Minimum Wages and Consumer Credit: Impacts on Access to Credit and Traditional and High-Cost Borrowing

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Abstract

Proponents of minimum wage legislation point to its potential to raise earnings and reduce poverty, while opponents argue that disemployment effects lead to net welfare losses. But these arguments typically ignore the possibility of effects on other aspects of household finances. This paper examines how state-level minimum wages affect the decisions of lenders and low-income borrowers in consumer credit markets. Using data derived from direct mailings of credit offers, survey-reported usage of high-cost alternative credit products, and debt recorded in credit reports, we find that higher minimum wages broadly improve borrowers' interactions with credit markets. In particular, higher minimum wages: increase the supply of unsecured credit, reduce usage of payday loans, reduce payment delinquency, and increase credit scores. Overall, minimum wages reduce borrowing costs and have positive spillover effects on disposable income and liquidity. On aggregate, a $1 increase in the minimum wages saves borrowers $90 million in fees and interest annually. The results also highlight several other unexplored social benefits of minimum wage policy, including as a policy lever to reduce payday borrowing and as a bolster to financial stability by reducing credit card default.

Keywords: consumer debt, credit limit, delinquency, payday loans, credit constraints

JEL codes: D12, D14, J38

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1. Introduction

Minimum wage policies have long been the subject of intense debate: proponents point to their potential to raise earnings, while opponents argue that disemployment effects lead to net welfare losses.[2] But both of these arguments focus on labor market outcomes, which, although clearly important, are just one piece of a household's finances. Interactions with consumer credit markets also play a crucial role in many families' economic wellbeing: borrowing helps families smooth across income or expenditure shocks, access to credit enables wealth- or productivity-enhancing investments, and the size of debt service payments affects disposable income, consumption and saving.

Does minimum wage policy affect lender and borrower interactions in consumer credit markets? And if so, does this weaken or amplify the policy's effect on economic well-being? This paper seeks to answer these questions empirically by examining lender and borrower behavior in traditional unsecured credit markets (for example, credit cards), as well was markets for high-cost alternative credit products (for example, payday loans). Our empirical strategy exploits state-month variation in minimum wage policy, combined with data on direct mailings of credit offers, survey data on high-cost credit usage, and panel data derived from credit reports. Identification is based on a comparison of the effects of higher minimum wages on lower income or skill households —those who are most likely to be affected by the policy— with other types of households.

Our analysis yields several novel empirical findings. First, higher minimum wages increase the number of credit card offers sent by lenders to low-income households, and increase

[2] Card and Krueger (1995), Neumark and Wascher (2008), and Belman and Wolfson (2014) provide excellent reviews of the literature on the benefits and costs of the minimum wage.

the favorability of their terms to households. Second, higher minimum wages reduce usage of payday loans and other high-cost alternatives to formal credit. Third, higher minimum wages increase credit card limits, reduce delinquencies and improve credit scores among low-skilled borrowers; and these patterns persist one year out among those who obtained access to additional credit. We find no corresponding effects of the minimum wage on any of these outcomes among higher income or higher skill borrowers, and our results are robust to numerous sensitivity checks on the sample construction and empirical specification.

A complete accounting of our results reveals that minimum wages reduce borrowing costs for low income borrowers—increasing borrowers' disposable income above and beyond the policy-mandated wage increase. Borrowing costs fall because our estimates indicate that higher minimum wages reduce payment delinquency and payday borrowing, which are both are associated with high fees and interest rates. A back of the envelope estimate suggests the reduction in borrowing costs are substantial: a $1 increase in the minimum wage saves low-income borrowers up to $90 million in fees and interest annually. Because of these reduced borrowing costs, the average effect of higher minimum wages on disposable income (that is, income net of debt service payments) is 0.8-1.1 percent larger than the direct earnings effect. To our knowledge, this amplification of the income effect of minimum wages via its impact on borrowing costs has not been previously explored.

Our results highlight an additional liquidity-enhancing effect of minimum wages, operating through increased credit supply to low income borrowers. We find that lenders send low-income borrowers more credit card offers, at terms more favorable to the borrower, when minimum wages are higher. And we observe increases in borrowers' credit limits following a minimum wage hike. This increase is credit supply represents an economically meaningful

increase in liquidity which could be used to weather future expenditure shocks. For example, we find that the average borrower's credit limit increases by $466, which is larger than the typical payday loan and also exceeds what a large share of U.S. families have available in savings to pay for emergencies (PEW, 2016; Larrimore et al., 2018).

Theoretically, these increases in credit card liquidity could harm borrowers' overall financial well-being if those families accumulate debt burdens they cannot afford, perhaps due to present-bias or low financial literacy. But our results indicate that payment delinquency falls—not rises—following a minimum wage hike. This suggest borrowers save some of their higher wages by paying down debts. Furthermore, we find that borrowers who had access to new credit as a result of the policy change also remain significantly less likely to be delinquent one year later. Together, this suggests borrowers are better able to manage their new and existing debt, and are not over-borrowing.

Our results also suggest that higher minimum wages could have persistent, positive effects on a household's financial well-being. After all, credit scores and payment histories are key components used in underwriting credit applications and we find credit records improve on both of these dimensions under higher minimum wages. These changes in credit records should boost approval rates on subsequent credit applications, increasing households' future access to affordable credit. This credit could be used to weather future shocks, or to finance lumpy investments (such as a home, vehicle, or education) that can promote wealth accumulation and labor market advancement.[3] And credit reports are used to screen rental and job applications,

[3] See, for example, Baum (2009) on the importance of vehicle ownership for employment opportunities; and Herbert, McCue and Sanchez-Moyano (2013) on home ownership and wealth accumulation.

which can directly affect housing affordability and employment.[4] Indeed, a growing literature suggests expanded access to credit can improve labor market outcomes (Carrell and Zinman, 2014; Karlan and Zinman, 2010), suggesting the possibility of a positive feedback loop.

Our results highlight two additional social benefits of minimum wages that have not been previously documented. First, we find that higher minimum wages are an effective tool to reduce low income borrowers' use of payday loans. Payday lending is a central policy concern because of the high costs to borrowers, and a perception that payday lenders exploit financially distressed families. As a result, many states have adopted policies to limit the availability of these loans. But the empirical literature suggests that these policies have had limited success at reducing borrowing costs for families (Bhutta, Goldin, and Homonoff, 2016; Zinman, 2010). And there is little consensus on whether banning these loans will improve welfare, since families may not have access to alternative sources of credit for meeting their liquidity needs (Melzer, 2011; Dobridge, 2018). We show minimum wages not only reduce payday borrowing and borrowing costs, but also increase access to cheaper, traditional forms of unsecured credit.

Second, we find higher minimum wages are associated with reductions in payment delinquency. Delinquency can be costly for both borrowers and lenders. For borrowers, delinquency imposes significant costs through interest and fees, and increases credit risk. Furthermore, most borrowers in delinquency remain there, which can lead to wage garnishment. And if borrowers declare bankruptcy, they also face expensive filing and legal fees.[5] For lenders, loans remaining in delinquency must eventually be charged off, resulting in losses to the lender.[6]

[4] There is a tangential literature on the impact of statewide bans on credit checks for employment screening on labor market outcomes, which has found mixed results (see, for example, Bartik and Nelson, 2016; Dobbie, Goldsmith-Pinkham, Mahoney and Song, 2017).

[5] See, for example, White (2007) on credit card delinquency and bankruptcy. In our data, 90 percent of borrowers who are in delinquency are still in delinquency two quarters later.

[6] See, for example, Sanchez (2015) for a review of credit card delinquency and losses. Federal banking regulations require lenders to "charge-off" or declare the debt as a loss after an account is delinquent for a period of time,

A back of the envelope estimate based on our results suggests a $1 increase in the minimum wage could reduce bank losses by $308 million annually by averting delinquencies and associated charge-offs. This spillover effect of social policy on default is similar to Hsu, Matsa, and Melzer (2018), who find that more generous unemployment insurance averts mortgage delinquency and foreclosures; and Dobbie and Song (2015), who find that consumer bankruptcy protection reduces foreclosure rates. Our paper focuses on a policy that targets lower income families —rather than unemployed homeowners or families in bankruptcy— but we too find that social policy can bolster financial stability.

The vast majority of the public debate and empirical literature on minimum wage policy concerns the size of disemployment effects. A caveat to our analysis is that we do not observe employment outcomes in most of our data. Thus, we cannot speak directly to whether disemployment effects exist, or whether families who lose their jobs might experience negative credit market outcomes. Still, we might expect families who lose their jobs to enter delinquency. Thus, one interpretation of the decline in delinquency we observe is that it is not consistent with widespread disemployment effects. Also, our analysis ignores teenagers (because they do not typically interact with credit markets), for whom there is stronger evidence of disemployment effects from minimum wages. Still, the evidence we present here suggests that cost-benefit considerations for minimum wage policy should consider spillover effects on adult families' income and liquidity stemming from lender and borrower behavior in credit markets.

