

Schedule Unpredictability and High-Cost Debt: The Case of Service Workers

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Abstract: High-cost financial services allow economically insecure families to make ends meet but often contribute to additional financial strain in the long run. This study uses novel data from the Shift Project to describe the link between schedule unpredictability and high-cost debt (i.e., payday loans, pawnshop loans, auto-title loans, overdrafts, and problematic credit card debt) among service workers. First, it compares the relative magnitude of the associations between high-cost debt, schedule unpredictability, and levels of income. Second, it investigates whether income volatility mediates the relationship between schedule unpredictability and high-cost debt. Finally, it describes whether the link between schedule unpredictability and high-cost debt varies by institutional and policy contexts. Results indicate that schedule unpredictability is a substantively meaningful, independent, and understudied dimension of inequality in financial outcomes.

Keywords: service workers; schedule unpredictability; temporal precarity; high-cost debt; high-interest lending; financial outcomes

MANY American families face a significant degree of household economic fragility (Federal Reserve 2019; Lusardi, Schneider, and Tufano 2011) and turn to consumer lenders, including payday lenders, pawn brokers, and credit card issuers, to make ends meet (Lee and Kim 2018; Schafter, Wong, and Castleberry 2005; Wilson et al. 2010). These high-cost financial services may allow families to cover basic expenses in the short term, but they also contribute to additional financial strain in the long run, particularly among low-income and economically insecure families (Bhutta 2014; Bhutta, Skiba, and Tobacman 2015; Melzer 2011) who are significantly more likely to use alternative financial services, to overdraft, or to incur problematic credit card debt (Avery and Turner 2012; Bhutta et al. 2015; Lawrence and Elliehausen 2008; Pew Charitable Trusts 2012). To date, scholarship has focused on income as an important predictor of high-cost debt. In this study, we explore how dimensions of *time*—another essential and limited resource—may be linked to the use of high-cost financial services independently from income (see Cheng et al. 2020; Western et al. 2012).

Over the past decades, American workers have experienced not only declines in real wages and fringe benefits, but also increased precarity in their work schedules (Kalleberg 2013; Osterman and Shulman 2011; Schneider and Harknett 2019). Schedule unpredictability, a *temporal* dimension of job precarity, is particularly widespread among workers in the service sector, who can no longer count on regular shifts and whose schedules are both set by employers on short notice and often changed at the last minute (Lambert 2008; Lambert, Fugiel, and Henly 2014). Although extant research on high-cost debt has documented the importance of income levels as a determinant of high-cost debt, reliance on financial services that

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provide easy and quick access to money may be more important for those who face unpredictable work schedules and volatile incomes than for those who have stable, even if low, incomes (Morduch and Schneider 2017; Morse 2011). Here, we compare the relative importance of the association between schedule unpredictability and levels of income to high-cost debt. We hypothesize that experiences of temporal precarity in the workplace are associated to high-cost debt *net* of income levels, thus constituting an independent dimension of inequality in financial outcomes. Based on prior literature (Farrell and Grieg 2016; Federal Reserve 2019; Schneider and Harknett 2017) suggesting that income volatility may be an important pathway linking schedule unpredictability to high-cost debt, we also examine whether a direct association between schedule unpredictability and high-cost debt remains when we adjust for this potential mediator in cross-sectional models. Given that high-cost financial services are often considered a “last resort,” workers may be less likely to rely on high-cost debt when other governmental or organizational supports are in place (Bhutta et al. 2015; Wilson et al. 2010). We investigate if the link between schedule unpredictability and high-cost financial services varies by institutional (i.e., employer-based hardship funds) and policy contexts (i.e., public assistance) that facilitate access to money. Although the association between temporal precarity and costly debt could be moderated by the provision of stable and generous cash assistance (e.g., Allen et al. 2014; Cui 2017), substantial retrenchment in public cash assistance (Danziger and Danziger 2005) and the sporadic nature of corporate hardship funds (Aspen Institute 2019) may undercut the ability of such programs to meaningfully buffer workers with unpredictable schedules. Our analyses, therefore, provide descriptive evidence of the adequacy of limited, conditional, or temporary cash assistance in improving financial outcomes of workers who experience both temporal and financial precarity.

We use novel data from the Shift Project (<https://shift.hks.harvard.edu/about/>) to describe the link between schedule unpredictability and high-cost debt (i.e., payday loans, pawnshop loans, auto-title loans, overdrafts, and problematic credit card debt) among service sector workers and then to test the moderating role of public benefits and employee hardship funds. This data set is uniquely suited for our study because it is the only one (1) to focus on a group of workers who are particularly likely to be exposed to temporal forms of precarity in their jobs; (2) to collect data on multiple dimensions of work schedules, week-to-week income volatility, and high-cost debt; and (3) to provide an employer–employee link that allows us to measure firm-level hardship fund offerings.

We find that schedule unpredictability has a substantively meaningful association with high-cost debt that is independent from income levels. We also find that a direct association between schedule unpredictability and problematic debt remains net of income volatility. Because of these results, we speculate that temporal precarity may be linked to high-cost debt through direct or non-financial pathways. Finally, we find that limited, conditional, and/or temporary cash assistance does not mitigate the association between temporal precarity in the workplace and high-cost debt. These associational findings suggest that regulating work schedules may be a more effective route to reducing high-cost debt among service sector workers than providing limited, conditional, or temporary cash assistance. Notably, all our

conclusions are based on cross-sectional data that cannot support causal inference. Still, our results highlight the potential importance of temporal precarity as an understudied predictor of problematic debt and motivate new scholarship on the causal relationship and causal pathways linking temporal precarity to problematic debt. Future research should also rely on longitudinal data and quasi-experimental or experimental designs to investigate the causal role of cash assistance policies in shaping problematic debt among those who experience schedule unpredictability.

Background

Alternative and Mainstream Sources of High-Cost Debt

Taking debt can help individuals pay for higher education, purchase a house or a car, relocate for better jobs, start businesses, and make other kinds of investments that savings alone cannot support. But not all debt is used as a tool for social mobility. Today, the financial lives of American families, and, particularly, low-income American families, are characterized by precarity, uncertainty, and unpredictability (Morduch and Schneider 2017). In this context, debt has increasingly become a tool for affording basic needs in the short term. As the need for short-term credit increased, however, access to safe and affordable credit lines decreased, creating a demand for high-interest credit products through alternative financial services that are often considered as predatory (Prager 2009; Servon 2018).

The alternative financial services industry¹ includes (1) payday lenders, which give customers small loans tied to their next paychecks; (2) pawnbrokers, which offer small loans collateralized by personal property such as jewelry, electronics, musical instruments, or firearms; and (3) auto-title lenders, which hold customers' car titles as collaterals for loans. Payday, pawnshop, and auto-title loans are all high-interest short-term loans—they often carry annual interest rates of 400 to 600 percent and are expected to be paid back between one week and one month from the transaction's date (Bhutta et al. 2015; Carter and Skiba 2012; Hawkins 2012; Martin and Adams 2012). These alternative financial services have gained popularity among low-income families for providing quick and easy access to credit (Prager 2009; Servon 2018) and are generally used as a last resort to make ends meet or make up for lost income (Bhutta et al. 2015; Drysdale and Keest 2000; FDIC 2009). The structure and costs of these loans, however, can also exacerbate borrowers' financial difficulties. High-interest loan use has been linked to increases in difficulty in paying bills, bank overdraft fees, financial hardships, and bankruptcy filings (Bhutta 2014; Bhutta et al. 2015; DiMaggio, Ma, and Williams 2021; Gathergood, Guttman-Kenney, and Hunt 2019; Melzer 2011; Skiba and Tobacman 2008). Such loans carry costs that are so high that current estimates suggest that the average payday borrower ends up paying more in fees over time than their original loan values (Pew Charitable Trusts 2012) and that one in five auto-title borrowers ends up having their vehicles seized (Consumer Financial Protection Bureau 2016).

Although alternative financial services are often portrayed as filling a void for those who have exhausted mainstream options (Bhutta et al. 2015; Lawrence and Elliehausen 2008; Lusardi et al. 2011), alternative services are often used in con-

junction with mainstream services (FDIC 2009, 2020). Furthermore, mainstream financial services can also serve as a source of high-cost debt for low-income families (Schafter et al. 2005). For instance, bank overdrafts, which occur when a checking account owner initiates a transaction that would bring the account balance below zero, are often used and seen as a form of small, short-term, and expensive consumer debt (CRS 2021; Melzer and Morgan 2014; Pew Charitable Trusts 2012). In fact, overdrafts incur flat fees (of about \$35) that can be charged even for small negative balances, and if they were construed as loans to account holders, typical overdrafts would carry exorbitant annual percentage rates of about 17,000 percent (Servon 2018). Similarly, as credit card lines have become more readily available to consumers who cannot borrow safely (Bird, Hagstrom, and Wild 1999; Park 1997), credit cards also serve as a mainstream source of problematic debt for low-income families (Dearden et al. 2010).

To date, scholarship suggests that families with low levels of income and less access to savings or home equity are the most likely to borrow from alternative financial institutions, to overdraft, and to incur problematic debt with credit cards (Avery and Turner 2011; Bhutta et al. 2015; Lawrence and Elliehausen 2008; Pew Charitable Trusts 2012). Although less attention has been given to the association between time precarity and problematic debt, qualitative studies (Morduch and Schneider 2017; Servon 2018) have hinted at how dimensions of time (e.g., mismatch between timing of earnings and expenses, urgency of needs, speed of high-cost options) may factor in individual decision-making regarding high-cost debt. In addition, research in behavioral economics suggests that scarcity of resources, whether time or money, may be linked to problematic debt (e.g., Mullainathan and Shafir 2013; Schilbach, Scholfield, and Mullainathan 2016). Extant literature, however, offers a limited systematic understanding of whether and how forms of *temporal precarity*, such as work schedule unpredictability, may be independently associated with high-interest credit.

