Effects of Bonus on the Demand for Auto Loans and the Long-Term Consequences

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Abstract

Using a large consumer panel data set of both credit and employment profiles, we study the demand for auto loans among consumers in response to receiving bonus payments. While bonus payments represent a one-time income increase, auto loans lead to a significant financial burden in the long term. We find an economically meaningful increase in auto loan demand around the month of receiving a bonus, even for low-income, subprime-credit-score consumers who only receive a small bonus. To explore the underlying mechanism that drives the demand, we test predictions from the permanent income hypothesis. Contrary to the theory prediction, the increase in auto loan demand is significant when the bonus is likely to be anticipated. Furthermore, the effect is robust for individuals who are unlikely to have liquidity constraints. These findings, however, can be explained by the mental accounting theory. Finally, we show that auto loans induced by bonus have a significantly higher delinquency rate than loans that originate at other times. This primarily comes from consumers with low incomes or subprime credit scores. Our findings can help financial institutions identify consumers who have a need for auto loans and those who have a higher delinquency risk in the future.

1. Introduction

This paper studies how consumer demand for auto loans responds to a short-term income increase in the form of bonus payments. With a $1.16 trillion balance in the first quarter of 2017,[2] auto loans represent the third largest consumer credit market in the United States after mortgage and student loans. The auto loan market is crucial to the automotive industry as over 80 percent of new vehicles sold in the United States are financed.[3] For consumers, auto loans represent the consumption of durable goods, which differs from the consumption of nondurable goods in two important ways: First, the benefit of purchasing a vehicle is long term through a consumption flow over at least several years. Second, taking out an auto loan requires monthly payments of the principal and interest which typically also last for years. Such payments can be a heavy burden for many households. If a consumer cannot make the required monthly payment, the loan will become delinquent. According to an estimate from the Federal Reserve Bank of New York, loans with payments overdue longer than 30 days reached $23.27 billion, and longer than 90 days reached $8.24 billion, in the first quarter of 2017. This has immediate and future impacts on both customers and financing institutions (i.e., banks, credit unions, or car manufacturers that provide the financing). For consumers, loan delinquency will harm their credit scores and thus significantly increase the cost of future loans. For financing institutions, the delinquency puts the outstanding balance at risk, which can increase the capital cost and, in the worst case, lead to bankruptcy and financial crises like the one in 2008.

Bonuses are a common component of employee compensation plans in the U.S. economy. A 2015 survey by the Society for Human Resource Management estimates 60 percent of firms offer an annual bonus to recognize employees' contribution. While 49 percent of firms offer compensation contracts that specify bonus payments on a regular basis, 45 percent offer spot or unscheduled bonuses recognizing the exceptional contribution which have not been specified in the contract. This suggests that, while some individuals are likely to anticipate a bonus every year, others may receive bonus as a surprise.

While bonus payments are a one-time income increase, car loans represent a significant financial cost in the long term. At the intersection of auto loans and bonus payments lies the fundamental research questions of this study: how does receiving a bonus payment lead to the change in demand for auto loans among consumers, and what is the long-term consequence of such a change in demand? To answer this question we use a large-scale panel data set provided by Equifax, with more than 23 million consumers

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[2] Federal Reserve Bank of New York, Quarterly Report on Household Debt and Credit, May 2017 Q1. https://www.newyorkfed.org/medialibrary/interactives/householdcredit/data/pdf/HHDC_2017Q1.pdf
[3] Consumer Reports, Consumers Rely on Car Financing More than Ever. http://www.consumerreports.org/cro/news/2013/09/car-financing-on-rise-loans-and-leases/index.htm

from over 2,000 companies in the U.S. This novel data set allows us to directly link the time when an auto loan is originated with the time when a bonus payment is received. Because the panel data tracks every consumer over multiple years and has detailed demographic information, we can include very rich fixed effects for every individual consumer, such as year-month, county/state, and credit score fixed effects, in the regression analysis to investigate how receiving a bonus payment influences the propensity of taking out a car loan. These fixed effects help us exclude alternative explanations, such as the systematic difference between individuals who receive different sizes of bonuses, and the correlation between the seasonality of car demand and bonus payments, for our findings.

After estimating the main effects of bonus on the demand for auto loans, we further investigate the potential heterogeneity among individual consumers in our data, depending on the form (anticipated or not) and size of the bonus, as well as the income level and credit score of the consumers. This exercise helps us examine the robustness of our findings across different types of consumers. More importantly, we use this to explore the underlying mechanism that drives the results. Finally, we investigate whether auto loans that are induced by bonus payments will result in a higher likelihood of delinquency in the long term and, if so, which types of consumers are more prone to the risk of delinquency. It is worth noting that this effect, if exists, is difficult to detect from ordinarily sized data set since auto loan delinquency is a rare event. One benefit of using the "big data" in this study is that it allows us to investigate what factors contribute to such rare events.

Our results show that auto loan demand increases by 6.6 percent in each month on average during the three-month window when a consumer receives a bonus, summing up to a 20 percent increase from the demand in a regular month. From the data, the average annual bonus payment is more than $7,000 among consumers who have received a bonus in our sample. This is higher than the average annual loan payment of about $4,800. The distribution of bonus payments, however, is very skewed, with half the consumers receiving under $2,000 a year. Surprisingly, the increase in demand for auto loans does not only come from individuals who receive large bonuses. Even for a small bonus (<$500), the average increase is 3.09 percent in the three-month window around receiving the bonus, or a total of 9.27 percent increase from the demand in a regular month. This effect is still significant for individuals with low incomes (annual income smaller than $50k) or subprime credit scores[4] (below 620) after they receive the small bonus. For low-income consumers, monthly repayments for car loans in the future cannot be covered by the small bonus; for subprime-credit-score consumers, taking out a car loan requires a high

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[4] There is no single standard definition for subprime credit scores. In the United States, the cutoff point typically ranges from 600 to 640.

interest payment. These results indicate the effect of bonus on the demand for auto loans will have a long-term financial cost.

To investigate the underlying mechanism that drives the results, we turn to the permanent income hypothesis (PIH) that has been widely studied in the economics literature (Modigliani and Brumberg 1955, Friedman 1957). PIH predicts that individuals adjust their consumption level based on how the permanent income changes. An anticipated income will not change the consumption level since this income should have been taken into account in the permanent income. Even when the income (e.g. a bonus payment) is unanticipated, it has to be large enough to support the amount of loan repayment in our empirical context over a long term to increase the auto loan demand. The finding that the increase in auto loans is significant even for individuals who receive a small bonus, however, is inconsistent with this prediction. We further test other predictions from the PIH. We find that the increase in auto loan demand is robust and significant for bonuses that recur every year and thus are likely to be anticipated. Furthermore, the increase is still significant, although smaller, for consumers whose bonus payment is smaller than the previous year, suggesting that it is not due to the anticipation of receiving higher payments in the future. Overall, our findings cannot be explained by the PIH.

One potential explanation for why our findings deviate from the predictions of PIH models is that bonuses help relax the liquidity constraint for consumers. However, we find that the increase in auto loan demand is significant among individuals who are unlikely to be under the liquidity constraint, such as those with a high income (above $100k a year), a high credit score (>760), a low credit card utilization rate (<5 percent), or a high available credit line (≤$30,000). In addition, the effect is significant for individuals who receive a small bonus (≤ $500) and have a high income or are getting a large auto loan (>$25k). Such a small bonus is unlikely to relax the liquidity constraint for car purchases for those individuals. Therefore, we conclude that our findings are not driven by bonus relaxing liquidity constraint of certain individuals.

The above evidence suggests that standard economic models cannot fully explain the strong relationship between the timing of auto loan origination and bonus payments, at least for a significant number of individuals whose bonus payments are likely to be anticipated and who are not under liquidity constraints. Therefore, we turn to the mental accounting theory (Shefrin and Thaler 1988, Thaler 1990) in the behavioral economics literature. This theory argues that consumers treat money differently depending on source of the income. Since consumers may perceive a bonus payment as a gain to the current state, they will have a higher propensity to spend the payment, even when it is anticipated, than when receiving a regular salary. They may also perceive the bonus payment as a disposable "house money" that can be

used for consumption (Thaler and Johnson 1990). With such a mindset, however, consumers may lose sight of the big picture of future costs from the consumption. Therefore, a small or large bonus payment, either anticipated or unanticipated, can be sufficient to induce different types of individuals to initiate auto loans that require significant monthly payments in the future. Our findings are consistent with such a prediction.

If, as the mental accounting literature suggests, auto loans induced by bonus payments can be a suboptimal decision, there will be a long-term costly consequence on consumers' future finance. We study this future consequence by investigating the delinquency of auto loans.[5] Our analysis shows that loans originated right around the months of receiving a bonus have a higher delinquency rate than loans that originated in other months. We further demonstrate that the increase in the delinquency primarily comes from consumers with a low income or a subprime credit score. These results suggest that, while bonus payment increases a consumer's short-term welfare, it can lead to a significant long-term burden that will have a negative financial consequence if the loan is delinquent.

To the best of our knowledge, this study is the first to use "big data" on individual income and auto loan records to document how consumers respond to bonus payments with big-ticket durable goods consumption. We also document a long-term consequence of the financial decision. Our findings have important managerial implications. Financial institutions can use our results to identify the time when consumers are more likely to have a need for auto loans, as well as those who have a high delinquency risk. This study also has implications on the consumer welfare. For consumers with low incomes or subprime credit scores, receiving a short-term gain from a bonus will lead to a long-term financial cost if they take out a loan, since they have limited capability to afford future loan payments. There will be even worse financial trouble for these consumers if the loans are delinquent.

Our paper proceeds as follows: We review the relevant literature in Section 2. In Section 3, we describe the data set and present some summary statistics. Section 4 presents results on how the demand for auto loans increases in response to bonus payments across different types of consumers. It also provides some tests on the underlying mechanism driving the results. Section 5 discusses the delinquency rate of those consumers. Finally, we conclude the paper in Section 6.

2. Literature Review

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[5] Consistent with the industry definition, we define "delinquency" as payments that are 30 or 60 days past due.

This paper is related to the consumer finance literature. The permanent income hypothesis and the mental accounting literature provide a conceptual framework to investigate the underlying mechanism of our findings.

