How Does Bonus Payment Affect the Demand for Auto Loans and Their Delinquency?

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Abstract

We study how receiving a lump-sum bonus changes the demand for auto loans and the risk of future delinquency. Unlike traditional consumer products, auto loans have a long-term impact on consumers' financial state because of the monthly payment obligation. Using a large consumer-panel data set of credit and employment information, we find that, after controlling for the income change, receiving a bonus increases auto loan demand by 19.4 percent. These loans, however, are associated with a higher risk; the 60- and 90-day delinquency rates increase by 12.9 and 20.8 percent respectively, after controlling for credit score and income. In contrast, while receiving an increase in base salary also leads to higher demand for auto loans, it does not increase the delinquency rate. Furthermore, we find that delinquency for bonus-induced loans only increases for consumers with lower financial resources. For welfare and policy implications, evidence suggests that the higher delinquency risk is costly for both consumers and financing institutions, but financing institutions have not taken into account the increased risk when setting the loan terms.

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1. Introduction

Bonuses are a common component of employee compensation in the U.S. It is estimated that 63 percent of firms offer annual bonuses to recognize their employees' contribution.[2] After the corporate tax cut in 2017, many companies, such as AT&T and The Home Depot, chose to pay bonuses to their employees with the tax savings.[3] The size of the bonus is significant. Based on data from Equifax, Inc., the average bonus payment was close to $5,000 in 2015, which is equivalent to 6.5 percent of an employee's annual income. Unlike salaries or commissions, which usually are paid monthly, a bonus is a lump-sum payment typically paid once a year.

How does a consumer respond to bonus payments by changing her purchase behavior, and what are the long-term consequences of the purchases? This paper seeks to answer these questions by empirically investigating the impact of bonus on the demand for auto loans and the future delinquency. Buying a car is a big-ticket purchase that very often has to be financed by an auto loan. Since a bonus payment significantly boosts an individual's income, it is not surprising that it may lead to a higher demand for auto loans. On top of the income effect, the payment also reduces liquidity constraints, which can lead to higher consumption (e.g., Johnson et al. 2006, Agarwal et al. 2007). The consumer may also perceive the bonus as a gain from the current wealth state and thus have a higher consumption propensity out of the bonus income (e.g., Epley et al. 2006, Milkman and Beshears 2009, Hastings and Shapiro 2018), which can increase auto loan demand even more. Despite the potential unique impact of bonus and its prevalence, not much work has been done in the marketing and economics literature to understand how it affects consumers' demand for loans. Another unique feature of our study is that demand for auto loans

[2] Society for Human Resource Management. 2018 Employee Benefits: The Evolution of Benefits. https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/Documents/2018%20Employee%20Benefits%20Report.pdf.
[3] CNBC.com. "These Companies Are Paying Bonuses with Their Tax Savings." https://www.cnbc.com/2018/01/26/us-companies-that-have-announced-bonuses-investments-after-tax-cut.html.

differ from demand for traditional goods or services. For the latter, transactions are completed after consumers pay for the product or service. For auto loans, however, future loan repayments can impose a substantial financial burden on consumers, especially for those who have limited resources. The financing decision for a car purchase induced by a current bonus payment therefore can lead to future delinquency, which will have a significant negative consequence for the consumer as well as for the financing institution that provides the auto loan.

Results from our study can have important policy implications. With a $1.28 trillion balance in the first quarter of 2019,[4] auto loans represent the third largest consumer credit market after mortgage and student loans. In the same quarter, however, $39 billion auto loan balance is at least 90 days past due.[5] 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. For consumers, loan delinquency will harm their credit scores, severely limiting their future access to the credit market, apartment rentals, or even job searches. Given the economic significance of the auto loan market, it is important to study how bonuses could impact auto loan demand and delinquency.

In summary, this paper seeks to answer the following two research questions: First, what is the impact of receiving bonus payments on consumers' auto loan demand on top of the income effect? Second, what is the delinquency risk for auto loans that are induced by a bonus?

To answer these research questions, we use a large-scale panel data set, provided by Equifax, Inc., with 2.5 million consumers from over 1,500 employers in the U.S. This novel data

[4] Federal Reserve Bank of New York. Quarterly Report on Household Debt and Credit, 2019: Q1. https://www.newyorkfed.org/medialibrary/interactives/householdcredit/data/pdf/hhdc_2019q1.pdf.
[5] Federal Reserve Bank of New York. https://www.newyorkfed.org/microeconomics/hhdc/background.html.

set contains individual-level information on the time an auto loan originates as well as the monthly loan repayments after the origination. In addition, it provides monthly payroll information, including when a bonus is received and how much it is. The variation in the bonus pay dates across employers allows us to investigate how receiving a bonus influences the propensity to take out an auto loan while controlling for other factors, such as seasonality and the change in annual and monthly income. The difference in the delinquency rate for loans originated when a bonus is received versus loans originated at a different time (without receiving a bonus) helps identify the effect of bonus on delinquency. It is worth noting that the effect is usually difficult to detect since the delinquency rate typically is small. One benefit of using "big data" involving millions of consumers in this study is that we can identify such a rare but impactful event.

Our results show that receiving a bonus increases auto loan demand more than the pure income effect. Compared to the demand in other months, the auto loan origination is 19.4 percent higher after receiving a bonus. However, bonus-induced auto loans are riskier compared to loans not induced by a bonus. The 90-day delinquency rate (i.e., loans that have been three months overdue) is 20.8 percent higher for loans originated in the month a bonus is received than loans originated in other months, and the 60-day delinquency rate is 12.9 percent higher for bonus-induced loans, after controlling for the month fixed effects. Moreover, to identify more severe delinquency events, we define that a loan has true delinquency if the consumer stops making future repayments for at least six months within a certain time period. We find that bonus-induced loans have higher true delinquency rates within one year (or three years) of loan

origination. Although delinquency is very costly for financing institutions,[6] the interest rate is slightly lower for bonus-induced auto loans in our data. These findings suggest that the higher delinquency risk for bonus-induced loans can be costly for both consumers and financing institutions.

To contrast the impact of bonus, we also study how receiving a base salary increase influences loan origination and delinquency, which is different from bonus payment since base salary increases tend to extend into the future. We find that although the increase in base salary leads to a higher demand for auto loans in a magnitude similar to receiving a bonus, the delinquency rate from loans induced by the salary increase is significantly lower. The result suggests that for bonus-induced loans, the increased delinquency may come from consumers who are financially vulnerable. Although the one-time, lump-sum bonus enables these consumers to purchase cars (e.g., by helping to pay the down payment), they will have difficulty keeping up with the monthly loan repayments. To investigate who are financially vulnerable, we further look at the potential heterogeneity in the effects of receiving a bonus. We find that the effect on demand is similar across consumers with different income levels and credit scores. However, receiving a bonus only increases the delinquency rate for consumers with a low income or low credit score. For consumers with different sized bonuses, demand for auto loans increases more among consumers who receive large bonuses, but the increase is still significant among consumers who receive very small bonuses (<$500). The increase in delinquency rate is only significant for those receiving very small bonuses (<$500).

[6] Despite the option of repossessing the vehicles under true delinquency, financing institutions typically will incur a heavy loss from delinquent loans by writing off the uncollectable amount.

To the best of our knowledge, our study is the first to use such large data sets on individual income and auto loan records to document how consumers respond to a one-time bonus with demand for a big-ticket consumer financial product. Most importantly, we identify the long-term consequence of such a consumption decision by documenting a higher delinquency rate for bonus-induced loans. Financial institutions can use our results to identify the time when consumers are likely to need auto loans, as well as consumers who have a higher delinquency risk. Our results suggest that financial institutions should take the additional risk into account if consumers request auto loans in the months close to receiving bonuses. Based on our data, the higher delinquency risk for bonus-induced loans have not been taken into account by financial institutions when pricing the loans.

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 the main findings of how receiving a bonus affects auto loan demand and the delinquency rate. In Section 5, we compare the effects with a base salary increase and also present the heterogeneity of the effects across different types of consumers. Finally, we conclude the paper in Section 6.

