The Psychological Cost of Debt: Evidence from Housing Mortgages in Pakistan*

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Abstract

Holding debt imposes both monetary and mental costs on the debtor. How do borrowers prioritize financial versus psychological costs, and what do these choices tell us about the mental burden of debt? In this project, we explore these trade-offs using repayment data for 3,705 borrowers with an Islamic housing mortgage in Pakistan. The product allows borrowers to make early payments that reduce anxiety but often increase the cost of borrowing. Forty percent of borrowers in our sample make early payments, leading to an average cost of PKR 354,155 ($4,132 USD) in additional fees and foregone savings. We develop a new model of consumer hedonics to explain these results, and we rule out religion, demand for commitment devices, and misunderstanding of costs as complete explanations. These findings suggest that the mental burden of debt is high, and that there is a psychological benefit to decreasing debt, even if an account is not closed fully.

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1 Introduction

Holding debt is costly. American consumers spend about $500 billion on interest payments for housing mortgages alone.[1] In lower income countries, reliance on mortgages and other debt contracts is expanding along with the middle class, and interest rates are often above 10% annually. Financial costs, however, are not the only burden of debt. Higher debt is associated with mental costs like anxiety, psychological distress, and depression (Gathergood 2012, Sweet et al. 2013, Richardson et al. 2013). Attending to debt also imposes a "bandwidth tax" on mental resources, which has been shown to reduce cognitive functioning (Mani et al. 2013, Ong et al. 2019). This evidence raises the question of whether psychological costs may sometimes exceed the financial burden of indebtedness.

The twin costs of debt—financial and psychological—often act in tandem to push consumers towards reducing their debt burden, making it difficult to separate their effects. In some contexts, however, financial and psychological costs run in opposite directions. When faced with the option to reduce one cost and increase the other, how do borrowers decide? What can these choices tell us about the unobservable mental cost of debt? In this project, we directly compare financial and psychological costs of debt in a novel field context. We analyze repayment behavior for 3,705 consumers in Pakistan with an Islamic housing mortgage called a *diminishing musharakah*. The product functions similarly to a standard mortgage loan but it contains a special feature that allows borrowers to add "early payments" with each installment that eliminate their debt more quickly. Faster repayment may reduce the anxiety of holding debt, but these early payments also bring additional costs. Borrowers are charged a 3% fee on repaid principal and forego earnings from keeping funds in a high-interest savings account, which often outweighs any savings from reduced interest on the loan.

The *diminishing musharakah* loan is an ideal field setting to study the dual costs of debt because with early payments, borrowers trade monetary losses for psychological gains. With

[1] Estimation based on data for 2019 from the Federal Reserve and Fannie Mae.

other debt products, psychological and financial costs increase or decrease simultaneously, which makes it difficult to separately identify their role in shaping preferences and behavior. In our study, decreasing stress with early payments increases financial costs, allowing us to quantify the mental costs of debt through the amount borrowers are willing to pay for psychological relief. Furthermore, the early payment feature provides a low-friction mechanism for borrowers to express their desire to repay debt early. Many mortgage products allow early payments, but due to high transaction costs, most borrowers only repay early if they are refinancing an entire loan. With the *diminishing musharakah* loan, borrowers can repay as little as one extra month and have no added paperwork, leading to a dynamic measure of desire for early repayment.

In the first part of the paper, we establish four facts about repayment behavior using data from the *diminishing musharakah* sample. In Fact 1, we show that early payments are frequent and sizable. Forty percent of borrowers make at least one early payment over the course of the fifteen year sample period. Since some loans are ongoing, it is likely that a higher proportion of borrowers will make early payments before their loans are complete. On average, early payers make 3.3 early payments totaling 85 months of principal repaid early, so the average early payment includes 25.7 months of principal (called "units"). Early payments can be as small as one unit repaid early, so the variance on payment size is substantial.

