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Compensation for Unstable and Unpredictable Work Schedules: Evidence from the National Longitudinal Survey of Youth 1997 Cohort*

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ABSTRACT

Prior research shows unpredictable and unstable work schedules are associated with negative health, family, and economic outcomes. But little research has examined what, if anything, workers gain from such schedule arrangements. I use data from the National Longitudinal Survey of Youth 1997 Cohort to analyze the effects of various schedules on the benefits and pay of employees in their 20s and 30s during the period 2011–2018. This longitudinal analysis provides a rigorous test of compensating differentials and efficient matching theories invoked by opponents of scheduling regulation. I find that workers are not compensated for scheduling risk in the form of higher pay, greater job retention, or beneficial flexibility. Compared with a stable schedule, workers in unstable and unpredictable arrangements report lower job satisfaction and much less possibility (−10 to −20 percentage points lower predicted probability) of receiving the benefit of a flexible work schedule. These results suggest imperfections in the market for working time, strengthening the case for regulations requiring that employers pay a premium for schedule changes.

Keywords: work schedules, job quality, nonstandard employment, compensating differentials, labor market stratification

INTRODUCTION

Time is a doubly precious resource. It can be spent producing goods and services for the market or passed at rest, providing care, or performing other worthwhile activities. Time is also a perishable resource that cannot be saved for future use. Every hour of market work represents an irreversible investment that may fail to return the expected pay or profit. Whatever the nature of the job, workers and employers incur risk through the very act of investing time and money in employment. How this risk is managed day by day and hour by hour is the subject of this paper.

In the classic economic model, workers choose their hours of labor and leisure to maximize utility at a given wage (Altonji and Paxson 1988; Borjas 2013). But the boundary between working time and time off of work is more fraught than this model recognizes. An

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employer may demand that employees be available for more time than they are actually called to work. An employer may also change the timing or number of hours that employees are scheduled to work with little warning or recourse (Lambert 2008). Though rarely specified in employment contracts, such unpredictable and unstable work schedules function as an option on workers' time, giving employers the right but not the obligation to expand, contract, or rearrange the workweek (Breen 1997).

I examine whether and how workers are rewarded for schedule instability and unpredictability. In a competitive labor market, employers should pay a premium for optional scheduling, compensating workers for the costs of making themselves available to work and the risk of involuntary idleness. In the absence of a monetary premium, workers may accept scheduling risk because it comes with greater flexibility or other job amenities. Alternatively, workers may bear uncompensated risk because market imperfections prevent them from bargaining over schedule arrangements or accessing more stable jobs.

These different explanations of why workers put up with scheduling risk have important theoretical and policy implications. If workers are not rewarded for giving their employer control over when and how long they work, this would challenge classic economic theories of labor supply and compensation. The absence of a risk premium for optional scheduling would complement recent work on monopsony in wage determination, further undermining the notion that workers earn what they are worth to their employer (Manning 2021; Rosenfeld 2021). Conversely, better evidence of stratification with respect to schedule arrangements may aid in the development of alternative theories to explain the allocation of labor market risk and reward, without relying on the convenient fiction of a competitive equilibrium (Kaufman 2008).

More practically, the existence of uncompensated scheduling risk would strengthen the rationale for "fair workweek" laws, which have been proposed or enacted in more than a dozen US jurisdictions (Mitchell et al. 2021). If workers are not rewarded for unpredictable schedules, then they have nothing to lose from regulations that mandate greater advance notice or pay for schedule changes. Employer associations and other opponents of these regulations claim that workers enjoy greater flexibility and opportunities for advancement in jobs with variable schedules (American Consumer Institute 2019; French 2016). But these claims are not consistent with mounting evidence that schedule instability harms workers' health and economic security (Harknett et al. 2021; Kelly and Moen 2020).

This paper uses data from recent rounds of the National Longitudinal Survey of Youth, 1997 Cohort (NLSY97). While prior studies have found little evidence of a wage premium for unstable schedules (Choper et al. 2021; McCrate 2005; McCrate et al. 2019), the current study represents the first longitudinal analysis of work schedules and compensation in a sample of employees spanning all major industries of the US labor market. My analysis exploits the exceptionally detailed and repeated observations of the NLSY97 to identify marginal effects of different schedule arrangements on monetary and non-monetary compensation, including beneficial flexibility and job satisfaction.

Alongside new empirical findings, I develop a risk-theoretic typology of schedule arrangements that distinguishes multiple dimensions and combinations of temporal variation. I adapt the notion of optionality from finance in order to improve upon the more generic concept of "risk shifting" thought to characterize many employer practices in the contemporary US, from individual retirement accounts to just-in-time scheduling (Kalleberg 2018; Lambert 2008;

Rosenbluth and Weir 2021). I argue for greater specificity in theorizing optional scheduling as a contingent and asymmetric arrangement for governing risk. Like the buyer of a call option, an employer can use unstable scheduling to avoid anticipated losses while retaining the ability to realize potential gains from transacting for available labor. However, optionality may come at the expense of workers' commitment to their job, especially if they are not compensated for idle time they are available to work or the burden of working when they had other plans. My risk-theoretic framework clarifies the functions of unstable scheduling and connects it to a broader tradeoff between optionality and commitment in employment relations (Desai 2017).

COSTS AND BENEFITS OF VARIABLE SCHEDULES

Much of the literature on variable schedule arrangements focuses on accommodations for personal and family obligations outside of work (Perry-Jenkins and Gerstel 2020). Such "family-friendly" or "flexible" arrangements may involve changing the timing or hours of work, but to the extent that the accommodations are effective, workers exercise control over their schedule (Hill et al. 2008; Lyness et al. 2012). Worker control distinguishes flexible arrangements from unstable schedules with variation outside of the worker's control (Lambert and Haley 2004; Lambert and Henly 2014; Kelly and Moen 2007). From the worker's perspective, schedule flexibility represents a benefit that can reduce work-life conflict and enhance job quality, whereas schedule instability reflects employer discretion over working time that can be disruptive or costly for the worker (Deitch and Huffman 2001; Jang et al. 2012; Lambert and Haley 2004).

A growing body of research examines the costs of schedule instability not only for workers themselves but also for their families and others tied to them in the "web of time" (Gerstel and Clawson 2018; Lefrançois et al. 2017). Organizational studies document the pervasive nature of schedule changes in sectors such as retail sales, food service, and health care, where fluctuations in customer demand are matched or surpassed by variation in working time (Clawson and Gerstel 2014; Halpin 2015; Henly and Lambert 2014). Without the benefit of advance notice or control of frequent schedule changes, workers are more likely to experience this variation as instability and to report health, relationship, or financial difficulties. Surveys of hourly service workers find that schedule instability correlates with economic insecurity and work-life conflict, which in turn predicts poor sleep, psychological distress, child behavioral problems, and job turnover (Ananat and Gassman-Pines 2021; Choper at al. 2021; Schneider and Harknett 2019). Qualitative interviews detail how erratic scheduling disrupts the lives of poor and working-class families, not only through unreliable earnings, but also wasted time, transportation costs, patchwork childcare arrangements, and loss of government or employer benefits tied to work hours (Alvarez et al. 2020; Carrillo et al. 2017; Lambert and Henly 2013; Morduch and Schneider 2017).

National data on unstable schedules remain limited, but available evidence seems consistent with the pattern of negative associations seen in firm- and industry-specific studies. Most labor force surveys rely on a summary measure of standard/nonstandard schedules that contrasts regular daytime hours with everything else (Kleiner and Pavalko 2010; Presser 2003). By this measure, nonstandard schedules are associated with work-family conflict, marital instability, and child emotional and behavioral difficulties (Han and Fox 2011; Hendrix and Parcel 2014; Kalil et al. 2010; Strazdins et al. 2006). Yet influential scholars in this field

emphasize unsociable timing (e.g., evening or night shifts) or schedule misfit (e.g., between parental work and nonparental childcare) rather than instability as the key explanatory factor (Mas and Pallais 2020; Presser 2003; Voydanoff 2005).

In the few studies that distinguish between nonstandard timing and other schedule characteristics, worker control is the most consistent predictor of health and family outcomes. Analyses of the National Survey of the Changing Workforce (NSCW) link a lack of control to work-family conflict, stress, burnout, dissatisfaction, poor general health, and symptoms such as headaches, upset stomach, and insomnia (Fenwick and Tausig 2001; Jang et al. 2012). In an analysis of the National Longitudinal Survey of Youth 1979 Cohort and Child Supplement, Leibbrand (2018) finds that parents working rotating and split shifts report more child behavioral problems, whereas the association is reversed or insignificant for evening and night shifts. Contrasting her study with earlier research emphasizing nonstandard timing, Leibbrand argues that "it is … instability and unpredictability that creates problems for parents and children" (2018: 2353). Using more detailed and recent data—albeit with a smaller sample—from the General Social Survey (GSS), Lambert, Henly, and Kim (2019) analyze the correlates of schedule instability, defined as volatility with little worker control over the number of hours, and unpredictability, defined as short notice or irregular timing with little control. They find positive associations between instability and job insecurity and between unpredictability and financial insecurity (Lambert et al. 2019).

Across these various studies, a common theme is clear: workers with unpredictable or unstable schedules fare worse than those with more stable arrangements. But the sorting of different workers into dissimilar jobs complicates comparisons of their welfare. Cross-sectional studies typically cannot distinguish the effects of work arrangements from the attributes of workers, unless an arrangement has been randomly assigned. Do unstable schedules exacerbate the labor market outcomes of already disadvantaged workers? Or would these workers be worse off if they did not offer their employer the option of unstable scheduling? This counterfactual question is addressed only in a handful of published studies.

Prior Evidence of Penalties for Schedule Instability

Perhaps the most compelling causal evidence of the costs of schedule instability comes from field experiments designed to increase employee control or stability of scheduling within establishments or work groups (Williams et al. 2018; Kelly and Moen 2020). Given random assignment of comparable groups to control and treatment conditions, treatment-induced benefits imply equivalent costs to the scheduling practices of the control group. In a series of experiments, researchers with the Work, Family & Health Network find positive treatment effects on job retention, sleep, and physiological stress response among corporate managers, IT professionals, and at least some subgroups of long-term care workers (for a review, see Kelly and Moen 2020). In line with earlier observational research, these experiments identify employee control and reduced work-to-family conflict as key mediators.

In a separate experiment, a research team led by Williams, Lambert, and Kesavan evaluated a multi-component Stable Scheduling Treatment implemented in Gap clothing stores. A difference-in-difference analysis of pre- and post-test surveys shows an improvement in sleep quality for treatment store employees during the intervention period (Williams et al. 2019). A

two-way fixed-effects analysis of store administrative data finds positive treatment effects on weekly sales and labor productivity (Kesavan et al. 2022).

In a different vein of research, Mas and Pallais (2017) use a discrete choice experiment to estimate the monetary value of schedule stability and control for workers. Presenting call center applicants with a choice between randomized combinations of wages and non-wage amenities, the authors analyze workers' "willingness to pay," i.e. accept lower wages, for standard or flexible schedules. They find a strong aversion to employer discretion over scheduling, particularly when this involves the possibility of working evenings or weekends. Job seekers are willing to pay on average 20 percent of wages to secure a standard workweek. More surprisingly, most workers put little monetary value on the ability to make their own schedule or choose the number of hours they work, although a sizable minority (at least 25 percent) are willing to accept 11 percent lower wages for such flexibility. The authors supplement their experimental evidence with national data from the Understanding America Survey, which reveals similar patterns and heterogeneity in workers' stated preferences for alternative schedule arrangements.

The closest analogue to the approach of the present study is an analysis of 2003–2004 panel data from the Canadian Workplace and Employee Survey (WES) by McCrate, Lambert, and Henly (2019). Using both a categorical and continuous measure of variability in weekly work hours, the authors find a positive cross-sectional association with underemployment, defined as a preference for more hours of work at the same hourly rate of pay. They then use a first-difference model to identify negative effects of variability on the total number of hours reported by workers who were underemployed or satisfied with their hours in 2003. While the WES does not directly measure schedule control, McCrate and her coauthors infer lack of employee control from the underemployment measure, interpreting their results as evidence of a demand-side constraint on the number of hours (2019: 1295). They find no evidence of compensating differentials with respect to hourly pay. However, this analysis does not examine non-monetary benefits such as flexible or family-friendly timing which may offset the costs of unstable hours (Golden 2008).

Other recent studies provide indirect evidence of compensation penalties for scheduling risk by linking instability to employer power and worker dissatisfaction. Finnigan (2018) used data from the Survey of Income and Program Participation (SIPP) to show that the incidence of variable hours increased in tandem with unemployment during the Great Recession and is associated with greater income volatility. In a related paper, Finnigan and Hale (2018) show that union members are less likely than non-union workers to report variable hours, particularly in states with high union density. They also find that union membership attenuates the monthly earnings penalties associated with variable hours and nonstandard schedules. Their results suggest that earnings penalties are due to lower average hours as opposed to a lower hourly wage, but (unlike the WES) the SIPP only captures variability in lieu of the number of usual hours of work (Finnigan and Hale 2018: 1564n1).

Using panel data from the Current Population Survey, LaBriola and Schneider (2020) find that hour volatility, defined as the coefficient of variation in actual hours of work per week, is greatest in the bottom wage quartile and that this disparity is positively related to state-level unemployment rates and negatively related to union coverage. Choper, Schneider, and Harknett (2021) use panel data from a survey of hourly workers at large retail and food service firms to show that schedule instability—measured by an index of employer-driven schedule changes and

unsociable arrangements (i.e. working consecutive closing and opening shifts or "clopenings")—is associated with lower job satisfaction and higher turnover.

