarious workers (Bernhardt 2014; McCall 2001), are excluded from union membership by definition (Kalleberg et al. 2000). Private sector unions have traditionally represented workers in industries like manufacturing. Even unionized factory workers commonly work non-standard hours, and have accepted indefinite layoffs in the hope of avoiding permanent job loss during deindustrialization (Milkman 1997).

Third, unionization rates have declined profoundly over recent decades, particularly for private sector workers (Hirsch 2008; Rosenfeld 2014). Even in the most heavily unionized states in recent years, fewer than a third of workers is part of a labor union. Meanwhile, unions are almost non-existent in the least unionized states (Brady et al. 2013). As a result, unions may not be sufficiently powerful to substantially regulate work variability, especially given the substantial surge of unemployment and involuntary part-time work in the Great Recession (Glauber 2013).

Many explain the decline of labor unions as the result of deindustrialization. The majority of private-sector union members historically worked in manufacturing, and the contraction of these industries diminished labor unions' ranks. However, changes in the sizes of

industries/occupations explains only a small fraction of the decline in total union rates over time. The majority of the decline is due to decreases in union rates within industries/occupations, including but not limited to manufacturing (Hirsch 2008). Rosenfeld (2014), among others, argues the decline of labor unions is in large part attributable to concerted and coordinated efforts by corporate employers and conservative lawmakers. Efforts to reinforce unregulated markets, including labor markets, undermined labor movements, and gave employers sufficient power to reshape employment relations to their benefit. Following this logic, unionization may do little to prevent work variability because the same set of forces driving work variability has also undermined labor unions.

Hypotheses

Below we explicitly state the hypotheses tested in our empirical analysis, based on the literature described above. The first set of hypotheses tests the relationships between work variability and unionization. The second set of hypotheses tests the relationships between earnings, work variability, and unionization. We include these additional hypotheses and corresponding analyses in correspondence with the substantial literature on the union wage premium (Hirsch 2004; Neumark and Wachter 1995; Rosenfeld 2014; Western and Rosenfeld 2011). Unionization may be associated with less work variability, and attenuate its negative consequences for wages.

The first hypothesis tests for a significant negative relationship between work variability and individual-level union membership. The second hypothesis tests for a negative relationship between work variability and state-level unionization, conditional on individual-level union membership. The third hypothesis tests for potential moderation of the individual-level union member difference in work variability by the level of state-level unionization.

Hypothesis 1: Union members experience less work variability than non-members.
Hypothesis 2: Workers in states with high levels of unionization experience less work variability than those in states with low unionization.
Hypothesis 3: The association between union membership and work variability is larger in states with high levels of unionization than in states with low unionization.

As described above, the corresponding null hypotheses, no significant association between unionization and work variability, are by no means trivial. The lack of significant negative relationships between work variability and unionization would support the argument that unions have become too limited to regulate a crucial element of work life.

The fourth and fifth hypotheses test for relationships to total monthly earnings. First, we test the perhaps trivial hypothesis that work variability is associated with significantly lower earnings. The fourth hypothesis serves as a prerequisite for the fifth and final hypothesis, that union membership significantly moderates the negative relationship between earnings and work variability.

Hypothesis 4: Workers experiencing work variability have lower earnings than those who do not.
Hypothesis 5: The negative association between work variability and earnings is weaker for union members than non-members.

Data & Methods

We analyze individual-level data from the 2001, 2004, and 2008 panels of the SIPP, downloaded from the National Bureau for Economic Research (NBER).[3] Each SIPP panel interviewed approximately 50,000 households every four months over three to five years. Each interview wave also included questions about each of the last four months specifically. We analyze observations of prime-age (25-55) civilian workers who report a primary job with non-zero earnings, and report being paid by the hour.[4] We also removed a small number of individuals who were likely misidentified between waves, as described in the appendix. Sample sizes vary between dependent variables, as described below.

Work Variability

The paper analyzes three measures of work variability in respondents' primary jobs: self-reported varying weekly hours, mixed full-time/part-time/no work within a calendar month,

[3] The data are available from: http://www.nber.org/data/survey-of-income-and-program-participation-sipp-data.html
[4] Hourly employees are generally subject to greater employment variability, but also suffer from reduced total earnings due to shortfalls in the availability of work hours. The Discussion section describes results including both hourly and salaried workers.

and self-reported irregular weekly schedules. These three measures are similar to the three forms of "work-hour insecurity" identified by of Alexander and Haley-Lock (2015:699): "work-hour inadequacy, variability, and unpredictability." Those working varying weekly hours experience variability, mixed full-time/part-time/no hours impart bouts of inadequacy, and irregular weekly schedules bring unpredictability.

First, the SIPP asks employed respondents how many hours they usually work per week during the four months since their last interview. Rather than reporting a number of hours, respondents in the 2004 and 2008 panels could also report, "hours vary." We code this option as a dichotomous variable equal to one, *Hours Vary*. The hours question refers to the entire four-month survey wave, so the unit of analysis for this variable is the person-wave.

Second, the SIPP measures employment status in each week, then creates a synthesized variable for working full-time, part-time, not at all, or a mixture within each calendar month. The dichotomous variable *Mixed FT/PT/None* equals one for months when respondents worked any mixture of weeks full-time (35+ hours), part-time (< 35 hours), or zero hours. The variable equals zero for those who either only worked full-time all weeks in the month, or only part-time all weeks. The unit of analysis for this variable is the person-month, with four observations per survey wave.