Income Volatility as a Pathway Linking Schedule Unpredictability to High-Cost Debt

Income volatility, inter- or intra-year variation in income, has been on the rise in the United States since the 1970s (Dynan, Elmendorf, and Sichel 2012; Haider, Jacknowitz, and Schoeni 2003; Hardy 2014; Morduch and Schneider 2017). Although income volatility is experienced across the income distribution, it is generally starker and more consequential among low-income families (Hill et al. 2013). Whereas earlier research focused on inter-year or year-to-year variation in income (i.e., Dynan et al. 2012), recent estimates suggest that intra-year volatility is also common. Today, about one-third of U.S. households experience variation in income from month to month (Federal Reserve 2019) and about three-quarters of the lowest-income U.S. households experience income fluctuations of 30 percent or more from month to month (Farrell and Grieg 2016).

Work schedules are a key driving force of intra-year income volatility (Farrell and Grieg 2016; Federal Reserve 2019). Workers in retail and food service occupations are particularly likely to experience swings in earnings and income because

they are paid by the hour and are exposed to unstable and unpredictable schedules (Farrell and Greig 2016; Federal Reserve 2019; Finnigan 2018). The income volatility experienced by service sector workers is particularly challenging because it is often outside of workers' control: work schedules vary often, workers receive little advance notice, and shifts can be canceled or shortened at the last minute without compensation (Golden 2015; Lambert 2008; Lambert et al. 2014). In contrast to other sources of income volatility that are experienced sporadically (e.g., changes in jobs or marital status), schedule unpredictability among low-wage service workers is likely to result in income volatility that is *chronic* (Schneider and Harknett 2017). This chronic income volatility resulting from unpredictable schedules is experienced not only from year to year or month to month (Farrell and Grieg 2016; Morduch and Schneider 2017), but from week to week.

Although data limitations have hindered a systematic analysis of the link between chronic income volatility and high-cost debt, previous qualitative work (Edin and Shaefer 2015; Morduch and Schneider 2017; Servon 2018) and surveys of payday loan users (Lawrence and Elliehausen 2008) suggest that, in addition to income levels, income volatility is a key driver of high-interest borrowing. Previous studies suggest that income volatility may be a main pathway linking schedule unpredictability to high-cost debt given that slightly more than two-thirds of service workers exposed to the high levels of schedule instability also experience chronic income volatility (Schneider and Harknett 2017) and that chronic income volatility resulting from schedule unpredictability has deleterious impacts on families' economic and food security (Bania and Leete 2009; Federal Reserve 2019; Schneider and Harknett 2017, 2020). Our study, thus, examines whether the direct association between schedule unpredictability and high-cost debt remains once we adjust for chronic income volatility.

The Role of State and Organizational Policies in Moderating High-Cost Debt

Schedule unpredictability together with the erosion of wages, benefits, job security, and public assistance are all part of a "Great Risk Shift"—a trend toward transferring economic risks from the government and from corporations to individuals (Hacker 2019; Kalleberg and Vallas 2018). The erosion of collective risk pooling and the individualization of welfare are also reflected in the increasing individual debt—and, particularly, increasing high-cost debt in liberal welfare regimes (Hacker 2019). The Great Risk Shift suggests that high-interest lending, which is considered as a last resort for most borrowers (Bhutta et al. 2015; Wilson et al. 2010), may be filling the gap left by inadequate public welfare or short-term cash assistance (Hembruff and Soederberg 2019; Karger 2005; Marston and Shevellar 2014; Michener, SoRelle, and Thurston 2020). In fact, an incipient literature finds that state welfare generosity shapes the landscape of the alternative financial services industry in the United States. For instance, individuals living in areas where Medicaid was expanded or with generous unemployment benefits are less reliant on high-cost debt (Allen et al. 2017; Fitzpatrick and Fitzpatrick 2020; Goldsmith-Pinkham, Pinkovskiy, and Wallace 2020; Wiedemann 2021).

After establishing the relative magnitude of the association between problematic debt and dimensions of time or money among low-wage workers who experience high levels of temporal precarity, our study sheds light on the role of public or private programs that offer cash assistance in protecting low-wage workers with unstable schedules against problematic debt. First, we investigate whether the cross-sectional link between schedule unpredictability and high-cost debt is moderated by the generosity of a cash assistance program that may mitigate reliance on high-cost debt: Temporary Assistance for Needy Families (TANF). TANF was established in 1996 by the Personal Responsibility and Work Opportunity Reconciliation Act as a means-tested program that provides cash assistance under several conditions, including a lifetime limit for benefit receipt, mandatory work rules, and sanctions for noncompliance (Danziger 2010). Over time, both TANF's caseload and its generosity have decreased (Burke 2004; CRS 2021), leading to an overall decrease in the share of poor families' monthly income that is generated by this public benefit (Danziger and Danziger 2010). Still, TANF has an important role in beneficiary families' well-being and economic security throughout the year (McKernan, Ratcliffe, and Iceland 2018; Reichman et al. 2004; Wang 2015), and, compared with other existing public benefit programs, it more easily represents a substitute product to high-interest debt given that it also provides monthly access to money that can be spent with flexibility.

Second, we investigate whether working for corporations that offer hardship funds moderates associations between unpredictable schedules and high-cost debt. Although hardship funds often vary from company to company in terms of structure, eligibility criteria, application processes, fund-raising mechanisms, and disbursement process, they generally try to help employees who experience highly unexpected events by giving them quick access to cash ranging from \$500 to \$5,000. As such, although corporate hardship funds do not make up for low wages and benefits, they offer quick and flexible access to cash in moments of need and may contribute to low-wage workers' financial health (Aspen Institute 2019), potentially helping service workers who experience unexpected events to avoid pawning their possessions, taking out payday or auto-title loans, overdrafting from their bank accounts, or running up credit card debt.

If access to these limited, conditional, or temporary cash assistance programs protect workers with unpredictable schedules against high-cost debt, we would expect the link between schedule unpredictability and high-cost debt to be weaker in states with more accessible TANF benefits and in institutions that offer cash grants. Notably, if TANF benefits are too small or inflexible to respond to people's needs arising from schedule unpredictability and/or if schedule unpredictability hinders access to TANF benefits (Ben-Ishai 2015; Hill and Ybarra 2014; Moffitt and Ribar 2009), we may see no variation in the link between schedule unpredictability and high-cost debt across policy contexts. Similarly, if corporate cash grants are unknown or not accessible (Aspen Institute 2019), we may see no variation in the link between schedule unpredictability and high-cost debt across institutional contexts. Although these cross-sectional analyses cannot support causal claims, they provide preliminary evidence on the (in)adequacy of limited, conditional,

or temporary cash assistance programs in addressing experiences of low-wage workers who experience temporal precarity.

Methods

Data

We draw on cross-sectional data from the Shift Project, which contains detailed measures of work schedule unpredictability and week-to-week income fluctuation for nearly 40,000 service workers employed by 150 of the largest firms in retail and food service in the United States. Data from the Shift Project are particularly well suited for this project, as they include a set of measures of high-cost financial services use, detailed information on exposure to unpredictable scheduling, and measures of income volatility, as well as state and company identifiers, that are missing from existing large-scale survey or administrative data sources. This study relies on data collected between 2017 and 2019.

The Shift Project has collected web-based survey data from a sample of low-wage service sector workers (front-line workers and front-line managers paid hourly) who were recruited through targeted advertising on Facebook. Schneider and Harknett (2019, 2022) provide detailed descriptions of the recruitment strategy used, potential bias related to the sampling frame, statistical adjustments for the nonprobabilistic nature of the sample, and validity checks. We used multiple imputation for respondents who completed the survey but had item nonresponse using the *mi* imputed *chained* commands in Stata ($n = 10$). Our post-stratification weights ensure that all estimates presented are weighted to the American Community Survey and account for employer size (see details on Schneider and Harknett 2022).

State-level measures of TANF generosity were collected from the National and State TANF to Poverty Data from the Center on Budget and Policy Priorities (CBPP 2022). We are not aware of any existing comprehensive database of employee hardship funds. To fill this gap, we created a data set with information about the availability of hardship funds among all the 150 companies included in the Shift Project data. We searched information about the availability, start dates, and end dates of these programs using online search tools, including the employer's name in addition to one or more of the following key words: "employee relief fund," "employee crisis fund," "hardship fund," "assistance funds," and "social responsibility report." We also searched for additional information in the websites of the U.S. Chamber Foundation, the Emergency Assistance Foundation, and the Community Foundation of Acadiana and in the Wayback Machine archive. Our database only includes programs that were documented and publicized and that were active between 2017 and 2019.

Measures

High-cost debt. We create five dichotomous measures that indicate respondents' self-report² of mainstream or alternative high-interest financial services in the past year. Specifically, our measures indicate whether the respondent (1) took out a

payday loan; (2) used a pawnshop; (3) took out an auto-title loan; (4) overdrew their checking or savings account; (5) experienced at least one of three adverse actions associated with credit cards: were only able to pay the minimum amount, were charged a late fee, or were charged an over-the-limit fee on a credit card. Notably, the subsamples of respondents who were exposed to auto-title loans, overdrafts, and problematic credit card debt are not randomly selected but must instead have owned a car, have had a bank account, or have held a credit card in order to be at risk for the associated form of high-cost borrowing. For this reason, we will also show and discuss results on whether respondents (6) had a car, (7) were banked, and (8) had a credit card.