There is a large literature in economics that studies consumer financial decisions (e.g. Arrow 1965, Friedman 1974, Agarwal et al. 2009). Classical economic models suggest that rational consumers should maximize expected utility over a lifetime by making borrowing and saving decisions to smooth consumption. Since such financing decisions typically are complex, a new stream of consumer finance literature in marketing and economics suggests that customers may make suboptimal decisions. For instance, consumers tend to underestimate the exponential growth of savings (Mckenzie and Liersch 2011), demonstrate inertial behavior in investment decisions (Madrian and Shea 2001), overly optimistic about future usage of credit card at adoption (Yang et al. 2007) and underestimate and overspend on exceptional expenses (Sussman and Alter 2012). Such financial mistakes will lead to excess interest and fee payments and are more likely to happen for younger and older adults than for middle-aged adults (Agarwal et al. 2009). In this paper, we study a type of consumer financial decision—auto loans—that is the third largest consumer credit market in the United States after mortgage and student loans. We document how the decision of taking auto loans is associated with receiving a one-time bonus and how such a decision can lead to future loan delinquency.

This paper also relates closely to the permanent income hypothesis (PIH) literature (e.g. Modigliani and Brumberg 1955, Friedman 1957) in economics. This literature states that consumers' consumption decisions are determined by their permanent income. The theory offers several key predictions. First, receiving an anticipated income gain should not change consumption as the gain has already been taken into account in the permanent income. The timing of auto loan origination therefore should not be impacted by the timing of a bonus payment if the bonus is anticipated. Second, when receiving an unanticipated bonus, consumers will adjust their permanent income and hence their consumption level. Given that auto loans involve significant future repayments, the bonus needs to be large enough to cover the future cost.

Starting with Flavin (1981), numerous papers have empirically tested the predictions from the PIH, most of which have focused on how the consumption of nondurable goods responds to an anticipated income change (for examples, see Parker 1999, Shapiro and Slemrod 2003, Stephens 2008; for a detailed discussion and review, see Jappelli and Pistaferri 2010). Results from these studies vary, but there is considerable evidence that is inconsistent with the PIH predictions. For example, using data from the Consumer Expenditure Survey, Souleles (1999) finds excess sensitivity in the response of households'

consumption to their income tax refunds. Stephens (2008) finds the household consumption significantly reacts to a predictable increase in discretionary income following the final payment for an auto loan, which may be explained by the presence of borrowing constraints. Pagel and Vardardottir (2016), however, use data from a financial account aggregation provider to document a significant increase in consumers' spending due to the arrival of both regular and irregular income, even though consumers are not cash constrained. They suggest this is because consumers make the consumption decision based on heuristic rules. In this paper, we also provide an empirical test for predictions from PIH models. Our study uses detailed income and loan data, allowing us to pin down the timing of bonus payments and the origination of auto loans. In addition, the paper documents how such loans may affect the long-term delinquency, which has not been studied in the previous literature.

This paper is also related to the behavioral economics literature. There have been a considerable amount of papers that demonstrate the role of behavioral factors, such as self control (Thaler and Benartzi 2004), reference dependence and loss aversion (Ho and Zhang 2008) and goal achievement (Wang et al. 2016) in consumer decision making with either lab studies or field data. The findings in this paper are specifically related to the mental accounting theory. The theory states that individuals may have different mental accounts from which they withdraw funds, and the marginal propensity to consume differs over accounts (Thaler 1990, Shefrin and Thaler 1988). Such mental accounts will affect households' spending and investing decisions (Zhang and Sussman 2017). Consumers are more likely to spend income framed as a gain from the current wealth state, such as a bonus, than income framed as a return to the prior state, such as a rebate (Epley et al. 2006). Different mental accounts are also shown to affect consumers' preferences between hedonic and utilitarian products (O'Curry and Strahilevitz 2001). The windfall theory (Arkes et al. 1994), as a special case of mental accounting, focuses on the unexpected nature of the income and shows that unexpected gains are spent more readily than expected gains. However, the previous literature typically relies on surveys or lab experiments of which there is little economic incentive for participants to make correct judgment. Instead, we contribute to this literature by providing an empirical study in the context of auto loan decisions which have significant future costs. We demonstrate how the decisions, when induced by bonus payments, can lead to an unintended long-term consequence in the form of higher delinquency rate.

3. Data Description

Our empirical analysis leverages anonymized data on individual credit profile and employment information from various databases operated by Equifax Inc. business units. Equifax operates one of the three major credit bureaus in the United States and also provides the largest consumer-reporting database of employment and income in the United States. We combine data on both credit and employment for this

study. The employment data covers millions of individuals from more than 8,000 employers in the United States and includes anonymous information on each employee's compensation, average hours worked each week, and job tenure, as well as some details of the firm the employee works for. The data is reported to Equifax Inc. on a payroll-to-payroll basis. We observe the individual compensation every month, which is further broken down into different components, including basic salary, bonus, commission, and overtime pay. This allows us to calculate the timing and size of bonuses. The credit data contains information for all individuals with a credit history, as all banks have to report the credit information to the three major credit bureaus. From the data, we observe whether these individuals have an auto loan and, if so, the time of the origination as well as its subsequent monthly repayments.

This study focuses on individuals for whom we have both employment and credit data. We merge these two data sets to obtain a monthly panel data set for three years from 2013 to 2015.[6] The merged data includes around 23 million individuals whose annual salary is above $10,000—approximately 10 percent of the U.S. adult population. About 10 million have received at least one bonus in the sample period. Among individuals who received bonus compensation and for whom we can exactly pin down the month when the bonus was received,[7] about 45 percent received at most one bonus per year (they may receive no bonus in some years). Panel A in Table 1 reports the number of individuals in the total sample in Column 1, those who received at most one bonus per year in Column 2, and those who received multiple bonuses per year in Column 3. For individuals who received multiple bonuses, it is difficult to pin down which bonus had the direct effect on the loan origination, since some of the bonuses were paid in consecutive months. To obtain clean analysis results, our regressions therefore focus on the 3.9 million individuals who received at most one bonus in a year (in Column 2). Our regression results do not change qualitatively, if we include all individuals, and assume car loans are induced by bonuses paid in the most recent months.[8]

Table 1 shows some descriptive statistics for individual credit score, total income, and bonus size. Individuals with bonuses have a higher credit score and income than the average sample, probably due to job differences. Between individuals who receive at most one bonus per year and those who receive

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[6] We also gather annual data for five years, from 2012 to 2016, and use the first and last years to help classify whether the bonus an individual receives is likely to be anticipated, which we will discuss in detail later, and whether there is delinquency in their loan repayments.

[7] There are about 1.2 million individuals for whom we cannot back out the month of receiving the bonus because some employers missed the month-to-month reporting for a few months and continued reporting at a later month. For these employees, we know that they received a bonus but do not know exactly when the bonus was received. Thus, they are excluded from the estimation sample.

[8] The auto-loan demand effect from bonuses is significant for consumers receiving multiple bonuses a year, although the magnitude is smaller, probably due to the smaller amount of bonus received each time. Furthermore, for those individuals, a bonus may be perceived as part of their regular compensation, so the effect on auto loans is smaller.

multiple bonuses, the former on average have higher credit scores, total income, and total bonus at the annual level; however, the difference is not substantial enough to suggest that they are completely different consumers.

<Insert Table 1 about here>

Whether or not an individual receives a bonus depends not only on the individual's work performance but also the employer's compensation scheme. Some employers never give bonuses during the sample period, while others regularly give bonuses. Our estimation sample (individuals who receive at most one bonus per year) consists of individuals from 2,065 employers. Employees receive bonuses in different times of the year. As Figure 1 shows, there is a wide distribution of when individuals receive bonuses, with higher percentages falling in February–April and December.

<Insert Figure 1 about here>

The distribution of bonus size is heavily right skewed, with the mean at $7,836 and median at $1,963 in the estimation sample (Column 2 of Panel D in Table 1). Table 2 shows some descriptive statistics of the bonus amount. There is a large variation among individuals. While around 50 percent of consumers receive a bonus larger than $2,000, about 30 percent of them receive bonuses smaller than $500. Small bonuses are more likely to occur among low-income or low-credit-score consumers (see the second and third panels in the table). However, even among those whose annual income is higher than $100,000, 5 percent of these high income individuals receive a bonus smaller than $500. These variations allow us to separate the effect of receiving a bonus from the effects of income and credit score on auto loans.

<Insert Table 2 about here>

For individuals who took out an auto loan from 2013 to 2015, we observe the loan's origination date and loan characteristics as well as the subsequent repayment behavior (for at least one year) after the loan origination. Table 3 presents some summary statistics for various loan characteristics, including loan amount, loan terms (length of time for loan repayment in years), monthly payment, and interest rate. On average, the auto loan amount in our sample is $23k, with about $400 monthly payment for over five years. The interest rates are significantly higher for individuals with low incomes and low credit scores, which is consistent with common industry practice.

<Insert Table 3 about here>

To have an overall sense from the data about the influence of bonus payments on the demand for auto loans, Table 4 compares the likelihood of auto loan origination for individuals during the three

months around receiving a bonus (one month before, the same month, and one month after) with other months. The likelihood of loan origination is significantly higher when a consumer receives a bonus (see p-value in the last column). This pattern is consistent across individuals with different levels of annual income (see the second panel of the table) and credit scores (see the last panel of the table). These results provide some preliminary evidence that receiving a bonus will increase the propensity of taking out a car loan across different types of consumers.

<Insert Table 4 about here>

Table 5 reports the delinquency rate for auto loans using the data of one year after the loan origination. Consistent with industry practice, delinquency is defined as loans that have been 60 days past due (60 DPD). Another measure, 30 days past due (30 DPD), is also examined for robustness check. We compare the delinquency rate for loans originating in the three months around receiving a bonus with other months. Overall, the delinquency rate for loans that are originated around the bonus month is higher than the rate in other months, and the difference is marginally significant. This difference primarily comes from consumers with low (below $50k) or medium ($50k to $100k) incomes and low credit scores (below 620), for whom the differences between the delinquency rates of different months are statistically significant.

<Insert Table 5 about here>

These descriptive statistics suggest that, while the demand for auto loans increases when consumers receive a bonus, the corresponding delinquency rate is also higher. In the following sections, we use a regression approach to pin down the demand and delinquency effect from bonuses, while using various controls and econometrics methods to control for omitted-variable bias in the analysis. For example, controlling for income and credit scores in the regression analysis is essential because they may correlate with whether an individual receives bonuses.