Third, a special topical module asks employed respondents about their usual work shift. The module was fielded once during the 2001 and 2004 panels and twice during the 2008 panel. The dichotomous variable *Irregular Schedule* equals one for those reporting irregular, split, or rotating shifts, and zero for those reporting regular day, evening, or night shifts, and "other." The unit of analysis for this variable is the person in the 2001 and 2004 panels, and person-wave in the 2008 panel (with up to two observations per person).

Figure 1 presents estimated trends in the three measures of work variability. The percentage of workers with varying weekly hours increased considerably, about three percentage points, in late 2008, and remained high for the remainder of the period. However, the percentage with varying hours increased steadily throughout the 2004 panel. The percentage of workers with irregular schedules also increased between panels, exceeding 16 percent in 2011 relative to less than 13 percent in 2002. These levels are quite a bit higher than those from a very similar

measure in the Current Population Survey (CPS), which Alexander and Haley-Lock estimate at a steady 4-5 percent from 1994 to 2013. However, CPS asks about the previous one month as its reference period, while the SIPP asks about the previous four. Month-to-month variability within the SIPP wave likely captures more hours variability than the shorter period in the CPS. However, the percentage of service workers reporting that their hours vary was much higher, reaching 25 percent in 2013.

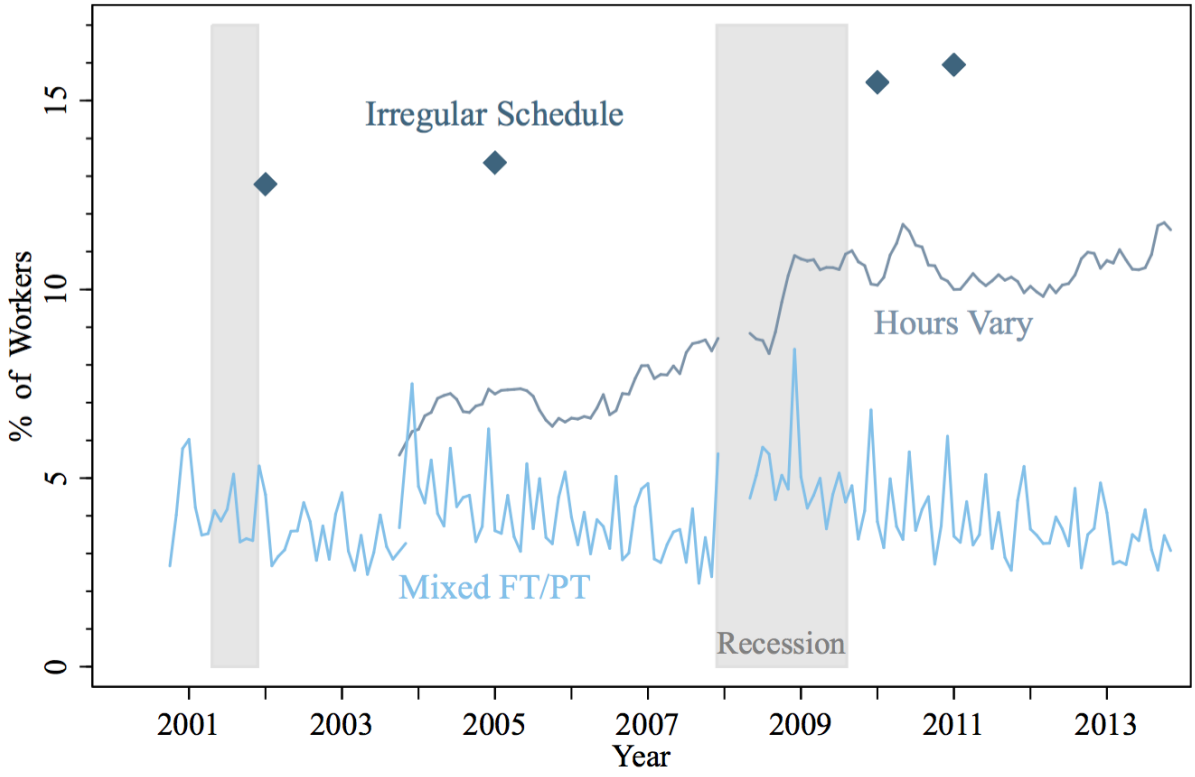

Figure 1. Trends in Three Measures of Work Variability in the 2001, 2004, and 2008 SIPP panels.
Note: Grey areas indicate NBER-defined economic recessions. Estimates include cross-sectional sample weights. Irregular schedule is measured in four topical modules, hours vary in each four-month wave, and mixed FT/PT/None each month.

Trends in mixed FT/PT/no work exhibit high monthly volatility, peaking in December of each calendar year.[5] Despite the monthly variation, mixed FT/PT/no work is highest during the

[5] Substantive results presented below are similar when measuring mixed FT/PT/none equal to one for two consecutive months only, which is less likely to happen with workers voluntarily taking time off.

Great Recession. Finally, an irregular schedule is the most common form of work variability, around 13 percent of hourly workers in the 2001 and 2004 panels. The percentage with irregular schedules increased after the Great Recession, exceeding 15 percent of hourly workers in both waves of the 2008 panel.

The growth of work variability in the Great Recession is particularly notable when comparing the cumulative proportions of workers experiencing work variability. Table A2 in the Appendix presents the percentage of respondents in the first three years (nine waves) of each panel who report ever experiencing each form of work variability.[6] The proportion who ever report varying hours increased from about 21 percent in the 2004 panel to about 29 percent in the 2008 panel, and mixed FT/PT/none increased from about 8.1 to 14 percent.