The rest of the paper is organized as follows. Section 2 describes our conceptual framework for understanding how minimum wages affect how low-income households interact with credit

usually 120 or 180 days. Lenders typically recover very little of those losses. For example, the average proceeds from sales to third-party collection agencies on charged-off credit card debt is four cents on the dollar. Most borrowers in our data who are delinquent 60 days will remain delinquent past the mandated 120 or 180 days for charge-off.

markets, along with the relevant literature. Section 3 presents our empirical analysis, including a description of minimum wages in the US, the three datasets we use, empirical strategies, and results. We begin with an analysis of credit card offers, then proceed to usage of alternative financial service credit products like payday loans in survey data, and finally examine credit limits, delinquency, and credit scores using credit report data. In Section 4, we take stock of our results and disentangle the relevant mechanisms, and in section 5 we discuss their policy implications.

2. Conceptual Framework and Related Literature

There is a vast empirical literature in economics devoted to understanding the effects of minimum wage policy on labor market outcomes of affected workers.[7] The general consensus emerging from this literature is there are positive earnings effects for a substantial majority of adult minimum wage workers following a minimum wage increase. One way we expect minimum wages to affect households' interactions with credit markets is via their effects on household income.

The first empirical paper to establish a link between minimum wage policy and borrowing behavior was Aaronson, Agarwal and French (2012). Their paper documents the income and consumption response to minimum wage hikes, and finds that although both rise following a minimum wage increase, the consumption response is nearly three times larger than the income response. This excess consumption is financed by increases in collateralized debt, mainly via a small number of families making debt-financed vehicle purchases. Their paper finds that these patterns best fit a model in which higher minimum wages ease collateral constraints, so that increases in income permit families to accumulate small down payments which can be used

[7] The important contributions to this literature are too numerous to adequately review here. Excellent literature reviews include Card and Krueger (1995), Neumark and Wascher (2008), and Belman and Wolfson (2014).

for large durables (vehicle) purchases. [8] Our analyses complement their analyses by showing that in addition to an outsized durables consumption response achieved by borrowing, minimum wages also have spillover effects via credit markets on default, disposable income, credit access, borrowing outside of traditional credit markets.

In addition to easing collateral constraints, minimum wages might also affect borrowing following a minimum wage hike by expanding the supply of unsecured credit to low-income borrowers. All things equal, lenders are generally willing to extend more credit, and at cheaper terms, to households with higher ability to pay. And if low income borrowers use their increased earnings to improve their credit records (perhaps by paying down existing debts) this could further increase the supply of credit available to those borrowers. Lenders may also respond to the policy itself – assuming that ability to pay will increase for a segment of the population in a particular state – rather than observed changes in individual income.[9]

If minimum wage workers were otherwise borrowing constrained, an increase in credit supply can lead to more borrowing. Indeed, borrowing constraints are a salient feature of minimum wage workers' financial lives; and data from the 2001-2013 waves of the Survey of Consumer Finances (SCF) indicate nearly 40 percent of households with adult minimum wage workers are credit constrained (appendix table 1). Some families may not need credit because

[8] Aaronson et al (2012) use panel data derived from credit reports for a sample of credit card borrowers to examine auto, home equity, mortgage and credit card borrowing, as well as total borrowing. Our samples differ on a number of dimensions: first, their sample consists of credit card borrowers from a single institution, while ours is a random sample of adults with a credit report; second, their data has information on self-reported incomes which can be used to identify minimum wage workers, while our does not and we must use the educational composition of a neighborhood to identify low-skill workers; third, their credit card borrowing consists of cards from a single institution, while ours includes all cards from any institution. We also look at a different set of credit card outcomes, including total credit limits and delinquency, rather than borrowing. For comparison, appendix table 3 provides results for collateralized borrowing using our data and estimation strategy. Despite the differences in the sample composition, our data also suggest an increase in auto borrowing within one year (although the results are not precisely estimated).

[9] We will discuss the plausibility of each of these mechanisms in more detail when we take stock of the full results in section 4.

they have other sources of liquidity, such as savings or family and friends they could turn to in an emergency, but the SCF data indicate this unlikely to be the case for minimum wage workers: the median minimum wage household holds less than two thousand dollars in liquid assets (a tenth of the amount held by the median U.S. household) and only about half of these families report being able to obtain $3,000 from friends and family.

Households who are unable to borrow in traditional credit markets can often still borrow through higher-cost alternative financial service (AFS) credit products, including unsecured debt such as payday loans, and secured debt such as pawn shop loans, auto title loans and "rent-to-own" furniture agreements.[10] Payday loans and other AFS credit products are offered with minimal underwriting (typically only proof of income or employment is required) and are characterized by very high effective interest rates. If low-income households use these products because they face borrowing constraints in traditional credit markets, an increase in the supply of traditional credit could lead to substitution away from high-cost alternatives to formal credit. Indeed, Bhutta, Skiba and Tobacman (2015) find that payday borrowers often shop (unsuccessfully) for traditional credit just before taking out a payday loan.

In addition to possibly facing barriers to borrowing in traditional markets, behavioral biases might be another possible reason some low-income borrowers might utilize AFS borrowing.[11] If borrowers are sufficiently present-biased, or have forecasting problems (e.g., Laibson, 1997; Skiba and Tobacman, 2008; Heidhues and Koszegi, 2010), the relaxation of credit constraints could lead to over-borrowing and a rise in delinquency as borrowers face difficulties servicing their new debt obligations.

[10] Some states ban payday lending in the period we study. However, Bhutta et al (2016) find these policies lead borrowers to use alternative AFS credit products, rather than discontinuing borrowing or using traditional credit.

[11] For more on the cognitive biases, financial literacy and AFS borrowing, see, for example, Bertrand and Morse (2011), Lusardi and de Bassa Scheresberg, (2013), or Burke, et al. (2016).

For low-income workers who do not need additional credit, increases in the minimum wage might reduce borrowing and delinquency among borrowers with existing traditional or AFS debt, if borrowers are in need of less debt-financed liquidity and/or choose to save new income via debt pay-down. Hsu, Matsa and Melzer (2014) find that unemployed borrowers use unemployment insurance income to avert mortgage default. Similarly, Agarwal, Liu, and Souleles (2007) and Sahm, Shapiro, and Slemrod (2010) find evidence that borrowers use tax rebates to pay down debts.

Throughout this discussion we have suggested that minimum wages only positively affect income for adults. While useful for simplifying the exposition, our empirical analysis will be reduced form in nature and agnostic about the size and direction of the effects of minimum wages on income. If there are disemployment effects for adults, then income may fall for some workers, and our predictions for the impacts on credit markets would generally work in the reverse for those workers. [12] We would expect these effects to be most evident on measures of financial distress which are relatively uncommon and typically associated with job loss, such as payment delinquency. Ultimately, the overall reduced form impact of minimum wages on credit markets is an empirical question that we seek to answer.

3. Empirical Analyses

3.1 Minimum Wages

Minimum wage legislation in the United States has a long history, dating back to the early 1900s. While originally adopted by states, the first federal minimum wage was enacted in

[12] Many studies have estimated negative employment effects of the minimum wage, though many have focused on teen workers, who typically do not interact with credit markets and would not be part of our analyses. See, for example, Neumark and Wascher (2008) for a review.

1938 with the Fair Labor Standards Act (FLSA). Since then, the federal minimum wage has grown periodically (though not always at pace with inflation), and various states have adopted minimum wages above the federal level. In this paper, we use monthly state-level minimum wage data from Neumark, Salas and Wascher (2014), which we update through 2015 using Economic Policy Institute's Minimum Wage Tracker.[13] Table 1 highlights the various state-level changes in the minimum wage during the time period we study in this paper, 1999-2015. There is considerable cross-sectional variation in the minimum wage across states and over time during this period, ranging from $5.15 to $10.50. The most recent change in the federal minimum wage became effective July 2009, increasing from $6.55 to $7.25.

3.2 Credit Offers

3.2.1 Data and Empirical Specification

For our first set of analyses, we use information on traditional credit offers obtained from direct mail advertising data from 1999 to 2015 compiled by Mintel Comperemedia (henceforth, Mintel). Mintel collects data from a sample of about 1,000 households each month, surveying household demographic and income characteristics, in addition to compiling information from all mail-based credit and sales advertising, including credit card, mortgage, auto, and unsecured loan offers received by the household during the month.[14] The data also include the terms of credit for credit card offers, including interest rates, credit limits and whether a credit card has rewards and an annual fee.