4. The Effects of Bonus Payments on Auto Loans

In this section, we use regression analysis to establish the effects of receiving bonus payments on the demand for auto loans. We show that the effects are significant not only for individuals who receive a large bonus payment, but also for individuals whose bonus payment is small and whose income level or credit score is low. We then investigate the underlying mechanism that drives our findings by specifically testing whether the effects exist for individuals whose bonus payments are likely to be anticipated as well as for individuals who are unlikely to have liquidity constraints.

4.1. Main Effects

To quantify the effects of bonuses on the auto loan demand, we evaluate how the demand changes when consumers receive a bonus. Consumers may take some time to research and shop around after receiving a bonus, so bonus may impact customers' auto loan decisions in the month after receiving the bonus. Moreover, customers may expect the bonus before it arrives in their paycheck, so bonus may have an impact on customers' decisions in the month before receiving the bonus. Therefore, we evaluate how auto loan demand changes in the three months[9] around receiving a bonus in a linear probability regression as follows:[10]

$$I(auto)_{im} = \gamma \cdot I(bonus)_{im} + X_{im}\beta + \alpha_i + \xi_m + \epsilon_{im} \tag{1}$$

where $I(auto)_{im}$ is an indicator variable that equals 1 if consumer i originates an auto loan in month m, and $I(bonus)_{im}$ is another indicator variable that equals 1 if the consumer receives a bonus in month $m-1, m \; or \; m+1$. The main parameter of interest, γ, measures the increase in auto loan origination during the three months around receiving a bonus. Control variables X_{im} consist of factors that could influence the consumer's auto loan demand, including the total income (bonus included), its square term,[11] and a vector of credit score fixed effects.[12]

To address the concern that $I(bonus)_{im}$ can be correlated with the unobserved factors that can influence the demand for auto loans, we utilize the richness of our panel data by including a lot of fixed effects in the regression. To account for potential unobserved differences among individuals in the sample that can affect auto loan demand, we include an individual fixed effect α_i for every consumer. This way, γ captures the change in auto loan origination when the individual receives a bonus relative to that in other months. We also include a vector of year-month fixed effects, ξ_m, to account for seasonality in auto demand.[13] This helps address the concern that the demand may be higher in the months when most consumers receive bonuses. We also include other fixed effects in further regressions, which will be described later. Finally, ϵ_{im} is a stochastic component which, after controlling for all of the fixed effects, is assumed to be *i.i.d.* across individuals and time, and also exogenous to the timing of receiving bonus.

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[9] Our results are qualitatively robust with respect to the number of months around receiving a bonus in the analysis. The magnitude of the effect is smaller when we consider a larger number of months around bonuses because the demand effect gradually diminishes in months further away from receiving a bonus.

[10] We choose this specification instead of other popular nonlinear specifications, such as the logit or probit models, because we need to estimate millions of individual fixed effects. Details are below.

[11] In our empirical context, the total income is the annual income and stays the same within a year.

[12] Since we have millions of individuals in the data, we allow each unique credit score to have a fixed effect. Our results do not change qualitatively if we group credit scores for fixed effects in the regression.

[13] Our estimation sample contains 36 months of observation.

Regression results of Equation (1) are shown in Column 1 of Table 6. Standard errors are robust and clustered at the individual level.[14] The average increase in auto loan demand when consumers receive a bonus payment is 0.092 percent. This implies a 6.6 percent increase from the average monthly auto loan origination rate during the three months around receiving the bonus, which sums up to a 19.8 percent increase from the auto loan demand in a regular month. To understand the economic significance of this increase, we use a study from McCarthy (1996) as a reference. The paper reports that the estimated price elasticity of new vehicle demand is -0.87. This suggests that, suppose an auto company wants to increase the demand by 19.8 percent in a month, it has to run a 22.8 percent price promotion for its new vehicles. Furthermore, the paper finds that the income elasticity of new vehicle demand is 1.70. Hence, there has to be an 11.7 percent increase in the permanent income across consumers to increase the demand by 19.8 percent. These results show that bonus payments have an economically meaningful impact on the demand for car loans.

To test the robustness of this result, we also estimate a model without the individual fixed effects. Results are shown in column 2 of Table 6. The estimated increase in auto loan demand is essentially the same. This suggests that controlling for individual fixed effects does not change the magnitude of the effect, perhaps because we have already controlled for a lot of observable factors in the regression.

<Insert Table 6 about here>

We conduct further robustness checks. First, one may be concerned that unobserved time-varying factors exist that will bias our estimation results. As an example, Figure 1 shows that many consumers receive bonuses in February–April and December. February–April is when many consumers also receive tax refunds from the previous year. Auto companies may run price and non-price promotions during those months, which can influence the level of auto loan demand. Note that, since the above regressions have controlled for year-month fixed effects, we have already addressed such omitted-variable bias in the analysis. We further test whether the estimated effect of bonus is different across months. We repeat our analysis only for consumers who received a bonus in the months when there are few bonuses observed in the data (i.e., in January and May–November; see Figure 1). The results are shown in Table 6, Column 3. The estimated effect is very close to that in the main regression. The three months around the bonus together represent a 0.29 percent increase in auto loan demand. This represents a 7 percent increase from the average monthly origination in each month during the three months around receiving the bonus, which

sums up to a 20.9 percent increase from the auto loan demand in a regular month. Thus, we conclude that the effect of bonus is robust across different months.

Our result may be biased if there are location-specific, time-varying unobserved factors that drive the correlation between the timing of bonus and auto loan origination. For example, if a major employer in a region typically offers bonuses in June, local auto dealers may run promotions around the same time. Such an effect would not be captured by the year-month fixed effects that are common across geographical locations. To address this concern, we include a county and year-month interaction effect to allow for different seasonality and time effects for each county in the regression. The results are reported in Column 4 of Table 6. The three months around bonus together bring a 0.28 percent increase in auto loan demand, implying a 6.8 percent increase from the average monthly origination in each month during the three months around receiving the bonus, or a total of 20.3 percent increase from the auto loan demand in a regular month.

To further quantify the effect of bonus payments, we run another regression as follows:

$$I(auto)_{i,m} = \gamma_1 \cdot B_{i,m} + \gamma_2 \cdot B_{i,m+1} + \gamma_3 \cdot B_{i,m-1} + X_{im}\beta + \alpha_i + \xi_m + \epsilon_{im} \qquad (2)$$

where $B_{i,m}$ is an indicator variable that equals 1 if consumer i receives a bonus in month m, and $B_{i,m+1}$ and $B_{i,m-1}$ denote the month before or after receiving a bonus, respectively. Coefficients γ_1, γ_2 and γ_3 represent the difference in auto loan origination compared to months that are beyond the three months around receiving a bonus. The other variables are defined the same as above.

The regression results are shown in column 5 of Table 6. As expected, the effect is the largest in the month when the bonus is received. To put the coefficients in perspective, we plot the increase as the percentage change from the average monthly auto loan origination (1.391 percent) in the data in Figure 2. During the month of receiving a bonus, the demand increases by a 9.3 percent relative to a regular month. Given that an auto loan represents a big ticket purchase, consumers are likely to take some time to research and shop around. Therefore, there is a 6.0 percent increase in demand one month after receiving the bonus. In addition, the 4.2 percent increase one month before receiving the bonus suggests that employees may know about an upcoming bonus before it arrives in their paycheck.

<Insert Figure 2 about here>

We now investigate how the effect of bonuses varies across consumers. Table 1 shows that the average bonus payment is close to $8,000 in the estimation sample. This is more than enough to pay the car loan payments, which are about $4,800 annually on average, if consumers continue to receive the same bonus every year. However, the distribution of bonus payments is very skewed. Table 2 shows that

more than half of the individuals receive annual bonuses of less than $2,000, which is less than half of the annual loan payments. To test whether the effect of bonus on the demand for auto loans only comes from individuals who receive a large bonus, we run another set of regressions that break down our sample into receiving small (≤$500), medium (between $500 and $2,000), and large (above $2,000) bonus payments. The results are reported in Column 1 in Table 7. With large bonus payments (over $2,000), the increase in demand for auto loans is higher: there is a 10 percent increase from the average monthly origination in each month during the three months around receiving the bonus. However, even for a bonus of $500 or less, there is a 3.1 percent increase from the average monthly origination, representing a total of 9.3 percent increase from the auto loan demand in a regular month.

To investigate whether the effect only comes from high-income individuals in the data, we further examine the effect of bonus payments for consumers across different income brackets in Columns 2–4 of Table 7. The effect is still significant for individuals with low income (≤$50k) and small bonuses (≤$500). There is a 4.1 percent increase from the average monthly origination, representing a total of 12.3 percent increase from the auto loan demand in a regular month. As the future loan repayments cannot be covered by such small bonus, car loans will become a large financial burden for these consumers.

As interest payments for car loans are typically much higher for consumers with subprime credit scores, we further investigate whether the increase in the demand for auto loans only comes from consumers with a low interest cost. We break down our sample into low (≤620), medium (between 620 and 760), and high (above 760) credit scores. Results are reported in Columns 5–7 of Table 7. For consumers with subprime credit scores (≤620) and small bonuses (≤$500), there is a 4.8 percent increase from the average monthly origination, representing a total of 14.4 percent increase from the auto loan demand in a regular month. It suggests that given a short-term, small increase in income, a significant proportion of consumers in this group will be stimulated to take out a car loan that comes with a high interest cost. Overall, we conclude the effect of bonus on the demand for auto loans is robust across different types of consumers.

<Insert Table 7 about here>

4.2. Effects from Anticipated Bonus Payments

We now explore the underlying mechanism that drives the effect of bonus on auto loan origination by testing the predictions from PIH models. PIH models predict that the consumption level will not change when consumers receive an anticipated income. One way to know whether a bonus is anticipated by consumers is through surveys. However, conducting a survey on such a large scale is extremely difficult. Instead, we use observational data to proxy anticipated bonus: for consumers who receive a bonus every

year, the bonus is likely to be anticipated. Therefore, we take the sample of consumers who have employment observations for five years, from 2012 through 2016,[15] and receive a bonus once a year consistently for those five years. We analyze the effect for the bonuses received during the middle three years in 2013 through 2015. These bonuses are likely to be anticipated.