Unionization

Individual-level unionization, *Union Member*, is a binary variable equal to one for those reporting union membership in their primary primary job. State-level unionization, *State Unionization*, is the percentage of workers in the state-year who are union members. The state-level measure comes from Hirsch and Macpherson's (2003) estimates based on the Current Population Survey (CPS).[7]

Table 1. Union membership and state-level unionization rates by SIPP Panel.

	2001	2004	2008
% Union Member	17.16	14.94	12.97
Mean State-Level Unionization	13.29	12.30	11.74

Note: Estimates use cross-sectional survey weights, and pool all person-months with each panel.

Table 1 presents the percentage of person-months among union members in each panel, and the average state-level unionization rate across person-months. Though much of the

[6] The proportion ever experiencing mixed FT/PT/none is about 40 percent in each panel, likely because many workers voluntarily take at least one week off at some point. Table A2 presents the percentage of workers who ever experience at least two consecutive months of mixed FT/PT/none. Only the 2008 panel measured irregular schedules twice instead of once. Table A2 presents the percentage of workers with irregular schedules in at least one of the two observations in the 2008 panel.

[7] Hirsch and Macpherson's (2003) database is available at http://unionstats.gsu.edu/MonthlyLaborReviewArticle.htm

long-term decline in unionization occurred prior to 2000, the percentage of observations from union members declined about 4.2 percentage points from the 2001 to 2008 SIPP panel. Average state-level unionization also declined between panels, though the decrease was less pronounced.

Analytic Strategy

The paper's analysis proceeds in multiple stages. First, we estimate work variability by union membership for each panel, as well as by individual-level union membership and state-level unionization. Second, a series of regression models predict each measure of work variability with union membership, state-level unionization, their interaction, and state- and individual-level control variables. The models can be expressed as,

$$Y_{ijt} = \beta_0 + \beta_1 Union\ Member_{ijt} + \beta_2 State\ Unionization_{jt} + \beta_3 Union\ Mem_{ijt} \times State\ Union_{jt} + \beta_X X_{ijt} + \beta_W W_{ijt} + \beta_t Year_t$$

where Y_{ijt} is one of the three measures of work variability for person *i* in state *j* and year *t*. The vectors X_{ijt} and W_{jt} are vectors of individual- and state-level control variables, respectively, and $Year_t$ represents year fixed effects. The control variables are defined below.

The regression models are OLS models with binary dependent variables, also called Linear Probability Models (LPM). LPMs closely approximate marginal effects from logistic regression for the difference in the probability of the dependent variable for a unit difference in the independent variable. Relative to logistic regression, coefficients from LPMs are readily comparable between models and outcomes (Angrist and Pischke 2008; Mood 2010). LPMs also circumvent the particularly cumbersome interpretation of interaction terms in logistic regression, which can be misleading due to both non-linearity (Ai and Norton 2003) and conflation with unobserved differences in residual variance between groups (Allison 1999). Our OLS models use Cameron and Miller's (2015) multiway clustering method to account for correlated errors within both individuals and states.[8] The robust errors also adjust for the inherent heteroskedasticity of binary outcomes in OLS. The Discussion section describes results from a variety of alternative estimation strategies for the regression analysis.

[8] Cameron and Miller's (2015) Stata command for multiway clustered errors is available from: http://faculty.econ.ucdavis.edu/faculty/dlmiller/statafiles/

The third stage of the analysis complements the LPM results with predicted probability figures of each work variability outcome from analogous logistic regression models. We present these figures to provide greater interpretability of the interaction effects, and to demonstrate the similarity between the LPM results and those from logistic regression. The figures present the difference in the predicted probability of each outcome between union members and non-members as a function of state-level unionization, also referred to as average marginal effects (AME). We estimated the AMEs and associated confidence intervals in Stata using the "margins" command.

Finally, the fourth stage of the analysis predicts logged monthly earnings from workers' primary jobs, adjusted to 2014 dollars with the CPI. We first predict earnings with union membership and all control variables, then including each measure of work variability and its interaction with union membership. The results from these models estimate the earnings premium for union workers, the earnings penalties for work variability, and the extent to which union membership ameliorates these penalties.

Control Variables

State-level controls include: logged gross state product per capita, *ln(GSP PC)*, adjusted for inflation with the Consumer Price Index (CPI); economic growth (percentage change in GSP from the previous year); the unemployment rate; the inflation-adjusted state minimum wage (or federal if higher); logged state population; Census-defined geographic region (Northeast, South, Midwest, West). Data for all state-level controls are from the University of Kentucky's Center for Poverty Research National Welfare Data (2015).

Individual-level controls include: age; sex (female = 1); race/ethnicity (White, Black, Latino/a, Asian, other race); marital status (married, separated, divorced, widowed, never married); household size; the presence of children under 5 years-old (yes = 1); metropolitan status (in a metro area, not in a metro area, not identified); education (less than high school, high school, some college, college, postgraduate); public employment (yes = 1); 23 occupation

categories; 13 industry categories.[9] The means for selected control variables by SIPP panel are presented in Table A1 in the Appendix.