The literature offers clear evidence of the costs of schedule instability for workers. However, it is harder to evaluate the potential benefits of these schedule arrangements. Few studies distinguish schedule instability from flexibility, which many employers advertise as a benefit of jobs with variable schedules. Prior studies of compensation for schedule instability focus on wages or weekly earnings, neglecting non-monetary forms of compensation. Leading scholars argue that compensation penalties for schedule instability result from employers exploiting workers already disadvantaged by a lack of or outside options or bargaining power in their jobs (McCrate et al. 2019; Choper et al. 2021). But there have been few attempts to test competing explanations.

SOURCES AND FUNCTIONS OF SCHEDULE INSTABILITY

If schedule instability is costly, why does it persist in many jobs? There is near consensus among scholars and practitioners that unstable scheduling benefits employers operating in unpredictable markets, such as consumer services (American Consumer Institute 2019; Houseman 2001; McCrate et al. 2019; Rubery et al. 2005; Yelowitz 2022). But commentators disagree over what leads workers to accept these arrangements. Do workers gain or are they exploited with unstable schedules?

In this section, I address this question by reframing it in terms of compensation for scheduling risk. I develop a conceptual framework that clarifies the risk governing functions of schedule arrangements. I adapt the notion of optionality from finance to conceptualize how unstable schedules function as a contingent labor contract with an asymmetric allocation of potential gains and losses (Breen 1997). I then draw on alternative theories of the labor market to formulate hypotheses about the form and conditions for compensation of the risk workers bear with unstable schedules.

Schedules as Risk Governance Arrangements

My conceptualization of scheduling risk begins with the premise that labor is a perishable resource. The productive potential of labor cannot be stored or separated from the activity of workers. If workers are idled for whatever reason, they will not produce what they could and may not earn what they expected. These costs motivate workers and employers to develop ways of anticipating, allocating, and insuring against the risk of idleness. Schedules serve this purpose by arranging when, where, and on what conditions work occurs. A risk governance perspective shifts our view of schedules from a static list of shifts toward a dynamic process of planning production and marshalling resources.

I focus on two elements of schedule arrangements with particular importance for risk governance: contingency and compensation. A schedule is contingent to the extent that the expected timing or duration of work depends on subsequent events or decisions. An extreme example is an "on-call" arrangement which requires workers to be available to work only if their employer decides they are needed shortly before they are scheduled to begin (Fugiel and Lambert 2019). But even shifts scheduled weeks in advance may be contingent if workers are dismissed early or kept later at work than planned. Schedule flexibility represents a different kind of contingency that depends not only on employer needs but also worker availability or

convenience. The opposite of contingency is mutual commitment, by which I mean adherence of the worker and employer to a predetermined schedule. I use these concepts rather than the more familiar notion of "predictability" to draw attention to the exercise of discretion over scheduling, as distinct from the length of advance notice or precipitating circumstances for setting or changing the schedule.

Compensation is another important element of risk governance in schedule arrangements. Here I refer to compensation based on the temporal coordinates of work—for instance, time of day or day of the week—rather than a generic rate of pay. For example, many union contracts specify a higher payrate for work in the evening or night, on weekends or holidays, or other non-standard shifts. Similarly, the Fair Labor Standards Act (FLSA) provides hourly employees with time and a half pay for work beyond 40 hours in a 7-day period. A less common form of compensation specific to unstable schedules is "reporting pay": a fraction of expected earnings paid to workers who report for a shift that is canceled or cut short (Alexander et al. 2015). Schedule arrangements may also involve non-monetary compensation. Salaried employees exempt from the overtime provisions of the FLSA may accrue "comp time" for excess work hours that they can redeem for time off at a later date. However, compensation not required by law or formal contract is more susceptible to employer or supervisor discretion, which can be exercised in arbitrary or biased ways (Kelly and Kalev 2006).

I synthesize these elements of risk governance into a model of unstable scheduling by means of an analogy with option contracts in finance. An option is a type of derivative contract in which one party obtains the right but not the obligation to transact in the future on prespecified terms (Options Institute 1999). The most relevant such contract is a call option, which specifies the price for an asset that the buyer may decline or defer to purchase until a future date. This arrangement exposes the seller to the risk that the market value of their asset will exceed the price specified in the contract, resulting in a loss. As compensation for this risk, the seller demands a premium that the buyer must pay whether or not the option is exercised, that is, regardless of the trade being carried out. The buyer of a call option limits their potential losses to the cost of the premium but can in principle realize unlimited gains by purchasing the asset for less than its future market value. In this way, a call option functions as a kind of insurance. But unlike accident or life insurance, the buyer enjoys greater upside potential than the seller.

I adapt this notion of optionality to model the relationship between contingency and risk in unstable scheduling (Breen 1997). Here the underlying "asset" is the time and effort of the worker, or "labor power" to use Marx's term ([1867] 1990). Like a call option, an unstable schedule gives the employer the right but not the obligation to transact for hours of labor in whatever quantity employees make available. By exercising discretion over when and how much available labor is put to work, the employer can limit losses from excess labor while realizing potential gains from productive work. The workers bear heightened risk for lending their employer time that they cannot commit to other endeavors so long as the employer has discretion over whether or not to employ it. This asymmetry in up- and downside risk distinguishes optional scheduling from mere externalization of risk, as in the shift by many US employers from defined-benefit to defined-contribution pension plans (Hacker 2006).

The analogy with a call option also indicates the dimensions along which scheduling risk can be compared and potentially compensated. Under standard economic assumptions, the premium for an option should reflect the riskiness of the underlying asset (Dixit and Pindyck

1994). The more volatile the price of an asset, the higher the premium a seller can demand for a call option on it. The premium should also increase with the length of maturity—how far in the future the option can be exercised—since risk is a function not only of the magnitude of price deviations but also the length of exposure. Similarly, I expect the total cost of instability for the worker to be a function of the magnitude of variation and length of advance notice provided by the employer. The more volatile or unpredictable the schedule, the greater the risk to which the worker is exposed, and the higher the expected premium for this option.

My model of work as an option provides a framework for analyzing scheduling risk but it does not specify the form or conditions for compensation in the labor market. I look beyond the literature on work schedules to identify three theories of the labor market with different implications for the allocation and compensation of scheduling risk. The first is a theory of efficient contracts whereby employers offer premium compensation to offset scheduling risk (Hamermesh 2019; Rosen 1994). The second is a theory of efficient matching whereby workers who prefer scheduling risk over stability are selected into unstable jobs (Mas and Pallais 2020; Sullivan and To 2014). The third is a theory of imperfect competition whereby workers bear uncompensated scheduling risk because they lack access to more stable jobs (Kalleberg 2018; McCrate et al. 2019). These theories allow me to formulate hypotheses that represent in more precise language opposing positions in the public debate over scheduling regulation.

Compensating Differentials for Scheduling Risk

The classic theory of efficient labor contracts, tracing back to Adam Smith, predicts compensating differentials for more risky jobs (Smith [1776] 2000: 143–150). Compensating differentials are monetary increments that "equalize the total monetary and nonmonetary advantages or disadvantages among work activities and among workers themselves" (Rosen 1986: 641). This theory is frequently used to explain observed wage premiums—for night shifts, for instance—and more generally to understand how wage differences can persist under equilibrium conditions in labor markets with heterogeneous jobs (Hamermesh 2019; Kostiuk 1990). In most applications, the value of such differentials is analyzed in terms of job "disamenties," i.e. costs, inconveniences, and other disadvantages workers experience (Rosen 1986). In a competitive labor market, these disadvantages should be compensated by higher earnings or other advantages such that the marginal worker is indifferent to changing jobs.

While this theory rests on strong assumptions about perfect competition and efficient contracts (McCrate 2005; Rosenfeld 2021), it has the merit of producing clear hypotheses regarding compensation for scheduling risk. If some jobs entail more risk than others, then workers must receive compensating differentials to take a job with scheduling risk rather than a less risky alternative. The most obvious way to compensate them would be to pay a monetary premium above what they could earn in otherwise equivalent jobs with a stable schedule. This leads to my first hypothesis.

Hypothesis 1. Employees receive higher pay for unpredictable and unstable schedules.

Compensating differentials need not take the form of an immediate pay premium. We can extend the logic of "equalizing differences" to other forms of compensation drawing on theories of implicit labor contracts (Rosen 1994). For instance, rational actor theories of social mobility provide a useful elaboration of this logic in models analyzing career trajectories as an implicit tradeoff between job security and opportunities for advancement (Breen and Goldthorpe 1997;

Halaby 2003). The key idea is that employers can entice a worker to accept less desirable starting terms if they offer some assurance of future rewards. The worker may accept schedule instability on a temporary basis as "a stepping stone" to greater compensation over time (Addison et al. 2015). Such deferred compensation may take the form of greater job security or upward mobility. My second hypothesis concerns a minimal condition for deferred compensation: retention by the same employer.

> Hypothesis 2. Unpredictable and unstable schedules increase the probability of job retention.

Intrinsic Rewards of Flexible Scheduling

An alternative explanation for why workers accept scheduling risk revolves around intrinsic rewards and worker preferences. Of particular relevance for my purposes are theories of efficient matching between jobs with heterogeneous attributes and workers with heterogeneous preferences or personal commitments, for instance, parents or students. The better the fit between worker and job, the greater the utility for the worker (Sullivan and To 2014). In this way, the utility derived from a job that satisfies the worker's preferences can compensate for scheduling risk that would be unacceptable to other workers (Mas and Pallais 2017). This is the logic underlying the most common explanation for why workers accept unstable schedules: they prefer the flexibility that comes with instability (American Consumer Institute 2019; French 2016). This claim may seem paradoxical given the distinction between instability and flexibility that I adopt from studies of employer versus employee schedule control (Lambert and Haley 2004; Lambert et al. 2014; McCrate 2012). But control is a relative concept. It is not a contradiction for workers to enjoy greater flexibility with variable than with rigid schedules, even if this variation mostly reflects employer discretion (Mathur 2017). My third hypothesis directly tests for the intrinsic reward of schedule flexibility often promised by employers who demand the option of unstable scheduling.

> Hypothesis 3. Unpredictable and unstable schedules increase beneficial flexibility for employees.

While beneficial flexibility figures most prominently in the public discourse around scheduling, there may be other non-monetary rewards for unpredictable or unstable schedules. Workers may prefer to work in a certain industry or occupation and be willing to accept greater scheduling risk in order to gain entry or remain in this line of work. Alternatively, workers may dislike a standard, 9–5 Monday–Friday workweek and may accept some risk to escape the tedium of a standard workweek. Note that here the benefit would be better alignment with the worker's preferences, rather than the flexibility to vary their schedule (Mas and Pallais 2020).

By the efficient matching logic, intrinsic benefits should contribute to worker utility, however intangible or idiosyncratic they may seem to an observer. Using job satisfaction as a proxy for utility, we can infer efficient matching from *equivalent* levels of job satisfaction in different schedule arrangements. If a worker is as satisfied with schedule instability as with schedule stability in otherwise similar jobs, this would imply either that the worker is indifferent to scheduling risk or derives sufficient utility from unobserved attributes of the job to compensate for this risk. My fourth hypothesis represents an omnibus test of efficient matching of schedules to workers using job satisfaction as a proxy for utility.

Hypothesis 4. Employees report equivalent job satisfaction with stable and unstable or unpredictable schedules.

Imperfections in the Market for Working Time

A more critical explanation for why workers accept scheduling risk emphasizes labor market imperfection rather than efficiency. The basic proposition is that workers accept jobs with uncompensated risk because they have limited access to better jobs. Different theories emphasize various kinds of limitations—asymmetric information, employer discrimination, market concentration, specific investments, or barriers to mobility—with different implications for labor market risk and reward (Card 2022; Rosenfeld 2021). I draw on theories of monopsony and social closure (Manning 2021; Tomaskovic-Devey and Avent-Holt 2019) which generate predictions that align with popular explanations for why employers penalize rather than reward workers exposed to scheduling risk (Alvarez et al. 2020; Sharma et al. 2022).

Imperfect competition gives employers discretion over compensation. Employers can exploit this discretion to pay workers less than what they produce for the firm. Since their outside options are limited, many workers will accept suboptimal pay or benefits as a condition of employment. Employers can allocate some of what they save on compensation to monitor current workers and recruit replacements for those that leave. Alternatively, employers can share rents with workers to reduce their recruitment costs through higher retention (Manning 2003). In retail, restaurants, and other consumer-facing services, the "low-road" strategy of setting compensation low and managing high turnover prevails among US employers (Carré and Tilly 2017; Osterman 2020). However, employer discretion is also compatible with a "high-road" strategy, which may be more effective in securing the desired quantity of labor when supply is limited, as in nursing (Clawson and Gerstel 2014).

If employers extract rents in the form of low wages, they may also extract rents through optional schedule arrangements. Workers in these arrangements would be doubly exploited—deprived of their marginal product at work and deprived of more productive uses of their time while idle (Sharma et al. 2022). We can infer employer rents from compensation penalties for jobs with greater scheduling risk. To the extent that employer rents are due to monopsony, circumstances that reinforce employers' power to set wages or reduce recruitment costs should magnify compensation penalties (LaBriola and Schneider 2020; Hirsch et al. 2018). I use local unemployment rates as a proxy for employer power to formulate my fifth hypothesis, which predicts a negative relationship between unemployment and compensation for scheduling risk.

Hypothesis 5. Increases in unemployment decreases compensation for unpredictable and unstable schedules.

A more general formulation of this power-based theory of labor compensation considers non-competitive allocation not only between employer and employee but also between groups of workers. *Social closure* refers to processes of allocating resources that privilege insiders or discriminate against outsiders to a categorically distinct group (Tomaskovic-Devey and Avent-Holt 2019, 135). If stability and flexibility in scheduling are scarce organizational resources, then social closure would predict the hoarding of these resources by workers in high-status groups and the offloading of scheduling risk onto low-status groups. This prediction seems consistent with evidence of gender and racial disparities in schedule arrangements among coworkers. For example, Storer, Schneider, and Harknett (2020) find that women and Black workers are more

likely than White men to experience schedule instability at large retail and fast-food chains, and that racial disparities in scheduling are greater among non-White workers with White managers.