Schedule unpredictability. We use six separate measures to capture the multifaceted nature of schedule unpredictability: (1) variable schedules (whether respondent categorized their own work schedule as variable—“one that changes from day to day”—instead of a regular day, evening, or night shift, a split shift, or on rotation), (2) amount of schedule advance notice (whether respondent knew their work schedules less than two weeks in advance), (3) on-call shifts (whether the respondent had at least one on-call shift in the past month), (4) canceled shifts (whether the respondent had at least one canceled shift in the past month), (5) timing of shifts (whether the timing or length of a respondent’s shift was changed by employer at least once in the last month), (6) control over schedule (whether the respondent had no say in deciding their work schedule). We also create (7) a composite index using all the measures above. To construct this index, we count up the number of types of schedule instability to which a worker is exposed to create an additive index that goes from 0 to 5. We top-code our scale at 5 because only about one percent of workers in our sample experienced all six types of schedule instability.

Household income. Household income is categorized as categorized as (1) less \$15,000, (2) \$15,000 to \$24,900, (3) \$25,000 to \$34,900, (4) \$35,000 to \$49,900, (5) \$50,000 to \$74,900, (6) \$75,000 to \$99,900, and (7) \$100,000 or more. We use this variable to compare the relative importance of levels of income and schedule unpredictability in predicting high-cost debt.

Chronic income volatility. In advancement of previous work that measures income volatility from year to year or month to month (Gennetian et al. 2015; Hardy 2014; Moffitt and Gottschalk 2012; Shin and Solon 2011), the Shift Project data allow us to measure income volatility from week to week. We use a dichotomous measure that indicates whether respondents’ income (from earnings and other sources³) goes up and down (1) or stays basically the same (0). This measure does not capture the magnitude of income swings, but it indicates the frequency of income changes (Gennetian et al. 2015; Western et al. 2012).

Public cash assistance. For each year included in our data (2017 to 2019), we measure TANF inclusion as the ratio of TANF family caseloads by the number of poor families with children (CBPP 2022). When this ratio falls for a given state, it suggests that TANF became less responsive to poor families’ needs. This ratio can fall because the number of families receiving cash assistance falls disproportionately more than the number of poor people within a given state. This ratio can also

fall because of increases in the number of poor families without corresponding increases in families that are TANF beneficiaries.

Corporate hardship funds. We create a binary variable that indicate whether each of the 150 corporations included in the Shift Project data offered hardship funds in each year included in our data (2017 to 2019). Notably, we compiled this data set using information obtained through online search engines. Thus, in each of these variables, a value of 1 denotes the publicization of a hardship corporate program in online platforms, and a value of 0 denotes the absence of information about such programs online. In other words, it is possible that a corporation offered hardship funds to its employees but never publicized this program in online platforms. A lack of online information about corporate programs may lead to measurement error and attenuation bias in our estimates.

Controls. Multivariate analyses control for respondents' socioeconomic and demographic characteristics (gender, race and ethnicity, age, presence of children in the home, whether English was a second language in the home, marital or cohabiting status, educational attainment, whether currently enrolled in school, household income), job characteristics (whether in managerial position, whether unionized, industry, usual work hours, hourly wages⁴), and access to mainstream financial services (i.e., whether respondents were banked). Our regression models also control for month and year fixed effects that adjust for unobserved period effects and for state fixed effects that adjust for geographical differences in access to financial services. Models interacting schedule unpredictability with measures of TANF generosity (state-level variable) also control for states' racial composition, annual unemployment rates, median household income, and bank density.

Sample

Table 1 reports on the characteristics of our sample of nearly 40,000 service workers. About 58 percent of workers in our sample were women, 45 percent had kids, and 46 percent lived with a cohabiting partner. About 62 percent of our sample was white, 12 percent was black, and about 18 percent was Hispanic. Whereas about 40 percent of our sample had a high school degree or less, 38 percent had some college education, and about 22 percent had at least a college degree. In terms of job characteristics, workers in our sample worked, on average, 33 hours per week and earned slightly more than \$12 per hour. Our sample was predominantly composed of individuals living in low-to-moderate-income households: 41 percent of the sample had an annual household income less than \$25,000, and only about 13 percent had an annual household income greater than \$75,000.

Table 2 reports on the extent to which service workers in our sample were exposed to schedule unpredictability. About one-third of workers stated that their work schedule was variable, and nearly 58 percent said that they had no control over their work schedule. About two-thirds experienced changes to the timing or length of their shifts, 14 percent had a shift canceled, and 22 percent were on call in the past month. Workers also received little advance notice about their schedules, with about 60 percent reporting less than two weeks in advance notice. Whereas about six percent of workers in our sample experienced none of the six

Table 1: Descriptive statistics for the sample (weighted)

Characteristics	Percent or mean (standard error)
Female	58%
Age	37.0 (0.3)
Has kids	45%
Cohabiting with a partner	47%
Race	
Non-Hispanic white	62%
Non-Hispanic black	12%
Hispanic	18%
Other or two or more	8%
Enrolled in school	24%
Education	
No degree or diploma earned	6%
High school diploma/GED	34%
Some college	38%
Associate degree	11%
Bachelor's degree	9%
Master's degree/advanced degree	2%
English as a second language	16%
Managerial position	20%
Usual hours	33.3 (0.3)
Hourly wages	\$12.4 (0.1)
Household annual income	
<\$15,000	17%
\$15,000–\$24,999	24%
\$25,000–\$34,999	18%
\$35,000–\$49,999	16%
\$50,000–\$74,999	13%
\$75,000–\$99,999	7%
>\$99,999	6%

Note: $N = 39,788$.

sources of schedule unpredictability studied, 18 percent experienced one source of unpredictability, 27 percent experienced two sources of schedule unpredictability, 25 percent experienced three, 16 percent experienced four sources of unpredictability, and eight percent experienced five or six sources of unpredictability.

Analytic Strategy

First, to describe the link between schedule unpredictability and high-cost debt, we estimate linear probability models with each of our five financial services variables as our dependent variables and the schedule unpredictability index as our key independent variable. All models adjust for all controls listed above as well as month, year, and state fixed effects. Results from these models also allow us to compare the magnitude of the associations between problematic debt and both work schedule unpredictability and household income.

Three of our variables of interest—“auto-title loans,” “overdrafts,” and “adverse experiences with credit cards,” are only relevant for a subset of respondents—those

Table 2: Prevalence of schedule unpredictability

Schedule unpredictability	Percent
Schedule varies	33
Has less than two weeks in advance notice	60
Had shift canceled in the past month	14
Was on call in the past month	22
Experienced changes to length or timing of shift	66
No control over schedule	58
Schedule unpredictability index	
No exposures	6
One exposure	18
Two exposures	27
Three exposures	25
Four exposures	16
Five or six exposures	8

Note: $N = 39,788$.

who have cars, who have bank accounts, and who have credit cards, respectively. For simplicity, in the models presented in the main section of this article, we restrict the sample to respondents who were *at risk* of incurring each of these three types of high-cost debt. These estimates indicate whether experiencing greater levels of schedule unpredictability is associated with high-cost debt for those who *are eligible* to incur a particular type of debt. We do, however, also run two-part models to estimate joint probabilities of both being selected in the subsample and experiencing the high-cost debt event of interest (e.g., estimating the joint probability of having credit cards *and* having adverse experiences with credit cards). These results are useful to understand the probability of incurring each type of high-cost debt in the general population of service workers, regardless of eligibility for or exposure to a specific type of service. This second set of results is included in the online supplement.

Notably, our results cannot be used to make causal claims. First, we rely on cross-sectional data that do not allow us to establish a temporal order between our dependent and independent variables. Although existing literature suggests a logical path from experiences of temporal precarity to problematic debt, we cannot discard the possibility of reverse causality in which workers in difficult financial straits, including those making use of high-cost debt, turn to precarious work that exposes them to unstable work schedules. Second, our models rely on a limited set of controls. Thus, we also cannot discard the possibility that the identified association is spurious—that is, driven by an omitted confounder. For instance, both uncertain work schedules and high-cost debt may be jointly predicted by workers' levels of financial literacy, assets, or experiences of social, environmental, or family instabilities. Rather than unstable schedules causing workers to take on problematic debt, the same kind of workers who end up in jobs with unstable schedules may also end up taking on problematic debt, and the characteristics upon which this selection occurs may be unobserved in our survey data. Absent a source of exogenous variation in scheduling, comparing similarly situated individuals who are not exposed to unstable scheduling, such

as the recently unemployed, could help improve our inference. However, these waves of the Shift Project data only contain workers who are currently employed, with the consequence that our analytical comparison must be between workers with relatively stable and predictable schedules and those exposed to instability and unpredictability. However, although we cannot identify or test the role of all potential omitted confounders, we conducted supplemental analyses investigating whether workers' human capital and financial literacy explain away the association of interest (described later).

Our second goal is to estimate whether the direct association between schedule unpredictability and high-cost debt remains after we control for an important potential mediator, income volatility. To do this, we add a measure of week-to-week income volatility to the baseline models described above. We also test for the degree and significance of the cross-sectional mediation by income volatility using the `khb` command in Stata (Karlson, Holm, and Breen 2012). The remaining association between schedule unpredictability and high-cost debt is interpreted as being direct or mediated by non-financial pathways that cannot be tested in this study.