In Fact 2, we establish that early payments can be financial costly to consumers. Borrowers who make at least one early payment in the sample lose an average of PKR 354,155 ($4,132 USD) in fees and foregone savings account earnings over the course of their loans. If we convert these costs to months of principal using the average loan size in our sample, early payers lose the equivalent of 17.6 months of principal by making early payments instead of keeping money in savings and paying on the regular schedule. The costs of each payment vary based on prevailing interest rates, but they are highest in the first quarter of loan tenure and lowest in the third quarter. One extra month (one unit) repaid in the first quarter of loan tenure costs early payers an average of PKR 5,967 ($70 USD), while an

equivalent repayment in the third quarter cost PKR \$1,070 (\$12 USD) on average. In Fact 1, we showed that early payers repay 85 units early on average, which leads to the average total cost of PKR 354,155 (\$4,132 USD).

In Fact 3, we show that early payments are more common early in the loan tenure. Among subjects who have fully repaid their loans in our sample period, 66% of early payments are made in the first half of loan tenure (e.g. the first ten years of a 20-year mortgage). This finding is surprising because in Fact 2 we show costs are higher earlier in the loan tenure. While the average cost per unit was nearly six times higher for payments in the first quarter versus the third quarter, almost 60% more early payments were made in the first quarter relative to the third quarter.

In Fact 4, we show that few early payments are made to fully close out a loan. We analyze repayment behavior in the final three years of actual installments and see no spike in payments at the final installment or in the final year. Only 3% of early payments are made within the last three months that a loan account is open, relative to 6% of payments being made in the first three months of a loan. This finding contrasts with prior theories that debt averse behavior is driven by a desire to fully close out accounts, which is explored more closely in subsequent sections (e.g. Amar et al. 2011).

To organize these facts, we develop a model of consumer hedonics around debt repayment. We show that a standard utility model with no debt aversion cannot explain Facts 1 and 2 that early payments are frequent and costly. We next test a model of *debt account aversion* in which holding debt causes stress and subjects can increase utility by fully closing a debt account. This model aligns with prior lab findings that people often willing to pay more in borrowing costs to close out small balance accounts (Amar et al. 2011, Kettle et al. 2016). Debt account aversion is consistent with the existence of costly early payments in Facts 1 and 2 but cannot explain Facts 3 and 4 that most early payments are made early in a loan. We adjust the model to add *debt level aversion* in which people gain utility by proactively paying down debt, regardless of whether the account is closed. This model appears consistent with

all the repayment facts presented.

Using this final model, we identify additional predictions about debt preferences to investigate in our data in order to provide extra support for the model. We supplement these tests with results from a survey of 63 *diminishing musharakah* borrowers from our sample on their perceptions and demand for early payments. We show that as the model predicts, early payers in the survey report high levels of debt-related stress and that early payments bring them positive emotions of relief and pride. Borrowers who self-report making early payments are 24 percentage points more likely to say debt makes them uncomfortable and 20 percentage points more likely to say debt causes them stress relative to non-early payers. Among early payers, 80% say early payments make them feel relieved and 80% say early payments make them feel proud, suggesting positive affective impacts from making early payments.

We also confirm that debt level aversion and debt account aversion are separable effects, as the model predicts. We collect a measure of debt account aversion from our survey sample using a one-period version of the lab game from Amar et al. (2011), which we compare to self-reported early payments. We find that respondents who made early payments are 30 percentage points less likely to prioritize closing the lowest balance accounts, which is the repayment strategy most closely associated with debt account aversion. Early payers are 17 percentage points more likely to prioritize the highest interest account, which technically would allow them to repay debt fastest because they would have more money to allocate to principal payments rather than interest. These findings suggest that debt account aversion in earlier studies may be different than the debt level aversion we observe in our context through early payments, which reflects a desire to reduce the integral on outstanding debt, even when full repayment is years in the future.

Last, the model predicts that early payments will be less frequent in periods when people face lower earnings and liquidity, which is supported by our data. Borrowers with installments due during the last week of the month are 11 percentage points less likely to make

any early payments, and 25 percentage points less likely to make small early repayments of 6 extra months or less. Most borrowers are paid monthly and likely face higher liquidity constraints at the end of the month, so this finding suggests that liquidity concerns lower the rate of early payments. Borrowers also make more payments in early months of the years when salary increases take effect and they are likely to have more cash on hand.