Because social closure is based on categorical distinctions and the relative power of groups, it is a contested and variable phenomenon (Tomaskovic-Devey and Avent-Holt 2019). Scheduling practices differ across industries, firms, and even establishments, not only due to differences in the composition of their workforce, but also the degree of coordination in production and volatility of demand (McCrate 2018). This variation means that some workers excluded from stable schedules in one organization can gain access to them at another. However, social closure may still inhibit these workers from bargaining over schedule arrangements, preventing them from bidding down compensation to secure a stable schedule. Workers who already have a stable arrangement are in a better position to negotiate premium compensation to take on scheduling risk. In this way, social closure may generate increased compensation for workers who transition from stable to unstable jobs but not for those who transition from unstable to stable jobs. My sixth hypothesis formulates this prediction as an inequality in the magnitude of compensation differentials.

> Hypothesis 6. Transitions from stable to unstable schedule arrangements lead to larger changes in compensation than transitions from unstable to stable schedules.

DATA AND METHODS

To test these hypotheses, I use the best available longitudinal data on schedules and compensation in the US labor market. These data come from four recent rounds (15–18) of the National Longitudinal Survey of Youth, 1997 Cohort (NLSY97). The NLSY97 is an ongoing survey sponsored by the Bureau of Labor Statistics (BLS) and conducted by NORC using a combination of in-person and telephone interviews with auxiliary web-based reporting (Hagerty 2015). The survey collects detailed information on the behavior, attitudes, and experiences of a cohort of 8,984 individuals born between 1980 and 1984 who were adolescents living in the United States at the time of the initial interview in 1997. The NLSY97 uses a stratified, area-probability sampling design with an oversample of Black and Hispanic youth (Moore et al. 2000). The public-use data include round-specific weights and information on sampling units that permit researchers to estimate characteristics of the cohort population and correct for design effects (BLS 2020a).

In 2011, the NLSY97 began asking questions about schedule control, advance notice, and variation in work hours recommended by Susan Lambert and Julia Henly (see Lambert and Henly 2014 for the rationale behind these questions). Together with existing items on usual hours of work, shift timing, and job benefits, these questions make it possible to distinguish multiple dimensions of schedule variation and identify optional arrangements. The NLSY97 also offers information on respondents' health, schooling, personal relationships, household composition, and other characteristics relevant to labor market outcomes. While the abundance of round- and job-specific items make these data more challenging to work with than a typical cross-sectional survey, they provide an exceptionally detailed and long-running record of the careers of workers entering the labor market around the turn of the millennium.

In general, the NLSY97 adheres to the highest standards for data collection and quality assurance. It has maintained a high response rate over time, interviewing nearly 75 percent of the

sample in round 18. However, the addition of new items to the already complex questionnaire can occasion errors or inconsistencies affecting data quality. This was the case with the work schedule items added in 2011. In each of the four rounds of data used in this paper, programming errors or changes during data collection resulted in a subset of eligible respondents being skipped past some of the scheduling questions. The details of these errors and characteristics of excluded respondents differ from round to round, and even from the beginning to the end of the field period in a single round.[1] In this working paper, I assume these data are missing completely at random. I discuss how data limitations qualify the conclusions I draw toward the end of the paper.

The population of interest consists of workers born between 1980 and 1984, residing in the US, and employed for at least one hour per week in a civilian "main job" (the job in which they work the most hours). This definition imposes a few additional restrictions on my analytic sample of NLSY97 respondents. I exclude workers whose main job is in the military or self-employment. I also omit employees with zero hours of paid work, whether due to an involuntary layoff or voluntary leave of absence. The resulting analytic sample comprises 15,776 observations on 6,368 unique employees interviewed between 2011 and 2018 when they were 26–38 years old. Appendix A provides summary statistics on the demographic and labor market characteristics of the cohort population represented by this sample.

Measures of Schedule Characteristics

I derive measures of schedule characteristics from a series of questions about advance schedule notice, employee control of timing, and the range of weekly hours worked in the past month. Appendix B provides the full text of the relevant questions and response categories in the NLSY97. Note that the questions on the number of work hours ask for "all hours," including overtime and time working from home, but instruct respondents *not* to report weeks in which they "missed work because of illness or vacation." I combine these items with information on respondents' usual hours of work to calculate a relative measure of volatility, using the formula below. The thinking behind this measure is that, for someone working 35 hours in a normal week, a few hours more or less may not make much difference, but for someone only working 20 hours, an equivalent difference in hours represents more substantial volatility.[2]

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[1] The number of employed respondents missing data on one of the main scheduling items ranges from a low of 935 in round 16 to a high of 3,122 in round 18, when the schedule control question was dropped two months into the field period due to concerns about interview length. The group most underrepresented in my analytic sample are workers who receive overtime pay (38 percent as compared with 42 percent for the full sample), since reporting overtime pay leads to a branch of the questionnaire where most of the skip errors were located. The analyses reported in this paper use listwise deletion and ordinary least squares estimation but include an indicator of overtime pay as a control variable.

[2] Lambert and Henly call this measure the "instability ratio" (IR) (2014: 7). It is analogous to the coefficient of variation (CV) used by LaBriola and Schneider to measure work hour volatility across four reference weeks of the CPS (2020). Whereas the IR measures the range of variation relative to self-reported normal hours, the CV measures the standard deviation relative to the mean hours worked in observed weeks. If we substitute the observed midpoint (0.5*most + 0.5*fewest) for self-reported normal hours in the denominator of formula 1, the measure of volatility would be equivalent to 2*CV for the two reference weeks.

$$Volatility = \frac{most - fewest}{normal\ hours} \quad (1)$$

Table 1 summarizes the distribution of schedules along the three main dimensions of schedule control, advance notice, and volatility in each of the four survey rounds. As a shorthand, I refer to rounds by the year in which data collection began. I accentuate contrasts of interest by collapsing some response categories and dividing my continuous volatility measure into four bins. I use round-specific weights that adjust for the initial sampling probability as well as differential non-response to estimate the schedule characteristics of employees in the 1980–1984 birth cohort (Moore et al. 2000). In the final row, I include the unweighted number of observations in the analytic sample, counting all cases with valid responses on at least one of these three characteristics.

Table 1. Distribution of schedule characteristics by year

Schedule characteristic		**2011** %	**2013** %	**2015** %	**2017** %
Control	Employee	22.6	27.9	29.6	32.8
	Employer	73.9	66.2	64.4	61.9
	Outside	3.5	5.9	5.9	5.3
Advance notice	1 week or less	37.3	26.5	24.7	26.6
	Between 1 and 2 weeks	11.5	9.8	10.5	11
	3 weeks or more	51.3	63.6	64.8	62.4
Volatility	< 5%	26.5	27.8	25.7	22.4
	[5, 25%)	27	25.6	27.2	24.8
	[25, 50%)	24.6	25.9	25.4	26.9
	50% or more	21.9	20.7	21.7	25.8
Sample N		3,495	4,002	4,080	4,199

Note: Percentages estimated using round-specific weights (SAMPLING_WEIGHT_CC). Year corresponds to the start of the field period, which typically runs from autumn through summer of the following year. Sample N is the number of employed civilian respondents for whom at least one of these schedule characteristics is observed.

For the first set of rows in table 1, the key contrast is between employee versus employer or outside control of scheduling. Most employees report that their starting and finishing times are decided by their employer with little or no employee input. Yet the share of employees who decide their own working hours increases from less than a quarter in 2011 to nearly a third in 2017. This increase may be a function of the age or seniority of cohort members or improving labor market conditions over the study period.

With respect to advance notice, the middle rows of table 1 suggest a bimodal distribution. Most employees say they usually know the days and hours they need to work 3 weeks or further in advance. But at least one in four report 1 week or less advance notice, which is below the 10–14-day standard for fair workweek laws (Mitchell et al. 2021). The incidence of such short notice decreases over the study period, although the trend is less consistent than the decrease in employer schedule control.

To tabulate volatility, I use convenient cut points that divide the distribution into four bins each with roughly a quarter of the cohort population. I follow studies of intra-year income

variation that treat 25 percent above or below normal as the threshold for "considerable" volatility (Hacker et al. 2014; Morduch and Schneider 2017). Approximately half of the employees in the NLSY97 cohort report this level or more volatility in their weekly hours of work in the past month. The incidence of considerable volatility increases somewhat over the study period, from less than 47 percent in 2011 to nearly 52 percent of employees in 2017. The appearance of cross-cutting trends in control, notice, and volatility bolsters the case for a multidimensional approach that distinguishes between different levels and combinations of schedule variation (Fugiel and Lambert 2019).

Typology of Schedule Arrangements

I classify schedule arrangements by dichotomizing each dimension of variation and combining them into an eightfold typology. This approach makes it possible to distinguish more precisely between stable, unstable, and flexible arrangements. Rather than relying on conventional summary measures of "nonstandard" or "variable" schedules, I differentiate arrangements in terms of the locus and extent of scheduling risk. I recognize that scheduling risk is a joint function of multiple dimensions of schedule variation, which may not have equivalent effects on compensation. Unlike an additive index, my typology allows for distinct combinations of schedule control, volatility, and advance notice to have specific effects once variation exceeds a certain threshold.

The thresholds I use to categorize arrangements reflect a mix of theoretical and practical concerns. The theoretical rationale is strongest for collapsing the five categories of schedule control into a dichotomous measure based on whether the locus of control lies mostly with the worker or external actors, i.e. with the employer or clients (Lambert and Henly 2014). This measure of control is critical to my distinction between the risk of instability and the benefit of flexibility. My choice of a week or less as the threshold for short notice reflects the two weeks' notice that has become standard in fair workweek regulations (Mitchell et al. 2021). For volatile hours, I adopt the 25 percent threshold from research on income volatility (Hacker et al. 2014), since for most employees this represents at least a day's worth of hours and, for hourly workers, earnings.

I use these three component indicators—external control, short notice, and considerable volatility—to define eight schedule arrangements. I build on work by Lambert, McCrate, and colleagues who define *unstable* schedules as the combination of variable hours with little or no employee control (Lambert et al. 2012; McCrate 2012). This arrangement is conceptually distinct from a *volatile* schedule over which the employee has more control. Similarly, I define *unpredictable* schedules as the combination of short notice with little or no employee control, which is distinct from a *short-term* arrangement with employee control. In my typology, the locus of schedule control changes the interpretation even of a relatively steady schedule (i.e. one with volatility of less than 25 percent of normal hours and more than a week advance notice), which I characterize as *rigid* without employee control but *stable* with it. Finally, I characterize the combination of volatile hours and short notice with outside control as an *erratic* arrangement, which is distinct from a *fluid* arrangement with employee control.

Table 2 lists these eight schedules with the corresponding values of the component indicators and estimates of their incidence over time. I array the rows in a symmetric fashion with the least variable schedules (stable and rigid) in the center and the most variable at either

end of a spectrum—from greater discretion for the employee to greater discretion for the employer. This ordering reflects my risk-theoretic model of work as an option. For example, I put erratic schedules at the bottom of the table since this arrangement implies more optionality for the employer, and greater risk for workers, than unpredictable schedules without volatile hours.

A plurality of employees in this cohort (30–33 percent) have rigid schedules, defined by external control, little volatility, and more than a week advance notice. The trend toward greater employee control and advance notice is evident in the increase of volatile and stable schedules on the one hand, and the decrease of unpredictable and erratic schedules on the other. Nevertheless, the incidence of unstable, unpredictable, and erratic schedules is much higher than standard measures would suggest (Fugiel and Lambert 2019; McCrate 2018). While only 2–3 percent of employees classify their schedule as "irregular" (not shown in table), some 37–47 percent report either instability or unpredictability (combining rows 6–8). Erratic schedules comprise a large share of this total, with 10–17 percent of employees reporting instability and unpredictability. These workers face acute scheduling risk that has been largely invisible in prior quantitative studies (except for Lambert et al. 2014).

Table 2. Schedule typology and incidence by survey year

Schedule type		**Component indicators** (Z)			**2011**	**2013**	**2015**	**2017**
		External control	Notice ≤ 1 week	Volatility ≥ 25%	%	%	%	%
1.	Fluid	0	1	1	4.9	4.4	4.3	4.9
2.	Short-term	0	1	0	3.4	2.6	2.1	2.2
3.	Volatile	0	0	1	6.5	9.8	11.4	12.8
4.	Stable	0	0	0	7.9	11.1	11.8	12.7
5.	Rigid	1	0	0	30.5	32.5	32.3	30.1
6.	Unstable	1	0	1	18	20.2	19.9	21.8
7.	Unpredictable	1	1	0	11.9	7.3	6.8	5.8
8.	Erratic	1	1	1	17	12.2	11.5	9.6

Note: Percentages estimated using round-specific weights.

This typology not only sheds new light on previously obscure arrangements, it also permits a more precise analysis of the effects of instability as distinct from flexibility. Conventional measures confound different sources and dimensions of schedule variation, relying on summary contrasts such as standard versus nonstandard or regular versus irregular. Recent research from the Shift Project uses more detailed measures of typical as well as occasional scheduling practices, including short notice, lack of employee control, shift cancellations, and working a clopening shift (Schneider and Harknett 2019: 94). Schneider, Harknett, and colleagues construct an additive scale of these items which they interpret as an index of schedule instability or precarity (Schneider and Harknett 2019; Shorer et al. 2020). Their approach implicitly assumes that component indicators have equivalent effects. I relax this assumption in order to identify the effects not only of quantitative differences in the *level* of scheduling risk, but also qualitative differences in the *function* of schedule arrangements—as an option for employer discretion, flexibility for the worker's benefit, or mutual commitment to maintaining stable work.