Our final aim is to assess whether policy and institutional contexts moderate the association between unpredictable work schedules and high-cost debt. In these analyses, we interact our measure of schedule unpredictability with measures of TANF inclusivity and presence of corporate hardship funds.

Results

Schedule Unpredictability as a Predictor of High-Cost Debt

First, we describe the relationship between schedule unpredictability and high-cost debt *net* of all controls, including household income. The first panel of Figure 1 plots the predicted probabilities of using each type of financial service across values of the schedule unpredictability index. Multivariate regression coefficients from which these probabilities were derived are included in Table A1 of the online supplement.

Figure 1 indicates a positive and monotonic relationship between schedule unpredictability and predicted probabilities of acquiring each type of high-cost debt, except for auto-title and payday loans. Within alternative financial services, the probability of using pawnshops quadruples, growing from 4.8 percent to about 19.2 percent, as the sources of instability increase from zero (index = 0) to five or six (index = 5). Similarly, the probability of using auto-title loans nearly doubles, going from about 7.8 percent to 13.5 percent as the number of sources of unpredictability grow from zero to five or six. The probability of using payday loans, however, is not significantly associated with schedule unpredictability. Within mainstream services, the probability of having an overdraft increases from 31.7 percent for workers who do not experience any type of unpredictability to 52.1 percent for those who experience five or six sources of unpredictability—which represents a 65 percent increase in the probability of overdrafting from bank accounts. The probability of having adverse experiences with credit cards (i.e., being only able to pay the minimum amount, being charged a late fee, or being charged an over-the-limit fee) also increases by nearly 20 percentage points, going from 55.5 percent to 73.2

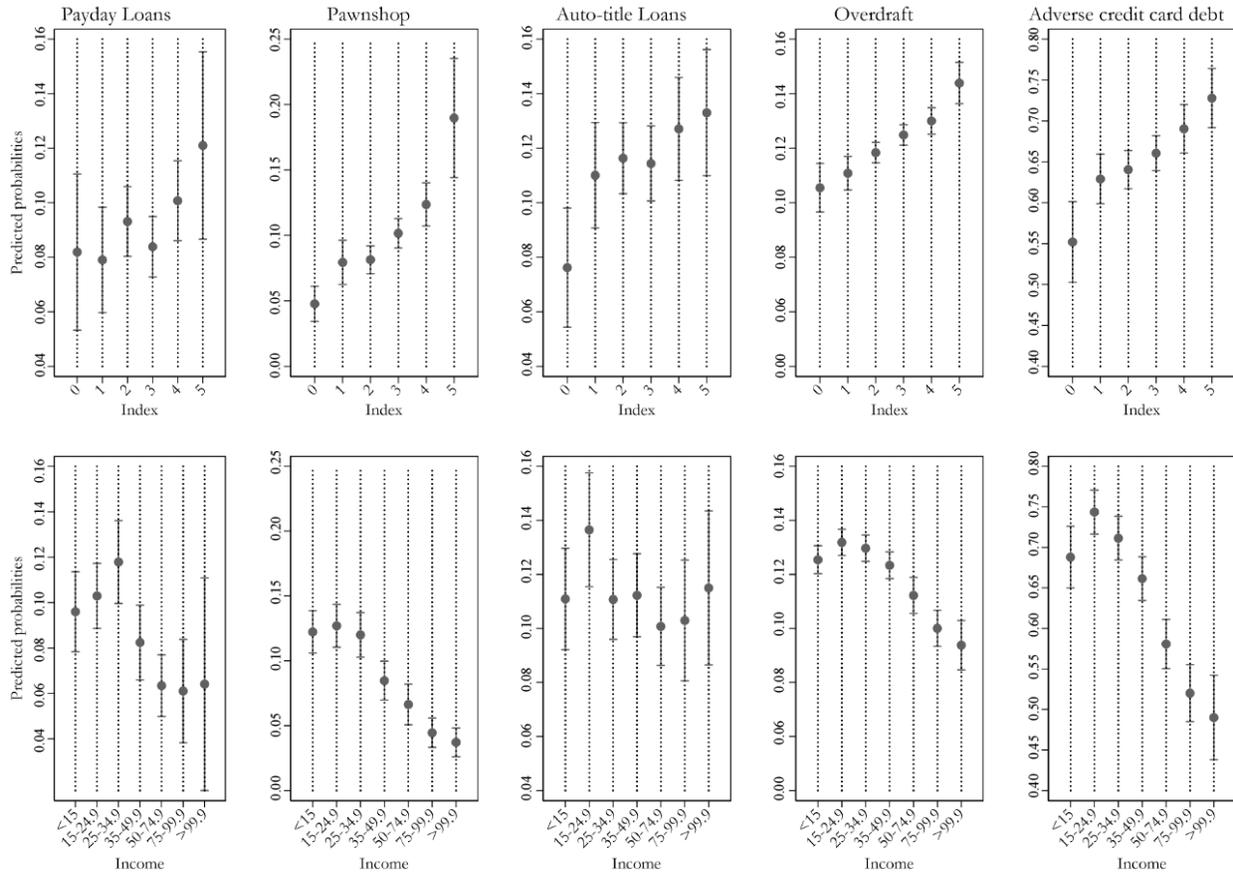


Figure 1: Predicted probabilities by schedule unpredictability index and household income (weighted). *Notes:* Models include all controls and use robust standard errors. Sample for auto-title loans conditional on having a car. Sample for overdraft conditional on being banked. Sample for adverse credit card debt conditional on having a credit card.

percent, as the number of sources of unpredictability increase from zero to five or six.

Overall, multivariate results suggest that, as the number of sources of schedule unpredictability increases from zero to five or six, service workers are more likely to use alternative financial services such as pawnshops and auto-title loans and to have negative experiences with mainstream services such as credit cards and bank accounts. Importantly, findings indicate that schedule unpredictability is a significant predictor of high-cost loans *net* of all covariates, including income levels. These results help to establish schedule unpredictability as an independent and understudied predictor of high-cost debt.

In additional analyses included in Table A2 of the online supplement, we investigate the association between each individual type of schedule unpredictability and financial service use. These analyses allow us to see if a specific type of schedule unpredictability is driving the results presented in Figure 1 and Table A2 of the online supplement. Overall, Table A2 suggests that different financial services may

be sought by workers who experience different types of schedule unpredictability. For instance, simply experiencing variable schedule or short advance notices alone is not associated with any of the investigated forms of high-cost debt; being on call, on the other hand, is associated with all forms of high-cost debt investigated in this study. In addition, Figure 1 and Table A2 suggest that exposure to multiple types of schedule unpredictability may yield joint associations that cannot be identified by looking only at a single type of instability. For instance, whereas auto-title loans are only marginally associated with one type of schedule unpredictability (being on call) in Table A2, they are significantly associated with our index of schedule unpredictability in Figure 1.

One of the main limitations of our results is the fact that, in the Shift Project data, high-interest financial services use is measured over the past 12 months, and schedule unpredictability is measured over the past month. As a result, the use of alternative financial services, credit cards, or overdrafts may precede the experience of schedule unpredictability. In a sensitivity analysis presented in Table A3 of the online supplement, we conditioned the sample to having at least one year of job tenure at their current employer. These analyses corroborate the main analyses, finding, once again, that schedule unpredictability is a significant predictor of high-cost loans *net* of income.

Another limitation of our results is that for three dependent variables (i.e., adverse experiences with credit cards, use of auto-title loans, and overdrafts), we limited our sample to those who were at risk of incurring these types of high-cost debt (i.e., those who had credit cards, cars, or bank accounts). This means that our estimates of the probability of incurring high-cost debt pertain to the population at risk rather than the whole population of service workers. In additional analyses included in Figure A4 of the online supplement, we estimated joint probabilities of incurring these types of debts for the whole population of service workers. Overall, Figure A4 corroborates our main results, suggesting that patterns identified for the group of service workers who are eligible to incur each type of high-cost debt are reproduced for the whole population of service workers, even if at lower levels. Notably, because the probabilities of having bank accounts or cars in the population of service workers are high, the joint probabilities of incurring overdrafts or using auto-title loans presented in Figure A4 are strikingly similar to the probabilities presented in Figure 1. The probability of having a credit card, however, hovers around 50 percent, and, as a result, the probability of incurring adverse credit card debt is much lower for the general population of service workers (Figure A4) compared with service workers who have a credit card (Figure 1). In addition, the probability of having a credit card declines as the experience of schedule unpredictability increases. Specifically, although workers who experience more schedule unpredictability are also more likely to incur adverse credit card debt *conditional* on having a credit card, they are also less likely to have credit cards in the first place. This results in a lack of relationship between adverse credit card debt and schedule unpredictability in the general population (see the virtually flat horizontal line presented in Figure A4).

Human Capital as a Potential Confounder

Our study finds that greater levels of schedule uncertainty are associated with increases in the incidence of high-cost debt among service sector workers. Our main models, however, do not adjust for workers' financial literacy or specific forms of human capital that pertain to financial decision-making. It is possible, therefore, that the cross-sectional association between work schedules and costly debt is explained by important omitted variables, namely, financial literacy and human capital. Financial literacy (i.e., the ability to process economic information and make informed financial decisions) is generally considered an appropriate measure of human capital that is specific to day-to-day financial decision-making (Hilgert, Hogarth, and Beverly 2003) and that has been widely linked to reliance on credit cards, payday loans, and other forms of high-interest credit (Allgood and Walstad 2013; Bertrand and Morse 2011; de Bassa Scheresberg 2013; Mottola 2013; Stango and Zinman 2009). In addition, financial literacy matters for several financial outcomes even after adjusting for cognitive ability (Gerardi, Goette, and Meier 2013) and educational attainment (Behrman et al. 2012; Lusardi and de Bassa Scheresberg 2013; Lusardi and Mitchell 2011; van Rooij, Lusardi, and Alessie 2011, 2012).