<Insert Table 8 about here>

Among those consumers with five years of observations, about 63 percent of their bonuses are anticipated based on the above classification. Table 8 shows some summary statistics for those consumers. Compared with the total estimation sample, these consumers have higher incomes, higher credit scores, and a larger bonus size. Still, around 11 percent of the anticipated bonuses are smaller than $500. Furthermore, Panel (B) shows that among these consumers, the likelihood of taking out car loans around the months of receiving a bonus is significantly higher than in other months, and Panel (C) shows that the delinquency rate of these loans is also significantly higher.

To formally test whether auto loan demand changes when consumers receive anticipated bonuses, we use the model in Equation (1) for the subsample of consumers who receive anticipated bonuses. Results are shown in Column 1 of Table 9. The average monthly increase in auto loan demand is 7.1 percent during the three months around receiving the bonus. The total increase compared to the average auto loan origination rate in a regular month is 21.3 percent, rejecting the prediction from the PIH that consumers will not adjust their consumption level when they receive an anticipated income increase.

<Insert Table 9 about here>

We further test the prediction using subsamples with stricter definitions. Regression of Column 2 in the table focus on customers' decisions in 2014 for customers who have received bonuses in 2012 and 2013 and will continue to receive bonuses in 2015 and 2016. For these customers, it is more likely that the received bonus in 2014 is anticipated. The estimated result on this subsasmple is almost identical.[16]

Still, consumers' expectations about bonuses can be shaped by an employer's past practices. For example, consumers may become uncertain about receiving future bonuses if they switch employers. To examine this possibility, Column 3 of Table 9 only focuses on the subset of consumers who stayed at the same company during the five years in the data. For these consumers, it is more likely that a bonus is anticipated. The estimated impact again is significant and close to the previous estimates.

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[15] About 46 percent of consumers in our sample have observations for five years.

[16] We do not include income and its square term in this regression because they remain unchanged in all months in 2014. The income effects are absorbed by the individual fixed effects.

Even though the bonus is anticipated, consumers may get a larger-than-expected bonus. Therefore, the bonus amount may be unanticipated and, consequently, consumers may change their expected income in the future and increase consumption. To test this possibility, in Column 4 we focus on consumers who receive a bonus that is at least 5 percent smaller in size than their bonus last year. If these consumers were to adjust their consumption level with the change in permanent income, they should adjust it downward. However, we find a significant increase in auto loan demand at 0.065 percent (4.5 percent increase per month during the three months around receiving the bonus compared to the average monthly origination, or a total increase of 13.6 percent for the three months).

The overall result with anticipated bonus may still be consistent with PIH if consumers receive bonuses at a similar time as their salaries increase, which represents a permanent income change. We test this explanation by estimating the impact for consumers who receive the same or a smaller salary next year. The result is shown in Column 5. The estimated effect of bonus is still significant and close to the overall result. We also run another regression using the whole sample, as in Column 1, but include the quadratic function of next year's income as additional control variables in the regression. Column 6 of Table 9 shows that the demand effect does not change quantitatively if we control for next year's income.

In summary, contrary to the prediction of PIH, we find that anticipated bonus payments still lead to a significant increase in auto loan demand. This result is robust across consumers with different salary and bonus trajectories.

4.3. Effects under Different Liquidity Constraints

The deviations of our results from the prediction of PIH could be due to the liquidity constraint for consumers. Therefore, we investigate the effect of receiving a bonus for consumers under different possibilities of liquidity constraint. First, consumers with high incomes and high credit scores are less likely to face liquidity constraint. Although Table 7 already demonstrates that the effect is significant across different types of consumers, we run further regressions for each income bracket and control for the fixed effect of each credit score.[17] Columns 1–3 of Table 10 show the effect for consumers in three income brackets. The effect is robust and significant across consumers at all three income-level groups. The average monthly percentage increase for the three months around bonus is 6.3 percent, 6.0 percent, and 9.0 percent for low-, medium-, and high-income consumers (with the total increase at 19 percent, 18 percent, and 27 percent respectively for the three months around bonus). The increase is the largest among high-income consumers who are less likely to face liquidity constraints. We then run different

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[17] These regressions allow the effect of credit score on origination to be different across income groups. Since we have a large data set, we choose this more flexible way by estimating the effect separately for each income group.

regressions for three credit score brackets and use the income and income squared as control variables. Columns 4–6 report the results. The average monthly percentage increase is 7.3 percent for subprime consumers (500,620), 6.3 percent for near prime consumers (620,760) and 7.3 percent for prime consumers (760,850), relative to the average monthly auto loan origination for that group (the total increase for the three months around bonus is 22 percent, 19 percent, and 22 percent respectively for the three groups). The magnitudes of the effects across different credit score groups are similar.

<Insert Table 10 about here>

We then run regression for each unique income bucket and credit group combination. The regression results are shown in Table 11. To better visualize the results, we plot the percentage increase over the average monthly origination rate in Figure 3. High-income but low-credit-score consumers (the third bar from the left of the figure) have the largest increase in auto loan demand around the time they get a bonus. The average monthly percentage increase is 13 percent for the three months around bonus (total increase is 39 percent for the three months together), significantly higher than the other groups. This result seems to indicate that these consumers are under the liquidity constraint as it may be difficult for them to borrow loans; thus, they have to wait until receiving bonuses to purchase a new car.[18] Still, the effect is large and significant for consumers with high incomes and high credit scores (the three bars on the right of the figure) who are least likely to face the liquidity constraint.

<Insert Table 11 about here>

<Insert Figure 3 about here>

Credit card balances and available credit lines provide us another way to assess whether a consumer is likely to be under the liquidity constraint. Two measures are used to represent the liquidity condition: credit utilization, which is measured by the current balance divided by the total credit limit, and available credit line, which is measured by the total credit limit minus the current balance. Both proxies are measured in the month prior to receiving the bonus. Consumers with a low credit utilization and a large available credit line are less likely to face liquidity constraint.

Results are shown in Table 12. Consumers who are less likely to be under liquidity constraints have a significant auto loan demand response when receiving the bonus. For consumers with less than 5 percent of credit card utilization , the average monthly percentage increase is 6.0 percent for the three months around bonus (the total increase is 17.9 percent for the three months together). Similarly, for

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[18] An alternative explanation is that these consumers are more likely to engage in excessive purchases. Consequently, despite the high income, they are likely to get into debt delinquency and thus have a subprime credit score.

consumers with a larger than $30,000 available credit line, the average monthly percentage increase is 5.7 percent (the total increase is 17.0 percent for the three months together).

<Insert Table 12 about here>

A small bonus is unlikely to relax the liquidity constraint for car purchases, especially for individuals with high incomes or high credit scores. However, Table 7 shows that the effect from a small (≤$500) bonus is significant among high-income consumers (>$100k). Similarly, the increase for a small bonus size is also significant for high-credit-score consumers (above 760). An argument for why a small bonus can still help relax the liquidity constraint is that the bonus can pay for the down payment if the auto loan is small enough. To test this explanation, we categorize auto loans into three sizes—large (>$25k), median (between $15k and $25k), and small (≤$15k)—and estimate the effect of receiving a bonus separately. Results are shown in Table 13. Even for a large-size auto loan (>$25k), a small bonus (≤$500) still has a significant effect on the demand.

<Insert Table 13 about here>

4.4. Mental Accounting as an Alternative Mechanism

Overall, we find that the effect of bonus on the demand for auto loans is robust across different types of consumers. Demand for auto loans increases among consumers who are likely to receive anticipated bonus payments, and this result remains significant with a range of robustness checks. We also find that the demand effect is significant even for consumers who have high incomes, prime credit scores, low credit utilization rates, or high available credit lines. Therefore, neither PIH nor liquidity constraints can fully explain our results.

All of the findings we presented above, however, are consistent with the predictions from the mental accounting theory. The theory suggests that by treating bonus as a gain to the current state, consumers are more likely to spend the money to reward themselves upon receiving a bonus, which could trigger the decision to borrow loans. This effect exists for anticipated or unanticipated bonuses. Thus, the results that demand for auto loans will increase for individuals who receive bonus payments in each year are consistent with theory predictions. The theory also suggests that even low-income or low-credit-score individuals may exhibit the same response. According to the theory, however, such decisions may be suboptimal as consumers may lose the big picture of future loan repayments. Consequently, a short-term and small bonus can induce consumers to purchase a car, even though the purchase has to be financed by loans that require substantive monthly payments (about $400 on average) for over five years on average.

5. The Delinquency of Auto Loans

If, as the mental accounting literature suggests, auto loans induced by bonus payments may be a suboptimal decision, there will be a long-term costly consequence on consumers' future finances. In this section, we formally test the potential consequence of the effect of receiving bonus by examining whether the auto loans induced by bonuses result in a higher delinquency rate. We compare the delinquency rate of auto loans originated in the three months around receiving bonus payments with loans that originate in other months, using the following linear probability regression:

$$I(deliquency)_l = \delta \cdot I(bonus - induced)_l + X_l\beta + \xi_y + \epsilon_l \tag{3}$$

where $I(delinquency)_l$ is an indicator variable that equals 1 if loan l has become delinquent within one year after the origination.[19] A loan is delinquent if the consumer has missed a payment for over 60 days (60 DPD). Another measure, 30 days delinquency (30 DPD), is also examined for robustness check. The indicator variable $I(bonus - induced)_l$ is equal to 1 if loan l is originated around the three months of receiving a bonus. Covariate X_l includes an intercept and other control variables that could influence an auto loan's delinquency rate, including the total annual income and its square term; loan characteristics, such as loan amount, loan terms, and interest rate and their square terms; as well as the credit score (representing a consumer's inherent riskiness). To control for the unobserved factors for each geographical market, we also include the fixed effect for each state in X_l. In addition, ξ_y is the year fixed effects to account for time-varying macro shocks. Our main parameter of interest is δ, which represents the difference in delinquency rates of auto loans originated in the three months around receiving the bonus and that in other months. Consistent with the analyses in the previous section, we focus on loans from individuals who have received at most a bonus in each year. Note that the sample here only includes individuals who have taken out at least one car loan from 2013 to 2015.