2. Literature Review

Since most consumers finance their car purchases, our study of auto loans is related to the empirical works in the marketing literature on factors influencing the demand for automobiles, such as brand names (Sullivan 1998), household characteristics (De Janosi 1959), and prices of own and competitors' products (Sudhir 2001). Our focus is on how the demand is influenced by bonus payment as a form of compensation; therefore, this paper is also related to marketing and economics studies that examine how consumption responds to income changes. Several studies have shown an excess sensitivity of consumption to the change in current income, which is

inconsistent with predictions from the permanent income hypothesis (e.g., Flavin 1981, Parker 1999, Shapiro and Slemrod 2003; see Jappelli and Pistaferri 2010 for a review). The excess sensitivity can be explained by borrowing frictions when consumers face liquidity constraints. However, studies have shown the phenomenon exists for consumers who are unlikely to be subject to such constraints (e.g., Stephens and Unayama 2011). Alternative explanations have been provided, including that consumption is determined by cultural norms—for example, consumers may feel an obligation to spend when they attain certain income levels (Akerlof 2007)—that consumers are present-biased or myopic (Ganong and Noel 2019), and that consumption decisions are made based on heuristic rules (Olafsson and Pagel 2018). We show that when employees receive a bonus payment, there is an additional effect on the demand for auto loans after controlling for the income effect. The key difference of this paper from the above literature is that we study not only the demand for auto loans but also the repayment behavior after transactions. The long-term consequences of consumption decisions have not been documented in the existing literature. The only study similar to our paper is Hankins et al. (2011), who show that winning the lottery only postpones rather than prevents bankruptcy filing.

This paper is also related to the large literature that studies consumer financial decision-making (e.g., Arrow 1965, Friedman 1974, Agarwal et al. 2009). Classical economic models assume that consumers maximize expected utility over a lifetime by making borrowing and saving decisions to smooth the consumption flow. As financing decisions typically are complex, a new stream of literature in marketing and economics examines how 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), become overly optimistic about future usage of credit cards at

adoption (Yang et al. 2007), and underestimate and overspend on exceptional expenses (Sussman and Alter 2012). In this paper, we study the financial decision of borrowing loans for big-ticket durable goods consumption. We document how the decision is associated with receiving a bonus and how it may lead to a long-term negative consequence in the form of a higher delinquency rate.

Various behavioral factors may influence consumer financial decision-making. In particular, the mental accounting literature provides a conceptual framework by predicting a different marginal propensity to consume over different mental accounts (Thaler 1985). 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. Although we cannot pin down the exact mechanism, the findings in this paper are consistent with predictions from the mental accounting theory. We also demonstrate how the loan decision can have a significant impact on a consumer's future financial state. Finally, related to our context, Thaler and Shefrin (1981) suggest that receiving a portion of salary via a bonus will promote savings because, by distributing a lump-sum payment instead of increasing each paycheck, it acts as an external self-control device. Our empirical results, however, show that this may not be the case.

3. Data Description

Our empirical analysis leverages anonymized data on individual credit profiles and employment information, combining different databases operated by multiple business units of Equifax, Inc. Equifax is one of the three major credit bureaus and it provides the largest consumer-reporting database of employment and income in the United States. The employment data in our study comes from the voluntary participation of about 1,500 employers in the U.S. The data is reported to Equifax, Inc. on a payroll-to-payroll basis. It consists of anonymous information on each employee's monthly compensation that is broken down into different components, including base salary, bonus, commission, and overtime pay. The detailed compensation data allows us to know the timing and size of bonuses as well as increases in base pay rate. The credit data contains information on all individuals with a credit history, as all banks are required to report the credit information to the three major credit bureaus. We observe whether these individuals have an auto loan and, if so, the time of the loan origination as well as subsequent monthly repayments. We merge the credit and employment data for individuals for whom we have both employment and credit data in the year 2015, then use the credit data of those individuals from 2016 to 2018 to assess their auto loan repayment behavior. This rich data set allows us to examine the impact of receiving a bonus on auto loan demand as well as the repayment behavior for those loans.

The main analysis in this study focuses on 2.5 million individuals, all of whom received one bonus payment in 2015.[7] Table 1 shows the descriptive statistics for credit score, annual income, bonus size, and base salary increase (with an increase in base pay rate) among these individuals. The average consumer has a credit score of 697 (in a range of 300 to 850) and makes

[7] To identify the effect of receiving a bonus, we exclude individuals who received multiple bonuses in the year. It is difficult to pin down which bonus has the direct effect on the loan origination, since some of the bonuses were paid out in consecutive months.

$73,000 in annual income, with about $4,800 coming from a bonus payment. The bonus payment is economically important for the individuals, as it is about 6.5 percent of the annual income. The distribution of bonus size is heavily right skewed, with a quarter of individuals receiving bonuses smaller than $481. In addition to bonuses, 70 percent of these consumers receive a base salary increase as well. The average salary increase is comparable to the size of the bonus, at about $5,800.

<Insert Table 1 about here>

Table 2 presents summary statistics for auto loans these consumers took out in 2015. The average auto loan amount in our sample is $22,100, with a 5.4 percent interest rate and $410 monthly payment for five years. The average annual payment is about 7 percent of the average annual income in Table 1. However, it is a much larger financial burden among low-income individuals. For example, the $374 monthly payment among individuals with annual incomes of $10,000–$50,000 implies that it takes 9–45 percent of income to pay for the loan. We also report the loan delinquency rate one year after the origination. Following industry practice, "delinquency rate" is defined as the percentage of loans that are 90 days past due (90 DPD). Another measure, 60 days past due (60 DPD), is also examined for robustness check. To measure severe delinquencies, we define true delinquency as when the consumer stops making any additional payments for at least six months. Table 2 shows that delinquency rates are significantly higher for individuals with low credit scores and low incomes.

<Insert Table 2 about here>

To identify the effect of receiving bonus on auto loan origination, it is important to take into account the seasonality of car sales. Demand for auto loans may be higher during certain months—for example, when new car models are released or when car manufacturers run

promotions. Figure 1 shows auto loan origination for each month, which is highest in the summertime and lowest in winter. In addition, it is also important that the individuals in our data receive bonuses at different times of the year. Figure 2 shows the distribution of when bonuses are paid out. There is a wide distribution, with higher percentages falling in February–April, when many employers end their fiscal year for accounting purposes, as well as in December, the end of the calendar year. The identification of the bonus effect comes from the likelihood of taking out an auto loan among individuals who receive a bonus in the month compared to those who do not receive a bonus that month. Without the variation in the timing of bonuses, we cannot separate the bonus effect from the seasonality of car sales.

<Insert Figure 1 about here>

<Insert Figure 2 about here>

4. Effects of Bonus on Auto Loans

In this section, we first document how receiving a bonus payment affects the demand for auto loans, then show how loans originated in the months of receiving a bonus have a higher delinquency risk. We will present various robustness checks of the results. Finally, we will offer some indirect evidence of how delinquency is costly to both consumers and financing institutions.

4.1 Demand for Auto Loans

To quantify the effect of bonus on demand, we evaluate the likelihood of auto loan origination for each consumer in each month. Let $Loan_{im}$ equal 1 if consumer i originates an auto loan in month m and 0 otherwise. Also, let B_{im} equal 1 if consumer i receives a bonus in month m and 0

otherwise. We use a linear probability model to quantify the relationship between the two variables. The effect of receiving a bonus can impact the auto loan decision in the months after because the consumer may take some time to research and shop around. To capture this possibility, we also include variables $B_{i,m-1}$, $B_{i,m-2}$, and $B_{i,m-3}$, denoting whether the consumer receives a bonus in month m-1 to m-3, in the regression analysis. Moreover, customers may know about the bonus before it arrives in their paycheck, so bonuses may have an impact on customers' decisions before individuals receive them. We use $B_{i,m+1}$ to represent that the consumer receives a bonus in month m+1.[8]

The linear probability model is specified as follows: [9]

$$Loan_{im} = \gamma_1 \cdot B_{im} + \gamma_2 \cdot B_{i,m-1} + \gamma_3 \cdot B_{i,m-2} + \gamma_4 \cdot B_{i,m-3} + \gamma_5 \cdot B_{i,m+1} + X_{im}\beta + \epsilon_{im} \quad (1)$$

The main parameters of interest $\gamma_1, \dots, \gamma_5$ measure the increase in auto loan origination during the months around receiving a bonus. In the equation, X_{im} includes the other relevant factors that will affect the demand. Most importantly, we include each consumer's annual income, which includes the amount of the bonus payment, to capture how the bonus will increase her financial resources. This way, we have controlled for the income effect from the bonus on auto loan demand. Therefore, the estimated γ_1 to γ_5 represent the effect of receiving a bonus in addition to the income effect.