[13] The Minimum Wage Tracker can be accessed online at http://www.epi.org/minimum-wage-tracker/.

[14] We limit the sample to households where the head is aged 18-64 in this and all subsequent analysis in order to exclude retirees and teenagers. We exclude teenagers (despite their prominence in the minimum wage literature) because they typically do not have credit reports and therefore would typically not receive credit offers (nor would they be included in the credit report data we use in subsequent analyses).

Our main analyses will focus on credit card offers, since they represent the vast majority of credit offer mailings and are the main source of unsecured credit in traditional credit markets.[15] We will examine various features of credit card offers, including credit limits, interest rates, annual fees, and whether or not the offers are pre-approved (rather than invitations to apply or pre-selected offers). These outcomes are designed to capture the amount of credit supplied (for example, the number of offers, credit limits and pre-approval) and the cost of borrowing (for example, interest rates and fees).

Importantly, the Mintel data include information on household income, household size, and the state of residence, which allows us to identify the subset of households which are likely to have a minimum wage worker. We identify these households, which we call "minimum wage households," as those whose household income is between 60 and 120 percent of the state minimum wage for a single-person household, or 120 and 240 percent of the state minimum wage for a multiple-person household. This is similar to Aaronson, et al. (2012). The top right panel of Table 2 summarizes the outcome variables and general socioeconomic characteristics of minimum wage households in the Mintel data.[16]

We estimate ordinary least squares regressions of the following form:

$$y_{ist} = \beta_1 minwage_{s,t-3} * minwagehousehold_{it} + \beta_2 minwage_{s,t-3} + \beta_3 minwagehousehold_{it} + X_{it} + unemp\ rate_{st} + \gamma_s + \gamma_m + \varepsilon_{it} \quad (1)$$

[15] In appendix table 3 we also investigate secured credit offers (mortgage, auto and home equity loans) and other unsecured personal loans. Analyses of some common secured offers (particularly, mortgage refinance and home equity loan offers) are complicated by differences in asset ownership across groups. There is also a small secured credit card market. We do not have information on whether or not cards require any collateral, but Santucci (2016) finds this market represent less than one percent of the total credit card market, and most secured cards have a fee and no rewards, an outcome we will examine in table 3.

[16] The top right panel of appendix table 2 summarizes the Mintel data for all households.

Where y_{ist} is the credit offer outcome of interest for household *i* in state *s* in month *t.* $minwage_{s,t-3}$ is the minimum wage in state *s* in month *t-3* (one quarter prior). We use a three month lag to be consistent to be consistent with the timing in the credit report data used in section 3.4, which is available quarterly.[17] $minwagehousehold_{it}$ is the indicator for whether or not the household is identified to have a minimum wage worker. X_{it} is a vector of demographic characteristics of the household (education, race/ethnicity, and age group), γ_s is a vector of state fixed effects, γ_m is a vector of month fixed effects. Standard errors are adjusted for clustering at the state level.

In these regressions, the coefficient of interest is β_1 captures the conditional effect the state-level minimum wage on credit card offers to minimum wage households. β_1 describes how a higher minimum wage affects the credit offers received by households who are most likely to be affected by changes in policy because of their incomes. β_2 captures the conditional main effect of state-level minimum wages on credit card offers. We interpret this as the effect of higher minimum wages on households who should not be affected by the policy because of their incomes.[18] In this setting, these households act as a control group, so this coefficient will capture any changes in credit availability that may be correlated with minimum wage policy, such as changes in the general economic environment. The level term $minwagehousehold_{it}$ captures the correlation between minimum wage household status and credit offers. We include the main effect of minimum wage status to facilitate a causal interpretation of β_1, but do not assign a causal interpretation to the coefficient on the main effect since the level correlation between

[17] Appendix table 4 displays alternative specifications using a one month or twelve month lag of the state minimum wage. Note that this data only covers the continental U.S., so Alaska and Hawaii are not in the data.

[18] The vast majority of this group is households with higher incomes than those in the minimum wage household group. Henceforth we will refer to these as "higher income households", though a small fraction (under 10 percent) of this group have lower incomes than minimum wage workers (below 60 or 120 percent of the minimum wage, depending on the household size).

credit offers and borrower type could be determined by a host of different factors; for example, average credit scores or home ownership rates.

We also control for time-varying state-level economic conditions that might affect credit offers. In particular, our analysis also includes the state-month unemployment rate ($unemp\ rate_{st}$), drawn from the Bureau of Labor Statistics (BLS) local area unemployment statistics. And our analyses also importantly include state and month fixed effects (γ_s and γ_m). This ensures that the estimated relationship between minimum wages and credit offers is not confounded by time-invariant differences in credit offers to states with higher or lower minimum wages, or national trends in minimum wage levels and credit availability.

3.2.2 Results for Credit Offers

Table 3 presents the results of estimating equation (1) on the outcomes of interest. Column (1) of table 3 presents the result for the number of credit card offers received in the month of the survey. This specification yields a point estimate on the interaction term between minimum wage worker status and the minimum wage (β_1) of 0.1874 (with a standard error of 0.0365). This indicates that minimum wage workers receive more credit card offers when minimum wages are higher. At the mean, these estimates imply that a $1 increase in the minimum wage would increase the number of credit card offers received by a low income household by 4.6 percent.

In contrast, we see that the conditional main effect of the minimum wage is small and imprecisely estimated, indicating that higher minimum wages have no effect on the number of offers received by higher-income households. The coefficient on $minwagehousehold_{it}$ indicate that, on average, low-income households receive fewer 2.628 (0.22) fewer credit card offers per month than higher-income households. This is consistent with minimum wage

households having relatively less credit available to them. Still, the results in table 3 indicate that typical changes in the minimum wage narrow, but do not erase, the offer gap between higher and lower income households. For example, under a $1 higher minimum wage, minimum wage households would still receive 2.44 fewer offers per month than higher income households. Extrapolating, our results imply that the minimum wage would need to increase fourteen-fold for minimum wage households to receive as many credit card offers as higher income households.

The rest of table 3 narrows in on the terms included in credit card offers received. The sample sizes vary across columns based on whether a household received any offers which included each feature since not all offer mailings include identical features (for example, a credit limit, annual fee, or an approval status). All of the outcomes are calculated only for the subsample of offers for which the feature is non-missing.[19] Column (2) examines the dollar amount of credit offered—captured by the mean credit limit—and indicates that higher minimum wages are associated with more credit being offered: under a $1 higher minimum wage, credit limits increase by $1,086 ($303), or 2.8 percent at the mean. Column (3) examines the fraction of offers that are pre-approved. This is a measure of the strength of the offer, since offers which are not pre-approved can be rescinded upon application. Column (3) of table 3 indicates higher minimum wages are also associated with more pre-approved offers – under a $1 higher minimum wage, the fraction of offers that are pre-approved increases by 1.42 percentage points (0.26 percentage points), or 3.8 percent at the mean. The conditional main effect of the minimum wage in columns (2) and (3) indicates there is no corresponding effect for higher income workers. And

[19] In Appendix Table 5, we estimate the effect of higher minimum wages on selection into receiving offers with each of the characteristics considered in this analysis. For minimum wage households, a higher minimum wage is associated with greater likelihood of receiving offers mentioning a credit limit, but has no measurable effect on the fraction of offers that are pre-approved, interest rates, fraction of offers without an annual fee, and the fraction of offers with a fee and no rewards.

the level terms indicate that minimum wage households, on average, are offered lower credit limits and fewer pre-approved offers. Again, we find that a typical minimum wage increase narrows but does not erase the offer gap between higher and lower income households. Extrapolating, our results imply the minimum wage would need to increase twelve-fold in order for minimum wage households to receive as high of credit limits as higher income households, or almost five-fold for minimum wage households to receive as many pre-approved offers as higher income households.