<Insert Table 14 about here>

Results are shown in the first two columns of Table 14. The likelihood of delinquency for auto loans originated around receiving a bonus is significantly higher. Compare them with the baseline 60 DPD for loans not originated close to receiving a bonus (1.23 percent), the effect represents a 5.75 percent increase. Similarly, compared to the baseline 30 DPD probability (4.60 percent), the effect represents a 5.28 percent increase. These results suggest that auto loans induced by bonus have a significantly higher risk in the long term.

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[19] We focus on the delinquency within one year because we can only follow the repayments for loans originated in the last year of the data (i.e., 2015) for one year.

Since the delinquency decision is a binary variable, we can test the robustness of the results by re-estimating the model for 60 and 30 DPD using a binary logit model. The results are reported in Columns 3 and 4 of Table 14. The magnitude of the coefficients for $I(bonus - induced)_l$ is very close to the counterparts in the linear probability model. The other estimated coefficients are also similar. These suggest that our results are robust under different model specifications.

We further investigate the delinquency across different consumer groups. We start with different income groups. The same regression specification as Equation (3) is run separately for the low-income (below \$50k), medium-income (from \$50k to \$100k), and high-income (above \$100k) consumers. The dependent variables are again 60 DPD and 30 DPD, respectively. Results are shown in Table 15, Panel A.

<center><Insert Table 15 about here></center>

Results show that when high-income (i.e., >\$100k) consumers take out auto loans in the three months around the bonus, the delinquency rate does not significantly change. For consumers with a lower income, however, the delinquency rate is significantly higher for loans originated around receiving a bonus. The increase in 60 DPD is 0.16 percent for the low-income group, which is a 6.1 percent increase compared to the baseline delinquency rate for that group. The increase in 60 DPD is 0.058 percent for the medium-income group, which is 8.2 percent over the baseline. The magnitudes of results are similar for 30 DPD. Overall, we find that consumers with low or medium income are less likely to keep up with the monthly loan payment down the road and thus will suffer the costly consequences of delinquency. To test the robustness of this finding, Panel B shows the results from a binary logit specification. The magnitude of the coefficients for $I(bonus - induced)_l$ is very close to the counterparts in the linear probability model. The other estimated coefficients are also similar.

We then break down our analysis by subprime (500,620), near prime (620,760) and prime (>760) credit scores. Results from the linear probability model are shown in Panel A in Table 16. The increase in delinquency happens primarily in the subprime group, the group of consumers who have been identified to have a high risk for loans. Our results suggest that the risk is even higher if the loans are induced by bonus: the 60 DPD is 0.27 percent, or a 5.7 percent increase, over the average delinquency rate for that group, and the 30 DPD measure is 0.97 percent, or a 6.1 percent increase, over the average delinquency rate for that group. The results from a binary logit specification shown in Panel B are very similar.

<center><Insert Table 16 about here></center>

Finally, we examine the delinquency rate for different sizes of bonus. We group bonuses into three sizes—smaller than \$500, from \$500 to \$2000, and larger than \$2000. Results are shown in Table

17. For loans induced by bonuses less than $500, the increase is 0.192 percent, or 15.4 percent over the average for 60 DPD (Column 1). The increase in delinquency is not significant for loans induced by larger bonuses. Since 30 percent of bonuses are smaller than $500 (Table 2), the economic implication of this effect is substantial. For 30 DPD measure, the increase in delinquency for bonus-induced loans is significant for bonuses of all sizes (Column 2). The results from logit model specification are very similar (Columns 3 and 4).

<Insert Table 17 about here>

Overall, we show that auto loans induced by bonus can lead to higher delinquency. The effect is significant for low-income and low-credit-score individuals. The delinquency rate is also higher for loans induced by a small bonus. High delinquency can be harmful for everyone in the lending market. Credit scores drop sharply when consumers fail to keep up with loan payments, which in turn will have a costly future consequence. Consumers are less likely to get approved for loans and even when approved usually will face a higher interest rate. Under serious loan delinquency (typically, 90–120 days unpaid or underpaid), lenders may repossess and resell the vehicle. Despite the option of repossessing the vehicle, lenders typically will incur a loss from defaulted loans by writing off the uncollectable amount. Our results suggest that financial institutions should take the risk into account if consumers request auto loans in the months close to receive bonuses.

6. Discussion and Conclusion

In this paper, we find a strong correlation between the timing of auto loan origination and receiving bonus payments. The increase in auto loan demand in the months around receiving a bonus is both statistically significant and economically meaningful. Even for a small bonus (<$500), the increase in demand for auto loans is significant. This effect still exists among individuals who have a low income or subprime credit score. Contrary to the predictions from PIH, the effect is significant for bonuses that recur every year and are likely to be anticipated. We also find that the demand for auto loans increases among consumers who have high incomes, high credit scores, low credit card utilization rates, and high available credit lines, suggesting that liquidity constraints cannot fully explain the results. These findings, however, are consistent with the mental accounting theory.

Auto loan decisions could carry long-term consequences. We show that auto loans originating close to receiving a bonus have a higher delinquency rate than loans originating in other months. The delinquency is primarily driven by the already risky consumers, i.e., consumers with a low income or subprime credit score. Furthermore, delinquency is also higher for individuals who only receive a small bonus.

Our findings have important policy implications. We show that receiving a bonus serves as a purchase trigger that significantly increases the demand for auto loans. The result helps financial institutions identify consumers who need auto loans and target those consumers at the right time. On the other hand, if taking out auto loans after receiving a bonus is a suboptimal decision, as the mental accounting theory suggests, this will lead to a higher delinquency rate. For low-income and low-credit-score individuals, financial institutions should take this risk into account. For governments or social planners, a program that helps reduce the purchase trigger from bonuses can be beneficial for these consumers and the corresponding financial institutions. For example, when consumers receive a bonus payment, a financial education or nudge to assist them for better financial decision-making may be useful if it can be offered "just-in-time" (Fernandes et al. 2014).

Bonus compensation is a common practice in the industry; however, not much is known about how it affects consumers' consumption behavior or financial decision-making. Future research should further investigate the impact of bonus payments on other important financial decisions, such as credit card expenses, mortgages, and repayment for previous debts. Moreover, if some of the financial decisions that are triggered by bonus payments lead to future costly consequences, such as loan delinquencies that we documented in this study, they can further influence consumers' future job performance and movements. The data that combines consumer financial decisions and employment records enables future research along this direction. Finally, we expect more research in the future to explore the underlying mechanisms that drive consumers' financial decisions with important long-term consequences. In this study, we show that PIH cannot fully predict why receiving a bonus will increase the demand for auto loans and suggest that the mental accounting theory can help explain the phenomenon. Further tests of the underlying mechanism are necessary to establish the causality. Field or lab experiments conducted in similar empirical environments are essential for achieving this goal.

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Tables and Figures

Table 1

This table shows the descriptive statistics on the number of individuals (Panel A), credit score (Panel B), total income (Panel C), and total annual bonus (Panel D). Column 1 shows the descriptive statistics among the entire sample, which includes both individuals who do not receive bonus compensation and those who do receive bonus compensation. Columns 2 and 3 show the descriptive statistics among two subsamples who receive one bonus a year and multiple bonuses a year respectively. Our main estimation sample consists of individuals who receive one bonus a year.

	Total Sample (1)	One Bonus/Year (2)	Multiple Bonuses/Year (3)
Panel A: Number of Individuals (in millions)			
	22.6	3.9	4.8
Panel B: Credit Score			
Mean	679	696	675
Median	689	716	682
Panel C: Total Income ($)			
Mean	$58,944	$81,082	$63,972
Median	$42,535	$63,635	$44,778
Panel D: Total Annual Bonus ($)			
Mean	-	$7,836	$7,240
Median	-	$1,963	$1,606

Table 2

This table shows the bonus-size descriptive statistics among the estimation sample. Columns 2–4 report the percentage of bonuses smaller than or equal to $500, between $500 and $2000, and larger than $2000. The percentages are further examined among different income groups and credit score groups.

Descriptive Statistics: Bonus Size

	Number of Bonuses (in millions) (1)	Bonus≤$500 (2)	($500,$2000] (3)	>$2000 (4)
Estimation Sample	6.0	30.0%	21.0%	48.9%
By Income Groups				
($10k, $50k]	2.3	57.8%	28.1%	14.1%
($50k, $100k]	1.9	18.8%	25.0%	56.2%
>$100k	1.7	4.9%	6.9%	88.2%
By Credit Score Groups				
(500,620]	1.4	51.5%	24.2%	24.3%
(620,760]	2.5	28.9%	22.5%	48.6%
>760	2.0	16.4%	17.0%	66.6%

Table 3

This table shows descriptive statistics for auto loan characteristics among the estimation sample. Column 1 reports the average auto loan amount. Column 2 reports the average loan terms—the length of the auto loan in number of years. Column 3 reports the average monthly payment, and column 4 shows the average interest rate (APR) for the auto loan. The auto loan characteristics are further examined among different income groups and credit score groups.

Descriptive Statistics: Auto Loan Characteristics

	Loan Amount (1)	Loan Terms (years) (2)	Monthly Payment (3)	Interest Rate (4)
Estimation Sample	$23,136	5.3	$414	5.7%
By Income Groups				
($10k, $50k]	$19,607	5.3	$366	8.1%
($50k, $100k]	$23,288	5.3	$409	5.3%
>$100k	$27,143	5.2	$478	3.5%
By Credit Score Groups				
(500,620]	$20,016	5.3	$405	11.9%
(620,760]	$23,896	5.4	$410	4.8%
>760	$24,185	5.1	$430	2.7%

Table 4

This table shows descriptive statistics for auto loan origination among the estimation sample. Column 1 reports the overall monthly auto loan origination. Column 2 shows the origination percentage among the three months around receiving a bonus, and column 3 shows the origination among months not around receiving a bonus. Column 4 reports the percentage increase, and column 5 shows the p-value from T-tests between columns 2 and 3. The origination percentages are further examined among different income groups and credit score groups.