Compensation Outcomes

An advantage of the NLSY97 in comparison with most other national surveys is that it captures job-specific measures of scheduling and compensation. This makes it possible to analyze the effects of scheduling risk on compensation by the same employer that exercises an implicit option on the worker's time. While part-time workers with volatile hours on their main job may supplement unreliable earnings with another job or other ways of generating income, this supplemental income does not constitute compensation for scheduling risk, but rather a coping strategy or hedge against this risk (Morduch and Schneider 2017). For this reason, I restrict my analysis to monetary and non-monetary compensation in the *main job*, defined by the BLS as the current job in which the employee works the most hours or, in the case of a tie, the job of the longest duration.

Hourly pay

I use the measure of total hourly pay (CV_HRLY_COMPENSATION) that the BLS calculates based on respondents' usual hours, wages, and other forms of earnings such as tips, bonuses, commissions, and overtime pay. This measure is preferable to the straight hourly wage (or hourly equivalent of a non-hourly salary) since it includes premium compensation that workers may be willing to bear greater scheduling risk in order to obtain, most importantly, overtime pay for full-time workers who pick up extra hours (Clawson and Gerstel 2014).

Job retention

I derive an indicator of job retention from the unique employer identifiers (YEMP_UID) in consecutive rounds of the study period. The indicator equals 1 when the employer ID for the main job in round t matches the corresponding ID in round $t-1$, roughly two years earlier. The indicator equals 0 when the respondent is no longer employed in the same main job as the preceding round. If the respondent is missing from the analytic sample in either round, the retention outcome is also treated as missing.

Beneficial flexibility

My measure of beneficial flexibility comes from a different subsection of the NLSY97 questionnaire than the items on schedule control and advance notice. It is an indicator of whether or not the respondent selects "a flexible work schedule" from a list of job benefits that "it would be possible for [the respondent] to receive." The interviewer refers to a showcard that lists a flexible schedule along with health, dental, and life insurance; paid and unpaid parental leave; tuition reimbursement; childcare; and an employee stock ownership plan as "benefits which employers sometimes make available to their employees." Although the questionnaire does not define "a flexible work schedule," the context implies a kind of flexibility that the employer provides for the benefit of the employee. Moreover, this beneficial flexibility is presented as distinct from paid parental leave, sick days, and vacation time, which are asked separately.

Job satisfaction

This is a standard item asking respondents how they feel about their job on a five-point scale from "like it very much" to "dislike it very much." Since very few respondents report disliking their current job, I convert this scale to a dichotomous measure that equals 1 only for the highest level of satisfaction.

Moderator Variable

I use local unemployment rates as a proxy for employer power, which theories of monopsony predict will moderate labor compensation. The local unemployment rate is defined as the percentage of the labor force actively seeking work in the city or county where the respondent resides at the time of the interview. The BLS calculates unemployment rates using data from the Current Population Survey and restricted-use location information contained in the NLSY97 Geocode data (BLS 2020b).

Analytic Strategy

I exploit the longitudinal nature of the NLSY97 data to analyze the effects of schedule arrangements on benefits and pay. For hypotheses 1–4, the estimands of interest are expected differences in potential compensation between a job with a stable schedule and one with an unpredictable, unstable, or erratic schedule, all else being equal. I identify these compensation differentials with the marginal effect of a change in schedule type *within employees*, holding constant potential confounders. I estimate marginal effects at the mean using ordinary least squares regression with a two-way fixed-effects estimator and, in my preferred specification, an array of covariates. This approach controls for observed time-varying confounders as well as unobserved individual traits such as personality and cognitive ability. If we assume that the same scheduling "treatments" have homogeneous effects across the cohort population and over time, then the estimated marginal effects can be given a causal interpretation (Goodman-Bacon 2021). However, I believe the results of this analysis can inform scholarly and policy debates around labor scheduling even if the conditions for causal identification are not met.

$$\ln(Y_{it}) = \alpha_i + \gamma_t + \boldsymbol{Z}_{it}\boldsymbol{\delta} + \boldsymbol{X}_{it}\boldsymbol{\beta} + \epsilon_{it} \quad (2)$$

Equation 2 represents the model that I use to estimate pay differentials for unstable schedules as predicted in my first hypothesis. I regress the natural logarithm of hourly pay for employee i in survey year t on contemporaneous schedule characteristics $\boldsymbol{Z}_{it}$ and controls $\boldsymbol{X}_{it}$. The coefficients of interest ($\boldsymbol{\delta}$) are estimated net of an individual fixed effect α_i and year fixed effect γ_t with residual error ϵ_{it}. This model simultaneously estimates seven $\boldsymbol{\delta}$ coefficients corresponding to the three main schedule indicators and their interactions. I then combine these coefficients, setting covariates equal to their respective means, to predict hourly pay for each of the eight schedule types (defined in table 2). Finally, I estimate the marginal effect of each schedule type relative to the reference category of a stable schedule. I repeat this procedure over three specifications of the model: (1) a baseline specification with no controls (except for year and person fixed effects), (2) a reduced specification with some controls, and (3) my preferred specification with the full set of controls described in the following section. I use robust standard errors clustered at the person level for statistical inference.

For the dichotomous outcomes—job retention, beneficial flexibility, and job satisfaction—I use a linear probability model (LPM) to estimate average partial effects of schedule arrangements. Equation 3 represents a static version of this model where the probability of "success" (e.g. the highest level of job satisfaction) is a function of contemporaneous predictors and two-way fixed effects. The LPM avoids the "incidental parameters problem" with unit fixed effects and obviates the need to rescale estimates of interaction terms in non-linear

(logit or probit) models (Allison 1999; Breen, Karlson, and Holm 2018; Wooldridge 2010). My use of cluster robust standard errors addresses heteroskedasticity and autocorrelation concerns.

$$\Pr(Y_{it} = 1|\alpha_i, \gamma_t, \boldsymbol{Z}_{it}, \boldsymbol{X}_{it}) = \alpha_i + \gamma_t + \boldsymbol{Z}_{it}\boldsymbol{\delta} + \boldsymbol{X}_{it}\boldsymbol{\beta} \quad (3)$$

I employ an alternate model for job retention since my interest is with the effects of scheduling risk on subsequent retention. Equation 4 represents a dynamic LPM, which predicts the probability of job retention in round $t + 1$, conditional on job characteristics in round t and other controls in round $t + 1$. I assume that scheduling risk affects job retention for a maximum of two years from the time of exposure, beyond which it is no longer consequential. Here the control variables comprise two vectors: $\boldsymbol{W}_{it}$ which precedes the outcome, and $\boldsymbol{X}_{it+1}$ which is contemporaneous or possibly antecedent to it. Besides ensuring the temporal precedence of my explanatory variables, this lag structure controls for changes that are likely to affect retention but can plausibly be treated as independent of prior schedule arrangements. An example would be the birth of a child, which I presume to be related to contemporaneous schedule arrangements and job retention since the previous round, but independent of prior schedule arrangements.

$$\Pr(Y_{it+1} = 1|\alpha_i, \gamma_{t+1}, \boldsymbol{Z}_{it}, \boldsymbol{W}_{it}, \boldsymbol{X}_{it+1}) = \alpha_i + \gamma_{t+1} + \boldsymbol{Z}_{it}\boldsymbol{\delta} + \boldsymbol{W}_{it}\boldsymbol{\lambda} + \boldsymbol{X}_{it+1}\boldsymbol{\beta} \quad (4)$$

To test my fifth hypothesis, I shift my focus from the marginal effects of schedule arrangements to the moderating effects of unemployment on compensation. Here the estimands of interest are differences in potential compensation between stable and unstable schedules for workers exposed to different levels of unemployment. I identify the effect of this "contextual moderator" as the expected change in the compensation differential (relative to a stable schedule) for a unit change in the unemployment rate (Hong 2015). To estimate this effect, I add to the model represented by equation 2 my continuous measure of unemployment and all possible interactions with the treatment vector $\boldsymbol{Z}_{it}$. The coefficients in $\boldsymbol{\delta}$ now estimate 15 partial effects (4 main effects, 6 two-way, 4 three-way, and 1 four-way interaction effect). I calculate the moderation effect as a linear combination of these partial effects, again setting covariates equal to their respective means.

Equation 5 provides a simplified formula for the moderation effect as the predicted margin of differential compensation between a stable and unstable job at high versus low levels of unemployment (e.g. 2 percentage points above or below the sample mean). Hypothesis 5 implies that $\theta < 0$ since the compensation penalty for scheduling risk is expected to be greater in the context of high unemployment.

$$\hat{\theta} = [\mathrm{E}(Y_{\text{unstable}} - Y_{\text{stable}}|\text{High UE})] - [\mathrm{E}(Y_{\text{unstable}} - Y_{\text{stable}}|\text{Low UE})] \quad (5)$$

Hypothesis 6 also predicts inequality in the magnitude of compensation differentials, but as a result of social closure favoring high-status groups and disadvantaging low-status groups in the allocation of organizational resources. To test this hypothesis, I focus on the contrast between optional arrangements (i.e. unstable, unpredictable, or erratic schedules) and all other arrangements (i.e. stable, rigid, short-term, volatile, or fluid), which maps scheduling risk onto the insider/outsider logic of social closure. I substitute a 2x2 classification of schedule mobility $\boldsymbol{M}_{it}$ for the eightfold schedule typology represented by $\boldsymbol{Z}_{it}$ in equations 2 and 3. My estimation model includes indicators for three forms of mobility: (1) into an optional schedule arrangement,

(2) out of an optional arrangement, and (3) remaining in an optional arrangement (whether with the same or different employers). The omitted reference category is remaining in a lower-risk schedule arrangement. This specification allows me to test for asymmetric effects of schedule transitions with a simple combination of coefficients ($H_0: \delta_1 + \delta_2 = 0$). While the person fixed effects absorb time-invariant characteristics like race and ethnicity, we can interpret inequality in the magnitude of compensation differentials as evidence of preferential treatment related to the worker's starting position. Descriptive evidence of stratification in the prevalence of scheduling risk by race and other ascriptive characteristics helps provide context for interpreting this analytic result.

Control Variables

I control for demographic and job characteristics that may confound the effects of scheduling risk on compensation. To reiterate, stable characteristics such as sex, race, and ethnicity are absorbed by the person fixed effects included in all models. For time-varying characteristics, I include controls for all relevant observables in the full model and compare the results with a reduced model that omits covariates with less complete data. I also estimate a baseline model with person and year fixed effects but no covariates.

I control for the following personal and household characteristics: age, education, enrollment in classes or training, cohabiting with a spouse or partner, having a biological child under 18, residing with a child under 6, residing in an urban area, self-rated general health (5-point scale), any health limitations on the amount or kind of work, and Census region (4 categories). The full model also controls for the following characteristics of the main job: full-time hours (at least 35 in a normal week), hourly pay status, years of tenure, any usual overtime pay, medical benefits, paid parental leave, days of paid time off, a nonstandard shift (i.e. outside of regular business hours), industry (13 categories), occupation (5 categories), union coverage, multiple employer locations, and workplace size. Because of greater missingness, I drop from the reduced model workplace size and the indicators of overtime pay, union coverage, nonstandard shifts, medical benefits, paid parental leave, and multiple employer locations.

I transform some continuous variables to improve normality. I control for age in years and years squared, the square root of days of paid time off, the natural logarithm of the number of employees in the workplace. I convert other covariates into indicator variables to control for differences between discrete levels or groups. For education, I use a pair of indicators to control for having at most a high school degree or at least a bachelor's degree, treating some college as the reference category.

RESULTS

In this section I present results on the prevalence, effects, and allocation of scheduling risks captured by my typology of schedule arrangements. I begin with descriptive statistics on the prevalence of unpredictable, unstable, and erratic schedules across demographic, job, and labor market characteristics. These tabulations provide preliminary evidence of compounding disadvantage but also some unexpected patterns of stratification in scheduling risk. I proceed to the results of regression analyses that identify the marginal effects of scheduling risk on pay, job retention, beneficial flexibility, and job satisfaction, controlling for observed job characteristics and unobserved heterogeneity between employees. I then test for moderating effects of

unemployment on compensation for scheduling risk and asymmetry in compensation changes resulting from transitions into and out of optional arrangements.

Descriptive Analyses of Scheduling Risk in a Stratified Labor Market

Table 3 shows the prevalence of optional schedule arrangements across groups defined by sex, race, education, and an array of job or labor market characteristics. As in prior cross-sectional studies, I find a pattern of compounding disadvantage with scheduling risk concentrated on workers in marginalized groups (McCrate 2012; Storer et al. 2020). This pattern is clearest in last column, which shows the prevalence of erratic schedules (little or no employee control, one week or less advance notice, and weekly hours that vary by 25% or more in the past month). I find large disparities in exposure to scheduling risk by education, usual hours, and wage level. Among workers with a high school education or less, 19 percent report an erratic schedule on their main job, compared with 5 percent of workers with a bachelor's degree or higher. Scheduling risk is most prevalent among part-time workers, with 22 percent reporting an erratic schedule and nearly half (48 percent) reporting an unstable arrangement (volatile hours with external schedule control). We see somewhat smaller but still considerable disparities by race and ethnicity. While 10 percent of non-Hispanic White workers report an erratic schedule, the rate is 13 percent for Hispanic and 15 percent for Black workers.