The last three columns of table 3 narrow in on the cost of borrowing, as captured by the mean purchase interest rate (measured as an annual percentage rate, or APR), the fraction of offers for cards with annual fees, and the fraction of offers for cards with fees and no rewards (since rewards cards can have perks, such as airline frequent flyer miles, which offset the annual fee).[20] Column (4) displays the results for the purchase APR, and column (5-6) displays the results for fees. In each case, borrowing costs are lower for minimum wage households when the minimum wage is higher. For example, a $1 higher minimum wage is associated with a 5 percentage point reduction (3.2 percentage points) in the offered purchase interest rate. Although this result is only statistically significant at the 13 percent level, it represents about 5 percent of the gap in interest rates faced by minimum wage households and higher income households. A $1 higher minimum wage is also associated with a statistically significant 4.03 percentage point (0.29 percentage point) increase in the fraction of offers with no annual fee (or 5.2 percent at the mean of the dependent variable), and a 2.0 percentage point (0.28 percentage point) reduction in the number of offers with a fee and no rewards (or 19 percent at the mean). The level term

[20] The purchase interest rate is the regular purchase interest rate. The data also include information on other rates which may be offered that we do not use in our analysis, including any introductory or promotional teaser rates (for a specific period of time before the regular rate applies), balance transfer rates, cash advance rates, and default rate (the rate the borrower pays upon missing a payment).

indicates that on average, minimum wage households tend to face higher interest rates and receive more offers with fees (and no corresponding rewards). As before, the minimum wage would need to increase substantially for the borrowing costs offered to high and low income borrowers to converge. And as in previous specifications, there is no effect of a change in minimum wages on higher income households.

Our preferred interpretation of these analyses is that they represent unsolicited credit offers, and as such, provide a unique opportunity for studying the availability of credit over time for the populations of interest. The evidence we find suggests minimum wage borrowers have more credit available to them when minimum wages are higher, and the credit that is available is less costly.

3.3 Alternative Financial Service (AFS) Credit Products

3.3.1 Data and Empirical Specification

Data on borrowing via AFS credit products come from the Current Population Survey Unbanked and Underbanked Households Supplement (henceforth, CPS), which has been conducted biennially since 2009 by the Federal Deposit Insurance Corporation in partnership with the U.S. Census Bureau.[21] The data include demographic and economic characteristics of households found in the CPS monthly survey, as well as information on usage of AFS credit products, including payday loans, rent-to-own stores, pawn shops, and since 2013, auto title loans.[22] Each of these products are high-interest loans that do not require a credit check with one

[21] Information on the supplements can be found at https://www.fdic.gov/householdsurvey/

[22] Usage of AFS products in the CPS are based on self-reported usage in the past year, which could be subject to non-classical measurement error if families do not want to report that they use AFS products (see, for example, Karlan and Zinman (2010), who find evidence of underreporting of high-interest loans in South Africa). This would only be a threat to identification if underreporting were systematically correlated with the minimum wage in the borrower's state.

of the main credit bureaus.[23] Usually, only a proof employment and a checking account are required. Payday loans are unsecured small-dollar short-term consumer loans, which usually carry an APR of about 400 percent. Pawn shop loans are also small-dollar short-term loans, but they are secured by personal property (e.g., electronics, jewelry, etc.). The effective APR on pawn shop loans is usually about 250 percent and if a borrower does not pay back the loan, the pawn shop keeps the collateral. Rent-to-own loans are loans for durable goods (e.g. furniture, electronics, etc.) that are secured by the good in question, which can be repossessed. The cost of purchasing the goods is typically much higher than if purchased directly, and the implied APRs vary from about 57 percent to 250 percent. Auto title loans are loans secured by a clean auto title, wherein default on the loan results in repossession of the vehicle.[24]

We create indicators for household usage of each product in the past year and merge in state-level minimum wage information for 12 months prior to the survey date.[25] We define a household as a minimum wage household by summing up total hours worked in a year for a family and dividing family income by total hours worked, where again, we use 60 to 120 percent of the state minimum wage as the cutoff.[26] We will again refer to these households as "minimum wage households." The top right panel of table 2 summarizes the data for minimum wage households: 3.3 percent took out a payday loan, 4.1 percent pawned items at a pawn shop, 2.7

[23] Bhutta, et al. (2016) provide detailed descriptions of each of the AFS products in the CPS data. All of the statistics in this paragraph were compiled from their summaries.

[24] The data do not include information on bank overdraft credit, which is an additional source of expensive, small-dollar credit. See, for example, https://www.consumerfinance.gov/about-us/blog/know-you-owe-we-are-designing-new-overdraft-disclosure-forms/

[25] The question wording changed between 2009 and 2011. We follow Bhutta, et al. (2016) to harmonize the data across survey waves.

[26] Since the CPS data collects information on households, which sometimes contain multiple families, we use only the primary family in this calculation to match the income measure.

percent rented items from a rent-to-own store, and 1.4 percent took out an auto title loan. We estimate ordinary least squares regressions of the following form:

$$y_{ist} = \beta_1 minwage_{s,t-12} * minwagehousehold_{it} + \beta_2 minwage_{s,t-12} + \beta_3 minwagehousehold_{it} + X_{it} + unemp\ rate_{st-12} + \gamma_s + \gamma_y + \varepsilon_{it} \quad (2)$$

Where y_{ist} is an indicator for use of an AFS product for household *i* in state *s* in the 12 months prior to the month of the survey (*t*). $minwage_{s,t-12}$ is the minimum wage in state *s* in month *t-12* (one year prior). We use a 12-month lag because AFS borrowing is collected annually (borrowing within the past year). $minwagehousehold_{it}$ is the indicator for whether or not the household is identified to have a minimum wage worker. X_{it} is a vector of demographic characteristics of the household (education, race/ethnicity, and age group). γ_s and γ_y are vectors of state and year fixed effects. Standard errors are adjusted for clustering at the state level.

The coefficient of interest β_1 captures the conditional effect of state-level minimum wages on usage of AFS credit products by minimum wage households. β_2 captures the conditional main effect of state-level minimum wages on usage of AFS credit products. We interpret this as the effect of higher minimum wages on workers who should not be affected by minimum wage policy. The level term $minwagehousehold_{it}$ captures the correlation between minimum wage household status and use of AFS credit products. As before, we include the main effect of minimum wage household to facilitate a causal interpretation of β_1, but do not assign a causal interpretation to the coefficient on the main effect since the level correlation between use of AFS credit products and borrower type could be determined by many different factors.

3.3.2 Results for Alternative Financial Service Credit Products

Columns (1)-(4) of Table 4 displays the results for: taking out a payday loans, pawning items at a pawn shop, renting items from a rent-to-own store, and taking out an auto title loan, respectively. For each outcome, the coefficient on the interaction term (β_1) indicates that higher minimum wages reduce usage of AFS products among minimum wage households. For payday loans and rent-to-own stores, these effects are precisely estimated and indicate a statistically significant decrease in usage of those AFS credit products. The coefficients indicate that a $1 increase in the minimum wage would reduce borrowing by 0.49-0.55 percentage points (0.17-0.38). At the mean of the dependent variable, these represent a reduction in usage of AFS credit products by minimum wage households of 24-36 percent.

In contrast, there is a small and statistically insignificant coefficient on the level term, $minwage_{s,t-12}$ for all four outcomes. This indicates there is no effect of higher minimum wages on usage of AFS credit products for higher income households. The level term, *MinimumWageHousehold* is positive for all of the outcomes (and statistically significant for payday and rent-to-own), indicating that, on average, minimum wage households are more likely than other types of households to use AFS products. While the interaction term shows that higher minimum wages would reduce AFS usage for low-income workers, our results suggest that even rather large increases in the minimum wage would not be large enough to eliminate the usage gap between income groups. For example, minimum wage households are 4.1 percentage points more likely to use a payday loan than higher income households, and a $1 higher minimum wage narrows that gap by only about half a percentage point. Extrapolating from our results, the minimum wage would need to be nearly 10 times higher in order to reduce payday loan usage rates among minimum wage households to the usage rates of higher income households.

3.4 Credit Limits, Payment Behavior, and Credit Scores

3.4.1 Data and Empirical Specification

Data on credit limits, payment behavior and credit scores come from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (henceforth, CCP/Equifax).[27] The CCP/Equifax is an individual-level panel dataset of consumer credit reports, obtained from one of the three main credit bureaus in the United States. The data have been collected four times per year (March, June, September and December) since 1999 and consist of a five percent random sample of all U.S. consumers with credit histories. The data include detailed information drawn from credit reports, such as loan balances, credit limits, payment status, and the Equifax risk score (a type of credit score).[28]

Our main outcomes of interest are measures of borrower-level credit availability, payment behavior, and overall credit risk.[29] To analyze credit availability, we examine total credit limits across all consumer credit cards.[30] We also separately examine limits for individuals who acquired new card(s) in the past quarter and those without new cards. We make this distinction to examine whether individuals are able to qualify for more credit on their existing cards, or if they take out new higher limit cards (perhaps in response to credit card offer

[27] Additional information about the dataset, including sampling and methodology, can be found in Lee and van der Klaauw (2010) at https://www.newyorkfed.org/research/staff_reports/sr479.html.