Additional variables are included in X_{im} as controls. First, the ability to access the credit market is important when considering the demand for a consumer financial product. For

[8] We have tried to include more lag months in the analysis, but the coefficients become insignificant; hence, we focus on the results that only include months m-1 to m-3. As we will present below, the coefficient for $B_{i,m+1}$ is statistically insignificant; therefore, we do not include more months prior to month m.

[9] We choose this specification instead of other popular nonlinear specifications, such as the logit or probit models, because we need to estimate many fixed effects.

example, lower credit score consumers may need to pay a higher interest rate or search more extensively for lenders when they apply for loans. This could influence their auto loan demand. We include a vector of fixed effects for each credit score in our data to control for this effect. Second, the geographic location of consumers can influence their auto loan demand. We include a list of fixed effects for the state in which the consumer resides to control for the geographic differentiation. Third, there could be seasonality in car sales. For example, car manufacturers may run price promotions during certain months, which has a direct impact on auto loan demand. Therefore, we include year-month fixed effects in Equation (1). The large sample size allows us to include these rich control variables of 610 fixed effects in the main specification. Finally, ϵ_{im} is a stochastic component which, after controlling for all other factors, is assumed to be *i.i.d.* across individuals and months and is exogenous to the time of receiving a bonus.

<Insert Table 3 about here>

Regression results of Equation (1) are shown in column 1 of Table 3. Auto loan demand significantly increases in the month of receiving a bonus by 0.13 percent. This represents a 7.7 percent increase from the 1.71 percent average monthly origination rate. There also are increases of 6.7 percent, 3.5 percent, and 1.5 percent (relative to the average monthly origination rate) one month, two months, and three months after receiving the bonus respectively. The effect on the demand for auto loans in the month before receiving bonus is not significant. Note that these demand effects are net of the income effect from bonus. Assuming the consumer's annual income is at the average level $73,000 (see Table 1) and that she receives an average bonus level $5,000, using the estimated coefficients for income and squared income, we find that the income effect from the bonus will increase her auto loan demand by 4.8 percent. On the top of that, there

is another 19.4 percent increase (relative to the average monthly auto loan origination rate) after receiving the bonus.

To understand the economic significance of this 19.4 percent 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 if an auto company wants to achieve a demand increase of 19.4 percent, it has to run a 22.3 percent price promotion for its vehicles. Furthermore, the paper finds that the income elasticity of new vehicle demand is 1.70. Hence, there has to be an 11.4 percent income increase for consumers to increase the demand by 19.4 percent. These results show that the effect identified here is economically meaningful.

Robustness Checks: To rule out potential confounding factors, we conduct several robustness checks. First, one may be concerned that car sales are higher in months when most consumers receive bonuses and that unobserved time-varying factors may bias our estimation results. As an example, Figure 2 shows that many consumers receive bonuses in February–April and in December. February–April is when many consumers also receive tax refunds from the previous year. Car manufacturers may run price and non-price promotions during those months, which can influence the level of auto loan demand. Such omitted-variable bias has already been controlled by the year-month fixed effects in the regression. We further rule out this alternative explanation by measuring the effect 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 2). The results are in column 2 of Table 3. The estimated coefficient is very close to that in column 1. Thus, we conclude that the effects are not an artifact of the seasonality of auto loan demand.

Second, our result may be biased if there are location-specific and time-varying unobserved factors that drive the correlation between the timing of the bonus and auto loan demand. 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 local supply-side response is not captured by the year-month fixed effects in Equation (1) that are common across geographical locations. To rule out this alternative explanation, we include county and month interaction fixed effects in the regression to allow for different time trends for each county.[10] The results are essentially the same as those in the main specification (see column 3 in Table 3).

Lastly, we assume the income effect of the bonus comes from the increase in annual income. However, the income effect may be driven by just the increase in take-home pay, which changes the available financial resources for consumers in that month. If this is the case, the estimated bonus effect may have been just an income effect for the month in which the bonus was received. To test the robustness of our results, we run another regression that includes the total monthly income (including base pay, bonus, and all other payments, such as overtime or commission). To identify the effects of monthly income from monthly income variation *within individuals*, we also include individual fixed effects in the regression, which rules out the estimated effects coming from variation across consumers. After controlling for total monthly income, we test whether receiving a bonus that month is likely to lead to higher auto loan origination. Results are shown in column 4 of Table 3. As expected, consumers are more likely to get an auto loan during months with higher income. Still, receiving a bonus will increase the

[10] The total number of observations in the regression is smaller because we exclude consumers without county information in the analysis. The number of fixed effects capturing the county-month interaction is 3,853.

auto loan demand beyond just the income effect. The net increase is comparable to the percentages shown in column 1.

4.2 Auto Loan Delinquency

Unlike traditional consumer products, auto loan demand carries inherent monthly payment obligations that extend into the future. In this section, we compare the delinquency rate between bonus-induced loans, i.e., loans originated in the months around receiving a bonus, and loans in other months. Each unit of observation in the analysis is an auto loan. As delinquency is a small-probability event, we increase the sample size in the analysis by using all auto loans originated in 2015, including those by individuals who did not receive a bonus in that year, which differs from the sample in the previous analysis that only includes individuals who received a bonus.

Let $Delinq_l$ equal 1 if loan l is delinquent and 0 otherwise (we will define below). Similar to Equation (1), let $B_{l,m}$ equal 1 if loan l is originated in the same month the consumer receives a bonus and 0 otherwise. We also use $B_{l,m-1}$, $B_{l,m-2}$, and $B_{l,m-3}$ to denote if loan l is originated one to three months after receiving a bonus, and $B_{l,m+1}$ captures if loan l is originated one month before receiving a bonus. Together, these indicator variables denote loans that happen close to receiving a bonus. We again use a linear probability model to quantify the effect of receiving a bonus on the delinquency rate, specified as

$$Delinq_l = \delta_1 \cdot B_{l,m} + \delta_2 \cdot B_{l,m-1} + \delta_3 \cdot B_{l,m-2} + \delta_4 \cdot B_{l,m-3} + \delta_5 \cdot B_{l,m+1} + X_l\beta + \epsilon_l \quad (2)$$

Our main parameters of interest, δ_1 to δ_5, represent the difference in the delinquency rate of likely bonus-induced loans compared to that of other loans. Covariate X_l includes an intercept and other factors that may influence the delinquency. First, the consumer's credit score is an important predictor of the loan delinquency rate. Financial institutions rely heavily on credit

scores to make lending decisions. Since we have far fewer observations in this analysis, we include the linear and quadratic terms of the credit score, instead of fixed effect for every score, in the regression. Second, similar to Equation (1), we include the linear and quadratic terms of the annual income. Third, the characteristics of the auto loan, including the loan amount, loan length, and the annual interest rate, are also used as controls. Fourth, X_l also includes the state fixed effects and the year-month fixed effects (for the month in which the loan originated) to control for the time and geographic differentiation across loans. Finally, to account for any potential systematic difference between individuals who received a bonus and those who did not, we include an indicator variable $has\ bonus$ that equals 1 if the consumer received a bonus in the year and 0 otherwise. After controlling for all of the above factors, the stochastic component ϵ_l is assumed to be *i.i.d.* across loans.

<Insert Table 4 about here>

90-Day Delinquency: We use several different measures for loan delinquency. In the first measure, we follow the industry practice of characterizing loan delinquency by whether the loan has missed payments for over 90 days (i.e., 90 days past due, or 90 DPD). Results are reported in column 1 of Table 4. The 90-day delinquency rate is significantly higher by 0.25 percent for auto loans originated in the same month of receiving a bonus. To put the coefficients in perspective, we compare them with the average 90 DPD for all loans at 1.2 percent. The effect represents a 20.8 percent increase in delinquency for loans originated in the month of receiving the bonus. The delinquency rate is also higher for loans originated one and two months after receiving the bonus, albeit in a smaller magnitude.