The Shift Project data do not contain measures of financial literacy. However, we constructed a binary measure of *exposure to financial education*⁵ during high school as a proxy for financial literacy to test the relevance of this potential confounder. To do so, we take advantage of data from the State Mandated Financial Education Database (<https://www.montana.edu/urban/financial-edu-database.html>) on financial education mandates that have been implemented in the last decades by several states. Exposure to such state-mandated financial education programs has been found to improve financial knowledge and behaviors (for a review, see Kaiser et al. 2021), to improve credit scores and repayment of debts (Brown et al. 2014; Urban et al. 2020) and to reduce both non-student debt (Brown et al. 2016) and reliance on alternative financial services and high-cost borrowing (Harvey 2019; Stoddard and Urban 2020).⁶ We reason that if financial literacy confounds the association between high-cost debt and unpredictable schedules, then this association should be weaker or absent when we control for workers' financial knowledge.

Because state-mandated financial education is offered during high school, Table 3 first reproduces our main results with a restricted sample of workers who completed high school ($n = 37,614$). A comparison between results presented in Table A1 of the online supplement and in models 1 of Table 3 suggests that restricting the sample to workers with at least a high school degree does not alter the associations between schedule unpredictability and high-cost debt. Keeping the restricted sample of workers with at least some high school education, models 2 report on the association between each financial outcome and exposure to financial education during high school, net of all controls. Workers who were exposed to state-mandated financial education are significantly less likely to take on payday loans or auto-title loans, to incur overdrafts, or to have adverse experiences with credit cards. As expected, we find that exposure to financial education matters for the financial outcomes of interest. Models 3 include both measures of schedule

unpredictability and of financial education. We find that controlling for exposure to financial literacy does not change the significance, direction, or magnitude of the associations between schedule unpredictability and high-cost debt. Overall, results presented in Table 3 indicate that the association between schedule unpredictability and high-cost debt is not explained away by levels of financial knowledge. We also conducted additional analyses (see Table A5 in the online supplement) where we interacted schedule unpredictability with exposure to financial literacy. Results presented in Table A5 corroborate Table 3 and show that exposure to financial education during high school does not moderate the link between schedule unpredictability and problematic debt.

Of course, it is possible that financial literacy does not appropriately capture all forms of human capital that would be involved in financial decision-making. To address this limitation, we conduct an additional set of analyses relying on an alternative proxy of human capital. Theoretically, we would expect selection at hire to be more rigorous when labor markets are slack (i.e., when unemployment rates are high) versus when labor markets are tight (i.e., when unemployment rates are low). In other words, employees hired in slack labor markets should be relatively more skilled or capable than those hired in tight labor markets. If differences in human capital or cognitive ability confound the association between schedule unpredictability and high-cost debt, we would expect to find that this key association is attenuated when we control for labor market conditions at hire. We use job tenure and county of employment to reconstruct local labor market conditions at the time of hire. We operationalize local labor market conditions using county-level unemployment rates from the Bureau of Labor Statistics. Because information on tenure at current institution is top-coded at six or more years, we restrict our sample to workers who were in their firm for five years or less ($n = 30,098$). Table 4 below reports on results from these analyses.

A comparison between models 1 of Table 4 and the same models conducted using the full sample (Table A1 in the online supplement) suggests that restricting the sample to workers with less than six years of job tenure does not substantially change the associations between most types of high-cost debt and schedule unpredictability. An exception is that the association between schedule unpredictability and auto-title loans becomes insignificant and substantively smaller when we use the restricted sample. Models 2 indicate that labor market conditions at time of hire have little to no association with all forms of high-cost debt. But, most importantly, models 3 show that adjusting for labor market conditions at the time of hire does not change the significance or magnitude of the association between schedule unpredictability and high-cost debt. Thus, results presented in Table 4 once again suggest that workers' levels of human capital do not explain away the association between schedule unpredictability and high-cost debt. In tandem, we conducted an additional analysis (see Table A6 in the online supplement) where we interacted schedule unpredictability with labor market conditions at the time of hire. Results presented in Table A6 corroborate Table 4 and generally suggest that the association between schedule unpredictability and problematic debt is independent from workers' human capital. Notably, even though all supplemental analyses described above are consistent with the notion that there is a real association between

Table 3: Coefficients from linear probability models (weighted)

Index (Ref: 0)	Payday			Pawnshop			Auto-title loan ^a			Overdraft ^b			Adverse experience with credit card ^c		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1	0.021 (0.020)	0.014 (0.018)	0.032* (0.013)	0.032* (0.016)	0.033 [†] (0.012)	0.032* (0.016)	0.044 (0.032)	0.029* (0.015)	0.043 (0.029)	0.057 (0.031)	0.078 [†] (0.029)	0.043 (0.029)	0.057 (0.031)	0.078 [†] (0.029)	0.043 (0.029)
2	0.020 (0.017)	0.018 (0.016)	0.032 [†] (0.011)	0.048* (0.015)	0.035 [†] (0.009)	0.048* (0.015)	0.094 [†] (0.028)	0.039 [†] (0.014)	0.072 [†] (0.026)	0.075* (0.031)	0.085 [†] (0.029)	0.072 [†] (0.026)	0.075* (0.031)	0.085 [†] (0.029)	0.072 [†] (0.026)
3	0.011 (0.016)	0.012 (0.016)	0.060 [†] (0.011)	0.048* (0.016)	0.053 [†] (0.009)	0.048* (0.016)	0.121 [†] (0.028)	0.034* (0.015)	0.104 [†] (0.026)	0.112 [†] (0.031)	0.108 [†] (0.029)	0.104 [†] (0.026)	0.112 [†] (0.031)	0.108 [†] (0.029)	0.104 [†] (0.026)
4	0.021 (0.018)	0.026 (0.017)	0.063 [†] (0.012)	0.038* (0.016)	0.072 [†] (0.012)	0.038* (0.016)	0.130 [†] (0.030)	0.040* (0.016)	0.124 [†] (0.027)	0.137 [†] (0.036)	0.135 [†] (0.032)	0.124 [†] (0.027)	0.137 [†] (0.036)	0.135 [†] (0.032)	0.124 [†] (0.027)
5 or 6	0.066* (0.029)	0.052* (0.024)	0.151 [†] (0.027)	0.068 [†] (0.021)	0.155 [†] (0.026)	0.068 [†] (0.021)	0.210 [†] (0.036)	0.057 [†] (0.018)	0.199 [†] (0.032)	0.179 [†] (0.035)	0.179 [†] (0.032)	0.199 [†] (0.032)	0.179 [†] (0.035)	0.179 [†] (0.032)	0.199 [†] (0.032)
Financial education	-0.026* (0.012)	-0.026* (0.012)	-0.009 (0.012)	-0.026* (0.012)	-0.009 (0.012)	-0.026* (0.012)	-0.046* (0.018)	-0.026* (0.012)	-0.046* (0.018)	-0.076 [†] (0.022)	-0.076 [†] (0.022)	-0.046* (0.018)	-0.076 [†] (0.022)	-0.076 [†] (0.022)	-0.046* (0.018)

Notes: Sample conditional on having completed high school ($n = 37,614$). Models include all controls and use robust standard errors (shown in parentheses). a. Sample conditional on having a car. b. Sample conditional on being banked. c. Sample conditional on having a credit card. * $p < 0.05$; $† p < 0.01$.

Table 4: Coefficients from linear probability models (weighted)

Index (Ref: 0)	Payday			Pawnshop			Auto-title loan ^a			Overdraft ^b			Adverse experience with credit card ^c		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1	0.013 (0.025)	0.013 (0.025)	0.018 (0.014)	0.007 (0.023)	0.018 (0.014)	0.007 (0.023)	0.014 (0.034)	0.007 (0.023)	0.015 (0.0345)	0.093* (0.041)	0.092* (0.041)	0.015 (0.0345)	0.093* (0.041)	0.092* (0.041)	0.015 (0.0345)
2	0.007 (0.021)	0.007 (0.021)	0.031* (0.014)	0.032 (0.023)	0.031* (0.014)	0.032 (0.023)	0.039 (0.031)	0.033 (0.023)	0.039 (0.031)	0.107 [†] (0.037)	0.107 [†] (0.037)	0.039 (0.031)	0.107 [†] (0.037)	0.107 [†] (0.037)	0.039 (0.031)
3	0.001 (0.021)	0.001 (0.021)	0.045 [†] (0.014)	0.027 (0.022)	0.044 [†] (0.014)	0.027 (0.022)	0.059 (0.031)	0.026 (0.022)	0.059 (0.031)	0.104 [†] (0.037)	0.105 [†] (0.037)	0.059 (0.031)	0.104 [†] (0.037)	0.105 [†] (0.037)	0.059 (0.031)
4	0.017 (0.022)	0.016 (0.022)	0.072 [†] (0.015)	0.039 (0.024)	0.072 [†] (0.015)	0.039 (0.024)	0.089 [†] (0.033)	0.039 (0.024)	0.089 [†] (0.033)	0.145 [†] (0.038)	0.147 [†] (0.038)	0.089 [†] (0.033)	0.145 [†] (0.038)	0.147 [†] (0.038)	0.089 [†] (0.033)
5 or 6	0.026 (0.024)	0.026 (0.024)	0.136 [†] (0.025)	0.045 (0.024)	0.136 [†] (0.025)	0.045 (0.024)	0.167 [†] (0.035)	0.045 (0.024)	0.167 [†] (0.035)	0.171 [†] (0.041)	0.171 [†] (0.041)	0.167 [†] (0.035)	0.171 [†] (0.041)	0.171 [†] (0.041)	0.167 [†] (0.035)
Unemployment rate	-0.001 (0.002)	-0.001 (0.002)	-0.005* (0.002)	0.001 (0.003)	-0.005* (0.002)	0.001 (0.003)	-0.001 (0.004)	0.001 (0.003)	-0.001 (0.004)	0.013 [†] (0.004)	0.013 [†] (0.004)	-0.001 (0.004)	0.013 [†] (0.004)	0.013 [†] (0.004)	-0.001 (0.004)