[28] By design, this dataset only includes individuals who have credit reports, and similar as in the other analyses, we limit the sample to 18-64 year olds. We also eliminate individuals with thin credit records, defined as being in the sample fewer than 4 quarters. We perform all analyses on a 30% random sample of the dataset, which represents a 1.5% sample of all individuals with credit reports.

[29] We do not examine credit card borrowing or spending directly as in Aaronson et al (2012) because our data do not have a precise measure of total monthly spending or borrowing on credit cards. All that is available in our data is the credit card balance, recorded at an arbitrary point in the billing cycle. This balance measure does not distinguish between spending and revolving debt. In practice, this means balances can change from month to month due debt paydown/accumulation, increases or decreases in spending, or changes in the timing of spending from month to month, all of which are indistinguishable from one another to the econometrician.

[30] We winsorize credit card limits at 99% to account for extreme outliers in the data. Winsorizing these values at 95% and 97% yields qualitatively similar results. Individuals without credit cards are coded as having a credit limit of zero.

mailings). We examine payment behavior using an indicator for credit card delinquency, defined as being 60 days or more past due on payments and zero otherwise.[31] To analyze overall credit risk, we use borrowers' credit scores (more precisely, the Equifax risk score). Credit scores are a composite measure of credit risk used by lenders in underwriting. Scores are proprietary and can vary by lender, but are typically determined by payment behavior, credit utilization and length of credit history.

Because this dataset is a panel, we estimate individual fixed effects models of the following form:

$$y_{ist} = \beta minwage_{s,t-k} + age_{it} + unemp\,rate_{st} + X_{ct} + \gamma_s + \gamma_m + \gamma_i + \varepsilon_{it} \qquad (3)$$

Where y_{ist} is the credit outcome of interest for individual *i* in state *s* in month *t.* $minwage_{s,t-k}$ is the minimum wage in state *s* in month *t-k*, where *k=3* (one quarter prior) or *k=12* (one year prior). We use a three month lag because the data are at a quarterly frequency, and additionally examine a 12 month lag in order to investigate longer run effects on payment behavior and credit scores. age_{it} is vector of dummies for the age group of person *i*, X_{ct} is a vector of Census-block/block-group characteristics (education, race/ethnicity, sex and median income), γ_s is a vector of state fixed effects, γ_m is a vector of month fixed effects, and γ_i is a vector of person fixed effects. We include person fixed effects so that we can interpret β as the effect of within-person changes in the minimum wage on within-person changes in our outcomes, net of any fixed characteristics of the borrower (such as their level of education or

[31] 60+ day delinquency is equivalent to three or more cycles of missed payments and is a standard measure of credit card delinquency (see, for example, CFPB, 2015). It is also highly predictive of eventual default: we find 90 percent of borrowers who are in delinquency remain there 180 days later (credit card companies typically need to charge-off the debt after an account is delinquent for 180 days). Note that individuals without credit cards are coded as not in delinquency, but estimation on the subsample of credit card borrowers only yields similar results.

race/ethnicity, which are not observed in the data). Standard errors are adjusted for clustering at the state level.

The CCP/Equifax has very rich debt information, but limited demographic characteristics; only the individual's age and location of residence are available.[32] To overcome this limitation, we proxy for the demographic characteristics of the sample member by merging to the data the demographic and economic characteristics of the individual's census block (or block-group) of residence (X_{ct}), tabulated from the 2000 Census. We use variables on the race, ethnicity, sex, median income (by age group) and educational attainment of the census block/block-group's inhabitants as control variables in our analyses.[33]

Because the CCP/Equifax does not have borrower income, we cannot directly observe whether an individual's income is consistent with working in a minimum wage job as we can in the Mintel and CPS data used in the previous analyses. Instead, we focus our analyses on borrowers who live in a census-block group with a relatively high fraction of low-skill workers, defined as more than 50 percent of adults over 25 on the census block-group having less than a high school education.[34] We interpret this as indicative that the borrower himself is, with high probability, a low-skill worker. More generally, this measure suggest he lives in a neighborhood where the cost-of-living is feasible for a low-skill (and typically lower income) borrower. Because this prediction will necessarily be imperfect, these analyses are akin to an "intent to

[32] Federal law prohibits lenders from discriminating applications on the basis of race, ethnicity, marital status, national origin, religion, or receipt of public assistance, and these demographic characteristics are not included in the data. Geography is included in the data although discrimination on the basis of geography alone is prohibited.

[33] Race/ethnicity and sex are available at the census block level, while the rest of the variables are available at the block-group level. Because we employ individual fixed effects and these controls are time-invariant, they will be differenced out for most borrowers. However, they are instructive for understanding the sample composition.

[34] Appendix figure 1 plots the regional representation of these types of Census Blocks, indicating they are diverse and represent all parts of the country.

treat" analysis, and the results are likely a lower bound on the causal effect for minimum-wage workers. The bottom panel of table 2 describes the CCP/Equifax data for these borrowers.

3.4.2 Results for Credit Availability, Payment Behavior and Credit Scores

Table 5 presents results for the CCP/Equifax data. Columns (1)-(3) examine the effect of the minimum wage on credit availability three months later, as measured by total credit card credit limits. Column (1) indicates that a $1 increase in the minimum wage increases total credit limits on credit cards held by low-skill borrowers by $466 ($121), or about 7 percent at the mean.

In columns (2)-(3) we then split the sample into those borrowers who did not acquire new credit card(s) and those who did. This allows us to examine whether the changing minimum wage increases limits on existing cards (perhaps after a request from the borrower, or through an lender-initiated increase when one updates their income or one's credit score improves), or if borrowers took out new credit cards (perhaps because of the change in offers demonstrated in table 3). Column (2) displays the results for individuals who did not acquire new cards: a $1 increase in the minimum wage raises credit limits for by $423 ($110). Column (2) displays the results for borrowers who *did* acquire new card(s): the total credit limit increases by $683 ($192), or about 50 percent more than the average effect for all borrowers in column (1).[35] This suggest borrowers appear to be increasing their credit limits via both margins, and that borrowers who acquire new cards increase their total credit limit more.

The effects of minimum wages on credit limits for all three samples are precisely measured at the 0.001 level and represent an economically meaningful increase in liquidity for low-skilled borrowers. For context, a recent survey finds that 40 percent of U.S. families would

[35] We also examined the effect of the minimum wage on the total number of cards held, which yields a point estimate of 0.04 (0.02).

not be able to cover a $400 expense using cash or its equivalent (Larrimore et al., 2018), and the typical payday loan is $375 (PEW, 2016). Since both of these amounts are *less* than the change in the credit limit, we interpret these changes in credit limits as economically large changes in liquidity for borrowers.

Column (4) of table 5 presents the effect of the minimum wage on payment behavior– as captured by missed payments (delinquency) on credit cards three months later. Column (4) indicates credit card delinquency falls by 0.6 percentage points (0.23 percentage points), about 5 percent at the mean, suggesting some previously delinquent borrowers catch up on missed payments when minimum wages rise, or that borrowers are less likely to enter delinquency.[36]

Column (5) examines credit scores three months later.[37] Since payment delinquency and unused credit limits are components of the score, it is not surprising that column (5) indicates that credit scores also improve: a $1 increase in the minimum wage increases credit scores by about 1.04 points (0.43). While one point is not large relative to the mean credit score of 620.7, credit scores are sticky, so one point is economically fairly sizeable relative to typical quarterly movements in credit scores. For context, Dobbie, et al. (2018) find that the removal of a bankruptcy flag increases credit scores for affected borrowers by 10 points. Not only is their estimate a treatment on the treated (whereas ours is an intent to treat on many borrowers who are likely unaffected), but bankruptcy is arguably the most derogatory flag contained in a credit

[36] We also ran specifications on overall delinquency on housing, auto, credit card or student loan debts (to account for the possibility that borrowers substitute on-time payments between debts) and confirm this more expansive measure of delinquency falls by 0.4 percentage points (with a standard error of 0.14 percentage points).
[37] In this analysis we limit the sample to borrowers who had a credit score in the prior quarter. We also examined whether minimum wage increases lead to higher probabilities of having a credit score. We find higher minimum wages lead to a small increase in the probability of having a credit score (coefficient of 0.003 with a standard error of 0.0008). Combining the two results and expanding the analysis in column (5) to individuals without credit scores in the pre-treatment period yields almost identical results.

report. As such, we interpret an average credit score improvement of one point in our context to be economically sizeable.

Taken together, the results from columns (4)-(5) suggests that low-skill borrowers would look more attractive to lenders (who underwrite using nearly the same kind of data we use here) following a minimum wage increase, because of their increasing credit scores and improved payment behavior.