One may be concerned that how delinquency behavior correlates with various control variables may be systematically different between individuals who receive a bonus and those who do not. To check the robustness of our results, we use only loans from individuals who have received a bonus. Results are in column 2 of Table 4. The estimated coefficient for the month of receiving a bonus is very close to the previous result. The effects from the two months after receiving a bonus are no longer significant, however, perhaps due to the lack of sample observations.

60-Day Delinquency: Another commonly used measure for loan delinquency is the 60-day delinquency rate (60 DPD). We use it as the target variable and repeat the regression analysis as in Equation (2). Results are in column 3 of Table 4. Similar to the results in column 1, the coefficient for auto loans originated in the month of receiving a bonus is significantly positive (0.22 percent). Relative to the average 60 DPD for all loans at 1.7 percent, this represents a 12.9 percent higher delinquency rate. We repeat the exercise by using loans from individuals with a bonus only. Results are in column 4 of Table 4. Again, the estimated effects on the delinquency rate are very similar to those in column 3.

True Delinquency: After loans become delinquent, consumers can stop making any payments, pay back the overdue amount in full, or make partial payments. In the regression analyses for 90 DPD and 60 DPD, we did not differentiate whether the delinquent loan is repaid later. However, the profit implications for financing institutions can be different. This is because consumers will be charged a substantial fee as penalty for late payments. Thus, delinquent loans that are repaid later can be profitable for the financing institutions, but those institutions will suffer significant loss for loans that are totally defaulted. The implications for consumers can

also be different. If they cannot repay the late payments and fees, their vehicles will be repossessed and they may have to declare bankruptcy to unwind their obligation to pay the loans.

We define a loan as truly delinquent when the consumer stops making any additional payments, which lasts for at least six months in our data. We further explore if bonus-induced loans have a higher chance of true delinquency. We run a similar regression as in Equation (2), where the new dependent variable $Delinq_l$ equals 1 if loan l is truly delinquent within a year of loan origination. In order to obtain a more complete picture of true delinquency, we collect additional loan data from 2017 and 2018 to further check for true delinquency within three years of loan origination. Since true delinquency is a rare event with very low probability, to avoid estimating too many parameters we use an indicator $B_{l,m,m-1}$, which equals 1 if the loan is originated in the month of receiving a bonus or one month after and 0 otherwise, to replace indicators *B's* of different months in the regression. The reason is that from the demand regression analysis (see Table 3), the effects of bonus on auto loans are the strongest in these two months, and are either insignificant or much smaller in magnitude.

Estimated coefficients for $B_{l,m,m-1}$ are reported in the first row of columns 1 and 2 in Table 5. They are both significantly positive. Compared with the baseline, the true delinquency rate is 20.1 percent higher (0.077 percent over the average rate at 0.384 percent) among bonus-induced loans within one year of origination, and 8.6 percent higher (0.137 percent over the average rate at 1.596 percent) within three years of loan origination.

<Insert Table 5 about here>

4.3 Costs of Delinquency

We argue that increased delinquency from bonus-induced auto loans will hurt consumers. Is it possible that for some consumers the cost of delinquency is low and therefore they choose to borrow with the anticipation that the loans will be defaulted in the future? If so, delinquency may not be so bad for them. Rather, the bonus payment allows them to buy cars (e.g., by relaxing their liquidity constraints) and may improve their welfare. While we cannot fully rule out such a counterargument, we find from data that consumers who experience true delinquency often show signs of struggling by repaying missing payments prior to letting the loan become truly delinquent. We calculate for each loan the number of months consumers repay for missing payments, divided by the total number of loan months, then compare the loans that become truly delinquent in the next six months to all other loans. Table 6 shows that the ratio is higher for loans that will be truly delinquent. For example, the first row of that table shows that, in the first six months after the loan origination, only 0.2 percent of all loan months in our data missed payments but are repaid later. For loans that are truly delinquent in the next six months, on average there are 3.4 percent of months that consumers missed payments that they repaid later. Note that late payments are costly because they come with a substantial late fee; still, consumers try hard to repay late payments before they finally cannot afford to make payments. This provides partial evidence suggesting that from the consumer perspective, delinquency is costly and should be avoided.

<Insert Table 6 about here>

We have also argued that delinquency is costly for financing institutions. As partial evidence we run a regression analysis, with the number of missing monthly payments that are not fully repaid at the end of one year after loan origination as the dependent variable and use the indicator of a loan originated in the month of receiving a bonus or the month after as a covariate.

The number of missing payments represents the loss for financing institutions in the first year. Results are reported in column 3 of Table 5. Bonus-induced loans have on average 10.1 percent more missing monthly payments compared to all auto loans in the data (i.e., 0.63 percent divided by 6.2 percent), suggesting that the bonus-induced loans are indeed riskier. We repeat the exercise by measuring the number of missing monthly payments at the end of three years. Column 4 of Table 5 shows that the bonus-induced loans have a 5.4 percent larger number of missing monthly payments (i.e., 1.75 percent divided by 32.66 percent), indicating the result is robust under different time windows.

Although bonus-induced loans carry a higher risk than do other auto loans, one may argue that these loans are not necessarily bad for financing institutions if the risk is taken into account when setting the loan terms. For example, a bank may charge a higher interest rate or limit the amount of borrowing if a loan request comes in the months of receiving a bonus. We explore from data whether the loan terms are systematically different for bonus-induced loans. We run the regression analysis similar to Equation (2), with the loan amount (in $1,000s), loan length (in years), and interest rate (in percentage) as the dependent variables. Results are reported in Table 7. The first row of the table shows that there are no significant differences in loan amount and loan length between bonus-induced loans and other loans. Surprisingly, the interest rate charged for bonus-induced loans on average is significantly lower than that for other loans (see column 3 of Table 7). The magnitude, however, is quite small at 0.087 percent (relative to the 5.4 percent average interest rate). There may be multiple reasons why the interest rates differ. For example, when applying for auto loans, consumers may be required to show income statements, and with the bonus payment that increases the total monthly income, financing institutions may be more willing to charge a lower interest rate. Whatever the reason is, results

from Table 7 suggest that financing institutions have not taken into account the higher delinquency risk of loans that are induced by bonus.

<Insert Table 7 about here>

5. Heterogeneity of the Effects on Auto Loans

We have shown how bonus payments simultaneously increase the demand for auto loans and the delinquency risk. In this section, we further investigate how the effects of bonus payments differ from those of a base salary increase, which implies a different future income pattern. We then investigate how the effects of bonus payments differ across different types of consumers. The objective is to better understand what drives the increased delinquency risk. The empirical results suggest that the underlying reason is the difference in financial resources.

5.1 Heterogeneity from Different Income Sources

A consumer's income increases when a bonus payment is received. The reason that auto loan demand increases beyond what the increase in annual or monthly income would warrant could be that the bonus relaxes the liquidity constraints or that the consumer perceives the income increase as a gain and thus has higher consumption propensity. In such cases, the demand for auto loans should also increase if the consumer receives a raise in her base salary. The pattern of future monthly income, however, will be totally different. A bonus is a one-time payment, and the consumer's future monthly income will drop back to the original level after the bonus. A raise in base salary, however, resets the consumer's future monthly income to the increased level. The effects on loan delinquency from these two income sources therefore can be different.

We first look at how the demand effects of a base salary increase are different from those of a bonus payment. We use a linear probability model, specified as follows:

$$Loan_{im} = \gamma_1 \cdot B_{i,m,m-1} + \gamma_2 \cdot S_{i,m,m-1} + X_{im}\beta + \epsilon_{im} \quad (3)$$

where $B_{i,m,m-1}$ is an indicator variable that equals 1 if consumer i receives a bonus in month $m-1$ or m and 0 otherwise. To capture the effect from a base salary increase, $S_{i,m,m-1}$ is another indicator that equals 1 if consumer i receives an increase in salary in month $m-1$ or m and 0 otherwise. Variables in X_{im} are defined the same as in Equation (1). In particular, we include the annual income level and its quadratic term as controls in the regression.