Notes: Sample conditional on providing a county identifier and having worked at current company for less than 5 years ($n = 30,098$). Models include all controls and use robust standard errors (shown in parentheses). a. Sample conditional on having a car. b. Sample conditional on being banked. c. Sample conditional on having a credit card. * $p < 0.05$; $† p < 0.01$.

unpredictable schedules and high-cost debt, these findings still do not establish a causal relationship between the two constructs.

The Relative Importance of Schedule Unpredictability and Income Levels

Extant literature highlights the role of income levels while neglecting the importance of schedule unpredictability as a predictor of high-cost debt. To underscore the importance of this oversight, we discuss the substantive importance of schedule unpredictability vis-à-vis income levels. The second panel of Figure 1 uses results from the baseline multivariate regression (see Table A1 in the online supplement) to plot the predicted probabilities of using each type of financial service across values of household income, net of schedule unpredictability and all controls.

Corroborating existing literature, household income is a key predictor of alternative financial services and other mainstream high-cost debt. Instead of having a monotonic relationship with high-cost debt, Figure 1 suggests that the relationship between income and high-cost debt varies based on specific thresholds. For instance, having an income greater than \$50,000 is protective against adverse experiences with credit cards and the use of overdrafts. Having an income greater than \$35,000 is also protective against the use of pawnshop loans. In other words, there are no significant differences in the probabilities of acquiring high-cost debt through pawnshops, credit cards, or overdraft among families with income below these thresholds. As families' incomes over these thresholds continue to increase, Figure 1 shows a negative and monotonic relationship between household income and predicted probabilities of using pawnshops, incurring overdrafts, or having adverse experiences with credit cards. Specifically, as households move from the lowest income group (less than \$15,000) to the highest income group (greater than \$100,000), the probabilities of using pawnshops, overdrafts, or having adverse experiences with credit cards also decrease by about eight, 15, and 24 percentage points, respectively. Finally, although having an income greater than \$50,000 also seems to be protective against payday loans, standard errors become progressively larger as income increases, hindering our ability to make precise claims. And, surprisingly, whereas schedule unpredictability is predictive of auto-title loan use net of all controls (see Figure 1), household income is not.

Overall, Figure 1 allows us to compare the magnitude of the association between income levels and high-cost debt with that of schedule unpredictability and high-cost debt. For instance, whereas an increase in annual income of about or greater than \$85,000 (from either having a household income of less than \$15,000 to having a household income greater than \$100,000 *or* from having a household income between \$15,000 and \$25,000 to having a household income between \$75,000 and \$99,000) decreases the probability of using pawnshop loans by about eight percentage points, elimination of all forms of observed schedule unpredictability (holding household income constant) decreases the probability of using payday loans by more: 14 percentage points. Similarly large increases in household income also decrease the probability of using auto-title loans and overdrafting relatively less than eliminating all forms of observed schedule unpredictability—zero versus eight

percentage points and 15 versus 20 percentage points, respectively. Compared with eliminating all observed sources of temporal precarity, increasing household income from the lowest to the highest income group only has a greater substantive association with high-cost credit card debt. These results indicate not only that schedule unpredictability represents an independent and significant predictor of high-cost debt but also that the association between schedule unpredictability and high-cost debt is substantively meaningful.

Cross-sectional Mediation: The Role of Income Volatility

Week-to-week income volatility is likely one of the key mechanisms linking schedule unpredictability to high-interest financial services. Table 5 compares results from the main multivariate regression models, which do not include our measure of week-to-week income volatility (“Main model”), and results from models that include our measure of week-to-week income volatility (“Full model”). It also includes the percentage of the original association between schedule unpredictability and each form of high-cost debt that is explained when a measure of volatility is included in the model (“% Explained”).

Table 5 indicates that experiencing week-to-week income volatility is significantly and positively associated with the use of pawnshops, auto-title loans, bank overdrafts, and adverse experiences using credit cards. Although the inclusion of a measure of income volatility reduces the coefficients for schedule unpredictability in all models, reductions are substantially small, explaining between four percent and 11 percent of disparities between workers who experience the most schedule unpredictability (index = 5) and those who experience the least schedule unpredictability (index = 0). Furthermore, a test for the degree and significance of the cross-sectional mediation by income volatility using the `khb` command in Stata (Karlson et al. 2012) found that differences in coefficients before and after the inclusion of the mediator are insignificant. These results suggest that a direct association between schedule unpredictability and high-cost debt remains net of income volatility. They highlight the importance of further investigating potential non-financial pathways mediating the link between temporal precarity and high-cost debt. Although we lack the data to examine other pathways that explain our focal relationship, we speculate about potential non-financial mediators in the Discussion section of this article.

A limitation of this analysis is that our measure of week-to-week income volatility does not capture the magnitude of income swings. In a sensitivity analysis included in the online supplement (Table A7), we use a subsample of workers who were asked a more detailed question about chronic income volatility to reproduce the analysis presented above. This analysis categorizes respondents into those (1) who do not experience week-to-week income volatility, (2) whose income goes up and down *a little*, and (3) whose income goes up and down *a lot* from week to week. This analysis suggests that workers who experience “a lot” of income volatility from week to week are at greater risk of incurring high-cost debt than workers who experience lower levels of week-to-week income volatility. Although the inclusion of this more detailed measure of income volatility reduces the coefficients for

Table 5: Coefficients from main and full linear probability models (weighted)

	Payday	Pawnshop	Auto-title loan ^a	Overdraft ^b	Adverse experience with credit card ^c
Schedule unpredictability index					
One exposure					
Main model	0.003 (0.018)	0.031 [†] (0.011)	0.033* (0.016)	0.051 (0.031)	0.075* (0.031)
Full model	0.003 (0.018)	0.030 [†] (0.011)	0.032* (0.016)	0.049 (0.030)	0.073* (0.030)
% Explained	5.7%	1.5%	0.9%	4.0%	2.7%
Two exposures					
Main model	0.013 (0.016)	0.033 [†] (0.009)	0.039 [†] (0.014)	0.069 [†] (0.026)	0.085 [†] (0.029)
Full model	0.012 (0.016)	0.032 [†] (0.009)	0.038 [†] (0.014)	0.063* (0.025)	0.077 [†] (0.029)
% Explained	5.6%	5.0%	3.4%	9.2%	8.4%
Three exposures					
Main model	0.006 (0.016)	0.053 [†] (0.009)	0.035* (0.014)	0.109 [†] (0.026)	0.104 [†] (0.029)
Full model	0.005 (0.016)	0.050 [†] (0.009)	0.033* (0.014)	0.098 [†] (0.026)	0.093 [†] (0.028)
% Explained	21.6%	5.5%	5.9%	10.1%	10.1%
Four exposures					
Main model	0.021 (0.017)	0.073 [†] (0.012)	0.046 [†] (0.016)	0.128 [†] (0.027)	0.131 [†] (0.033)
Full model	0.018 (0.017)	0.068 [†] (0.012)	0.043 [†] (0.016)	0.112 [†] (0.027)	0.116 [†] (0.032)
% Explained	9.5%	6.3%	7.8%	13.1%	11.4%
Five or six exposures					
Main model	0.044 (0.023)	0.144 [†] (0.024)	0.056 [†] (0.018)	0.205 [†] (0.031)	0.176 [†] (0.032)
Full model	0.041 (0.024)	0.130 [†] (0.024)	0.052 [†] (0.018)	0.184 [†] (0.031)	0.157 [†] (0.032)
% Explained	5.2%	3.7%	7.3%	10.0%	10.7%
Volatility					
Main model	—	—	—	—	—
Full model	0.010 (0.008)	0.023 [†] (0.007)	0.017* (0.007)	0.087 [†] (0.012)	0.074 [†] (0.014)

Notes: $N = 39,788$. Models include all controls and use robust standard errors (shown in parentheses). a. Sample conditional on having a car. b. Sample conditional on being banked. c. Sample conditional on having a credit card. * $p < 0.05$; † $p < 0.01$.

schedule unpredictability in all models presented in Table A7, reductions are still substantially small and statistically insignificant.

The Role of Limited, Conditional, and Temporary Cash Assistance

In a final set of analyses, we investigate whether the link between schedule unpredictability and high-cost debt is moderated by policy and institutional contexts.