Table 3. Prevalence of scheduling risk by demographic and labor market characteristics

Characteristic	**Group**	Unstable %	Unpredictable %	Erratic %
Sex	Men	33***	23***	14***
	Women	27	15	8
Race	Asian	25	13	7*
	Black	35***	26***	15***
	Hispanic	29	24***	13**
	White	29	16	10
	Other	28	19	11
Education	HS or less	38***	31***	19***
	Some college	31	19	12
	BA or higher	23***	8***	5***
Wage	Bottom tercile	40***	32***	19***
	Middle tercile	27	17	10
	Top tercile	25*	10***	6***
Union contract	Covered	35***	17	10
	Not covered	28	17	10
Usual hours	Part-time (< 35/wk.)	48***	29***	22***
	Full-time	26	17	9
Shift timing	Regular day	24***	14***	8***
	Regular non-day	46	25	16
	Rotating or irregular	42*	27	19
Workplace size	1–9 employees	28	21	13
	10–49	30	20	12
	50–249	29	17**	10*
	250+	27*	11***	6***
Unemployment	< 6 % locally	27***	15***	9***
	6 % or higher	33	24	14

Note: Percentages estimated for pooled sample using 1997 base weight (R1236101). Unstable and unpredictable percentages include subset of erratic schedules. Italicized group serves as reference category for multiple contrasts. Significance levels based on design-adjusted, two-tailed Wald tests. *** p<0.001, ** p<0.01, * p<0.05

There are exceptions to the pattern of compounding disadvantage. Erratic schedules are more prevalent among men (14 percent) than women (8 percent). And even relatively advantaged groups report substantial levels of scheduling risk. Workers with a regular daytime shift are far less likely than those with a regular evening or night shift to experience

unpredictable or unstable schedules. Nonetheless, 14 percent of daytime workers report an unpredictable schedule with a week or less advance notice and 24 percent report unstable hours with considerable volatility. Across all these groups, unstable schedules are more prevalent and exhibit smaller disparities than unpredictable arrangements.

These descriptive results give some indication of the overall relationship between scheduling risk, compensation, and bargaining power. Table 3 suggests a negative association between unpredictability and pay. Grouping workers by terciles of the wage distribution, I find that workers in the bottom third (e.g. those earning $15.30 per hour or less in 2017) are three times more likely than workers in the top (those earning $18.51 per hour or more in 2017) to have unpredictable or erratic schedules. Given the macroeconomic relationship between wages and unemployment, it is not surprising to see that scheduling risk is more prevalent in areas with above average unemployment rates. Perhaps more surprising is the lack of a similar contrast between workers with and without a union contract, which tends to protect workers from employment risk (Jacoby 2001; Kalleberg 2018). Both union and non-union workers report similar rates of unpredictable schedules. And union workers are somewhat more likely to report unstable schedules (35 versus 28 percent).

Comparing workers by occupation and industry magnifies disparities in scheduling risk. Table 4 shows the prevalence of unstable, unpredictable, and erratic schedules across major occupational groups.[3] Management, professional, and related occupations comprise the largest group which serves as the reference for significance levels indicated in the table. Although managerial and professional jobs are often associated with long hours, non-routine tasks, and an ethic of career devotion (Blair-Loy 2003), this group reports much lower rates of scheduling risk than most other occupational groups in my sample. Only 8 percent of employees in management, professional, and related occupations report an erratic schedule, as compared with 17 percent of sales and office and 30 percent of other service occupations.

Table 4. Prevalence of scheduling risk by occupation

	Unstable %	Unpredictable %	Erratic %
Management, Professional, related occupations	47	23	8
Service	57***	42***	30***
Sales and Office	39***	23	17***
Construction, Extraction, Maintenance, Repair	63***	47***	37***
Production, Transportation, Material Moving	56***	43***	33***

Note: Percentages estimated for pooled sample using base year weight. Italicized group serves as reference category. Significance levels based on design-adjusted Wald tests. *** p<0.001, ** p<0.01, * p<0.05

Much prior scheduling research focuses on retail and other consumer services in which unpredictability is thought to be the norm (Alvarez et al. 2020; Mitchell et al. 2021; Schneider and Harknett 2019). Table 4 reveals that scheduling risk is also widespread in "blue-collar" jobs.

[3] These groups are based on two-digit occupation codes in the Census 2002 classification scheme, combining occupations into seven broad categories. I present results only for the five largest groups in my sample, excluding fewer than 100 respondents in farming, fishing, forestry, and military-specific occupations.

More than 1 in 3 employees (37 percent) in construction, extraction, maintenance, and repair occupations have an erratic schedule, nearly half (47 percent) have an unpredictable schedule, and a substantial majority (63 percent) have an unstable schedule. I find similarly high rates of scheduling risk in production, transportation, and material moving occupations. Since these occupations are dominated by men, their high rates of scheduling risk help explain why men are more likely than women overall to report unpredictable or unstable schedules.

Table 5 displays estimates of scheduling risk across 13 industries, allowing for more focused comparisons that reveal even wider disparities. Here the reference group is education, health care, and social assistance, which is the largest sector in my sample and has among the lowest rates of scheduling risk. Only public administration has a lower prevalence of unstable schedules (18 versus 29 percent). The industries where scheduling risk is most prevalent are construction; arts, entertainment, hospitality, food services; and transportation, warehousing, and utilities. These high-risk sectors have rates of erratic schedules four to five times those of low-risk sectors.

Table 5. Prevalence of scheduling risk by industry

	Unstable %	Unpredictable %	Erratic %
Agriculture, Forestry, Fishing, Hunting, Mining	41**	27***	19***
Construction	48***	38***	28***
Manufacturing	33*	24***	13***
Wholesale Trade	26	17**	10**
Retail Trade	30	27***	13***
Transportation, Warehousing, Utilities	42***	29***	20***
Information	21**	10	6
Finance, Insurance, Real Estate, Rental, Leasing	15***	10	4
Professional, Scientific, Management	24***	15***	10***
Educational, Health Care, Social Assistance	29	9	5
Arts, Entertainment, Hospitality, Food Services	46***	38***	25***
Other Services	25	16***	11***
Public Administration	18***	9	4

Note: Percentages estimated for pooled sample using base year weight. Italicized group serves as reference category. Significance levels based on design-adjusted, two-tailed t tests. *** $p<0.001$, ** $p<0.01$, * $p<0.05$

The contrast between retail trade and transportation, warehousing, and utilities is instructive. Despite comparable rates of schedule unpredictability (27 and 29 percent), erratic schedules are less common in retail trade (13 versus 20 percent). This difference stems from lower rates of schedule instability in retail than in transportation, warehousing, and utilities (30 versus 42 percent). Indeed, the prevalence of schedule instability in retail trade is not significantly different from education, health care, and social assistance, despite much higher rates of unpredictability (27 versus 9 percent). While retail trade has been a primary target of fair workweek laws, transportation and warehousing have received less scrutiny for schedule instability. Chicago is the only jurisdiction so far to include warehouse workers in its Fair Workweek Ordinance (Mitchell et al. 2021).

Transitions Into and Out of Risky Schedules

We can gain further insight into the incidence of scheduling risk and the suitability of my analytic strategy by examining transitions between schedule arrangements. While the overall incidence of scheduling risk decreases over the study period (see table 2 above), this decrease does not tell us much about the probability that an individual worker will leave an unstable job or be promoted into a stable job from one year to the next. If this probability is high, then the deferred compensation hypothesis would seem more plausible. If this probability is low, then we would expect whatever compensation workers receive to coincide with scheduling risk. However, very low transition rates between schedule types would limit the scope for my analysis of compensation differentials. With little variation in scheduling risk within employees, fixed-effects estimates of compensation differentials would be imprecise and more susceptible to selection bias.

Table 6 presents transition rates between each of the eight schedule types defined previously. These rates are calculated as the percentage of person-year observations with the schedule type corresponding to the rows of the table in the initial round and the type corresponding to the columns in the subsequent round (roughly two years later). Each row sums to 100, as I restrict the analysis to employees with at least two successive observations during the study period. The percentages are weighted to adjust for the oversample of Black and Hispanic youth.

Table 6. Transition rates by schedule type

Initial	**Schedule arrangement two years later** (%)							
schedule	Fluid	Short	Volatile	Stable	Rigid	Unstable	Unpred.	Erratic
Fluid	19	4	25	18	10	13	3	8
Short-term	7	14	12	27	14	14	5	8
Volatile	8	3	38	21	11	13	2	5
Stable	5	5	23	33	21	8	3	2
Rigid	1	1	5	8	55	20	5	4
Unstable	3	1	10	7	30	37	4	9
Unpredictable	3	3	3	8	35	14	19	16
Erratic	6	2	5	3	16	23	13	32

Note: Row percentages of weighted person-year observations using base year weight. Shaded cells indicate an optional arrangement with external schedule control and short notice or considerable volatility.

The transition table reveals a great deal of mobility across schedule arrangements over a two-year period. Only employees who start with a rigid schedule—defined by external control with little instability and more than a week advance notice—are more likely than not (55 percent) to remain in the same type of arrangement. For employees who start with a volatile, stable, unstable, or erratic schedule, around 1 in 3 remain in the same arrangement two years later. Among employees with unpredictable or fluid schedules, less than 1 in 5 stay in the same arrangement. These results suggest there is adequate within-employee variation for a fixed-effects analysis.

Looking at the off-diagonal cells in table 6, we see that transitions are most likely within a narrow band of schedule types. Since my typology is ordered by the values of the three

component indicators (external control, short notice, and volatile hours), adjacent schedule types have more in common than types at either end. Employees with stable schedules have a roughly 1 in 5 chance of moving to a volatile arrangement (keeping schedule control and advance notice) or a rigid arrangement (keeping advance notice with little volatility), but less than a 1 in 10 chance of moving to a fluid or erratic arrangement (changing values on two indicators). At the same time, some transitions are more likely than others with an equivalent "distance." For instance, workers with unpredictable schedules more than twice as likely to transition to a rigid arrangement as to an erratic one (35 versus 16 percent).

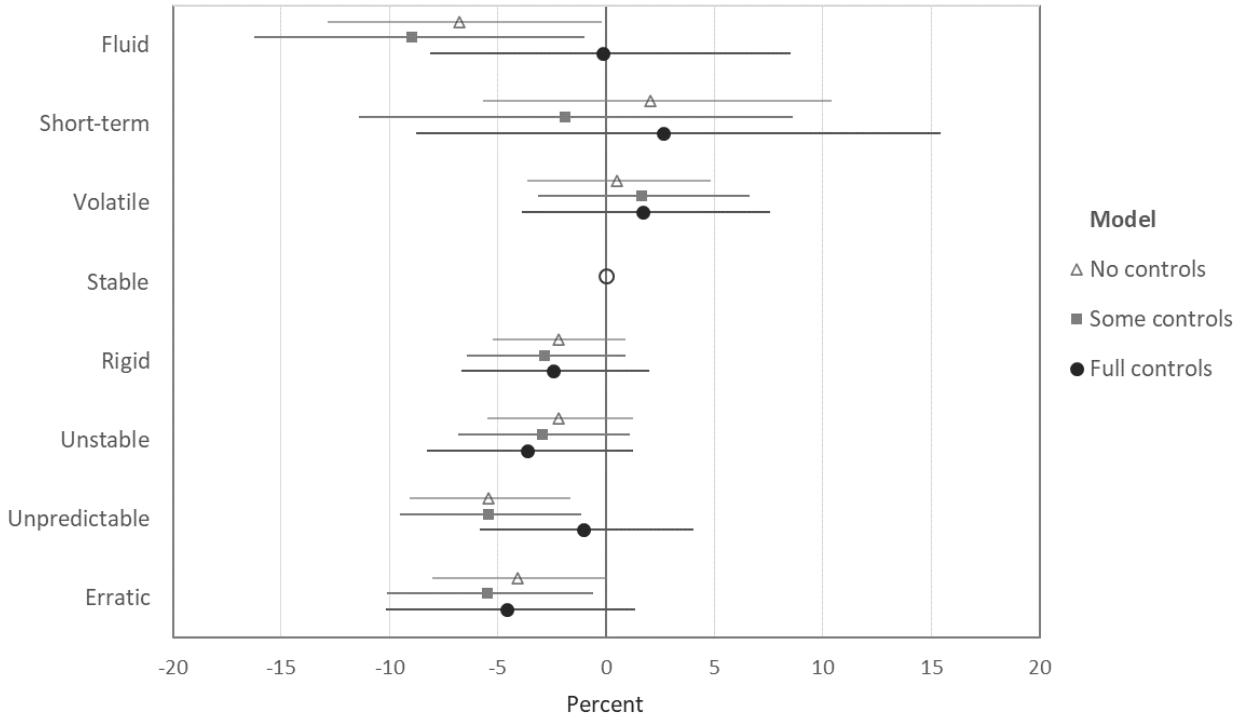
If we group schedule types into low-risk schedules (with employee control or little variation) and optional arrangements (with external control and either short notice or volatile hours), the directional difference in transition rates becomes starker. Workers with low scheduling risk are three times more likely to remain in this group than to move to a riskier, optional arrangement (76 versus 24 percent). By contrast, workers in optional arrangements are 10 percentage points *more likely* to remain in this group than to move to less risky arrangements (55 versus 45 percent). The persistence of scheduling risk belies the idea that schedule instability is a stepping stone toward more stable employment. Although more employees in this cohort transition out of risky schedule arrangements than into them (the joint probabilities are 17 and 15 percent, respectively), scheduling risk persists for many over a period of two years (or longer) even in the midst of overall labor market expansion.

Regression Analyses of Schedule Effects on Compensation

For a more rigorous evaluation of compensation for scheduling risk, I turn to regression analyses of the marginal effects of unstable schedules, beginning with hourly pay. Figure 1 summarizes the marginal effects of different schedule types across the three specifications of my model: no controls, some controls, and full controls. I calculate the marginal effect as the predicted pay differential, as a percent of pay with a stable schedule, while setting covariates equal to their respective means. I plot the point estimates as markers and 95% confidence intervals (based on clustered robust standard errors) as horizontal lines, whose shape and shade differ by model specification. The marginal effect of a stable schedule (with employee control, more than a week advance notice, and less 25% volatility) is zero by definition, since this is the reference category. For the other schedule types, the farther the marker lies from zero, the larger the predicted effect size. If a confidence interval overlaps with zero, I infer that the effect is not significant (at the two-tailed $p < 0.05$ level).