In the final part of the paper, we test several alternate explanations for our repayment facts and find that they cannot fully explain our facts. We show religious pressure is unlikely to drive payments because early payments are less frequent during times of religious salience and early payers in the survey are no more likely to say that debt should be reduced for religious reasons. Similarly, we conclude early payments are not explained by demand for commitment devices because borrowers have more profitable alternatives like term deposit savings accounts that offer higher interest in exchange for multi-year savings commitment. Early payers and non-early payers are also equally likely to say that having excess cash in savings would cause them to spend unnecessarily or give money to friends/family, showing consistent demand for commitment vehicles across groups.

We also find evidence that misunderstanding of costs do not fully explain early payments, though we cannot determine if people have accurately calculated the full cost of these payments. Borrowers appear to be generally aware that early payments entail financial costs because 87% say that early payments are "responsible" even if there is a financial cost to making them. Early payers also express a willingness to accept up to a 6% principal fee on average, which is double the actual fee charged on early payments. We therefore conclude that people are aware of the directionality of financial costs, but we cannot determine definitively that they have accurately calculated the magnitude.

This project contributes to our understanding of the trade-offs between financial and psychological costs of debt in several ways. First, the context allows us to quantify the psychological cost of debt via revealed preference for early debt payments over savings. Other studies have documented that debt appears associated with higher levels of stress,

both in terms of correlation (see Richardson et al. 2013 for a meta-review) and causality (Gathergood 2012, Ong et al. 2019). Without a way to quantify the impact of debt on stress in dollar terms, however, it is difficult to assess how much the rational debtor should pay money to reduce psychological costs, or whether people should prioritize cost minimization above all else in deciding how to repay debt. In our study, early payers chose to forgo over $4,000 USD to repay early, and lower debt-related anxiety appears to be the primary benefit. While the magnitude of this estimate may be impacted by miscalculations in the costs of early payments, the general awareness of financial costs and stated willingness to pay higher fees that we found in our survey show that early payers are consciously choosing to reduce stress through early payments in exchange for a higher cost of borrowing.

This finding highlights the importance of mental costs in the growing literature on optimal debt repayment. Several studies have documented that borrowers often fail to minimize costs when repaying debts (Gathergood et al. 2019, Keys et al. 2016, Ponce et al. 2017, Stango and Zinman 2009). Our study shows that the mental burden of holding debt and mental benefits from repayment can be a contributing factor to repayment strategies that appear sub-optimal. To help consumers optimize their debt repayment and increase overall well-being, it will is critical to account for the weighty psychological impacts of debt and help borrowers adopt strategies that decrease both the mental and financial costs of debt.

Second, our findings expand the conception of debt aversion to include a preference to pay down debt even when an account remains open. Prior studies have shown debt aversion in people's preference to close out small debt accounts rather than minimize borrowing costs (Amar et al. 2011, Besharat et al. 2014, Kettle et al. 2016). Studies typically attribute this behavior to motivational impacts and the desire to achieve a tangible sense of progress towards full debt repayment, although the reduction in transaction costs from reducing open accounts also seems important. We find little evidence of debt account aversion in our setting because few early payments are made to fully close a loan. This divergence with prior literature may arise because borrowers are charged a 3% fee on early payments in our

setting, which may suppress the demand to repay faster when full repayment is proximate. Furthermore, earlier work on debt account aversion analyzes repayment across multiple small loans, while we only observe repayment of one loan that is likely the largest in a consumer's portfolio.

Third, studies on debt repayment have focused largely on credit card debt and other debt accounts that are within a few years of repayment (Gathergood et al. 2019, Ponce et al. 2017). Our study explores long-term debt repayment and captures trends that may not be apparent in short-term liabilities. We find that early payments are most common at the start of the loan, suggesting that the psychological cost of debt might be highest in the early stages of repayment. Our findings are especially pertinent to the study of housing-related debt because loans have a long tenure and psychological forces like the fear of foreclosure or the pride in home ownership are strong and may influence attitudes towards repayment.