Results

Cross-Tabulations

Table 2 presents the percentages of observations with each form of work variability by SIPP panel and union membership. Both varying hours and mixed FT/PT/none are less prevalent among union members than non-members in all panels, supporting hypothesis 1. The differences are statistically significant with $p<0.001$ in two-sample tests of proportions. However, the percentages of workers/observations with irregular schedules are not statistically distinguishable between union members and non-members in the 2001 and 2008 panels. Moreover, a significantly greater ($p<0.05$) percentage of union members works irregular schedules in the 2004 panel.

Table 2. Percentages of observations with each form of work variability by SIPP panel and union membership.

	2001	2004	2008
Varying Hours		**7.17**	**10.43**
Non-Union		7.39	10.70
Union		5.89	8.59
Mixed FT/PT/None	**3.71**	**4.01**	**4.11**
Non-Union	3.91	4.19	4.23
Union	2.75	3.00	3.30
Irregular Schedule	**12.79**	**13.36**	**15.72**
Non-Union	12.75	12.95	15.78
Union	13.00	15.57	15.30

Note: Estimates use cross-sectional survey weights, and pool all person-observations in each panel.

[9] We do not control for monthly earnings in models predicting work variability. Total monthly earnings are a function of both hourly wages and total hours worked, and so are a function of the dependent variable. Controlling for earnings would then induce substantial bias by conditioning on a collider variable (Elwert and Winship 2014).

Figure 2 presents the percentages of observations with each form of work variability by SIPP panel, union membership, and state-level unionization. State unionization is split into "low" and "high" by the median for all pooled person-months, 13.5 percent. Percentages of observations experiencing work variability are lower in high-union states than low-union states when comparing within union members or non-members. The exception is very slightly higher percentages of mixed FT/PT/none among non-members high-union states compared to low-union. These comparisons generally provide support for hypothesis 2. Finally, union members in high-union states have the lowest percentages of varying hours and irregular schedules in the 2008 panel. These patterns provide some support, albeit limited, for hypothesis 3.

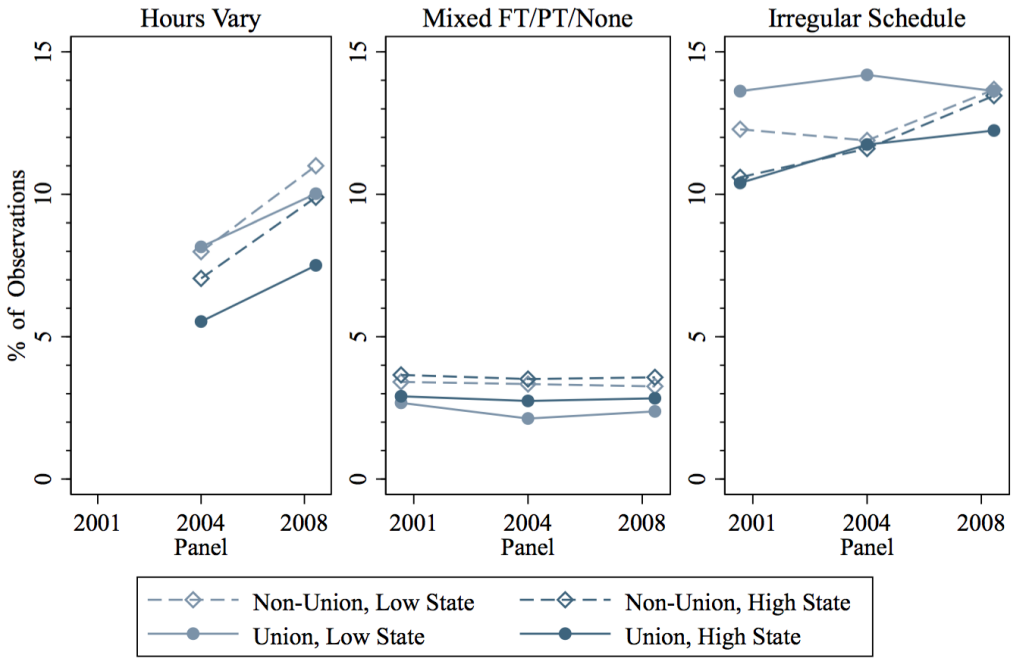

Figure 2. Percentage of observations with each form of work variability by SIPP panel, union membership, and state-level unionization.
Note: High and low state-level unionization are defined as above or below the median value for all pooled observations, 13.6 percent. Percentages are estimated with cross-sectional sample weights.

Regression Results

Table 3 presents results from LPMs predicting each form of work variability. Table 3 omits coefficients for the control variables in the interest of space. Coefficients for the control

Table 3. Results from linear probability models predicting work variability, presented as percentage-point coefficients and (robust-clustered t-statistics).

	Model 1	Model 2	Model 3	Model 4
Hours Vary				
Union Member	-1.577***	-1.272**	-1.162*	-0.757
	(-3.57)	(-2.78)	(-2.48)	(-1.60)
State Unionization	-0.069	-0.052	0.003	0.031
	(-0.99)	(-0.68)	(0.05)	(0.41)
Union Member × State Unionization		-0.148+		-0.191*
		(-1.70)		(-2.48)
Persons	60,964	60,964	60,964	60,964
Person-Periods	322,078	322,078	322,078	322,078
Mixed FT/PT/None				
Union Member	-1.271***	-1.244***	-0.878***	-0.823***
	(-11.52)	(-11.70)	(-7.34)	(-7.96)
State Unionization	0.041**	0.043**	0.004	0.008
	(2.71)	(3.13)	(0.25)	(0.45)
Union Member × State Unionization		-0.011		-0.022
		(-0.42)		(-1.46)
Persons	89,188	89,188	89,188	89,188
Person-Periods	1,706,630	1,706,630	1,706,630	1,706,630
Irregular Schedule				
Union Member	0.746	1.258	2.077**	2.688***
	(0.94)	(1.54)	(2.94)	(3.51)
State Unionization	-0.056	-0.031	-0.049	-0.013
	(-0.99)	(-0.51)	(-0.60)	(-0.15)
Union Member × State Unionization		-0.205+		-0.242*
		(-1.79)		(-2.29)
Persons	42,021	42,021	42,021	42,021
Person-Periods	49,423	49,423	49,423	49,423