I find few significant pay differentials. Workers with unstable schedules receive approximately the same predicted hourly pay as workers with a stable schedule, despite having less control or more volatile hours of work. Where there are significant differentials, they run counter to risk premium predicted by hypothesis 1. Jobs with unpredictable schedules have lower pay than comparable jobs with stable schedules, at least in the baseline and reduced versions of my model. This pay penalty is attenuated by the addition of controls, particularly in the full model that includes days of paid time off, medical benefits, and paid parental leave.

Figure 1. Hourly pay margins and 95% confidence intervals by schedule type and model



Source: National Longitudinal Surveys, U.S. Bureau of Labor Statistics.

To put these marginal effects in terms of dollars and cents, table 7 reports the predicted pay for each schedule type in the 2015 reference year at covariate means using the reduced model (i.e. some controls). I estimate hourly pay with an unpredictable schedule to be $18.31, which is −5.4 percent lower than the predicted pay with a stable schedule ($19.36). I find an equivalent pay penalty for erratic schedules, which is the riskiest arrangement in my typology. Fluid schedules, which combine short notice and volatile hours with employee control, have the lowest predicted pay ($17.62 per hour), nearly 9 percent lower than stable schedules. If we conceive of schedule control as a job amenity, this result could be interpreted as a compensating differential though not a premium for risk.

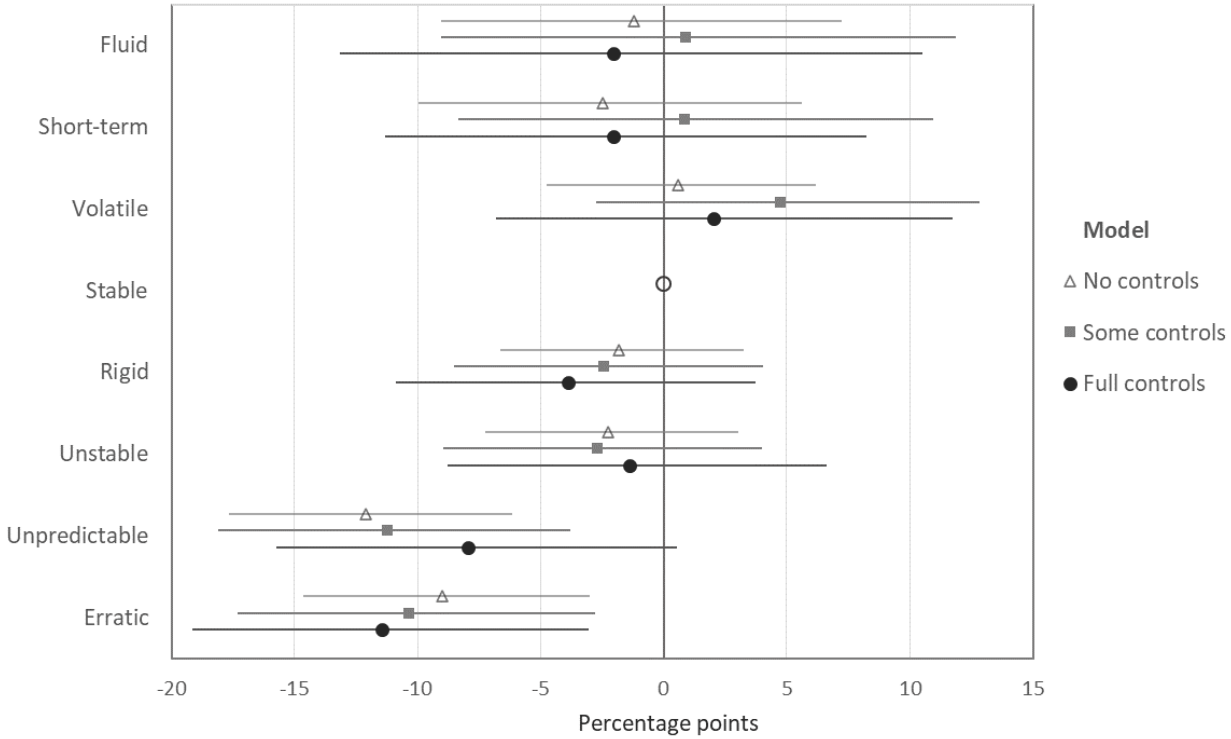
Table 7. Predicted hourly pay margins by schedule type

Schedule type	E($/hour)	Differential %	95% C.I.		z statistic	p value
Fluid	17.62	−8.95	[−16.26,	−1.00]	−2.19	0.028
Short-term	18.99	−1.91	[−11.40,	8.59]	−0.37	0.710
Volatile	19.67	1.63	[−3.15,	6.65]	0.66	0.510
Stable	19.36	0				
Rigid	18.80	−2.85	[−6.43,	0.87]	−1.51	0.132
Unstable	18.79	−2.94	[−6.82,	1.09]	−1.44	0.150
Unpredictable	18.31	−5.41	[−9.50,	−1.14]	−2.47	0.014
Erratic	18.30	−5.47	[−10.12,	−0.59]	−2.19	0.029

Note: Predicted hourly pay in 2015 dollars based on reduced model with covariates at their respective means. Differentials expressed as a percent of pay with a stable schedule. Cluster robust 95% confidence intervals in brackets. P values based on two-tailed z tests. See table 2 for definition of schedule types.

Turning from monetary to non-monetary compensation for scheduling risk, I now examine job retention, defined as remaining (in an employee's main job) with the same employer from one survey round to the next. Figure 2 plots the marginal effects of schedule types on the probability of job retention on the percentage scale. I find negative effects of erratic and unpredictable schedules, both on the order of −10 percentage points. The effect of erratic schedules is robust to the inclusion of the full set of controls, while the effect of unpredictable schedules is not.

Figure 2. Job retention margins and 95% confidence intervals by schedule type and model



Source: National Longitudinal Surveys, U.S. Bureau of Labor Statistics.

Table 8 provides numerical estimates of the job retention probability and marginal effect of each schedule type based on the full model. At the average values of covariates, I predict the probability of job retention to be 0.7 with an erratic schedule (outside control, short notice, and volatile hours)—12 percentage points lower than the probability of retention in a job with a stable schedule (0.82). This effect size is roughly equivalent to the difference in average job retention rates between health and education (0.854) and retail establishments (0.748) over a similar period (Lazear and McCue 2018). While employees in the NLSY97 cohort are more likely than not to remain in their main job (albeit at lower rates than older workers), my results imply higher turnover rates in jobs with erratic schedules. Contrary to hypothesis 2, scheduling risk is not offset by greater job retention, which is precondition for deferred compensation through promotion or pay raises.

Table 8. Predicted job retention margins by schedule type

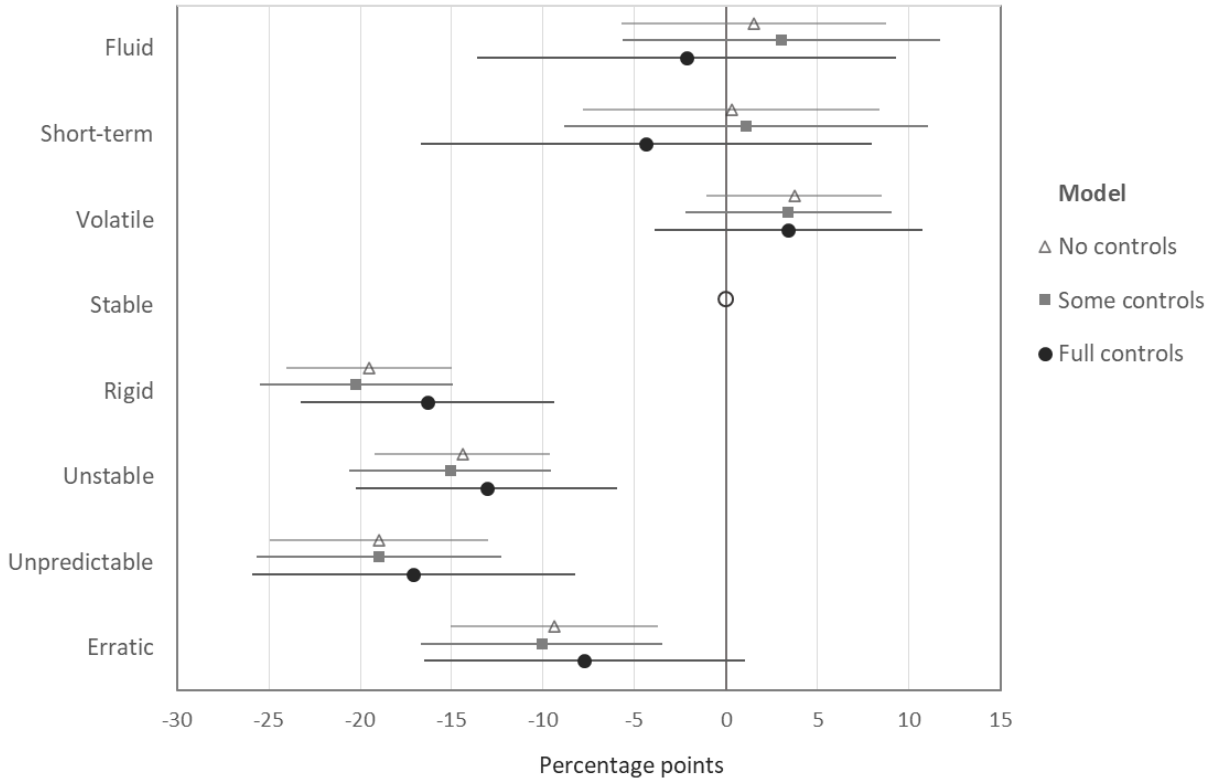
Schedule type	Pr(Y=1)	Difference*100	95% C.I.		z	p
Fluid	0.801	−2.04	[−13.2	10.5]	−0.34	0.737
Short-term	0.801	−2.04	[−11.3,	8.22]	−0.41	0.685
Volatile	0.841	2.05	[−6.8,	11.7]	0.44	0.662
Stable	0.821	0				
Rigid	0.782	−3.86	[−10.9,	3.73]	−1.02	0.310
Unstable	0.807	−1.39	[−8.8,	6.62]	−0.35	0.725
Unpredictable	0.738	−7.95	[−15.7,	0.54]	−1.84	0.066
Erratic	0.700	−11.5	[−19.1,	−3.04]	−2.63	0.009

Note: Predicted probabilities of remaining with same employer in subsequent survey round, based on full model with covariates at their respective means. Marginal differences with respect to a stable schedule are expressed on percentage scale. Cluster robust 95% confidence intervals in brackets. P values based on two-tailed z tests.

I next examine beneficial flexibility as reported by employees. Although this measure is collected separately from the item on schedule control, I expect them to be closely related. My theoretical distinction between flexibility for the worker and optionality for the employer hinges on control over schedule variation. My analysis confirms there is a strong relationship between schedule control and beneficial flexibility, but it defies the predictions of efficient matching theory. External control over starting and ending times has a strong *negative* effect on beneficial flexibility for employees. This flexibility penalty is not offset by volatile hours or short notice.

Figure 3 summarizes the marginal effects of schedule arrangements on beneficial flexibility. In all model specifications, I find significant reductions in expected beneficial flexibility for rigid, unstable, unpredictable, and erratic schedules. The flexibility penalty is consistently around −20 percentage points for unpredictable arrangements, −15 percentage points for unstable arrangements, and −10 percentage points for erratic arrangements. These results represent strong evidence against the hypothesis that workers are rewarded for scheduling risk with beneficial flexibility. The absence of positive marginal effects for volatile or fluid schedule types reinforces the critical importance of schedule control for beneficial flexibility. Conditional on being able to decide their schedule freely or within certain limits, employees are no more likely to report beneficial flexibility with volatile than with more stable hours.

Figure 3. Beneficial flexibility margins and 95% confidence intervals



Source: National Longitudinal Surveys, U.S. Bureau of Labor Statistics.

I report the marginal effects and predicted probabilities of beneficial flexibility from the full model in table 9. The difference in the probability of beneficial flexibility with a rigid versus a stable schedule provides an estimate of the negative effect of external control (−16 percentage points). Workers in unstable and unpredictable arrangements have similarly low probabilities of beneficial flexibility (below 0.5). Interestingly, I find that erratic schedules result in a smaller flexibility penalty than rigid schedules (−7.75 + 16.3 = 8.6 percentage points, two-tailed $p < 0.05$). Conditional on having little or no schedule control, employees are more likely to report beneficial flexibility with volatile hours and short notice than with a lower-risk rigid arrangement. This suggests there is a grain of truth to the claim that workers enjoy greater flexibility with variable schedules—not categorically, as implied by hypothesis 3, but in a more limited comparison between schedule arrangements with external control.