Table 6 reproduces the main linear probability models and interacts our measure of schedule unpredictability with quartiles of TANF inclusivity (i.e., ratio of beneficiary families to poor families) in the state in which respondents live. Table 6 indicates that, overall, the generosity of public cash assistance is not a significant moderator of the relationship between schedule unpredictability and high-cost debt. An exception is that we find that workers who experience low levels of unpredictability (index = 1) are less likely to have adverse credit card experiences when they live in states that are more inclusive (top two quartiles of TANF inclusivity). Still, living in states that are more inclusive or generous does not protect service workers who most experience schedule unpredictability against any type of high-cost debt. In sensitivity analyses (not shown) we also found that measuring a state's TANF generosity as the average or maximum TANF payouts yields the same conclusions.

Table 7 interacts our measure of schedule unpredictability with a dummy variable measuring the availability of hardship funds in the organization in which respondents work. This analysis also finds that availability of hardship funds does not significantly moderate the relationship between schedule unpredictability and high-cost debt. Overall, results presented in Tables 6 and 7 indicate that increased exposure to schedule unpredictability is associated with greater use of high-cost financial services regardless of the availability of public or private alternatives. These findings suggest that offering limited, conditional, or temporary access to money does not compensate for the negative associations between temporal precarity and high-cost debt.

Discussion and Conclusions

Low-to-moderate-income households often rely on consumer lenders, such as payday lenders, auto-title lenders, pawn brokers, and credit card issuers, or on overdrafts to make ends meet and cope with economic insecurity and income volatility. Although household income is known to be an important determinant of high-cost debt, scholars have yet to explore how other dimensions of instability and precarity are linked to the use of high-cost financial services. Schedule unpredictability is an increasingly common form of temporal precarity among service sector workers. In this study, we document that (1) the association between schedule unpredictability and high-cost debt is *independent* from income levels; (2) this association is not fully accounted for by income volatility, which represents a main pathway linking schedule unpredictability to high-cost debt according to the literature (e.g., Morduch and Schneider 2017; Morse 2011); and (3) the focal association is not moderated by access to public or private cash assistance.

We hypothesize that reliance on financial services that provide easy and quick access to money may be more important for those who face unpredictable work schedules net of income. In tandem, findings indicate that schedule unpredictability is an important predictor of high-cost debt that is independent from levels of income. We find a positive and monotonic relationship between schedule unpredictability and predicted probabilities of acquiring high-cost debt through pawnshops, overdrafts, and credit cards, net of income. We also find that experiencing all observed

Table 6: Coefficients from linear probability models (weighted)

	Payday	Pawnshop	Auto-title loan ^a	Overdraft ^b	Adverse experience with credit card ^c
Schedule unpredictability index					
One exposure	0.004 (0.040)	0.039 (0.024)	-0.001 (0.029)	0.050 (0.058)	0.196 [†] (0.062)
Two exposures	-0.014 (0.033)	0.038 (0.020)	0.022 (0.030)	0.094 (0.053)	0.147* (0.065)
Three exposures	-0.023 (0.032)	0.084 [†] (0.021)	0.039 (0.031)	0.151 [†] (0.052)	0.182 [†] (0.061)
Four exposures	0.017 (0.034)	0.088 [†] (0.024)	0.029 (0.031)	0.141* (0.055)	0.172 [†] (0.065)
Five or six exposures	0.039 (0.037)	0.142 [†] (0.029)	0.069 (0.039)	0.206 [†] (0.060)	0.258 [†] (0.069)
Inclusion quartiles					
Q2	-0.043 (0.052)	-0.005 (0.047)	0.011 (0.062)	0.074 (0.099)	0.012 (0.139)
Q3	0.030 (0.075)	-0.015 (0.055)	0.056 (0.076)	0.007 (0.114)	0.021 (0.146)
Q4	-0.026 (0.076)	0.031 (0.061)	-0.037 (0.088)	-0.082 (0.124)	-0.056 (0.157)
Index × quartiles					
One exposure × Q2	0.023 (0.049)	0.012 (0.037)	0.043 (0.039)	-0.023 (0.080)	-0.130 (0.091)
One exposure × Q3	-0.041 (0.058)	-0.009 (0.031)	0.046 (0.052)	0.026 (0.086)	-0.221* (0.087)
One exposure × Q4	0.006 (0.053)	-0.025 (0.025)	0.058 (0.035)	0.009 (0.080)	-0.169* (0.083)
Two exposures × Q2	0.063 (0.044)	-0.007 (0.029)	0.021 (0.040)	-0.049 (0.074)	-0.033 (0.083)
Two exposures × Q3	-0.011 (0.049)	0.005 (0.026)	0.006 (0.044)	-0.044 (0.070)	-0.135 (0.082)
Two exposures × Q4	0.062 (0.049)	-0.009 (0.023)	0.048 (0.035)	-0.010 (0.074)	-0.093 (0.081)
Three exposures × Q2	0.078 (0.042)	-0.042 (0.028)	-0.007 (0.040)	-0.055 (0.072)	-0.073 (0.079)
Three exposures × Q3	-0.008 (0.049)	-0.030 (0.028)	-0.040 (0.043)	-0.087 (0.069)	-0.139 (0.078)
Three exposures × Q4	0.052 (0.047)	-0.043 (0.024)	0.022 (0.035)	-0.032 (0.073)	-0.120 (0.080)
Four exposures × Q2	0.038 (0.046)	-0.007 (0.036)	0.029 (0.044)	-0.021 (0.076)	-0.016 (0.083)
Four exposures × Q3	-0.040 (0.050)	-0.026 (0.030)	-0.008 (0.044)	-0.029 (0.073)	-0.031 (0.085)
Four exposures × Q4	0.014 (0.048)	-0.019 (0.028)	0.048 (0.038)	-0.001 (0.077)	-0.128 (0.089)
Five or six exposures × Q2	0.031 (0.056)	0.025 (0.066)	-0.041 (0.048)	-0.013 (0.083)	-0.080 (0.089)
Five or six exposures × Q3	-0.077 (0.054)	-0.018 (0.039)	-0.038 (0.053)	-0.003 (0.078)	-0.113 (0.089)
Five or six exposures × Q4	0.056 (0.076)	0.024 (0.063)	0.002 (0.046)	0.012 (0.089)	-0.154 (0.096)

Notes: $n = 39,481$. Models include all controls and use robust standard errors (shown in parentheses). a. Sample conditional on having a car. b. Sample conditional on being banked. c. Sample conditional on having a credit card. * $p < 0.05$; † $p < 0.01$.

Table 7: Coefficients from linear probability models (weighted)

	Payday	Pawnshop	Auto-title loan ^a	Overdraft ^b	Adverse experience with credit card ^c
Schedule unpredictability index					
One exposure	0.007 (0.013)	0.018 (0.012)	0.020 (0.014)	0.020 (0.028)	0.034 (0.035)
Two exposures	0.029* (0.013)	0.034 [†] (0.011)	0.036 [†] (0.014)	0.046 (0.024)	0.057 (0.030)
Three exposures	0.020 (0.012)	0.050 [†] (0.011)	0.032* (0.014)	0.087 [†] (0.025)	0.073* (0.029)
Four exposures	0.034* (0.013)	0.070 [†] (0.013)	0.045 [†] (0.015)	0.106 [†] (0.026)	0.099 [†] (0.032)
Five or six exposures	0.072* (0.024)	0.124 [†] (0.023)	0.054 [†] (0.017)	0.177 [†] (0.031)	0.157 [†] (0.033)
Hardship funds (HF)	0.030 (0.026)	0.001 (0.014)	0.006 (0.022)	-0.008 (0.042)	-0.022 (0.048)
HF × unpredictability index					
HF × one exposure	-0.001 (0.035)	0.026 (0.023)	0.025 (0.031)	0.058 (0.056)	0.077 (0.060)
HF × two exposures	-0.029 (0.031)	-0.006 (0.018)	0.007 (0.027)	0.049 (0.048)	0.053 (0.055)
HF × three exposures	-0.022 (0.032)	0.005 (0.020)	0.007 (0.029)	0.049 (0.049)	0.068 (0.054)
HF × four exposures	-0.017 (0.035)	0.005 (0.029)	0.000 (0.036)	0.054 (0.055)	0.079 (0.066)
HF × five or six exposures	-0.084 (0.046)	0.079 (0.073)	0.004 (0.044)	0.076 (0.063)	0.024 (0.065)

Notes: Models include all controls and use robust standard errors (shown in parentheses). $N = 39,788$. a. Sample conditional on having a car. b. Sample conditional on being banked. c. Sample conditional on having a credit card. * $p < 0.05$; † $p < 0.01$.

types of schedule unpredictability is associated with significant increases in one's probability of using auto-title loans, compared with not experiencing any of the observed types of schedule unpredictability, net of income. Thus, we find a positive and independent association between workers' exposure to forms of schedule unpredictability and their likelihood of relying on high-cost debt. This association remained substantively similar and significant even after we controlled for two different proxies of human capital (i.e., exposure to financial literacy and labor market conditions at the time of hire). Notably, these conclusions hinge upon the assumption that we are sufficiently controlling for potential confounders.

Our results suggest that eliminating all observed sources of temporal precarity is associated with greater reductions on the use of pawnshop loans, auto-title loans, and overdrafts compared with increasing household income from the lowest to the highest income group. Notably, although these substantive comparisons suggest that unstable schedules may be similarly or even more detrimental to the use of high-cost financial services compared with household income, experiencing low income levels is more common than experiencing the most unstable types of schedule. Whereas only about eight percent of our sample experienced the most

unstable work schedules (index = 5) and only about 24 percent experienced four or more types of schedule unpredictability, slightly more than 40 percent of our sample reported an annual household income less than \$25,000. Thus, we speculate that policies that address income levels (such as raising the minimum wage) would likely have a less dramatic effect on high-cost lending at the individual level but could also affect a greater number of workers.