Notes: Models 3 and 4 include all control variables. State-level unionization is centered at 13.5 percent. All models apply cross-sectional weights, and cluster standard errors within persons and states.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

variables from model 4 for each dependent variable are presented in Table A3 in the Appendix. Only models 3 and 4 include control variables.

Model 1 provides a basic test of hypotheses 1 and 2, that union members and workers in more unionized states are less likely to experience work variability. Union members are significantly less likely to report varying hours and mixed FT/PT/none in model 1 by more than one percentage point, but there is no significant difference for irregular schedules. However, work variability is not significantly less likely with greater state unionization, and mixed FT/PT/none is very slightly more likely.

Model 3 provides the same test, but conditioning on all individual- and state-level controls. Again, union members are significantly less likely to report varying hours or mixed FT/PT/none. However, they are significantly more likely to report irregular schedules by about two percentage points.[10] State unionization is not significant for any of the outcomes with controls included. These results provide mixed support for hypothesis 1, regarding individual union membership, but no support for hypothesis 2, regarding state unionization.

Models 2 and 4 add the interaction term between union membership and state unionization to test hypothesis 3. State unionization is centered around the median for all person-months in the sample, 13.5 percent. The 'main effect' of union membership in these models is then in states with 13.5 percent unionization rates. The state unionization coefficient is the association with the probability of work variability among non-members, and the interaction term is the association for union members.

In model 2, union members are less likely to report varying hours and irregular schedules in states with higher unionization (only with $p<0.10$), while there is almost no association for non-members. The positive association between state unionization and mixed FT/PT/none applies only to non-members, and there is no association for union members.

With controls included in model 4, the interaction between union membership and state unionization is stronger when predicting varying hours. There is no association between state unionization and varying hours for non-members, and the difference between union members

[10] An alternative analysis predicted each of the separate categories for irregular schedules (rotating, split, and irregular shifts) relative to regular daytime shifts using multinomial logistic regression. The union member coefficient was significantly positive for each outcome.

and non-members is not statistically significant at median state unionization. However, the probability of varying hours is significantly lower for union members in states with greater unionization.

The pattern has some similarities to model 4 predicting irregular schedules. Though union members are significantly more likely to report irregular schedules at median state unionization, union members are less likely to report irregular schedules in more unionized states. There is no relationship to state unionization for non-members. Finally, union members are slightly but statistically significantly less likely than non-members to report mixed FT/PT/none. However, there is no association between mixed FT/PT/none and state unionization for either members or non-members.