Table 9. Predicted beneficial flexibility margins by schedule type

Schedule type	Pr(Y=1)	Difference*100	95% C.I.		z	p
Fluid	0.541	−2.17	[−13.6,	9.26]	−0.37	0.710
Short-term	0.519	−4.38	[−16.7,	7.93]	−0.70	0.486
Volatile	0.597	3.41	[−3.90,	10.7]	0.92	0.360
Stable	0.563	0				
Rigid	0.400	−16.3	[−23.2,	−9.37]	−4.61	0.000
Unstable	0.432	−13.1	[−20.2,	−5.96]	−3.60	0.000
Unpredictable	0.392	−17.1	[−25.9,	−8.24]	−3.79	0.000
Erratic	0.486	−7.75	[−16.5,	1.01]	−1.73	0.083

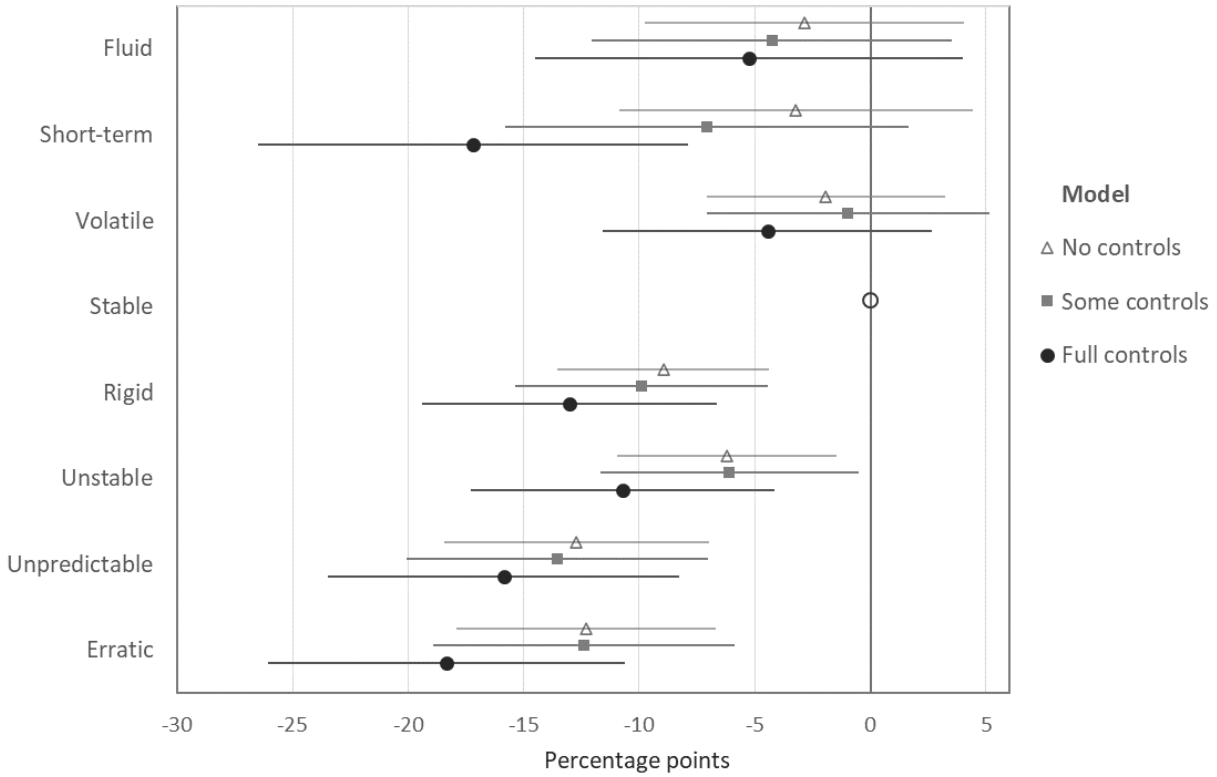
Note: Predicted probabilities of reporting a flexible work schedule as a job benefit, based on full model with covariates at their respective means. Marginal differences with respect to a stable schedule are expressed on percentage scale. Cluster robust 95% confidence intervals in brackets. P values based on two-tailed z tests.

Having found no evidence of compensating differentials in the form of premium pay, job retention, or beneficial flexibility, I now consider whether other, possibly unobserved forms of compensation offset the disutility of scheduling risk, resulting in equivalent levels of job satisfaction with stable and unstable schedules. This fourth hypothesis represents an omnibus test of efficient labor market matching. Figure 4 shows the marginal effects of schedule arrangements on job satisfaction, measured by the probability of reporting the highest level of satisfaction.[4]

I find a negative relationship between scheduling risk and job satisfaction. Across specifications, the satisfaction penalty is between −5 and −10 percentage points for unstable schedules and −12 to −18 percentage points for unpredictable or erratic schedules. There is also some evidence of a negative effect on job satisfaction of short-term schedules, defined by short notice and relatively stable hours with employee control. However, this is an uncommon arrangement and my estimates are imprecise.

[4] Another set of analyses, not included in this paper, find similar negative effects of scheduling risk on job satisfaction using a continuous Likert scale.

Figure 4. Job satisfaction margins and 95% C.I. by schedule type and model specification



Source: National Longitudinal Surveys, U.S. Bureau of Labor Statistics.

Table 10 provides numerical estimates of expected job satisfaction and differences by schedule type from the full model. At average covariate values, I predict that 49 percent of workers with a stable schedule like their jobs very much. The predicted probability falls by 10.7 percentage points for workers with an unstable schedule. Satisfaction is lower still with an unpredictable or erratic schedule, bottoming out at 18 percentage points below jobs with a stable schedule. Although scheduling risk has a robust negative effect on job satisfaction, it is important to note that the effect is not homogeneous. I find no significant difference in job satisfaction between volatile and fluid schedules, but a 7.6 percentage point difference between unstable and erratic schedules (two-tailed $p < 0.05$). These results suggest the disutility of short notice depends on the locus of schedule control and volatility of weekly hours.

Table 10. Predicted job satisfaction margins by schedule type

Schedule type	Pr(Y=1)	Difference*100	95% C.I.		z	p
Fluid	0.440	−5.27	[−14.5,	3.99]	−1.12	0.265
Short-term	0.321	−17.2	[−26.5,	−7.87]	−3.62	0.000
Volatile	0.448	−4.45	[−11.6,	2.68]	−1.22	0.221
Stable	0.493	0				
Rigid	0.363	−13.0	[−19.4,	−6.65]	−4.00	0.000
Unstable	0.386	−10.7	[−17.3,	−4.15]	−3.20	0.001
Unpredictable	0.334	−15.9	[−23.5,	−8.28]	−4.10	0.000
Erratic	0.309	−18.3	[−26.1,	−10.6]	−4.65	0.000

Note: Predicted probabilities of liking job very much, based on full model with covariates at their respective means. Marginal differences with respect to a stable schedule are expressed on percentage scale. Cluster robust 95% confidence intervals in brackets. P values based on two-tailed z tests.

Moderation Analyses of Risk Penalties

The preceding results demonstrate that employees in the NLSY97 cohort do not receive premium compensation for scheduling risk. On the contrary, they are penalized in the form of lower job satisfaction, less beneficial flexibility, and—in some specifications—reduced pay and job retention. I now consider whether penalties for scheduling risk are moderated by workers' outside options in an imperfect labor market.

I first present results derived from a fixed-effects regression of log pay on the full set of controls and a four-way interaction between the continuous unemployment rate and three schedule indicators. I tabulate the predicted pay differentials at two levels of local unemployment: low (4%) and high (8%). These points are roughly one standard deviation below and above the average unemployment rate across the areas where respondents resided during the study period.

Table 11 summarizes the unemployment-moderated effects of schedule arrangements on hourly pay. The first column reports predicted pay differentials relative to a stable schedule in the context of low unemployment. The middle column shows the pay differentials of the same schedule contrasts but in the context of high unemployment. The last two columns display the estimate and standard error of the unemployment moderation effect, defined as the difference in pay differentials between high and low unemployment contexts. Again, I report these differentials as a percent of predicted pay with a stable schedule, although I use the log scale for estimation.

When unemployment is low, I predict a pay penalty of −7 percent for unpredictable schedules and nearly −10 percent for erratic schedules. But I find a positive moderating effect of unemployment on the erratic schedule differential (8 percent). This interaction results in a negligible pay differential between erratic and stable schedules when unemployment is high. Contrary to hypothesis 5, unemployment seems to mitigate rather than exacerbate the penalty for erratic schedules.

Table 11. Predicted margins of total hourly pay by schedule type and local unemployment rate

Schedule type	Low (4%) unemployment differential (%)	(s.e)	High (8%) unemployment differential (%)	(s.e.)	High – low unemployment differential (%)	(s.e.)
Fluid	−11.4	(6.40)	−6.74	(5.01)	5.26	(7.21)
Short-term	8.11	(9.54)	−9.88*	(4.86)	−16.6	(10.7)
Volatile	3.11	(3.03)	−0.691	(3.61)	−3.69	(4.3)
Rigid	−5.75*	(2.35)	0.072	(2.74)	6.18	(3.16)
Unstable	−5.94*	(2.62)	−0.026	(3.00)	6.29	(3.58)
Unpredictable	−7.01**	(2.85)	−3.44	(3.06)	3.84	(3.59)
Erratic	−9.7**	(3.37)	−2.4	(3.35)	8.09*	(3.89)

Note: Predicted margins of total hourly pay, based on reduced model with covariates at their respective means. Differences expressed as a percent of predicted pay with a stable schedule. Cluster robust standard errors in parentheses. ** p<0.01, * p<0.05

I conducted further analyses stratified by job characteristics in order to determine whether the moderating effect of higher unemployment on the pay differential for erratic schedules is specific to certain types of jobs. These analyses reveal that the puzzling relationship between unemployment and compensation is driven almost entirely by procyclical variation in work hours among non-hourly employees (i.e. those paid a salary, commission, or piece rate rather than a wage). While erratic schedules are typically associated with lower normal weekly hours (as shown in table 3), non-hourly employees with erratic schedules work substantially more hours than those with stable schedules when unemployment is low. When unemployment is high, the gap in normal work hours closes, suggesting that the hours of non-hourly employees with erratic schedules are more responsive to the business cycle. Because hourly pay is calculated by dividing usual weekly earnings by hours, the rate of pay decreases if there are diminishing marginal returns to increasing work hours. This is the case with non-hourly employees in erratic jobs for whom increases in hours outpace increases in earnings under favorable labor market conditions.

I did not find significant moderation effects of unemployment on any other compensation outcomes. The flexibility penalties for unpredictable and unstable schedules do not depend on the local unemployment rate. Employer power, at least by this contextual measure, does not appear to exacerbate the effects of scheduling risk on compensation. This is not to say that employers have no monopsony power over schedule arrangements. The fact that compensation penalties obtain even in a context of low unemployment suggests imperfections in the market for working time.

My final hypothesis predicts unequal compensation for scheduling risk favoring "insiders" (who transition from low-risk schedule arrangements) over "outsiders" (who transition from riskier, optional arrangements). To test this hypothesis, I estimate a series of models regressing each compensation outcome on three mobility indicators: (1) moving from a low- to high-risk schedule, (2) moving from a high- to low-risk schedule, and (3) staying in a high-risk schedule from one survey round to the next. I find no significant differences in the magnitude of coefficient estimates for mobility indicators 1 and 2. For instance, mobility into a high-risk

schedule significantly reduces the predicted probability of job satisfaction ($\hat{\delta}_1 = -0.076, s.e. 0.037$), but mobility into a low-risk schedule does not significantly increase satisfaction ($\hat{\delta}_2 = -0.035, s.e. 0.035$). A two-sided test of the linear combination $\hat{\delta}_1 + \hat{\delta}_2$ fails to reject the null hypothesis ($t = -1.74$). This result could be explained by endogenous preferences for schedule arrangements, but it is not consistent with the social closure hypothesis as I have formulated it.

DISCUSSION

Unpredictable and unstable schedules have received increased scrutiny in recent years from labor scholars, policymakers, and a broader public concerned about job quality and work-life conflict. Unstable scheduling is now recognized as a social problem that overlaps with and potentially exacerbates more familiar problems of low wages, job insecurity, and inadequate paid leave. This recognition is reflected in a growing body of research on how schedule instability harms workers and their families (Ananat and Gassman-Pines 2021; Gerstel and Clawson 2018; Schneider and Harknett 2019). It is also evident in new scheduling regulations, such as the Seattle Secure Scheduling Ordinance and Oregon Fair Workweek Law, which seek to limit problematic scheduling practices, particularly in large retail or restaurant chains. These regulatory efforts have met with powerful opposition from employer associations and their political allies, who defeated previous scheduling proposals in Minneapolis and Washington, D.C. A key point of contention in the public debate is whether workers are compensated for unpredictable schedules in the form of beneficial flexibility or greater economic opportunity (French 2016; Lambert 2020; Mathur 2017). This question connects to longstanding scholarly debates between efficiency- and power-based theories of the labor market (Manning 2003; Rosenfeld 2021).

The present study clarifies the terms of these debates and evaluates the claim that workers are already compensated for schedule instability. I adapt the notion of "optionality" from finance to model how unpredictable and unstable schedules function as risk governance arrangements, which give employers discretion over the timing and hours of work. My model of work as an option provides a conceptual framework for identifying different types and levels of scheduling risk. Employer control over schedule variation distinguishes unstable from flexible arrangements, which give employees more control, as well as from stable arrangements, which involve mutual commitment to a set schedule. I argue that greater conceptual clarity about the functions of scheduling risk allows for more precise analysis of its effects on workers.

I provide new evidence that workers are worse off with unpredictable and unstable schedules. Using previously unanalyzed data from the National Longitudinal Survey of Youth, I estimate marginal effects of schedule arrangements on hourly pay, job retention, satisfaction, and beneficial flexibility for a cohort of employees born in 1980–84. I find no evidence of compensating differentials for scheduling risk as predicted by efficient labor market theories (hypotheses 1–4). On the contrary, unpredictable schedules decrease employees' job satisfaction and lower their chances of receiving beneficial flexibility. Although employers and opponents of scheduling regulation often present flexibility as a benefit of unstable arrangements, workers with little or no schedule control are much less likely to have beneficial flexibility. Overall, 49 percent of employees in this cohort report "a flexible work schedule" as a benefit of their job.