<Insert Table 8 about here>

Regression results are reported in column 1 of Table 8. When receiving a base salary increase, the demand for auto loans will grow by 0.10 percent, which is very close to the effect from receiving a bonus payment (0.09 percent).[11, 12] We also run another regression in which we control for monthly income. Column 2 of Table 8 shows very similar results. Based on these results, we conclude that receiving either a bonus payment or a base salary increase leads to a similar increase in auto loan demand. Note that these are the net effects after controlling for the level of annual or monthly income.

Next, we test whether the effects from a base salary increase on loan delinquency differ from those from a bonus payment. We run a regression that is similar to Equation (2), specified as follows:

[11] The average increase per month is 5.5 percent with a bonus payment (0.094 percent over the average monthly origination 1.71 percent), so the total increase during the two months around bonus is 11.0 percent. Similarly, the average increase per month is 5.96 percent with a base salary increase (0.102 percent over the average 1.71 percent), so the total increase during the two months around a base salary increase is 11.9 percent.

[12] One concern about the validity of this comparison is that the magnitude of bonus payments can be different from that of salary increases. In our data, the average annualized base salary increase is $5,774 (median at $2,550). It is higher than the average bonus amount at $4,764 (median at $1,782), but the magnitudes are still comparable.

$$Delinq_l = \delta_1 \cdot B_{l,m,m-1} + \delta_2 \cdot S_{l,m,m-1} + X_l\beta + \epsilon_l \quad (4)$$

where $B_{l,m,m-1}$ is an indicator that equals 1 if loan l is originated in the same month or one month after receiving a bonus, and $S_{l,m,m-1}$ is another indicator that equals 1 if loan l is originated in the same month or one month after a base salary increase. The other variables are defined the same as in Equation (2). We use both 90 DPD and 60 DPD for the dependent variable $Delinq_l$.

<Insert Table 9 about here>

Regression results are reported in Table 9. The first row of the table shows that bonus-induced loans have higher 90 DPD and 60 DPD delinquency risks, consistent with the findings in the previous section. In contrast, after controlling for other factors (in particular, the income effect), loans induced by a base salary increase do not have a higher 90 DPD. The effect on the 60 DPD is small and significantly negative.

We repeat the exercise by running a similar regression using true delinquency and the number of monthly payments overdue to banks as the dependent variables. Results are reported in Table 10. Similar to the previous table, the first row of Table 10 shows that the effects from receiving a bonus are significantly positive, while the second row of the table shows that the effects from a base salary increase are insignificant. Overall, the results suggest that while a base salary increase has a positive effect on the demand for auto loans similar to that of bonuses, it has either an insignificant or a negative effect on the delinquency rate. The results highlight the unique effect of a higher delinquency rate for bonus-induced loans. One of the possible reasons is that, unlike the bonus payment, consumers who experience a salary increase will continue to

have higher monthly income in the future. The stability of financial resources is important to alleviate the loan burden in future months.

<Insert Table 10 about here>

5.2 Heterogeneity by Income and Credit Scores

Consumers have different financial resources, depending on their income level. Their credit scores may also play an important role since those with higher credit scores have easier access to other loan sources when they face a delinquency risk. Such information can help financing institutions correctly evaluate the delinquency risk that comes from the bonus-induced auto loans. To investigate the importance of financial resources in alleviating the delinquency risk, we explore the heterogeneous effects from bonus payments on auto loans across consumers with different characteristics.

We start with the demand analysis for consumers from different income brackets by running separate regressions (Equation 1) for each income group. We separate consumers into three income buckets: annual incomes smaller than $50,000, between $50,000 and $100,000, and larger than $100,000. This classification places roughly one-third of the individuals in the data in each bucket. We also control for other covariates that may affect the demand, including credit scores, time, and state fixed effects. Columns 1–3 in Table 11 report the regression results. The demand effect is significant across all three income groups. Relative to the average monthly auto loan origination of each group, the total percentage increase for the two months after bonus is 8.9 percent, 13.7 percent, and 23.3 percent for low- (<$50,000), medium- ($50,000–$100,000), and high-income (>$100,000) consumers.

We then run the analysis for consumers in three different credit score brackets: subprime (smaller than 620), near prime (620–760), and prime (above 760). The classification again amounts to roughly one-third of consumers in the data in each bucket. Columns 4–6 of Table 11 report the regression results. The magnitude of the effects across different credit score groups is similar, with a 13.9 percent increase for subprime consumers, 14.1 percent increase for near-prime consumers, and 13.0 percent increase for prime consumers.

<Insert Table 11 about here>

Next, we investigate the potential heterogeneity in the effects of bonus payments on the delinquency rate. We use the 90 DPD as the dependent variable in the regression.[13] Results are reported in Table 12. Columns 1–3 show that for high-income (>$100,000) consumers, the delinquency rate does not significantly change when they take out loans after receiving a bonus. For consumers with annual incomes lower than $100,000, however, the delinquency rate is significantly higher for bonus-induced loans. In particular, the increase in 90 DPD for the low-income (<$50,000) group is 0.195 percent, which represents a 10.1 percent increase relative to the baseline delinquency rate.

Columns 4–6 in Table 12 show that the increase in delinquency for bonus-induced loans does not occur for prime consumers. However, for consumers who have lower credit scores and have been identified as having a higher risk, the results suggest that the risk is even higher if the loans are induced by bonuses. The 90 DPD increases by 0.303 percent, or 8.4 percent higher than the average delinquency rate for the subprime group. For near-prime consumers, the increase in

[13] Results from using 60 DPD are similar. To save space, we chose not to report the results in this paper.

90 DPD for bonus-induced loans is 0.088 percent, or 21.5 percent higher than the average delinquency rate of this group.

<Insert Table 12 about here>

5.3 Heterogeneous by the Size of Bonus

Finally, there is a wide-ranging distribution in the size of bonuses across consumers. We test how the effects of bonus differ across consumers who receive very small (≤$500), small ($500–$2,000), medium ($2,000–$7,000), and large (>$7,000) bonuses. This classification gives us roughly one-fourth of consumers in the data in each group. The first row of Table 13 shows that the effects of bonus on the demand for auto loans are significantly positive. The demand increase is higher when consumers receive a larger bonus payment. Surprisingly, even for a very small bonus, i.e., less than $500, demand for auto loans will increase by 5.4 percent. Given that the average monthly payment for auto loans is $410 (see Table 2), after the first month of the loan there will be little left for future payments.

<Insert Table 13 about here>

Next, we use regression to investigate how the delinquency rate differs across different sizes of bonus payments. The first row in Table 14 shows that the delinquency risk is only significantly higher among consumers who receive very small bonuses (<$500). Compared with the average delinquency rate of this group, the increase in delinquency for bonus-induced loans is 14.7 percent.

<Insert Table 14 about here>

Overall, the analysis results in this section suggest that the higher delinquency risk from bonus-induced loans is associated with the financial resources a consumer has. Consumers who have a low income, a low credit score, or a small bonus have only limited financial resources. Although the one-time bonus could help enable them to purchase cars (e.g., by paying for the down payment), these consumers are less capable of dealing with the financial burden of future payments of bonus-induced loans, and therefore their loans are more likely to become delinquent. Note that we have controlled for annual income in all regressions. The results suggest an additional delinquency risk among financially constrained consumers that cannot be explained by the income effect.

6. Conclusion

In this paper, we find a significant increase in auto loan demand after consumers receive a bonus payment. These loans, however, have a higher delinquency risk than loans originated in other months. Multiple potential mechanisms could explain the increase in auto loan demand. Based on the permanent income hypothesis (e.g., Modigliani and Brumberg 1955, Friedman 1957), bonus payments increase the lifetime income flow, and thus consumers can increase the consumption flow accordingly. However, we have controlled for annual and monthly income in the regression analysis. Therefore, the additional increase in the demand for auto loans is not driven by the income effect. It is also possible that bonus payments alleviate liquidity constraints for some consumers who are able to afford the down payment with the extra take-home pay from receiving a bonus. Furthermore, the demand increase can also be explained by behavioral factors, such as mental accounting (Thaler 1985). Consumers may perceive bonus payments as a gain to the current state and thus are more likely to spend the money to reward themselves. While we cannot pin down the exact mechanism, we show that there can be a long-term negative

consequence for bonus-induced loans, reflected by the increase in the delinquency rate. We find that consumers who are financially vulnerable, either with low incomes, low credit scores, or small bonus amounts are prone to this risk. In contrast, we show that loans induced by a base salary increase do not have the increased delinquency risk.