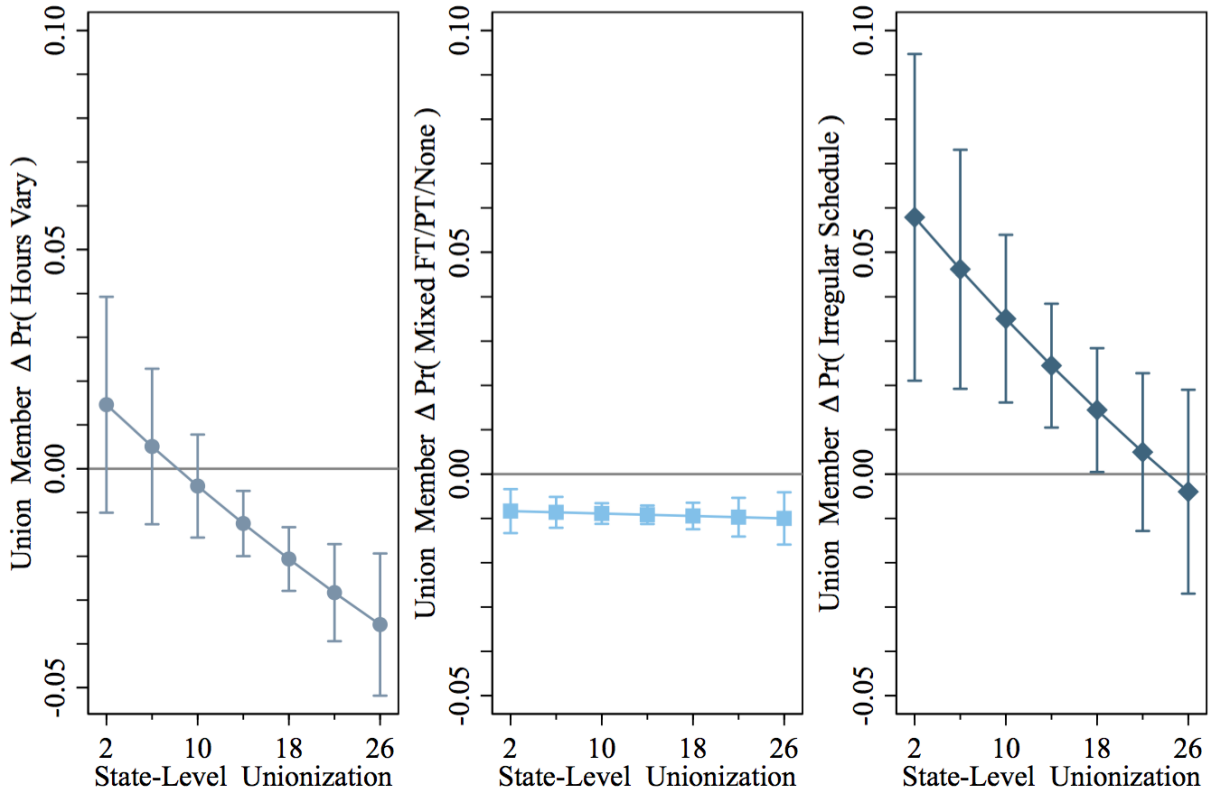

Figure 3. Differences in predicted probabilities between union members and non-members as a function of state-level unionization.

Note: The predicted probabilities are from logistic regression models predicting work variability equivalent to model 4 in Table 3, including all control variables and with standard errors clustered within states.

As described above, we complement the regression results in Table 3 with predicted probabilities from logistic regression in Figure 3. The logistic regression model is analogous to model 4 in Table 3, including all control variables. The y-axis is the difference in the predicted probability of each form of work variability between union members and non-members, and the x-axis is state unionization.

The left graph of Figure 3 shows the union member difference in the probability of varying hours by state unionization. The probability of varying hours is not significantly different for union members and non-members in states with low unionization. However, union members are 3.5 percentage points less likely to report varying hours in states with very high unionization, 26 percent.[11] For comparison, this difference is approximately six times the gender difference in the probability of varying hours (Table A2).

As also seen in Table 3, union members are less likely to report mixed FT/PT/none than non-members in the center graph of Figure 3. The difference does not vary with state unionization. The difference is also relatively small, less than one percentage point. For comparison, the gender difference is about 1.5 percentage points (Table A2). The right graph of Figure 3 shows union members are almost six percentage points more likely to report irregular schedules than non-members in states with two percent unionization. However, there is no difference in states with the highest unionization.

In sum, the results from Table 3 and Figure 3 provide mixed support for hypotheses 1 and 3, but little or no support for hypothesis 2. Union members are significantly less likely than non-members to report varying hours and mixed FT/PT/none, supporting hypothesis 1. However, members are more likely to report irregular schedules, contradicting hypothesis 2 (Table 3, model 3). There is little support for hypothesis 2, that workers experience less variability in highly unionized states above and beyond union membership (Table 3, model 3). With control variables included, there is no significant relationship between state unionization and work variability for any of the three outcomes (Table 3, model 4). Finally, the results lend support to hypothesis 3, that union membership and state unionization interact. Union members' lower probabilities of reporting varying hours hold only in highly unionized states. Meanwhile, union

[11] The highest union density in the sample is 26.9 percent in New York in 2001, and the lowest is 2.3 percent in South Carolina in 2005.

members' higher probabilities of reporting irregular schedules hold only in less unionized states (Figure 3).

Work Variability, Union Membership, and Earnings

The next portion of the analysis tests hypotheses 4 and 5, that earnings are lower for those experiencing variability, but the difference is attenuated for union members. As described above, this analysis can help illuminate the total impact of union membership if total earnings are one of workers' primary concerns about work variability. Table 4 presents results from regression models predicting logged monthly earnings from workers' primary jobs. All models include but do not present all control variables.

Table 4. Results from linear models predicting logged total monthly earnings with (robust-clustered t-statistics).

	Model 1	Model 2	Model 3	Model 4
Union Member	0.321***	0.318***	0.311***	0.317***
	(30.38)	(31.95)	(28.25)	(26.50)
Hours Vary		-0.343***		
		(-19.65)		
Union × Hours Vary		0.114***		
		(3.94)		
Mixed FT/PT/None			-0.603***	
			(-47.36)	
Union × Mixed FT/PT/None			0.140***	
			(4.20)	
Irregular Schedule				-0.217***
				(-12.69)
Union × Irregular Schedule				0.136***
				(4.59)
Person-Periods	1,720,209	322,078	1,706,630	49,423

Notes: All models include all control variables. All models apply cross-sectional weights, and cluster standard errors within persons and states.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Union members have about 38 percent $(0.38 = e^{0.321} - 1)$ higher monthly earnings than non-members, conditional on all controls in model 1. Prior estimates of the union wage premium are considerably lower, about 20 percent (Hirsch 2004; Rosenfeld 2014). However, these estimates are based on estimated hourly wages from the past month in the CPS, rather than total monthly earnings. Union members likely have both higher wage rates and work more hours than non-members, making the premium for total monthly earnings greater.

Each of models 2, 3, and 4 include one of the three measures of work variability and its interaction with union membership. The 'main effect' of each work variability measure is the conditional earnings difference associated with variable work for non-members. The interaction term is the earnings difference associated with variable work for union members relative to the difference for non-members. In model 2, non-members with varying hours have 29 percent $(0.29 = 1 - e^{-0.341})$ lower earnings than non-members with more regular hours. However, earnings are only 20 percent $(0.20 = 1 - e^{-0.341+0.114})$ lower for union members with varying hours relative to union members with more regular hours. Then overall, predicted earnings for a union member with varying hours are still about 9.4 percent greater $(0.094 = e^{0.318-0.341+0.114})$ than for a non-member with more regular hours.