Descriptive Statistics: Auto Loan Origination

	Monthly Origination (1)	Monthly Origination Around Bonus (2)	Monthly Origination Not Around Bonus (3)	Percentage Increase (4)	P-value (5)
Estimation Sample	1.414%	1.485%	1.391%	6.76%	<0.0001
By Income Groups					
($10k, $50k]	1.271%	1.328%	1.253%	5.99%	<0.0001
($50k, $100k]	1.547%	1.617%	1.525%	6.03%	<0.0001
>$100k	1.457%	1.543%	1.429%	7.98%	<0.0001
By Credit Score Groups					
(500,620]	1.288%	1.374%	1.261%	8.96%	<0.0001
(620,760]	1.684%	1.765%	1.659%	6.39%	<0.0001
>760	1.163%	1.215%	1.146%	6.02%	<0.0001

Table 5

This table shows descriptive statistics for auto loan delinquency among the estimation sample. Two measures of delinquency rate are used: 60 days past due (60 DPD) in Panel A and 30 days past due (30 DPD) in Panel B. We report the overall delinquency rate in column 1, delinquency rate among loans that originated around receiving a bonus in column 2, as well as delinquency rate among loans that did not originate around receiving a bonus in column 3. Column 4 shows the percentage increase, and column 5 shows the p-value from T-tests between columns 2 and 3. The delinquency rates are further examined among different income groups and credit score groups.

Descriptive Statistics: Auto Loan Delinquency

Panel A: 60 DPD (60 days past due)

	Overall Delinquency (1)	Around Bonus (2)	Not Around Bonus (3)	Percentage Increase (4)	P-value (5)
Estimation Sample	1.251%	1.300%	1.234%	5.35%	0.010
By Income Groups					
($10k, $50k]	2.658%	2.797%	2.612%	7.08%	0.004
($50k, $100k]	0.734%	0.804%	0.710%	13.24%	0.005
>$100k	0.202%	0.203%	0.201%	0.99%	0.924
By Credit Score Groups					
(500,620]	4.796%	5.049%	4.710%	7.20%	0.001
(620,760]	0.401%	0.395%	0.403%	-1.99%	0.699
>760	0.033%	0.032%	0.033%	-3.03%	0.914

Panel B: 30 DPD (30 days past due)

	Overall Delinquency (1)	Around Bonus (2)	Not Around Bonus (3)	Percentage Increase (4)	P-value (5)
Estimation Sample	4.661%	4.840%	4.601%	5.19%	0.000
By Income Groups					
($10k, $50k]	8.310%	8.573%	8.224%	4.24%	0.001
($50k, $100k]	3.651%	4.004%	3.530%	13.43%	0.000
>$100k	1.546%	1.635%	1.515%	7.92%	0.022
By Credit Score Groups					
(500,620]	15.870%	16.629%	15.613%	6.51%	<0.001
(620,760]	2.251%	2.309%	2.232%	3.45%	0.108
>760	0.310%	0.290%	0.317%	-8.52%	0.257

Table 6

This table reports the estimates of the increase in auto loan demand when receiving a bonus.

$$I(auto)_{im} = \gamma \cdot I(bonus)_{im} + X_{im}\beta + \epsilon_{im}$$

$I(bonus)_{im}$ is an indicator variable that takes the value of 1 if consumer i receives a bonus in month $m - 1$, m or $m + 1$. γ measures the mean monthly increase in auto loan demand during the three months around receiving a bonus. X_{im} is a vector of control variables that could influence a consumer's auto loan demand, including total income (bonus included) for consumer i and its square term, a vector of year-month fixed effects, and a vector of credit-score fixed effects. Results are shown in column 1. Columns 2–5 show the results of various robustness tests by adding individual fixed effects (column 2), only considering those that receive bonuses in non-prime bonus months (column 3), adding county year-month fixed effects (column 4), and separating the effects for each of the three months (column 5).

Auto Loan Origination & Timing of Bonus

	Dependent Variable:				
	Originate Auto Loan				
	(1)	(2)	(3)	(4)	(5)
3 Months around Bonus	0.00092***	0.00092***	0.00097***	0.00094***	
	(0.00004)	(0.00003)	(0.00006)	(0.00004)	
1 Month before Bonus					0.00058***
					(0.00005)
Bonus Month					0.00130***
					(0.00006)
1 Month after Bonus					0.00083***
					(0.00006)
income	0.00018***	0.00058***	0.00017**	0.00019***	0.00018***
	(0.00003)	(0.00001)	(0.00007)	(0.00003)	(0.00003)
income.sq	-0.000003***	-0.00001***	-0.000002	-0.000003***	-0.000003***
	(0.000001)	(0.0000002)	(0.000002)	(0.000001)	(0.000001)
Year-Month FE	Yes	Yes	Yes	No	Yes
County-Year-Month FE	No	No	No	Yes	No
Credit Score FE	Yes	Yes	Yes	Yes	Yes
State FE	No	Yes	No	No	No
Individual FE	Yes	No	Yes	Yes	Yes
Observations	71,526,172	71,526,172	22,064,384	71,526,172	71,526,172

Note: Cluster-robust standard errors $^*p<0.1; {}^{**}p<0.05; {}^{***}p<0.01$

Table 7

This table reports estimates of the increase in auto loan demand when receiving a bonus of different sizes—≤\$500, \$500–\$2000, and larger than \$2000—in column 1. Columns 2–4 report the increase by three income groups, and columns 5–7 report the increase by three credit score groups.

Auto Loan Origination by Bonus Level and Income & Credit Groups

	Dependent Variable:						
	Originate Auto Loan						
	Whole Sample	By Income Groups			By Credit Score Groups		
		≤\$50k	(\$50k,\$100k]	>\$100k	≤620	(620,760]	>760
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bonus Size: (0,\$500]	0.00043^{***}	0.00051^{***}	0.00025^{*}	0.00069^{**}	0.00060^{***}	0.00035^{***}	0.00032^{**}
	(0.00006)	(0.00007)	(0.00014)	(0.00029)	(0.00009)	(0.00010)	(0.00013)
(\$500,\$2000]	0.00060^{***}	0.00062^{***}	0.00057^{***}	0.00032	0.00081^{***}	0.00035^{**}	0.00005
	(0.00007)	(0.00010)	(0.00012)	(0.00024)	(0.00018)	(0.00016)	(0.00018)
>\$2000	0.00138^{***}	0.00236^{***}	0.00139^{***}	0.00145^{***}	0.00173^{***}	0.00177^{***}	0.00110^{***}
	(0.00005)	(0.00015)	(0.00009)	(0.00007)	(0.00015)	(0.00009)	(0.00007)
income	0.00018^{***}				0.00106^{***}	-0.00001	0.00014^{***}
	(0.00003)				(0.00010)	(0.00005)	(0.00003)
income.sq	-0.000003^{***}				-0.00002^{***}	0.0000003	-0.000002^{***}
	(0.000001)				(0.000003)	(0.000001)	(0.000001)
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes	No	No	No
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,526,172	27,844,729	23,218,999	20,464,512	17,013,368	30,333,121	24,179,683

Note: Cluster-robust standard errors *p<0.1; **p<0.05; ***p<0.01

Table 8

This table shows the descriptive statistics for the sample of consumers who receive anticipated bonuses. We observe employment data for these consumers for five years from 2012–2016, and they receive a bonus every year consistently. Anticipated bonuses represent about 63 percent of bonuses among consumers with five years' employment observation and about a third of all bonuses in the total estimation sample. Consumers who receive anticipated bonuses tend to have higher incomes and receive a larger bonus, but there are about 11 percent of anticipated bonuses that are below $500. Panels B and C show auto loan origination and delinquency among consumers who receive anticipated bonuses for loans originated around bonus (column 2) and not around bonus (column 3). Column 4 of Panels B and C reports the p-value from T-tests between columns 2 and 3.

Panel A: Descriptive Statistics – Anticipated Bonus

	Total Income (1)	Credit Score (2)	Bonus (3)	Bonus ≤$500 (4)
Mean	$108,816	721	$13,029	10.9%
Median	$92,959	744	$6,178	

Panel B: Auto Loan Origination – Anticipated Bonus

	Monthly Origination (1)	Monthly Origination Around Bonus (2)	Monthly Origination Not Around Bonus (3)	P-value (4)
Mean	1.461%	1.540%	1.434%	0.000

Panel C: Auto Loan Delinquency – Anticipated Bonus

	Overall Delinquency (1)	Around Bonus (2)	Not Around Bonus (3)	P-value (4)
60 DPD	0.584%	0.635%	0.565%	0.021
30 DPD	2.986%	3.252%	2.891%	0.000

Table 9

This table reports estimates of the increase in auto loan demand for anticipated bonuses. The main result is in column 1. Columns 2–6 show the results of various robustness checks. Column 2 uses anticipated bonus in 2014 only. Column 3 is for consumers who stayed at the same company only. Column 4 is for consumers whose bonus size is at least 5 percent smaller than that of last year. Column 5 is taken among consumers who get the same or a smaller salary next year. Column 6 adds next year's salary as covariates.

Auto Loan Origination – Anticipated Bonus

	Dependent Variable:					
	Originate Auto Loan					
	(1)	(2)	(3)	(4)	(5)	(6)
3 Months around Bonus	0.00102***	0.00101***	0.00100***	0.00065***	0.00113***	0.00102***
	(0.00007)	(0.00012)	(0.00007)	(0.00010)	(0.00008)	(0.00007)
income	0.00047***		0.00051***	0.00032***	0.00075***	0.00047***
	(0.00005)		(0.00006)	(0.00011)	(0.00010)	(0.00005)
income.sq	-0.00001***		-0.00001***	-0.000005**	-0.00001**	-0.00001***
	(0.000001)		(0.000001)	(0.000002)	(0.000002)	(0.000002)
next year income						0.00103***
						(0.00009)
next year income.sq						-0.00006**
						(0.00003)
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,042,014	8,284,334	22,163,052	10,219,185	14,631,934	24,042,014

Note: Cluster-robust standard errors *p<0.1; **p<0.05; ***p<0.01

Table 10

This table reports estimates of the increase in auto loan demand when receiving a bonus by three income groups (columns 1–3) and by three credit-score groups (columns 4–6).