Since we are interested both in immediate reactions to a change in the minimum wage, as well as whether borrowers who have access to more credit are able to manage it, columns (6)-(7) examine payment behavior and credit risk measured one year later for the subsample of borrowers who experienced an increase in their total credit limit over the same one year period.[38] Column (6) indicates delinquency declined for this group by 0.5 percentage points (0.15 percentage points), or about 3 percent at the mean. Column (7) indicates that credit scores for borrowers with higher limits also increased by 1.6 points (0.6 points). This suggests borrowers who had access to new liquidity were able to keep up with payments and improve their credit records (at least one year later).

In our previous analyses, we were able to use higher income borrowers as a control group to examine whether minimum wages have an impact on borrowers who are unlikely to be affected by the policy. While we do not have income in the credit bureau data which would allow for a parallel analysis, we can conduct a quasi-falsification test by repeating the previous analyses using census blocks with higher concentrations of residents with a college education

[38] Individuals with new credit cards or higher limits on existing cards are likely to ex ante have lower credit risk than at least some of the individuals who did not obtain new credit (who either applied and were denied, or did not apply, possibly due to fear of denial). Still, we are interested in the manageability of this newly extended credit after one year to analyze the possibility that more credit could pose problems for borrowers. We also analyzed these outcomes for the full set of borrowers (including those with unchanged limits) and found point estimates of: -0.004 (0.0019) on payment delinquency and 0.455 (0.3822) on credit scores.

(appendix table 6). Of course, as before, these are only "intent to treat" estimates, and we caution that it is likely that some treated minimum wage workers reside on these blocks as well (though we would expect there to be far fewer than in blocks with a high concentration of low-skilled workers). Furthermore, if minimum wages pass-through to prices (Aaronson, 2001), higher income borrowers could be affected as well. Still, we find that—unlike the analysis of borrowers on low-skilled blocks—there is little evidence that increases in minimum wages are associated with changes in credit availability, payment behavior, or credit scores in the short or medium run for borrowers on higher-skill census blocks.[39]

4. Discussion of Mechanisms and Impact on Borrowing Costs

In this section, we explore which mechanisms are consistent with the full set of results, drawing on the conceptual framework outlined in section 2. To summarize, our previous analyses in section 3 indicate that higher minimum wages lead to:

(1) increases in the number of credit card offers and improvements in their terms,

(2) reductions in usage of payday loans and other forms of high-cost credit,

(3) increases in credit limits on credit cards,

(4) improvements in credit scores and reductions in delinquency in the near term,

(5) persistent improvements in credit scores and declines in credit card delinquency one year out among borrowers who had access to more credit because of the change in policy and,

(6) no change in any of these credit outcomes for higher income or higher skill workers.

[39] The possible exceptions are the results on credit limits in the short run, and the credit score result one year out. In each case the coefficients are much smaller than in the less educated block sample, though they are statistically significant at traditional levels. Note that mean limits are much higher in this sample, so as a percent of their means, these represent considerably smaller effects than those in table 5.

We draw a number of conclusions from the full set of results. First, because we find no effects on higher income workers (6), our preferred interpretation is that of a causal mechanism; that is, that higher minimum wages cause changes in credit supply (1) and borrower usage of credit products (2-5). We have also conducted numerous robustness checks on our results, including controlling for a host of additional state-level social welfare and income support policies, census-division-year fixed effects and state-year trends (as suggested by Allegretto, et al., 2011), and alternative definitions of households that we might expect to be affected by minimum wage policy (appendix tables 7-12).[40] Nearly all of our results were insensitive to these changes in the empirical specification.

Second, because we observe both changes in offers (1) and credit card limits (3), we interpret the credit offer results as representing meaningful changes in credit supply to the affected borrowers. A plausible explanation for this result is that the documented improvements in credit risk (4) would make these borrowers more attractive to lenders. When considering or underwriting potential customers, credit card companies see the same kinds of credit report data that we analyze, and create their own proprietary credit scoring algorithms for generating credit offers. Positive changes in credit scores and payment behavior generally lead to more offers and

[40] The top panels of appendix tables 7-9 examine the robustness of the results when including additional policy control variables obtained from the University of Kentucky Center for Poverty Research (including AFDC, SNAP, SSI, EITC, among others, as noted in the table footnotes). In the Mintel and CPS results, the bottom panels of appendix tables 7-8 we further examine robustness to additional fixed effects as in Allegretto et al (2011). We do not do this in the CCP/Equifax because those analyses use individual fixed effects, and we do not employ the county-border segment methodology of Dube, et al. (2010) because the Mintel and CPS data do not have county identifiers. Results are almost identical, with one exception: in the CPS, including the full set of extra fixed effects (bottom panel of appendix table 8) reduces the precision of the payday results, although the magnitude of the coefficient is similar. Appendix tables 10-12 examine the sensitivity of the results to alternative definitions of potentially affected workers (e.g., alternative definitions of "minimum wage households"). In the Mintel and CPS data we continue to use information on imputed wages (top panel appendix tables 10-11) and household/family incomes (bottom panel of appendix tables 10-11) to look at heterogeneity across a broader range of households. In the CCP/Equifax, we use alternative census-block-group characteristics (including median incomes, employment in food services/retail, and different education groups, appendix table 12). In each case, there is evidence for effects on a wide range of incomes/wages/household-types who are likely to engage in minimum wage work.

terms more favorable to borrowers. It is also possible that the lenders respond to the policy itself—perhaps with the belief that changes in minimum wages might affect demand for credit among certain household-types. While lenders do not see income information on households who are not their customers, credit scores are highly correlated with income (Federal Reserve Board, 2007). As such, a lender could target certain parts of the credit score distribution in states where minimum wage policy has changed.[41] Hsu, Matsa, and Melzer (2014) find that more-generous unemployment insurance not only reduces mortgage delinquency but also increases credit card offers and improves their terms for borrowers, further providing support for the notion that credit supply is sensitive to changes in social policy.

Third, because we see reductions in payday borrowing (2) and improvements in credit records for borrowers with access to more credit (5), we interpret our results as a rejection of the hypothesis that these changes in credit supply lead to over-borrowing among low-income households (at least over the time period we observe). More generally, this result is not consistent with extensive present-bias or financial illiteracy among these population (at least on average). Our preferred interpretation of our full set of our results is that they are consistent with widespread (and binding) borrowing constraints faced by these populations, which can be alleviated by income support policy.

Our full set of results indicate that higher minimum wages reduce borrowing costs among low income borrowers, since no borrowing, or borrowing on a credit card (3), is generally cheaper than payday borrowing (2), and staying current on credit card is cheaper than paying late

[41] We have had numerous conversations with credit card companies about the plausibility of these different mechanisms. Since marketing strategies are proprietary, none were willing to go on the record about the strategies, however, we were told off the record that both mechanisms seem plausible. One suggestive piece of evidence that minimum wages are an important consideration of lenders and credit reporting agencies is the following report on minimum wages prepared by Equifax: https://investor.equifax.com/~/media/Files/E/Equifax-IR/documents/presentation/minimum-wage-wp-may-2014.pdf.

fees and interest charges (4). To fully understand the potential magnitude of these changes, we conduct several back-of-the-envelope exercises on the potential impact on borrowing costs. PEW (2016) estimates each year 12 million Americans borrow using payday loans. The typical borrower takes out a $345 loan, which is rolled over for five months and accumulates $520 in fees. By not borrowing altogether, the former borrower would have an extra $520 in disposable income (income net of debt service costs). And even if the marginal payday borrower is not the typical borrower, even a one-time payday borrower would save the $55 fee associated with a typical two-week loan that is repaid in full (PEW, 2016). Thus, our point estimates (table 4, column 1) imply that a $1 increase in the minimum wage would lead to 104,006 fewer payday borrowers, who would save $5.7 to $54 million in total fees over the course of year. The vast majority of households do not use payday loans (and therefore would not accrue these savings). Still, on per household basis, these back-of-the-envelope cost savings amount to $3.20-$4.50 per minimum wage household, or approximately 0.8-1.1 percent of the average income effects of a minimum wage hike estimated in Aaronson et al (2012).[42]

Our results indicate that credit card limits rise by $425 (table 5, column 3), which is larger than the typical payday loan of $345. This suggests that rather than discontinuing borrowing altogether, former payday borrowers might instead have the option of substituting to credit cards.[43] Bhutta, Skiba and Tobacman (2015) find that most payday borrowers resort to payday loans when their access to traditional credit is lowest (such as when little or no liquidity remains on any credit cards they have), and many shop (unsuccessfully) for traditional credit just before they take out a payday loan, suggesting many borrowers would prefer to use a credit card