The pattern is similar for the other two forms of work variability. Predicted earnings are about 45 percent lower with mixed FT/PT/none among non-members, but about 37 percent lower among union members. Predicted earnings are about 20 percent lower with irregular schedules among non-members, but only about 7.8 percent lower among union members. Union members with irregular schedules still have earnings about 26 percent greater than non-members with regular schedules.

Altogether, the results not surprisingly support hypothesis 4; earnings are significantly lower for those experiencing work variability. The results also support hypothesis 5. The negative association between work variability and earnings is significantly weaker among union members than non-members. Moreover, union members with varying hours or irregular schedules still have higher predicted wages than non-members with regular hours or schedules.

Discussion

This article's findings contribute both to literature precarious work, and the moderating effects of unionization. First, we examine panel data from the 2001, 2004, and 2008 panels of the SIPP to estimate the prevalence of three forms of work variability: varying hours from week to week, mixed full-time/part-time/no work within the same month, and irregular schedules. Our analysis shows work variability is fairly common, with 15 to 29 percent of workers ever experiencing each of the three forms of variability at some point between 2008 and 2011 (Table A2). Moreover, work variability increased substantially during and after the Great Recession.

Union members were significantly less likely to report varying hours and mixed full-time/part-time/no work within a month, but more likely to report irregular schedules. The relationships are also moderated by state-level union density. Union members' lower probabilities of varying hours only held in states with high unionization, and their higher probabilities of irregular schedules only held in states with low unionization. However, state-level unionization had no significant relationship to work variability for non-union members.

Finally, the paper's analysis shows significantly lower total monthly earnings for those experiencing work variability, as expected. The negative association was significantly weaker among union members than non-members, however. Union members with varying hours or irregular schedules have higher predicted monthly earnings than comparable non-members with regular hours or schedules. Altogether, the paper's results are consistent with literature documenting the salience of labor unions as a labor market institution. At the same time, the findings demonstrate some of unions' significant limitations for regulating work variability.

Unions have traditionally been one of the most prominent labor market institutions protecting workers from risks in a variety of capacities (Freeman and Medoff 1984). However, their steady and substantial decline in recent decades undermines any certainty that union members continue to substantially benefit (Rosenfeld 2014). Though unionization continued to demonstrate significantly positive effects on earnings and equality up to the Great Recession (Brady et al. 2013; Western and Rosenfeld 2011), we find their benefits for work variability are somewhat mixed. Continued examination of union's potential diminution is crucial for

understanding possible long-term trajectories of worker risk and precarity in the US labor market (Kalleberg 2009).

The present study is not without limitations of course, which future research may overcome. First, the SIPP data have limited abilities to discern employer-driven work variability versus employee-driven flexibility. Though substantial fractions of workers reporting non-standard work report wanting more hours (Alexander and Haley-Lock 2015), workers' abilities to work flexible schedules around their non-work lives represent a promising avenue for resolving increasingly common work-life conflicts (Henly et al. 2006; Kalleberg 2009; Presser 2005).

Second, the SIPP data have limited information on workers' employers, or labor unions' negotiations with them. More detailed firm-level or organizational information (Tomaskovic-Devey 2014), particularly those revealed by detailed case studies (Appelbaum et al. 2003), would illuminate the specific practices and policies through which employers increase work variability and unions limit it.

Finally, our analysis does not extend decades back to peak periods of unionization. Given the general decline of unions' size, strength, and their associated wage premium (Rosenfeld 2014), it is possible that unions were once much more effective at regulating work variability than they are in recent years. However, the Great Recession and subsequent recovery were characterized by widespread unemployment, involuntary part-time work, and substantial growth of "bad jobs" replacing the "good jobs" that were lost. If union membership and density have any significant association with work variability in such an inhospitable labor market, they were very likely more salient in earlier decades.

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Appendix

Inconsistencies within Persons between Waves

Some key variables within the SIPP have differences within persons between waves that indicate probable misreporting or person misidentification. The proportion of likely miscoded observations for each variable is relatively small, most below one percent except education. We excluded individuals from the sample with inconsistent sex (320 out of 131,892 persons ever in the 2008 SIPP). Though gender identity and reporting is certainly malleable, close inspection of several cases reveal misidentification of individuals between waves. One example is a husband and wife in a married-couple household whose identifiers swapped between two survey waves. We also excluded an additional 1,627 individuals with age differences larger than likely misreporting (age larger by two years in preceding wave, or smaller by five years). Again, close inspection of several of these cases indicated misidentification of individuals between waves.

Next, we resolved within-person inconsistencies with education, nativity, citizenship, and race by using the modal category reported across all waves. Individuals' education was replaced with their modal categories (2.23% of all person-months) if their reported education declined between waves, or increased two or more categories between four-month waves. Nativity was replaced with the modal category when reporting changed with persons, affecting 0.03% of all person-months. Similarly, citizenship status was replaced with the modal category for individuals switching from citizens to non-citizens between waves, affecting only 15 individuals.

Race/ethnicity was replaced with the modal category for individuals reporting different categories between waves, affecting 0.2% of all person-months. Individuals with multiple modal categories were recoded as "Other Race." This recoding is not meant to negate the socially constructed and context-dependent nature of racial identification, even within longitudinal quantitative surveys (Saperstein and Penner). However, fixed categories within persons facilitate comparison of longitudinal and cumulative employment outcomes between groups. Additionally, we emphasize that a very small fraction of person-months are recoded.