Auto Loan Origination by Income and Credit Groups

	Dependent Variable:					
	Originate Auto Loan					
	By Income Groups			By Credit Score Groups		
	($10k, $50k]	($50k, $100k]	>$100k	(500,620]	(620,760]	(760,850]
	(1)	(2)	(3)	(4)	(5)	(6)
3 Months around Bonus	0.00080***	0.00095***	0.00131***	0.00095***	0.00107***	0.00087***
	(0.00005)	(0.00007)	(0.00007)	(0.00008)	(0.00006)	(0.00006)
income				0.00098***	-0.000001	0.00014***
				(0.00011)	(0.00005)	(0.00003)
income.sq				-0.00002***	0.0000002	-0.000002***
				(0.000003)	(0.000001)	(0.000001)
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	No	No	No
Observations	27,844,729	23,218,999	20,462,444	14,296,290	30,333,121	24,179,683

Note: Cluster-robust standard errors $^*p<0.1$; $^{**}p<0.05$ $^{***}p<0.01$

Table 11

This table reports estimates of the increase in auto loan demand when receiving a bonus by interacting income and credit score groups.

Auto Loan Origination by Interacting Income and Credit Groups

	Dependent Variable:								
	Originate Auto Loan								
	($10k, $50k]			($50k,$100k]			>$100k		
	(500,620]	(620,760]	>760	(500,620]	(620,760]	>760	(500,620]	(620,760]	>760
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3 Months around Bonus	0.00074***	0.00100***	0.00067***	0.00100***	0.00131***	0.00082***	0.00240***	0.00158***	0.00102***
	(0.00009)	(0.00009)	(0.00012)	(0.00009)	(0.00017)	(0.00010)	(0.00033)	(0.00012)	(0.00008)
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,344,235	11,623,982	4,712,799	3,745,047	10,910,150	8,096,441	1,207,008	7,798,989	11,370,443

Note: Cluster-robust standard errors $^*p<0.1$; $^{**}p<0.05$ $^{***}p<0.01$

Table 12

This table reports estimates of the increase in auto loan demand when receiving a bonus by credit card utilization rate in columns 1–3, as well as by available credit line in columns 4–6. In percentage terms, the total increase in the three months around bonus is 8.89 percent for consumers with larger than 25 percent credit card utilization, 17.59 percent for those with 5 percent, 25 percent utilization and 17.93 percent for those with under 5 percent credit card utilization. For the three available credit-line groups, the percentage increase is 17.34 percent for those with under \$5000 available credit line, 14.61 percent for those \$5000 to \$30,000, and 16.97 percent for larger than \$30,000 available credit line.

Auto Loan Origination by Credit Card Utilization and Available Credit Line

	Dependent Variable:					
	Originate Auto Loan					
	By Credit Card Utilization			By Available Credit Line		
	>=25%	[5%,25%)	<5%	<\$5000	[\$5000,\$30,000)	>=\$30,000
	(1)	(2)	(3)	(4)	(5)	(6)
3 Months around Bonus	0.00048***	0.00089***	0.00071***	0.00079***	0.00070***	0.00079***
	(0.00009)	(0.00008)	(0.00007)	(0.00011)	(0.00009)	(0.00006)
income	0.00023**	0.00007	0.00007	0.00040***	0.00007	0.00011***
	(0.00009)	(0.00007)	(0.00006)	(0.00015)	(0.00008)	(0.00004)
income.sq	-0.000003	-0.000002	-0.000001	-0.00001*	-0.000001	-0.000002**
	(0.000002)	(0.000001)	(0.000001)	(0.000004)	(0.000002)	(0.000001)
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,407,783	14,849,039	16,046,405	7,826,621	12,406,322	23,068,864

Note: Cluster-robust standard errors $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 13

This table reports the effect of receiving different size bonuses on the demand for auto loans with three loan sizes: large (>$25k), median ($15k, 25k], and small (≤$15k).

Auto Loan Origination by Bonus Level & Size of Auto Loan

	Dependent Variable:		
	Large Loan (>$25k)	Median Loan ($15k, $25k]	Small Loan (≤$15k)
	(1)	(2)	(3)
Bonus Size: (0,$500]	0.00015***	0.00016***	0.00012***
	(0.00003)	(0.00004)	(0.00003)
($500,$2000]	0.00021***	0.00030***	0.00009**
	(0.00004)	(0.00005)	(0.00004)
>$2000	0.00072***	0.00052***	0.00014***
	(0.00003)	(0.00003)	(0.00002)
income	0.00012***	0.00002	0.00004***
	(0.00002)	(0.00002)	(0.00001)
income.sq	-0.000002***	-0.0000003	-0.000001***
	(0.0000004)	(0.0000003)	(0.0000002)
Year FE	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes
Observations	71,526,172	71,526,172	71,526,172

Note: Cluster-robust standard errors $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 14

This table reports estimates of the difference in auto loan delinquency rates for auto loans originated close to a bonus and those further away from bonus.

$$I(deliquency)_l = \delta \cdot I(bonus - induced)_l + X_l\beta + \xi_y + \epsilon_l$$

where $I(delinquency)_l = 1$ if loan l has gone delinquent one year after origination. $I(bonus - induced)_l = 1$ if loan l is originated three months around bonus. Columns 1 and 2 report the results of the linear probability model for 60 DPD and 30 DPD. Columns 3 and 4 report the results of the logit model.

Auto Loan Delinquency for Bonus – Induced Auto Loans

	Dependent Variable:			
	Linear Probability Model		*Logit Model*	
	60 DPD	30 DPD	60 DPD	30 DPD
	(1)	(2)	(3)	(4)
3 Months around Bonus	0.00071***	0.00243***	0.00075***	0.00246***
	(0.00025)	(0.00046)	(0.00025)	(0.00045)
loan amount	0.00019***	0.00076***	0.00020***	0.00082***
	(0.00003)	(0.00010)	(0.00002)	(0.00004)
loan amount.sq	-0.000001***	-0.000005***	-0.000001***	-0.00001***
	(0.0000004)	(0.000001)	(0.0000002)	(0.0000004)
loan terms	0.00022	0.00307***	0.00014	0.00293***
	(0.00029)	(0.00070)	(0.00024)	(0.00044)
loan terms.sq	-0.00003	-0.00017***	-0.00003*	-0.00017***
	(0.00002)	(0.00006)	(0.00002)	(0.00003)
interest	0.05854***	0.60282***	0.06108***	0.63631***
	(0.01059)	(0.01783)	(0.00700)	(0.01287)
interest.sq	0.71036***	-0.37471***	0.75969***	-0.33253***
	(0.05280)	(0.08121)	(0.02738)	(0.05031)
income	-0.00112***	-0.00184***	-0.00114***	-0.00184***
	(0.00004)	(0.00007)	(0.00004)	(0.00008)
income.sq	0.00003***	0.00004***	0.00003***	0.00004***
	(0.000001)	(0.000002)	(0.000001)	(0.000002)
Constant			0.09528***	0.21047***
			(0.00114)	(0.00209)
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes
Observations	1,002,397	1,002,397	1,002,397	1,002,397

Note: *p<0.1; **p<0.05; ***p<0.01

Table 15

This table reports estimates of the difference in auto loan delinquency rates for auto loans originated close to a bonus and those further away from bonus by three income groups. Panels A and B present results from the linear probability model and logit model respectively.

Auto Loan Delinquency by Income Groups

	Dependent Variable:					
	60 DPD			30 DPD		
	($10k,$50k]	($50k,$100k]	>$100k	($10k,$50k]	($50k,$100k]	>$100k
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: *Linear Probability Model*						
3 Months around Bonus	0.00159***	0.00058*	-0.00013	0.00291***	0.00360***	0.00051
	(0.00062)	(0.00033)	(0.00018)	(0.00102)	(0.00070)	(0.00050)
loan amount	0.00076***	0.00011*	0.00003***	0.00249***	0.00083***	0.00016***
	(0.00009)	(0.00006)	(0.00001)	(0.00021)	(0.00012)	(0.00003)
loan amount.sq	-0.00001***	-0.0000004	-0.0000001	-0.00003***	-0.00001***	-0.000001*
	(0.000002)	(0.000001)	(0.0000001)	(0.000004)	(0.000002)	(0.0000003)
loan terms	-0.00161	0.00072**	0.00075***	-0.00013	0.00233***	0.00248***
	(0.00098)	(0.00033)	(0.00015)	(0.00130)	(0.00070)	(0.00052)
loan terms.sq	0.00005	-0.00004*	-0.00005***	-0.00005	-0.00011**	-0.00017***
	(0.00009)	(0.00002)	(0.00001)	(0.00011)	(0.00005)	(0.00004)
interest	0.15146***	0.06025***	0.02573*	0.81013***	0.56545***	0.38088***
	(0.01906)	(0.01488)	(0.01355)	(0.03008)	(0.02811)	(0.02959)
interest.sq	0.46480***	0.50399***	0.44936***	-0.95287***	-0.34843**	-0.12120
	(0.08128)	(0.08263)	(0.10945)	(0.12120)	(0.14166)	(0.20935)
Panel B: *Logit Model*						
3 Months around Bonus	0.00172***	0.00062*	-0.00014	0.00304***	0.00356***	0.00047
	(0.00061)	(0.00032)	(0.00019)	(0.00101)	(0.00068)	(0.00050)
loan amount	0.00078***	0.00012***	0.00003***	0.00269***	0.00089***	0.00018***
	(0.00009)	(0.00004)	(0.00001)	(0.00015)	(0.00007)	(0.00003)
loan amount.sq	-0.00001***	-0.000001	-0.0000001	-0.00003***	-0.00001***	-0.000001**
	(0.000001)	(0.000001)	(0.0000001)	(0.000002)	(0.000001)	(0.0000003)
loan terms	-0.00191***	0.00073***	0.00077***	-0.00082	0.00227***	0.00269***
	(0.00070)	(0.00028)	(0.00022)	(0.00116)	(0.00060)	(0.00059)
loan terms.sq	0.00006	-0.00004**	-0.00005***	-0.00004	-0.00011***	-0.00019***
	(0.00006)	(0.00002)	(0.00002)	(0.00010)	(0.00004)	(0.00005)
interest	0.16048***	0.06158***	0.02772***	0.85322***	0.59884***	0.40019***
	(0.01510)	(0.00958)	(0.00679)	(0.02517)	(0.02040)	(0.01822)
interest.sq	0.49345***	0.54735***	0.49513***	-0.94857***	-0.31010***	0.03754
	(0.05532)	(0.04024)	(0.03509)	(0.09220)	(0.08567)	(0.09414)
Constant	0.09563***	0.06665***	0.07245***	0.19244***	0.18236***	0.22654***
	(0.00237)	(0.00161)	(0.00157)	(0.00396)	(0.00344)	(0.00422)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	350,589	356,494	295,314	350,589	356,494	295,314

Note: Cluster-robust standard errors   *p<0.1; **p<0.05; ***p<0.01

Table 16

This table reports estimates of the difference in auto loan delinquency rates for auto loans originated close to a bonus and those further away from bonus by three credit score groups. Panels A and B present results from the linear probability model and logit model respectively.