Unstable schedules lower the probability of beneficial flexibility by 13 percentage points; unpredictable schedules lower it by 17 percentage points in comparison with a stable schedule. I also find some evidence of an hourly pay penalty and lower job retention for employees with erratic schedules that combine short notice and volatile weekly hours. These results suggest that workers have little to lose from fair workweek laws that require advance notice or extra pay for schedule changes.

At the same time, my study does not support certain power-based accounts of scheduling and compensation. My results show little relationship between compensation penalties and unemployment, which theories of monopsony identify as an important source of employer pricing power. Where I do detect a relationship, it runs counter to the prediction that employers extract rents in proportion to their power in the local labor market (hypothesis 5). I find a pay penalty for erratic schedules when unemployment is low but not when it is high. Further analyses reveal that this penalty is concentrated on non-hourly employees whose work hours increase more rapidly than their earnings in the context of falling unemployment. These results are consistent with a model where employers constrain work hours and extract rents from underemployed workers (McCrate et al. 2019), but they place some bounds on the extent of exploitation through unstable scheduling. Scheduling risk is more widespread but not more exploitative in slack labor markets. Similarly, I find no evidence of asymmetry in compensation changes between workers who transition into and out of optional arrangements (hypothesis 6), as we would expect if social closure favored already privileged workers with respect to scheduling.

My descriptive results provide a fuller picture of stratification in schedule arrangements that only partially conforms to a pattern of compounding disadvantage. On the one hand, unpredictable schedules are more common among already disadvantaged groups of workers, including Black and Hispanic workers, low-wage workers, and those without a college degree. On the other hand, men are more likely than women to have erratic schedules and union workers are somewhat more likely than non-union workers to have unstable schedules. Yet these differences pale in comparison to disparities in scheduling risk by occupation and industry. High-risk sectors include both “pink-collar” service and “blue-collar” production jobs, which have rates of erratic schedules four to five times greater than low-risk sectors with more “white-collar” jobs. At least 1 in 4 employees in construction and arts, entertainment, hospitality, and food services have an erratic schedule with little or no worker control, a week or less advance notice, and volatile weekly hours. By contrast, this arrangement is reported by only 5 percent of employees in finance, insurance, education, health care, and public administration. While existing scheduling laws mostly target large retail and fast food chains, I find comparable or even higher rates of scheduling risk in manufacturing, construction, transportation, and warehousing.

My findings challenge the assumption that schedule stability is an “amenity” or resource to which we can apply general theories of labor compensation. The market for working time is clearly an imperfect one, but these imperfections may differ from those involved in wage determination. Workers do not receive monetary or non-monetary rewards for scheduling risk. Nor does scheduling risk map neatly onto labor market power. Rather than an overarching logic of competition or exploitation, scheduling may be better understood in terms of the institutions and technologies that shape specific processes of production.

Limitations and Areas for Further Research

This study takes advantage of unusually detailed data on work schedules, but these data are limited to a specific cohort of workers, born between 1980 and 1984. This cohort was 26–38 years old during the period (2011–2018) covered by my study (BLS 2020a). National data from the Survey of Household Economic Decision-making suggest that the rate of schedule instability is highest among workers under 25, lowest among those in their early 40s, and also elevated among those 55 or older (Fugiel and Lambert 2019). Given this convex relationship between age and instability, my study of employees in their late 20s and 30s would seem to be a good testing ground for theories of scheduling and compensation. However, if employers compensate middle-aged workers differently from how they compensate younger workers for schedule instability, my findings may not generalize to a broader population.

Even if employers compensate young workers in a similar way to older workers, my results could be biased by selection issues in data collection. While the NLSY97 maintained high response rates (~80 percent) over the study period, some respondents were improperly skipped past scheduling questions due to programming errors. Available evidence—including multiple imputation analyses not reported in this paper—suggests that the missing employees have above average rates of schedule instability. This means my estimates of the prevalence of unstable schedules are likely conservative, particularly for subgroups in which overtime is common (e.g. construction and production workers) (McCrate 2018). The key assumption of the analyses reported here is that a more complete dataset would not yield qualitatively different results with respect to compensation. I believe this assumption is warranted since, conditional on observed job characteristics included as controls in my regression analyses, the excluded respondents have comparable rates of hourly pay, job retention, and beneficial flexibility. The best test of this assumption would be to replicate my regression analyses using an alternative data source, although I am not aware of any with sufficiently detailed, repeated observations on scheduling and compensation.

My study provides clear evidence of uncompensated scheduling risk among early-career employees by comparing stable and unstable jobs held by the same individuals. But this approach leaves out transitions between employment and unemployment, self-employment, or non-participation in the labor force, say, to stay at home with young children. While job-to-job transitions provide the cleanest test of compensating differentials for scheduling risk, these results do not address the welfare of workers on the margins of the labor market. Some critics of fair workweek legislation point to localized increases (or slower declines) in involuntary part-time work as a perverse consequence of fair workweek regulations (Yelowitz 2022). Further research is needed on the relationship between scheduling risk and changes on the employment or hours margin of the labor market.

Despite growing scholarly interest and innovative data collection strategies around scheduling, large gaps remain in the evidence base for scheduling research (Lambert and Henly 2014; Fugiel and Lambert 2019). Besides the NLSY97, the most detailed national surveys are the National Survey of the Changing Workforce, for which the last public data release is from 2008, and the Quality of Work-Life Module of the General Social Survey, which has a sample of only several hundred workers for the relevant items (Lambert et al. 2019). With the removal of the schedule control question from round 19 of the NLSY97, we lose a critical piece of evidence just as the COVID-19 pandemic has elevated concerns over the risks and rewards of frontline service

work. Fortunately, there is growing recognition not only of the problem of schedule instability, but also the need for better data on its nature and extent. A recent report by the National Academies of Sciences, Engineering, and Medicine recommends adding questions to the Current Population Survey measuring schedule autonomy, predictability, and volatility (NASEM 2020: 10). With or without new sources of data, future research should compare different ways of measuring schedule instability—for instance, with a multinomial typology or additive index (Schneider and Harknett 2019)—to shed light on their relative merits in theory and practice.

CONCLUSION

'Who decides when and how long to work?' is a crucial question for labor market scholarship and policy. It touches on fundamental issues of labor supply, employment contracts, and business operations, especially in a service-based "24/7" economy (Hamermesh 2019; Rubery et al. 2005). It has wide-ranging implications for economic performance, worker welfare, family and civic life (Boushey 2016; Lambert et al. 2019; Snyder 2016). And its policy stakes have only become more pressing as state and local jurisdictions consider legislation to protect employees against abusive and unpredictable scheduling (Mitchell et al. 2021; Sharma et al. 2022). Despite its importance, research on this topic has been limited by a lack of detailed, national data on schedule control and variation. Few labor force surveys ask about schedule control, and those that do tend to focus on the worker's ability to accommodate commitments outside of work, rather than the employer's ability to vary the timing and hours of work (Fugiel and Lambert 2019; McCrate 2018).

In this paper, I present a study of the functions and effects of unstable schedules which puts employer control at the center of the analysis. I develop a model of "work as an option" to conceptualize how schedule discretion allows employers to realize potential gains while limiting their losses from idle labor. I elaborate a typology of schedule arrangements that distinguishes unpredictable and unstable schedules—characterized by short notice or volatile hours with little or no employee control—from stable schedules and from flexible arrangements, which allow employees more control over schedule variation. I ask how workers are compensated, if at all, for the risks of allowing their employer an implicit option of their time. Drawing on theories of compensating differentials, job matching, monopsony, and social closure, I formulate hypotheses concerning the form and conditions under which workers might be compensated for scheduling risk.

I test these hypotheses using longitudinal data on detailed schedule arrangements from a nationally representative survey of young employees. My findings challenge both efficiency- and power-based theories of the market for working time. On the one hand, I find no evidence of compensating differentials and some evidence of substantial penalties with respect to beneficial flexibility and job satisfaction, contrary to the predictions of efficient contract theory. On the other hand, I find little evidence of a moderating relationship between penalties for scheduling risk and proxies for employer or worker power. High unemployment attenuates the negative pay differential for erratic schedules and union coverage is not associated with lower overall rates of scheduling risk. These results suggest workers have little to lose and potentially much to gain from fair workweek laws that mandate advance notice or compensation for schedule changes. They also provide a rationale for extending scheduling protections to both union and non-union

workers beyond the relatively narrow segment of retail and restaurant chains targeted by early scheduling legislation.

In addition to providing empirical evidence that strengthens the case for regulating unstable schedules, this paper contributes an alternative framework for conceptualizing the costs and benefits of schedule arrangements more broadly. I emphasize the routine and contingent nature of unstable schedules, which differ from the secular process of externalizing risk that pervades accounts of "the great risk shift" (Hacker 2006; Rosenbluth and Weir 2021). My model of work as an option calls into question common assumptions that unstable scheduling maximizes worker utility or employer profits—instead pointing to a tradeoff between optionality and commitment as opposing mechanisms for creating value in the employment relationship (Breen 1997; Desai 2017). Employers who seek to maximize optionality by expanding the pool of available labor beyond what they can reliably employ may suffer from higher turnover and lower productivity as a result of their lack of commitment (Kesavan et al. 2022; Ton 2014). For some employers, stable scheduling may be a "beneficial constraint" (Streeck 1997), leading them away from inefficient practices by requiring them to bear a greater share of the costs of instability.

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APPENDIX A: CHARACTERISTICS OF POOLED ANALYTIC SAMPLE

Variable	Mean	Std. dev.	Min.	Median	Max.	N
Age in fractional years	32.6	2.70	26.8	32.7	38.6	15,776
Female	0.49	0.50	0	0	1	15,776
Asian	0.02	0.15	0	0	1	15,776
Black	0.15	0.36	0	0	1	15,776
Hispanic	0.13	0.33	0	0	1	15,776
Foreign born	0.04	0.19	0	0	1	15,758
Cohabiting spouse/partner	0.63	0.48	0	1	1	15,703
# of biological children	1.01	1.2	0	1	7	15,767
Age of youngest in HH	15.5	16.9	0	7	96	13,838
Health (1 = excellent)	2.22	0.91	1	2	5	15,763
Health limits work	0.03	0.16	0	0	1	15,766
High school diploma or less	0.53	0.50	0	1	1	15,718
4-year college degree or more	0.38	0.49	0	0	1	15,718
Current student	0.08	0.27	0	0	1	15,702
Ratio of family income to poverty threshold	4.45	3.87	0	4	23	14,275
Hourly wage of main job ($)	21.79	19.97	0.00	17.50	666.67	15,445
Total hourly pay ($)	23.91	24.27	0.00	18.87	812.73	15,017
Flexible schedule benefit	0.49	0.50	0	0	1	13,812
Health insurance benefit	0.79	0.41	0	1	1	13,810
Paid parental leave	0.43	0.50	0	0	1	13,585
Days of PTO per year	15.1	14.5	0	14	106	12,960
Job satisfaction (1 = highest)	1.93	0.96	1	2	5	13,835
Tenure of main job in weeks	231	206	1	169	1,435	15,628
Normal weekly hours	39.7	10.7	1	40	80	15,776
Most hours per week	46.6	14.7	1	44	100	15,749
Fewest hours per week	35.1	11.9	0	40	70	15,737
Hourly pay status	0.49	0.50	0	0	1	15,752
Any usual overtime pay	0.38	0.48	0	0	1	11,075
Nonstandard shift timing	0.28	0.45	0	0	1	13,838
Nontraditional contract	0.08	0.28	0	0	1	15,776
# of employees at workplace	602	2,841	1	60	86,515	13,147
Multiple locations	0.68	0.47	0	1	1	13,128
Union coverage	0.14	0.35	0	0	1	13,646
Multiple current jobs	0.08	0.27	0	0	1	15,776
Local unemployment rate	5.9	2.1	–	5.4	–	15,527
# person-year observations in sample	3.0	1.0	1.0	3.0	4.0	15,776

Note: Statistics estimated using base year weight. Pooled sample includes all responses from rounds 15–18 for which there is valid data on at least one work schedule item (YEMP-WS) and non-zero normal hours (CV_HRS_PER_WEEK) for the main employee-type job (N = 15,776). Minimum and maximum unemployment rates suppressed to ensure confidentiality.

APPENDIX B: WORK SCHEDULE ITEMS IN THE NLSY97

Number of hours

How many hours do you work for [EMPLOYER] in a normal week? Please include all hours you work whether at your normal work site, at home, or in some other location. [YEMP-98402]

In the last month, what is the *greatest number of hours* you've worked in a week at this job? Please consider all hours, including any extra hours, overtime, work you did at home, and so forth. [YEMP-WS1]

In the last month, what is the *fewest number of hours* you've worked in a week at this job? Please do not include weeks in which you missed work because of illness or vacation. [YEMP-WS2]

Advance notice

How far in advance do you usually know what days and hours you will need to work?

[YEMP-WS3]

- One week or less
- Between 1 and 2 weeks
- Between 3 and 4 weeks
- 4 weeks or more

[YEMP-WS3_REV]

- 3 days or less
- 4 to 7 days
- Between 1 and 2 weeks
- 3 weeks or more
- ALWAYS WORKS SAME SCHEDULE

Schedule control

Which of the following statements best describes how your working hours are decided? By working hours we mean the time you start and finish work, and not the total hours you work per week or month. [YEMP-WS4, SHOWCARD DDD]

- Starting and finishing times are decided by my employer and I cannot change them on my own;
- Starting and finishing times are decided by my employer but with my input;
- I can decide the time I start and finish work, within certain limits;
- I am entirely free to decide when I start and finish work.
- When I start and finish work depends on things outside of my control and outside of my employer's control

Beneficial flexibility

I'm going to refer to a list of benefits which employers sometimes make available to their employees. At this time, which of the benefits on this list would it be possible for you to receive as part of your job with [EMPLOYER]? [YEMP-100300, SHOWCARD O]

- A flexible work schedule