Self-Employment Status

In each wave, the SIPP longitudinally tracked up to two jobs in each four-month wave, as well as up to two self-owned businesses. Respondents also report the number of businesses they own in each wave. We code employed person-months as self-employed for respondents with missing values for both job identifiers ("eeno1" and "eeno2"), but at least one self-owned business ("ebuscntr"). These observations are then excluded from the analysis.

Additional Descriptive Tables

[Tables A1-3 here]

Table A1. Weighted means for selected control variables by SIPP panel.

	2001	2004	2008
ln(Earnings)	7.76	7.72	7.65
State-Level Controls			
ln(GSP PC)	3.89	3.96	3.94
Economic Growth	1.59	2.81	0.69
Unemployment Rate	5.42	5.03	8.43
Minimum Wage	5.37	5.85	7.36
ln(Population)	15.97	15.98	16.03
Individual-Level Controls			
Age	39.35	39.24	39.39
Female	50.47	49.61	50.00
Race/Ethnicity			
White	66.00	62.30	60.02
Black	14.04	13.13	13.15
Latino/a	15.51	18.64	20.42
Asian	3.22	2.86	3.47
Other	1.23	3.07	2.93
Marital Status			
Married	59.73	58.64	55.33
Separated	3.36	3.09	2.98
Divorced	14.24	13.29	12.40
Widowed	1.30	1.01	1.14
Never Married	21.37	23.97	28.15
HH Size	3.26	3.33	3.33
Children under 5	26.60	29.05	31.47
Metropolitan Status			
Metro	76.06	76.30	78.02
Not metro	23.94	19.50	17.64
Not identified	0.00	4.21	4.34
Education			
Less than HS	13.26	12.86	11.22
HS/GED	37.20	31.68	30.31
Some Coll	35.94	41.23	41.41
College	11.06	11.62	13.82
Postgrad	2.54	2.62	3.25

Public Employee	14.24	11.46	11.37
Max. Persons	26,183	31,237	31,924
Max. Person-Periods	405,695	539,058	686,124

Table A1. Proportion of observations ever experiencing work variability in the first three years of each panel.

	2001	2004	2008
Varying Hours		23.68	30.69
Mixed FT/PT/None	7.20	8.89	10.08
Irregular Schedule			21.28

Note: Estimates use panel survey weights, and pool all person-observations in each panel.

Table A3. Control variables from Table 3.

	Hours Vary	Mixed FT/PT/None	Irregular Schedule
State-Level Controls			
ln(GSP PC)	3.650	1.070*	1.088
	(1.41)	(1.99)	(0.36)
Economic Growth	-0.139	0.033+	-0.030
	(-1.42)	(1.85)	(-0.24)
Unemployment Rate	0.751**	0.113*	0.086
	(2.64)	(2.38)	(0.26)
Minimum Wage	-0.820+	0.170*	0.385
	(-1.85)	(2.45)	(0.95)
ln(Population)	0.139	-0.247***	0.123
	(0.44)	(-3.35)	(0.26)
Individual-Level Controls			
Age	0.010	-0.036***	-0.090***
	(0.95)	(-8.64)	(-3.73)
Female	0.586*	1.493***	-0.534
	(2.02)	(15.56)	(-1.18)
Race/Ethnicity (White = ref)			
Black	-0.081	-0.385***	-2.003***
	(-0.16)	(-3.43)	(-4.27)
Latino/a	-0.538	-1.200***	-3.567***
	(-1.09)	(-6.50)	(-7.24)
Asian	1.082	-1.001***	-1.242
	(1.26)	(-5.92)	(-1.48)
Other Race	0.672	0.653*	-1.077
	(0.64)	(2.46)	(-1.00)
Marital Status (married = ref)			
Separated	0.810	0.944***	2.945*
	(1.60)	(6.64)	(2.15)
Divorced	0.644*	0.334***	1.036*
	(2.18)	(4.36)	(2.05)
Widowed	0.888	0.718*	-0.829
	(1.20)	(2.49)	(-0.65)
Never Married	1.532***	0.218**	1.765***
	(3.42)	(3.11)	(3.50)

HH Size	0.199**	0.046+	0.157
	(2.60)	(1.75)	(1.12)
Children under 5	-0.696*	0.254***	-0.294
	(-2.33)	(3.64)	(-0.62)
Metropolitan Status (Metro = ref)			
Non-Metro	2.832**	-0.129	0.174
	(2.89)	(-0.97)	(0.30)
Not Identified	0.274	-0.146	-0.763
	(0.17)	(-0.46)	(-0.85)
Education (Less than HS = ref)			
HS/GED	-0.587	-0.323***	0.732
	(-1.07)	(-3.70)	(1.52)
Some College	-0.746	0.041	1.955**
	(-1.58)	(0.38)	(2.73)
College	-0.335	0.551***	2.883**
	(-0.60)	(4.58)	(3.07)
Post-Graduate	0.832	1.688***	7.190***
	(0.77)	(6.99)	(6.61)
Public Employee	-1.184**	0.690***	-0.838
	(-3.21)	(4.36)	(-1.03)
Person-Periods	322,078	1,706,630	49,423

Notes: Models for each dependent variable are from Model 4, Table X. All models apply cross-sectional weights, and cluster standard errors at the state level. Models include but do not show coefficients for 24 occupation categories, 13 industry categories, 4 geographic regions, and year fixed-effects.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001