Auto Loan Delinquency by Credit Groups

	Dependent Variable:					
	60 DPD			30 DPD		
	(500,620]	(620,760]	>760	(500,620]	(620,760]	>760
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: *Linear Probability Model*						
3 Months around Bonus	0.00270***	0.00001	0.000003	0.00972***	0.00088*	-0.00025
	(0.00100)	(0.00020)	(0.00008)	(0.00181)	(0.00048)	(0.00023)
loan amount	0.00132***	0.00011***	-0.000004	0.00494***	0.00048***	-0.00003*
	(0.00013)	(0.00002)	(0.00001)	(0.00026)	(0.00007)	(0.00002)
loan amount.sq	-0.00001***	-0.0000004	0.0000001	-0.00005***	-0.000002**	0.0000002
	(0.000002)	(0.0000003)	(0.0000001)	(0.000004)	(0.000001)	(0.0000002)
loan terms	-0.00333**	0.00061**	0.00021***	-0.00473**	0.00192***	0.00090***
	(0.00159)	(0.00026)	(0.00007)	(0.00215)	(0.00071)	(0.00022)
loan terms.sq	0.00011	-0.00004**	-0.00001**	0.00016	-0.00013**	-0.00006***
	(0.00016)	(0.00002)	(0.00001)	(0.00019)	(0.00006)	(0.00001)
interest	0.26411***	0.09017***	0.00808	1.27963***	0.64383***	0.04434**
	(0.02385)	(0.01135)	(0.01015)	(0.04160)	(0.02083)	(0.01802)
interest.sq	0.27463***	0.34534***	0.21000	-1.73448***	-0.50963***	0.76977***
	(0.09392)	(0.07319)	(0.15115)	(0.15508)	(0.11917)	(0.23353)
income	-0.00513***	-0.00067***	-0.00005***	-0.00882***	-0.00167***	-0.00019***
	(0.00021)	(0.00004)	(0.00001)	(0.00040)	(0.00009)	(0.00004)
income.sq	0.00013***	0.00002***	0.000001***	0.00022***	0.00004***	0.000004***
	(0.00001)	(0.000001)	(0.0000004)	(0.00002)	(0.000002)	(0.000001)
Panel B: *Logit Model*						
3 Months around Bonus	0.00271***	0.00001	0.000002	0.00980***	0.00088*	-0.00026
	(0.00099)	(0.00020)	(0.00008)	(0.00178)	(0.00047)	(0.00024)
loan amount	0.00133***	0.00012***	-0.000002	0.00509***	0.00051***	-0.00003
	(0.00015)	(0.00001)	(0.00001)	(0.00028)	(0.00003)	(0.00002)
loan amount.sq	-0.00001***	-0.0000004***	0.0000001	-0.00005***	-0.000002***	0.0000002
	(0.000002)	(0.0000002)	(0.0000001)	(0.000004)	(0.0000004)	(0.0000002)
loan terms	-0.00357***	0.00060***	0.00021**	-0.00539***	0.00186***	0.00090***
	(0.00114)	(0.00018)	(0.00010)	(0.00205)	(0.00043)	(0.00029)
loan terms.sq	0.00011	-0.00004***	-0.00001*	0.00015	-0.00013***	-0.00006**
	(0.00010)	(0.00001)	(0.00001)	(0.00017)	(0.00003)	(0.00003)
interest	0.27537***	0.09017***	0.00889**	1.30498***	0.64269***	0.04231***
	(0.02256)	(0.00615)	(0.00357)	(0.04072)	(0.01442)	(0.01094)
interest.sq	0.22988***	0.34665***	0.20742***	-1.82435***	-0.49561***	0.77885***
	(0.08080)	(0.03018)	(0.03048)	(0.14583)	(0.07074)	(0.09333)
income	0.00153	0.00086***	-0.00004	-0.00189	0.00179***	0.00018
	(0.00110)	(0.00022)	(0.00009)	(0.00199)	(0.00052)	(0.00026)
income.sq	0.00234**	0.00164***	0.00016**	-0.01014***	0.00320***	0.00080***
	(0.00105)	(0.00022)	(0.00008)	(0.00190)	(0.00050)	(0.00026)
Constant	0.01843***	-0.00308***	-0.00047	0.01139*	-0.01573***	-0.00034
	(0.00323)	(0.00067)	(0.00030)	(0.00583)	(0.00157)	(0.00091)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	192,630	506,649	279,623	192,630	506,649	279,623

Note: Cluster-robust standard errors　　　　　　　　　　　*p<0.1; **p<0.05; ***p<0.01

Table 17

This table reports estimates of difference in auto loan delinquency rates (60 DPD and 30DPD) for bonus-induced loans and other loans for bonuses of different sizes: ≤$500, $500–$2000, and larger than $2000. Columns 1 and 2 use a linear probability model and columns 3 and 4 use a logit model.

Auto Loan Delinquency by Bonus Size

	Dependent Variable:			
	60DPD	30DPD	60DPD	30DPD
	Linear Probability Model		Logit Model	
	(1)	(2)	(3)	(4)
<=500	0.00192***	0.00251**	0.00206***	0.00273***
	(0.00061)	(0.00102)	(0.00044)	(0.00081)
(500,2000]	0.00040	0.00203**	0.00041	0.00202**
	(0.00055)	(0.00099)	(0.00048)	(0.00089)
>2000	0.00023	0.00257***	0.00023	0.00253***
	(0.00022)	(0.00048)	(0.00033)	(0.00060)
loan amount	0.00019***	0.00076***	0.00020***	0.00082***
	(0.00003)	(0.00010)	(0.00002)	(0.00004)
loan amount.sq	-0.000001***	-0.000005***	-0.000001***	-0.00001***
	(0.0000004)	(0.000001)	(0.0000002)	(0.0000004)
loan terms	0.00022	0.00307***	0.00014	0.00293***
	(0.00029)	(0.00071)	(0.00024)	(0.00044)
loan terms.sq	-0.00003	-0.00017***	-0.00003*	-0.00017***
	(0.00002)	(0.00006)	(0.00002)	(0.00003)
interest	0.05844***	0.60277***	0.06097***	0.63622***
	(0.01059)	(0.01784)	(0.00701)	(0.01287)
interest.sq	0.71011***	-0.37444***	0.75942***	-0.33219***
	(0.05281)	(0.08121)	(0.02738)	(0.05032)
income	-0.00110***	-0.00185***	-0.00111***	-0.00184***
	(0.00004)	(0.00008)	(0.00005)	(0.00008)
income.sq	0.00003***	0.00004***	0.00003***	0.00004***
	(0.000001)	(0.000002)	(0.000001)	(0.000002)
Constant			0.09508***	0.21048***
			(0.00114)	(0.00210)
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes
Observations	1,002,175	1,002,175	1,002,175	1,002,175

Note: Cluster-robust standard errors   *p<0.1; **p<0.05; ***p<0.01

Figure 1

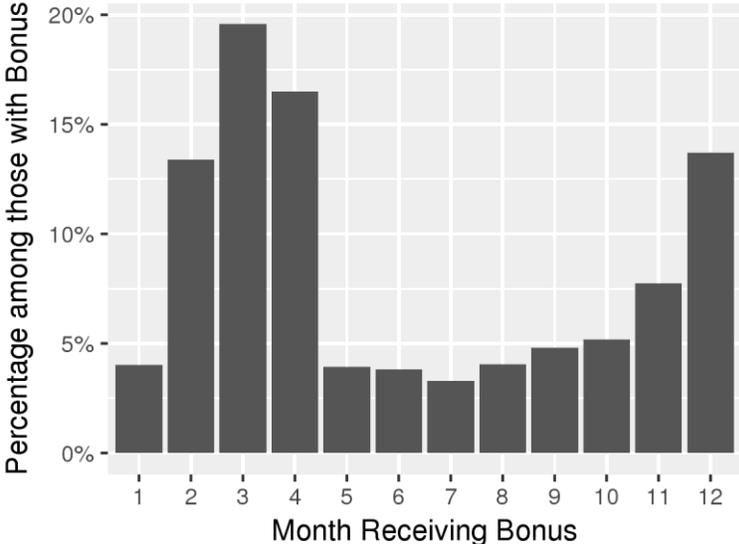Distribution of the Percentage of People Receiving a Bonus Each Month

Figure 2

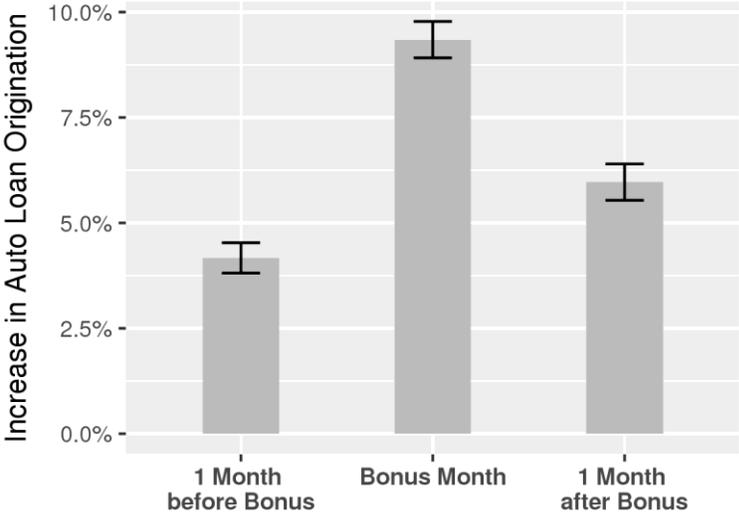Percentage Increase in Auto Loan Origination around Bonus Month

Figure 3

Percentage Increase in Auto Loan Origination around Bonus Month by Income and Credit Group
Interaction