Our findings have important managerial and policy implications. We show that receiving a bonus serves as a purchase trigger that significantly increases demand for auto loans. The result can help financial institutions identify consumers who need auto loans and target those consumers at the right time, especially consumers with high incomes and high credit scores who are not associated with the higher delinquency risk. Low-income and low-credit-score individuals still have an increase in demand, but financial institutions should take into account the additional risk, for example, by adjusting the interest rate charged. For public policy makers, a program that helps reduce the purchase trigger of bonuses can be beneficial for those consumers. For example, when consumers receive a bonus payment, financial education or a nudge to assist them with better financial decision-making may be useful if it can be offered "just in time" (Fernandes et al. 2014).

There are several limitations of this research that should be addressed in future studies. First, we focus on the impact of bonus on auto loans. Given the limited knowledge of how bonus affects consumers' financial decision-making and the prevalence of bonuses in practice, future research should further investigate the impact on other important financial decisions, such as credit card purchases, mortgages, and repayment of previous debts. Moreover, if some of the financial decisions triggered by bonus lead to future costly consequences, such as the loan delinquency we document in this study, they can further influence consumers' future job performance and movements. A data set that combines consumer financial decisions and

employment records enables future research along this direction. Finally, we call for more research in the future to explore the underlying mechanisms that drive consumers' financial decision-making. Tests of the underlying mechanism, such as mental accounting, are necessary to establish the causality. Field or lab experiments conducted in similar empirical environments are essential to achieve this goal.

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Tables and Figures

Table 1. Descriptive Statistics

	Mean (1)	25 Percentile (2)	Median (3)	75 Percentile (4)
Credit Score	697	628	716	784
Annual Income	$72,968	$38,248	$64,123	$99,830
Bonus Payment	$4,764	$481	$1,782	$6,250
Base Salary Increase	$5,774	$1,784	$2,550	$4,566

Table 2. Auto Loan Characteristics

	Loan Amount (1)	Loan Length (years) (2)	Monthly Payment (3)	Interest Rate (4)	Delinquency Rate 90 DPD (5)	60 DPD (6)	True Delinquency (7)
Average	$22,137	5.1	$410	5.4%	1.2%	1.7%	0.39%
By Income Groups							
$10–50K	$19,486	5.1	$374	7.7%	1.9%	2.7%	0.62%
$50–100K	$22,594	5.1	$410	4.8%	0.5%	0.8%	0.16%
>$100K	$24,925	4.8	$459	3.1%	0.1%	0.3%	0.04%
By Credit Score Groups							
<620	$20,102	5.2	$415	11.3%	3.6%	5.1%	1.11%
620–760	$22,825	5.1	$406	4.2%	0.4%	0.6%	0.15%
>760	$22,564	4.8	$414	2.4%	0.04%	0.1%	0.02%

Table 3. Increase in Auto Loan Demand with Bonus

	Dependent Variable:			
	Originate Auto Loan			
	(1)	(2)	(3)	(4)
1 Month Before Bonus	0.00003	0.00010	0.00007	-0.00001
	(0.00009)	(0.00012)	(0.00009)	(0.00009)
Bonus Month	0.00132***	0.00124***	0.00132***	0.00099***
	(0.00009)	(0.00013)	(0.00009)	(0.00010)
1 Month After Bonus	0.00114***	0.00093***	0.00116***	0.00107***
	(0.00009)	(0.00011)	(0.00009)	(0.00010)
2 Months After Bonus	0.00062***	0.00054***	0.00064***	0.00061***
	(0.00009)	(0.00010)	(0.00009)	(0.00009)
3 Months After Bonus	0.00025***	0.00037***	0.00026***	0.00029***
	(0.00009)	(0.00011)	(0.00010)	(0.00010)
Annual Income ($1,000)	0.00010***	0.00010***	0.00010***	
	(0.000002)	(0.000002)	(0.000002)	
Annual Income.sq	-0.0000003***	-0.0000003***	-0.0000003***	
	(0.00000)	(0.00000)	(0.00000)	
Monthly Income ($1,000)				0.00005***
				(0.00002)
Monthly Income.sq				0.000001
				(0.0000004)
Month FE	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	No	No
Individual FE	No	No	No	Yes
County-Mon FE	No	No	Yes	No
Observations	30,345,984	22,759,488	30,343,500	30,345,984
R^2	0.00137	0.00139	0.00148	0.07925
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 4. Delinquency for Bonus-Induced Auto Loans

	Dependent Variable:			
	90 DPD		60 DPD	
	(1)	(2)	(3)	(4)
1 Month Before Bonus	0.00072	0.00064	0.00140**	0.00165***
	(0.00051)	(0.00044)	(0.00067)	(0.00059)
Bonus Month	0.00249***	0.00217***	0.00226***	0.00240***
	(0.00050)	(0.00044)	(0.00066)	(0.00060)
1 Month After Bonus	0.00090*	0.00052	0.00113*	0.00098
	(0.00051)	(0.00045)	(0.00068)	(0.00061)
2 Months After Bonus	0.00110**	0.00049	0.00150**	0.00121**
	(0.00050)	(0.00043)	(0.00065)	(0.00059)
3 Months After Bonus	0.00076	0.00046	0.00060	0.00031
	(0.00052)	(0.00045)	(0.00069)	(0.00061)
Has Bonus	-0.00050**		-0.00054**	
	(0.00020)		(0.00026)	
Income ($1,000)	-0.00011***	-0.00015***	-0.00014***	-0.00019***
	(0.000003)	(0.00001)	(0.000004)	(0.00001)
Income.sq	0.0000003***	0.000001***	0.0000004***	0.000001***
	(0.00000)	(0.0000000)	(0.00000)	(0.0000000)
Credit Score	-0.00072***	-0.00062***	-0.00115***	-0.00112***
	(0.00001)	(0.00002)	(0.00001)	(0.00002)
Credit Score.sq	0.000001***	0.0000004***	0.000001***	0.000001***
	(0.00000)	(0.00000)	(0.00000)	(0.0000000)
Loan Amount ($1,000)	0.00027***	0.00019***	0.00040***	0.00033***
	(0.00001)	(0.00003)	(0.00002)	(0.00004)
Loan Amount.sq	-0.000001***	-0.000001***	-0.000003***	-0.000003***
	(0.0000002)	(0.0000004)	(0.0000002)	(0.000001)
Loan Length (year)	-0.00222***	-0.00145***	-0.00026*	0.00071
	(0.00011)	(0.00033)	(0.00015)	(0.00045)
Loan Length.sq	0.00003***	0.00004	-0.00003**	-0.00008**
	(0.00001)	(0.00003)	(0.00001)	(0.00004)
Interest	-0.00802**	-0.03774***	0.12452***	0.08280***
	(0.00370)	(0.00686)	(0.00487)	(0.00930)
Interest.sq	1.03614***	1.03656***	0.89190***	0.92174***
	(0.01449)	(0.02756)	(0.01906)	(0.03733)
Month FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	No	No
Observations	2,355,058	529,001	2,355,058	529,001
R^2	0.04204	0.03809	0.05464	0.05174
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5. True Delinquency and Months of Payments Overdue