[42] Aaronson et al (2012) estimate an average income effect of $250 per quarter, or $415 over five months.
[43] Bhutta, Skiba and Tobacman (2015) find that nearly all payday borrowers have credit records, and over 90 percent have a credit score. Thus, our CPS and Equifax samples should overlap, although we have no way of testing whether the same borrowers who discontinue using AFS have access to additional credit card liquidity.

than a payday loan. If instead of payday borrowing, the typical $345 payday loan balance were revolved for the same five months on the most expensive type of subprime credit card, the borrower would still save about $460, which amounts to almost $48 million in savings on borrowing costs in total.[44]

Similarly, the cost-savings of exiting (or not entering) credit card delinquency can also be substantial. For example, a borrower who fails to make payments on the mean credit card balance of $4019 (table 1) for at least three billing cycles (which equates to our measure of 60+ day delinquency) on the typical credit card would pay at least $360 in fees and interest.[45] Our point estimates (table 5, col 4) imply that on aggregate, a $1 increase in the minimum wage would lead to 101,875 fewer low income credit card borrowers in delinquency, which implies a total savings of $36.7 million in fees and interest.[46] And although the majority of families are not in payment delinquency and would not accrue this savings directly, on a per-household basis these cost savings still amount to about $2.88 per household, or 1.1 percent of the income effect of a minimum wage hike estimated by Aaronson et al (2012).

Thus, our estimates indicate that the reduction in borrowing costs stemming from an increased minimum wage can be substantial, and increase disposable income above and beyond the pure earnings effect of minimum wage hike – by about 2.2 percent for the average minimum wage worker, and by substantially more for borrowers whose behavior is directly affected. For example, for a full-time worker, a $1 increase in the minimum wage generates $865 in income

[44] The typical subprime card has fees and APR charges of about 40 percent (CFPB, 2015).
[45] According the CFPB, the typical retail APR is 17 percent. After the CARD act, late fees were typically $25 on the first late payment and up to $38 on subsequent late payments (CFPB, 2017). Fees were even larger before that time.
[46] Our dataset includes 217,218 credit card borrowers, which is a 1.5 percent random sample (thus representing 14.5 million credit borrowers).

over 5 months. The $360-$520 in savings implied by our estimates from exiting delinquency or forgoing a payday loan are therefore 40-60 percent of the direct income effect.

Moreover, declines in delinquency can also reduce bank losses. If an account remains delinquent for a period of time, usually 120 or 180 days, financial regulations require a bank to "charge-off" the debt, or declare it as a loss and send it to collections (either internally or through a third party collection agency). Banks are only able to recover a small fraction of debts that must be charged off, while the remainder is incurred as losses. A good proxy for these recovery rates is the proceeds from sales to third party collection agencies, which on average is about 4 cents on the dollar (Sanchez, 2015). Since about 90 percent of borrowers in 60+ day delinquency are still delinquent 180 days later, our delinquency estimates (table 5, column 4) imply $308 million in averted losses for banks.[47]

With respect to the vast literature on employment effects of minimum wage increases, we urge caution that our data do not contain information about employment status, and as such, our results are averaged over adults who could have experienced positive or negative employment (and earnings) effects under higher minimum wages. Still, we might expect families who lose their jobs to enter, rather than exit, delinquency; so one interpretation of the decline in delinquency we observe is that it is not consistent with disemployment effects.[48] That said, our

[47] Among those borrowers who are delinquent for at least three quarters, the mean amount past due is $3503. Of course, banks can also profit from delinquent borrowers due to fees and penalty interest rates if the borrowers do eventually re-pay their debt. This calculation is only the savings from averted charge-offs for the borrowers who do not pay.

[48] We might conduct some sort of inframarginal analysis to quantify the impact on and relative size of groups with positive and negative credit outcomes. Such an analysis, though, would not be very straightforward in our setting for a number of reasons. For example, unemployed individuals might still receive more credit offers since the lenders whose credit supply effects we measured in (1) would also be unable to observe employment status. Moreover, unemployed people would potentially have great need for credit in order to smooth their expenditures across their unemployment spell. Methodologically, because most of our outcomes are either binary or count variables, we cannot analyze those outcomes with commonly used inframarginal analytical tools like quantile regression. We do note, however, that appendix tables 10-12 provide some evidence that positive effects are widespread, although the magnitudes do vary somewhat across the income/wage/household type distributions.

analysis ignores teenagers (because they do not typically interact with credit markets), for whom there is stronger evidence of negative employment effects of minimum wages. Also, we note that much of the current public discussion about minimum wages surrounds a target of $15 an hour. State level minimum wages range from $5.15 to $10.50 per hour during our analysis period, and we do not have enough information to extrapolate further out of sample. We leave it to future research to analyze some of the higher minimum wages set by local jurisdictions on credit market outcomes and borrowing costs.

5. Conclusion

Proponents of minimum wage legislation tout minimum wages as a way to lift households out of poverty by increasing earnings, but critics argue disemployment effects outweigh earnings gains. Our results provide new evidence on additional social benefits of minimum wage policy not accounted for in these debates. We show that minimum wages expand access to formal credit to low-income borrowers, reduce usage of high-cost alternatives to traditional credit products, and reduce credit card delinquencies. These spillover effects on credit market outcomes reduce borrowing costs: a $1 increase in the minimum wage would save low income borrowers up to $90 million annually in interest and fees. This amplification of the income effect of via reduced borrowing costs should be considered in cost-benefit analyses of the minimum wage. Furthermore, the potential role of the minimum wage as a policy to reduce high-cost payday borrowing and credit card delinquencies is an important, and to our knowledge, unrecognized, spillover effect of the policy that impacts borrower welfare and overall financial stability.

Borrowing is critical for smoothing shocks, particularly for low-income households who often have little flexibility in their budgets to cover spikes in expenditures. Establishing a good

credit record and improving one's credit scores increases families' ability to borrow both in present and in the future; and credit records are used to screen employment and rental applications. Thus, the changes in credit supply and borrowing behavior we document in our empirical analyses suggest that minimum wages have the potential to create persistent long run positive effects on households' well-being, potentially leading to positive feedback loops if minimum wage-induced improvements in credit access lead to improvements in labor market outcomes, which leads to further improvements in credit access, and so on. Though we leave a formal investigation of long run effects of higher minimum to future work, our results hint that minimum wage policy could have persistent positive ripple effects on household welfare and financial health through the actions of borrowers and lenders in credit markets.

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7. Tables and Figures

Table 1: State Minimum Wage Legislation 2000-2015

State	Minimum Wage Jan, 2015	Year(s) Minimum Wage Increased (above Federal)	State	Minimum Wage Jan, 2015	Year(s) Minimum Wage Increased (above Federal)
DC	$9.50	2005, 2006, 2014, 2015	OH	$8.10	2007, 2008, 2009, 2011,2012, 2013, 2014, 2015
WA	$9.47	2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015	AZ	$8.05	2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015
OR	$9.25	2003, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015	FL	$8.05	2005*, 2006, 2007, 2008, 2009, 2011*, 2012, 2013, 2014, 2015
CT	$9.15	2000, 2001, 2002, 2003, 2004, 2006, 2007, 2009, 2010, 2014, 2015	MT	$8.05	2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015
VT	$9.15	2001, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015	MD	$8.00	2007, 2015*
CA	$9.00	2001, 2002, 2007, 2008, 2014	MN	$8.00	2005*, 2014, 2015
MA	$9.00	2000, 2001, 2007, 2008, 2015	NE	$8.00	2015
RI	$9.00	2000*, 2004, 2006*, 2007, 2013, 2014, 2015	WV	$8.00	2006, 2015
AK	$8.75	2003, 2010, 2015	HI	$7.75	2002, 2003, 2006, 2007, 2015
NY	$8.75	2005, 2006, 2007, 2014, 2015	MO	$7.65	2007, 2008, 2009, 2013, 2014, 2015
SD	$8.50	2015	AR	$7.50	2006, 2014
NJ	$8.38	2005, 2006, 2014, 2015	ME	$7.50	2002, 2003, 2004, 2005, 2006
DE	$8.25	2000, 2007, 2008, 2014, 2015	NM	$7.50	2008, 2009
IL	$8.25	2004, 2005, 2010	IA	$7.25	2007, 2008
NV	$8.25	2006, 2007,2010	NC	$7.25	2007
CO	$8.23	2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015	PA	$7.25	2007
MI	$8.15	2006, 2014	WI	$7.25	2005*, 2006*