We conduct cross-sectional mediation analyses to determine whether the link between schedule unpredictability and problematic debt is mediated by income volatility, as suggested by previous studies (e.g., Morduch and Schneider 2017; Morse 2011). We find, however, that income volatility only explains a substantially small and statistically insignificant portion of the relationship between schedule unpredictability and high-cost debt. Thus, the studied temporal dimension of precarity is not only an important predictor of high-cost debt; it is also independent of two often-studied financial dimensions of insecurity (i.e., income levels and income volatility). These results indirectly suggest that the association between schedule unpredictability and high-interest financial services is either direct or mediated through other non-financial pathways.

Although we do not have the appropriate data to test the role of other potential mediators that may account for the significant remaining association between schedule instability and problematic debt, a review of the existing literature suggests some venues for future research. We speculate that three non-financial pathways could partly explain the direct association between schedule unpredictability and high-cost debt. First, temporal precarity may strain social networks of support, which represent a key adaptive strategy to cope with marginalization and economic constraints (Kornblum 1974; Stack 1975) by offering financial support in times of need (e.g., Morduch and Schneider 2017). For instance, low-wage workers with unpredictable schedules may strain these networks by repeatedly asking family members for last-minute favors such as child care (e.g., Carillo et al. 2017; Henly and Lyons 2000), or they may withdraw from these time-consuming networks to protect their scarce time (Desmond 2012; Liebow 2003) or for fear of not being able to live up to the reciprocal responsibilities (Domínguez and Watkins 2003; Rainwater 1970). Second, temporal precarity may hinder access to mainstream services or public assistance programs that could reduce reliance on high-cost debt (e.g., Allen et al. 2014; Cui 2017) simply because these businesses operate within standard hours (Servon 2018) or require time-intensive work of those who have little control over their schedules (Auyero 2011; Hays 2003; Ozoliņa-Fitzgerald 2016; Redko, Rapp, and Carlson 2006). Third, research in social psychology and behavioral economics suggests that scarcity of resources such as time may decrease one's cognitive bandwidth and ability to make complex decisions (Damingier et al. 2015; Kaplan and Berman 2010; Mani et al. 2013; Mullainathan and Shafir 2013) and result in biased thinking, that is, a focus on present issues at the expense of long-term trade-offs (Shah, Mullainathan, and Shafir 2012), both of which are linked to suboptimal financial decisions such as high-cost debt (Schilbach et al. 2016). Future studies should further investigate these and other non-financial pathways that may link time precarity to financial outcomes.

Finally, given that the structure and costs of high-interest lending can result in financial hardships (Melzer 2011), policymakers and scholars are often interested in uncovering new levers to protect workers against this type of debt. Our study indicates that neither TANF nor corporate hardship funds generally protect service workers against high-interest lending, regardless of the level of schedule unpredictability that they experience. Notably, this result does not necessarily suggest that public and private alternatives to high-cost debt are bound to be ineffective but instead that the alternatives studied here may simply not be viable alternatives—likely because they are limited, conditional, or temporary. For instance, since the mid-1990s, when cash assistance became a smaller portion of the government's efforts to combat poverty, both TANF caseloads and benefits have fallen precipitously (Burke 2004; Danziger 2010). It is possible that the size and overall availability of TANF benefits during the studied period (2017 to 2019) are too small to relieve demand for high-cost debt. In tandem, results presented in Figure 1 suggest that only substantively large increases in income would be associated with decreases in high-cost debt. Furthermore, because applying to TANF can be time-intensive and burdensome, it is possible that any monetary gains are offset by deleterious consequences of further time scarcity.

Hardship funds, on the other hand, may offer access to larger amounts of money, but they require that workers experience a significant unforeseen event, and, although little is known about the operation and effectiveness of such funds, it may be that funds are difficult to access (Aspen Institute 2019). Given that much high-cost debt is acquired to afford basic needs and ongoing expenses (Lee and Kim 2017; Pew Charitable Trusts 2012), it is perhaps unsurprising that the availability of such funds does not mitigate the association between schedule unpredictability and high-cost debt. Overall, these descriptive analyses suggest the importance of addressing the underlying instability and scarcity experienced by service workers rather than providing potential alternatives to high-cost debt through limited cash assistance.

In this respect, we conjecture that legislative efforts to regulate unstable and unpredictable work scheduling practices may be a far more effective route to reducing the use of high-cost debt among service sector workers. Since 2015, ordinances that regulate unstable and unpredictable schedules have been passed and implemented in San Francisco, Seattle, Philadelphia, Oregon, New York City, and Chicago. With some relatively minor differences, these laws require large service sector employers to provide workers with at least two weeks' advance notice of their schedules and mandate predictability pay for last-minute shift cancellation or changes to schedule timing. A large-scale evaluation of the effects of Seattle's Secure Scheduling Ordinance found that two years after implementation, the ordinance significantly increased the share of workers receiving at least two weeks' advance notice of their schedules and reduced last-minute schedule changes without pay (Harknett, Schneider, and Wolfe 2020). Notably, although the evaluation did not examine the use of high-cost credit as an outcome, the ordinance did significantly reduce economic hardship among hourly workers, and in models using the ordinance as an instrumental variable, Harknett et al. (2020) estimate that schedule instability significantly increases material hardships. Although secure scheduling laws are

a relatively recent legislative innovation, these results suggest that efforts to raise the floor on job quality could also help to reduce the use of high-cost credit. These policies become particularly relevant in light of our finding that temporal precarity has a substantively meaningful association with financial outcomes that is independent from income levels and that is not lessened by access to limited, conditional, or temporary forms of cash assistance.

Our study has several limitations. First and foremost, our findings are based on cross-sectional data and cannot establish a causal relationship between work schedules and debt patterns. Our cross-sectional findings may be spurious if there are omitted variables driving the association of interest. Results from supplemental analyses investigating the role of one important omitted variable (human capital, financial literacy) are consistent with the notion that the association between work schedules and costly debt is real. Still, there may be other omitted confounders driving our results. Relatedly, our measure of high-cost debt captures instances of use in the past year, whereas our measures of schedule unpredictability capture experiences in the past month. Thus, the use of high-cost debt may precede the experience of schedule unpredictability. Although we conducted a robustness check restricting the sample to those with at least one year of tenure in their jobs, models using restricted data still assume that experiences of precarity within the same employer are somewhat similar throughout the year. Second, although the Shift Project data provide more detailed measures of schedule unpredictability than available in other sources, these measures do not allow us to differentiate between workers who experience precarious scheduling practices (such as a shift cancellation) one time or several times in the past month. Similarly, measures of high-cost debt are coarse, capturing whether a worker used each form of high-cost debt but not how often these sources of debt were used or how much debt was acquired. In addition, our measure of income volatility does not capture the magnitude of shifts in income from week to week. Although we conducted a robustness check using a more detailed measure of income volatility in a restricted sample, this measure is still subjective, classifying workers as experiencing “a lot” or “a little” volatility. As a third limitation, we found that income volatility is not the main pathway linking schedule unpredictability to high-cost debt, but we cannot test some of the non-financial pathways that are suggested in the literature (i.e., stress, inability to plan, disruption of social networks). Future research should not only investigate whether there is a causal link between temporal precarity and problematic debt but also test the varied pathways through which this link exists. Despite these limitations, our research unveils the importance of schedule unpredictability as a predictor of high-cost debt and has important policy implications for the financial well-being of workers in the service sector and beyond.

Notes

- 1 The regulatory landscape of high-interest lending is continuously evolving. Today, individual states are primarily responsible for the regulation of the high-interest lending industry. Some states (e.g., Pennsylvania, New York), for instance, outright ban payday lenders, whereas others have sought to restrict specific loan products or limit the number

of loans per person (McKernan, Ratcliffe, and Kuehn 2011; Pew Charitable Trusts 2012). High-interest lenders are adept at lobbying to prevent new regulations (Baradaran 2020) and developing new products that circumvent existing laws (Bea 2019). As a result, payday lenders continue to operate storefronts in more than 35 states.

- 2 Previous research suggests that self-reported measures of alternative financial services use or overdrafts suffer from measurement errors due to underreporting (Stango and Zinman 2009, 2014). Although this underreporting is expected to bias our results, the direction of this bias is unclear and depends on the degree and pattern of underreporting, which is unknown.
- 3 Although schedule unpredictability is a key driver of volatility in earned income, earned income is not the only income source for service sector workers. Here, we use a broad measure of household income volatility that captures volatility in income from all sources.
- 4 Hourly wages are bottom-coded at the federal minimum and top-coded at the 99th percentile in the data.
- 5 To construct a measure of workers' financial knowledge, we use workers' age, state of residence, and educational attainment. We assume that respondents still live in the same state in which they graduated from high school, and we calculate the year in which respondents graduated from high school by subtracting 17 from respondents' current age and then subtracting this difference from the year of data collection. The final variable is a binary variable that indicates whether a financial education mandate was in place in the year and state in which service workers graduated from high school.
- 6 Importantly, there is no clear geographic pattern in either the implementation or form of these state mandates, and, at some point in the past, nearly all states have proposed legislation to mandate financial education, which suggests that trends in the states without requirements are a good counterfactual for those whose policies were passed (Stoddard and Urban 2020).

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