	Dependent Variable:			
	True Delinquency (1 year)	True Delinquency (3 years)	Months Overdue (1 year)	Months Overdue (3 years)
	(1)	(2)	(3)	(4)
Bonus-Induced Loans (two months after bonus)	0.00077***	0.00137***	0.00630***	0.01754**
	(0.00021)	(0.00048)	(0.00160)	(0.00766)
Has Bonus	-0.00018*	-0.00053**	-0.00149**	-0.00489
	(0.00010)	(0.00022)	(0.00074)	(0.00352)
Income ($1,000)	-0.00003***	-0.00015***	-0.00046***	-0.00293***
	(0.000002)	(0.000004)	(0.00001)	(0.00006)
Income.sq	0.0000001***	0.0000004***	0.000001***	0.00001***
	(0.00000)	(0.00000)	(0.0000000)	(0.0000002)
Credit Score	-0.00014***	-0.00071***	-0.00330***	-0.01494***
	(0.00001)	(0.00001)	(0.00004)	(0.00018)
Credit Score.sq	0.0000001***	0.0000005***	0.000002***	0.00001***
	(0.00000)	(0.00000)	(0.0000000)	(0.0000001)
Loan Amount ($1,000)	0.00008***	0.00045***	0.00134***	0.00723***
	(0.00001)	(0.00002)	(0.00006)	(0.00027)
Loan Amount.sq	-0.000001***	-0.000004***	-0.00001***	-0.00005***
	(0.0000001)	(0.0000002)	(0.000001)	(0.000003)
Loan Terms (year)	0.00011*	0.00257***	-0.00513***	0.01840***
	(0.00006)	(0.00015)	(0.00049)	(0.00236)
Loan Terms.sq	-0.00001**	-0.00010***	-0.00001	-0.00144***
	(0.000005)	(0.00001)	(0.00004)	(0.00017)
Interest	0.00325	0.16193***	0.24830***	2.90545***
	(0.00208)	(0.00483)	(0.01600)	(0.07664)
Interest.sq	0.31255***	0.85082***	4.01970***	19.40067***
	(0.00816)	(0.01889)	(0.06263)	(0.29999)
Month FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	2,355,058	2,355,058	2,355,058	2,355,058
R^2	0.01164	0.04932	0.05497	0.07884

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

Table 6. Ratio of Late Payments Months Prior to True Delinquency

	All Loans	Loans That Become Truly Delinquent in the Next 6 Months
	(1)	(2)
6 Months	0.00159	0.03365
12 Months	0.00765	0.10582
18 Months	0.01229	0.13533
24 Months	0.01559	0.13942

Table 7. Auto Loan Terms

	Dependent Variable:		
	Loan Amount ($1,000)	Loan Length (year)	Interest Rate
	(1)	(2)	(3)
Bonus-Induced Loans (two months after bonus)	-0.03599	0.00379	-0.00087***
	(0.03320)	(0.00354)	(0.00017)
Has Bonus	-0.36758***	0.04047***	-0.00071***
	(0.01526)	(0.00163)	(0.00008)
Income ($1,000)	0.05763***	-0.00351***	-0.00013***
	(0.00027)	(0.00003)	(0.000001)
Income.sq	-0.00005***	0.000001***	0.0000003***
	(0.000001)	(0.0000001)	(0.00000)
Credit Score	-0.00161**	0.00542***	-0.00185***
	(0.00080)	(0.00009)	(0.000004)
Credit Score.sq	-0.000004***	-0.000003***	0.000001***
	(0.000001)	(0.0000001)	(0.00000)
Loan Amount	5.90988***		0.01150***
	(0.00912)		(0.00005)
Loan Amount.sq	-0.06331***		-0.00019***
	(0.00075)		(0.000004)
Loan Terms		0.09862***	-0.00197***
		(0.00011)	(0.00001)
Loan Terms.sq		-0.00057***	0.00001***
		(0.000001)	(0.0000001)
Interest	-98.66558***	21.69024***	
	(0.32469)	(0.03238)	
Interest.sq	234.25730***	-74.22024***	
	(1.28985)	(0.12963)	
Month FE	Yes	Yes	Yes
State FE	Yes	Yes	No
Observations	2,355,058	2,355,058	2,355,058
R^2	0.41340	0.48592	0.48191
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 8. Auto Loan Demand with Bonus and Salary Increase

	Dependent Variable:	
	Originate Auto Loan	
	(1)	(2)
Two Months After Bonus	0.00094***	0.00078***
	(0.00007)	(0.00007)
Two Months After Salary Increase	0.00102***	0.00089***
	(0.00007)	(0.00007)
Annual Income ($1,000)	0.00010***	
	(0.000002)	
Annual Income.sq	-0.0000003***	
	(0.00000)	
Monthly Income ($1,000)		0.00004**
		(0.00002)
Monthly Income.sq		0.000001
		(0.0000004)
Month FE	Yes	Yes
Credit Score FE	Yes	Yes
State FE	Yes	No
Individual FE	No	Yes
Observations	30,345,984	30,345,984
R^2	0.00138	0.07926
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 9. Delinquency for Loans Induced by Bonus and Salary Increase

	Dependent Variable:	
	90 DPD	60 DPD
	(1)	(2)
Bonus-Induced Loans (two months after bonus)	0.00146***	0.00144***
	(0.00037)	(0.00049)
Base Salary Increase Induced Loans (two months after salary increase)	-0.00006	-0.00043*
	(0.00020)	(0.00026)
Has Bonus	-0.00024	-0.00020
	(0.00017)	(0.00022)
Income ($1,000)	-0.00011***	-0.00014***
	(0.000003)	(0.000004)
Income.sq	0.0000003***	0.0000004***
	(0.00000)	(0.00000)
Credit Score	-0.00072***	-0.00115***
	(0.00001)	(0.00001)
Credit Score.sq	0.000001***	0.000001***
	(0.00000)	(0.00000)
Loan Amount	0.0000003***	0.0000004***
	(0.00000)	(0.0000000)
Loan Amount.sq	-0.00000***	-0.00000***
	(0.00000)	(0.00000)
Loan Length	-0.00018***	-0.00002*
	(0.00001)	(0.00001)
Loan Length.sq	0.0000002***	-0.0000002**
	(0.0000001)	(0.0000001)
Interest	-0.00804**	0.12447***
	(0.00370)	(0.00487)
Interest.sq	1.03616***	0.89201***
	(0.01449)	(0.01906)
Month FE	Yes	Yes
State FE	Yes	Yes
Observations	2,355,058	2,355,058
R^2	0.04203	0.05464
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 10. True Delinquency and Months of Payments Overdue for Loans Induced by Bonus and Salary Increase

	Dependent Variable:			
	True Delinquency (1 year)	True Delinquency (3 years)	Months Overdue (1 year)	Months Overdue (3 years)
	(1)	(2)	(3)	(4)
Bonus-Induced Loans (two months after bonus)	0.00075***	0.00142***	0.00632***	0.01815**
	(0.00021)	(0.00049)	(0.00161)	(0.00770)
Base Salary Increase Induced Loans (two months after salary increase)	0.00013	-0.00023	-0.00008	-0.00304
	(0.00011)	(0.00026)	(0.00086)	(0.00410)
Has Bonus	-0.00018*	-0.00054**	-0.00149**	-0.00491
	(0.00010)	(0.00022)	(0.00074)	(0.00352)
Income	-0.00003***	-0.00015***	-0.00046***	-0.00292***
	(0.000002)	(0.000004)	(0.00001)	(0.00006)
Income.sq	0.0000001***	0.0000004***	0.000001***	0.00001***
	(0.00000)	(0.00000)	(0.0000000)	(0.0000002)
Credit Score	-0.00014***	-0.00071***	-0.00330***	-0.01494***
	(0.00001)	(0.00001)	(0.00004)	(0.00018)
Credit Score.sq	0.0000001***	0.0000005***	0.000002***	0.00001***
	(0.00000)	(0.00000)	(0.0000000)	(0.0000001)
Loan Amount	0.0000001***	0.0000004***	0.000001***	0.00001***
	(0.00000)	(0.0000000)	(0.0000001)	(0.0000003)
Loan Amount.sq	-0.00000***	-0.00000***	-0.00000***	-0.00000***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Loan Terms	0.00001*	0.00021***	-0.00043***	0.00153***
	(0.00001)	(0.00001)	(0.00004)	(0.00020)
Loan Terms.sq	-0.0000001**	-0.000001***	-0.0000001	-0.00001***
	(0.0000000)	(0.0000001)	(0.0000003)	(0.000001)
Interest	0.00326	0.16190***	0.24830***	2.90517***
	(0.00208)	(0.00483)	(0.01600)	(0.07664)
Interest.sq	0.31252***	0.85088***	4.01972***	19.40149***
	(0.00816)	(0.01889)	(0.06263)	(0.30000)
Month FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	2,355,058	2,355,058	2,355,058	2,355,058
R^2	0.01164	0.04932	0.05497	0.07884