Observe federal: AL, GA, ID, IN, KS,KY, LA, MS, ND, NH, OK, SC, TN, TX, UT, VA, WY
*Multiple changes in year

Table 2: Summary Statistics for Mintel, CPS and CCP/Equifax

	Mean	SD		Mean	SD
Mintel Data			*CPS Data*		
Number of Credit Card Offers	2.439	3.433	Took out a Payday Loan	0.030	0.171
Mean Credit Limit	27230	30073	Pawned Items at a Pawn Shop	0.040	0.195
Fraction of Offers Pre-Approved	0.361	0.388	Rented Items at a Rent-to-own Store	0.029	0.169
Mean Purchase Interest Rate	14.602	4.713	Took out an Auto Title Loan	0.014	0.117
% Offers with No Fee	0.724	0.379			
% Offers with Fee, No Rewards	0.186	0.346			
Median Income*	22500	7681	Median Family Income*	22500	33099
High School Dropout	0.144	0.351	High School Dropout	0.183	0.387
High School Grad	0.401	0.490	High School Grad	0.369	0.483
Some College	0.266	0.442	Some College	0.311	0.463
College	0.159	0.365	College	0.108	0.311
Post-Graduate	0.030	0.170	Post-Graduate	0.028	0.164
White	0.709	0.454	White	0.577	0.494
Black	0.084	0.278	Black	0.129	0.336
Hispanic	0.210	0.407	Hispanic	0.224	0.417
Under Age 25	0.045	0.206	Under Age 25	0.122	0.328
Age 25-34	0.176	0.381	Age 25-34	0.257	0.437
Age 35-44	0.228	0.420	Age 35-44	0.224	0.417
Age 45-54	0.252	0.434	Age 45-54	0.238	0.426
Age 55-64	0.299	0.458	Age 55-64	0.159	0.366
CCP/Equifax Data					
Number of Credit Cards	1.555	2.016	*Census Block-group Characteristics (CCP/Equifax)*		
Credit Card Limit	11638	17062	Block Median Income	35330	17749
Credit Card Balance	4019	6610	Share White	0.342	0.340
Credit Card Utilization Rate	0.643	0.682	Share Black	0.172	0.279
Credit Score	621	102	Share Hispanic	0.416	0.355
Delinquent	0.195	0.396	Share Male	0.492	0.070
Under Age 25	0.101	0.301	Share High School Dropout	0.405	0.210
Age 25-34	0.284	0.451	Share High School Grad	0.243	0.087
Age 35-44	0.274	0.446	Share Some College	0.216	0.100
Age 45-54	0.213	0.410	Share College or More	0.089	0.090
Age 55-64	0.128	0.334			

Notes: Data sources are Mintel Comperemedia, Current Population Survey and CCP/Equifax. Data are for 2000-2015 in Mintel, 2009, 2011, 2013 and 2015 in CPS, and 1999-2015 in CCP/Equifax. In Mintel and CPS, the sample is households identified as having income consistent with a minimum wage worker. In the CCP/Equifax, the sample is individual who have ever lived on a Census Block-groups where more than 50 percent of the adult population was a high-school dropout in 2000. * indicates variable expressed as median.

Table 3: Minimum Wages and Credit Card Offers Received

	(1) Number of Credit Card Offers	(2) Mean Credit Limit	(3) Fraction of Offers Pre-Approved	(4) Mean Purchase Interest Rate	(5) Fraction of Offers With No Annual Fee	(6) Fraction of Offers w/ Fee and No Rewards
Minimum Wage$_{st-3}$*Minimum Wage Household$_i$	0.1874***	1086***	0.0142***	-0.0489	0.0403***	-0.0200***
	(0.0365)	(303)	(0.0026)	(0.0320)	(0.0029)	(0.0028)
Minimum Wage$_{st-3}$	0.056	91	-0.0018	0.0445	0.0006	-0.0034
	(0.0435)	(333)	(0.0020)	(0.0293)	(0.0029)	(0.0027)
Minimum Wage Household$_i$	-2.6281***	-13882***	-0.0829***	1.0025***	-0.3063***	0.2086***
	(0.2201)	-1811	(0.0189)	(0.1941)	(0.0181)	(0.0177)
Mean of Dependent Variable						
Full Analysis Sample	4.12	40,915	0.38	13.13	0.77	0.11
Min. Wage Subsample	2.44	27,230	0.36	14.16	0.72	0.19
N	315,832	133,875	221,017	223,079	224,309	219,990

Notes: Data source is Mintel Comperemedia 2000-2015. Displayed are coefficients and standard errors (in parentheses). Minimum Wage Household defined as reported income consistent with one or two minimum wage full time workers, as described in text. Sample includes households with working age adults 18-64, and for columns (2)-(6), households who received offers with the feature listed in the column heading. Controls include age-group, sex, race/ethnic group, education group, state, and year-month fixed effects and state-month unemployment rates. Dependent variable means are displayed for all observations used in the regression, as well as the mean for the subsample of observations identified as minimum wage households. Standard errors adjusted to allow for clustering at the state level. *p<0.05, **p<0.01, ***p<0.001.

Table 4: Minimum Wages and Use of Alternative Financial Services

	(1)	(2)	(3)	(4)
	Took out a Payday Loan	Pawned Item at Pawn Shop	Rented Items from a Rent-to-Own Store	Took out an Auto Title Loan
Minimum $Wage_{st-12}$*Minimum Wage $Household_i$	-0.0049*	-0.0053	-0.0055**	-0.0023
	(0.0027)	(0.0038)	(0.0023)	(0.0017)
Minimum $Wage_{st-12}$	-0.0026	0.0016	-0.0009	0.0014
	(0.0025)	(0.0019)	(0.0014)	(0.0026)
Minimum Wage $Household_i$	0.0414**	0.0484	0.0485***	0.0203
	(0.0202)	(0.0296)	(0.0175)	(0.0135)
Mean of Dependent Variable				
Full Analysis Sample	0.0203	0.0223	0.0154	0.0088
Min. Wage Subsample	0.0301	0.0395	0.0294	0.0139
N	157896	158001	157974	74488

Notes: Data source is Current Population Survey Unbanked/Underbanked Supplements, 2009, 2011, 2013 and 2015 (column 4 data is for 2013 and 2015 only). Sample includes households with working age adults 18-64. Displayed are coefficients and standard errors (in parentheses). Min Wage Household defined as total family income divided by total family hours worked consistent with the minimum wages, as described in text. Controls include age-group, sex, race/ethnic group, education group, and state fixed effects and state-month unemployment rates. Dependent variable means are displayed for all observations used in the regression, as well as the mean for the subsample of observations identified as minimum wage households. Standard errors adjusted to allow for clustering at the state level. *p<0.05, **p<0.01, ***p<0.001.

Table 5: Minimum Wages and Credit Card Limits, Credit Risk and Payment Behavior

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total Credit Card Limit (k=3)			Delinquency and Risk (k=3) All Borrowers		Delinquency and Risk (k=12) Borrowers with Higher Limits	
	Full Sample	Individuals Without New Cards	Individuals With New Cards	Delinquent on Credit Card(s)	Credit Score	Delinquent on Credit Card (s)	Credit Score
Minimum $Wage_{st-k}$	466***	423***	683***	-0.006**	1.039*	-0.005**	1.606*
	(121)	(110)	(192)	(0.0023)	(0.4327)	(0.0015)	(0.6138)
Mean of Dependent Variable	6,752	6,059	13,730	0.132	620.7	0.178	640.7
N	11,579,606	10,534,324	1,045,282	11,579,606	11,273,837	3,248,116	3,228,276

Notes: Data Source is CCP/Equifax 1999-2015. Sample includes adults 18-64. Displayed are coefficients and standard errors (in parentheses). Columns (1) and (4) are estimated on the entire sample. Column (2) and (3) are estimated on the subsample that did or did not acquire new credit card(s) since one quarter prior, as indicated in the column heading. Column (5) is estimated on the subsample of borrowers with a credit score in both the current and prior quarter. Column (6) is estimated on the subsample of borrowers who have higher total credit card limits in the current period than 12 months prior, and column (7) is estimated on the same sample, but omitting observations with missing credit scores 12 months prior. K refers to the lag on the minimum wage variable, which is three months in columns (1)-(5) and 12 months in columns (6)-(7). Controls includes individual, age-group, state, and quarter fixed effects, demographic and economic characteristics of census-block-group, state-year unemployment rates. Sample is limited to individuals who have ever resided in Census block-group where more than 50 percent of the population over age 25 had no high school degree in 2000. Standard errors adjusted to allow for clustering at the state level. *p<0.05, **p<0.01, ***p<0.001