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

Table 11. Auto Loan Demand by Income Levels and Credit Scores

	Dependent Variable:					
	Originate Auto Loan					
	By Income Group			By Credit Score Group		
	<$50K	$50–100K	>$100K	<620	620–760	>760
	(1)	(2)	(3)	(4)	(5)	(6)
Two Months After Bonus	0.00070***	0.00124***	0.00204***	0.00117***	0.00140***	0.00088***
	(0.00010)	(0.00011)	(0.00015)	(0.00014)	(0.00011)	(0.00011)
Income ($1,000)	0.00026***	0.00007**	0.00004***	0.00015***	0.00010***	0.00005***
	(0.00002)	(0.00003)	(0.00001)	(0.000004)	(0.000003)	(0.000003)
Income.sq	-0.000002***	-0.0000002	-0.0000001**	-0.000001***	-0.0000003***	-0.0000001***
	(0.0000003)	(0.0000002)	(0.0000000)	(0.0000000)	(0.00000)	(0.00000)
Month 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	11,180,340	11,607,936	7,557,708	7,035,600	13,168,392	10,131,660
R^2	0.00107	0.00139	0.00196	0.00129	0.00094	0.00073

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

Table 12. Delinquency by Income Levels and Credit Scores

	Dependent Variable:					
	90 DPD					
	By Income Group			By Credit Score Group		
	<$50K (1)	$50–100K (2)	>$100K (3)	<620 (4)	620–760 (5)	>760 (6)
Bonus-Induced Loans (two months after bonus)	0.00195**	0.00072*	-0.00009	0.00303**	0.00088***	0.00016
	(0.00080)	(0.00038)	(0.00026)	(0.00133)	(0.00031)	(0.00014)
Has Bonus	-0.00002	-0.00040**	-0.00023*	-0.00063	-0.00018	-0.00008
	(0.00034)	(0.00018)	(0.00013)	(0.00059)	(0.00014)	(0.00006)
Income ($1,000)	-0.00080***	-0.00008	-0.000003	-0.00041***	-0.00006***	-0.00001***
	(0.00005)	(0.00006)	(0.000004)	(0.00001)	(0.000003)	(0.000001)
Income.sq	0.00001***	0.0000003	0.00000	0.000001***	0.0000001***	0.00000***
	(0.000001)	(0.0000004)	(0.00000)	(0.0000001)	(0.00000)	(0.00000)
Credit Score	-0.00078***	-0.00041***	-0.00030***	-0.00088***	-0.00024***	-0.00014
	(0.00001)	(0.00001)	(0.00001)	(0.00007)	(0.00005)	(0.00011)
Credit Score.sq	0.000001***	0.0000003***	0.0000002***	0.000001***	0.0000002***	0.0000001
	(0.00000)	(0.00000)	(0.00000)	(0.0000001)	(0.0000000)	(0.0000001)
Loan Amount ($1,000)	0.00057***	0.00014***	0.00002***	0.00115***	0.00017***	0.00002***
	(0.00003)	(0.00002)	(0.00001)	(0.00007)	(0.00001)	(0.000004)
Loan Amount.sq	-0.000004***	-0.000001***	-0.0000001	-0.00001***	-0.000001***	-0.0000001*
	(0.0000004)	(0.0000003)	(0.0000001)	(0.000001)	(0.0000001)	(0.0000000)
Loan Terms (year)	-0.00455***	-0.00036***	0.00016*	-0.01120***	0.00014	0.00010***
	(0.00025)	(0.00013)	(0.00009)	(0.00066)	(0.00010)	(0.00004)
Loan Terms.sq	0.00010***	-0.000005	-0.00001**	0.00026***	-0.00002***	-0.000004*
	(0.00002)	(0.00001)	(0.00001)	(0.00006)	(0.00001)	(0.000002)
Interest	0.04023***	-0.00813*	-0.01771***	0.11960***	0.02321***	-0.02453***
	(0.00599)	(0.00461)	(0.00426)	(0.01048)	(0.00334)	(0.00223)
Interest.sq	0.93819***	0.73500***	0.62356***	0.69036***	0.62395***	0.75460***
	(0.02254)	(0.01969)	(0.02138)	(0.03741)	(0.01583)	(0.01676)
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,254,103	749,632	351,323	642,164	1,191,442	521,452
R^2	0.04319	0.02368	0.01669	0.03504	0.01188	0.00696

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

Table 13. Auto Loan Demand by the Size of Bonus

	Dependent Variable:			
	Originate Auto Loan			
	<$500	$500–$2,000	$2,000–$7,000	>$7,000
	(1)	(2)	(3)	(4)
Two Months After Bonus	0.00044***	0.00064***	0.00153***	0.00284***
	(0.00012)	(0.00013)	(0.00015)	(0.00016)
Income	0.00015***	0.00010***	0.00007***	0.00004***
	(0.000004)	(0.000004)	(0.000004)	(0.000005)
Income.sq	-0.000001***	-0.0000003***	-0.0000002***	-0.0000001***
	(0.0000000)	(0.0000000)	(0.0000000)	(0.0000000)
Month FE	Yes	Yes	Yes	Yes
Credit Score FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	8,641,632	7,655,892	7,355,316	6,693,144
R^2	0.00125	0.00123	0.00150	0.00191
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 14. Delinquency by the Size of Bonus

	Dependent Variable:			
	90 DPD			
	<$500 (1)	$500–$2,000 (2)	$2,000–$7,000 (3)	>$7,000 (4)
Bonus-Induced Loans (two months after bonus)	0.00256***	-0.00011	0.00016	0.00033
	(0.00089)	(0.00066)	(0.00049)	(0.00032)
Income ($1,000)	-0.00029***	-0.00018***	-0.00007***	-0.00003***
	(0.00003)	(0.00002)	(0.00002)	(0.00001)
Income.sq	0.000001***	0.000001***	0.0000002***	0.0000001***
	(0.0000001)	(0.0000001)	(0.0000001)	(0.0000000)
Credit Score	-0.00074***	-0.00064***	-0.00036***	-0.00030***
	(0.00004)	(0.00003)	(0.00003)	(0.00002)
Credit Score.sq	0.000001***	0.0000004***	0.0000003***	0.0000002***
	(0.0000000)	(0.0000000)	(0.0000000)	(0.0000000)
Loan Amount ($1,000)	0.00050***	0.00029***	0.00004	0.00004**
	(0.00010)	(0.00007)	(0.00005)	(0.00002)
Loan Amount.sq	-0.000004**	-0.000003***	0.0000002	-0.0000002
	(0.000002)	(0.000001)	(0.000001)	(0.0000003)
Loan Terms (year)	-0.00366***	-0.00196***	0.00027	-0.00007
	(0.00110)	(0.00062)	(0.00050)	(0.00029)
Loan Terms.sq	0.00005	0.00011**	-0.00004	-0.00001
	(0.00010)	(0.00005)	(0.00004)	(0.00003)
Interest	-0.01501	-0.00611	-0.04235***	-0.00502
	(0.01736)	(0.01345)	(0.01069)	(0.00759)
Interest.sq	1.09458***	0.76219***	0.92357***	0.61970***
	(0.06547)	(0.05327)	(0.04641)	(0.03801)
Month FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	143,180	133,025	129,645	123,151
R^2	0.04347	0.03061	0.02554	0.01813
Note:				*p<0.1; **p<0.05; ***p<0.01

Figure 1. Distribution of Auto Loan Origination Each Month

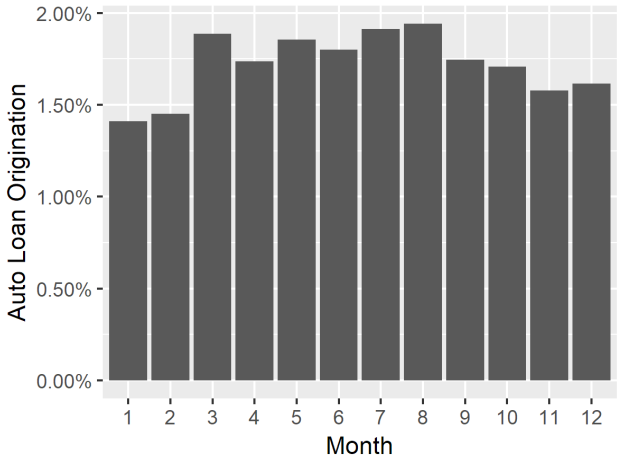

Figure 2. Distribution of the Percentage of People Receiving a Bonus Each Month