The remainder of the paper proceeds as follows. In Section 2, we provide additional details on the loan context, data, and sample. In Section 3, we establish facts from our data on the costs and prevalence of early repayments. In Section 4, we present a model of consumer hedonics to explain these facts. In Section 5, we provide supporting evidence for implications from the model. In Section 6, we rule out alternative explanations for our facts. Section 7 concludes.

2 Data and Context

This section first discusses our primary data sample of *diminishing musharakah* repayments. We provide details about the product and borrowers represented. We detail additional data used for cost estimates and exchange rate calculations. We then discuss the borrower survey.

Data for the project come from 3,705 loans at an Islamic bank in Pakistan. The bank has national coverage, but borrowers with our loan are concentrated in the major cities of Islamabad, Karachi, and Lahore. The sample includes all monthly repayments from

November 2003–June 2018, totaling over 275,000 observations. We observe each loan from the start of repayment, but individual loans in the sample may be ongoing.

All borrowers in the sample have taken a *diminishing musharakah*, which is a popular loan product for housing mortgages in Pakistan and other Islamic countries.[2] In this model, a fixed asset like a house or car is divided into equity units and the initial ownership is divided between units owned by the consumer and units owned by the bank. Each month, the consumer purchases one unit of equity back from the bank, and the bank charges a rental fee on the remaining units it owns. These rental payments operate similar to interest, but the structure allows the bank to capture profits without violating Islamic tenets prohibiting the collection of interest (Obaidullah 2005).[3]

For consumers, the loan's borrowing cost and repayment structure are similar to other non-Islamic interest-bearing loans on the market, with one important caveat: *diminishing musharakah* borrowers can also decide to purchase additional equity units each month to shave months off the end of their loan tenure. While some other loans allow early payments (for example, refinancing a loan or making a large balloon payment), the *diminishing musharakah* model makes it much easier to make these payments on a regular basis. Borrowers need only to state the number of additional units (i.e. months of principal) they wish to purchase upon each repayment and pay a fee equal to 3% of the repaid principal. The low transaction cost to making an early payment leads many borrowers to make one or several early payments over the course of their loan, and these repayments provide an easily quantifiable measure of the desire to reduce one's debt burden.

Descriptive statistics for the sample population are shown in Table 1. The average annual income of borrowers is PKR 5,851,114 ($68,274 USD), which is significantly higher

[2]We use the term "loan" here and throughout the paper to denote money borrowed to finance an asset. We note that this definition diverges from the Islamic finance interpretation, where a "loan" denotes money borrowed on interest without the presence of an asset, which is prohibited. In this context, *diminishing musharakah* is not considered a loan. Nonetheless, we choose to use this term to allow for interpretability for a general audience.

[3]Similar to the prior note, we may refer to rental rates as interest rates in this paper for general interpretability, but they should not be considered interest rates in the Islamic finance sense.

than Pakistan's average income per capita over the sample period of PKR 94,270 ($1,100 USD). Anecdotally, the bank describes the typical customer for this loan as substantially wealthier, more educated, and more urban than the general population of Pakistan.

In addition to the overall sample, Table 1 provides statistics on subjects who do and do not make early payments over the course of the sample period. We assess three subsets of these groups: *All* borrowers, *Scheduled Repaid* borrowers whose original loan contracts were scheduled to end within the sample period, and *All Repaid* borrowers who have fully repaid their loans in the sample period, regardless of when they were expected to complete repayments. Among early payers, the All Repaid group includes the full Scheduled Repaid group in addition to people who completed their loans earlier than expected due to early payments. These Repaid groups are important to later analysis because we can observe repayment behavior throughout the entire loan tenure, whereas the All borrower group includes some loans that remain open at the end of our sample period.

Analysis of observables uncovers few differences between early payers and non-early payers, but suggests that the Scheduled Repaid group diverges from the sample of All Borrowers. In Table 1, early payers and non-early payers in the All groups appear similar along observable characteristics like income, loan size, loan interest rate (determined by credit risk), and contract tenure. Among early payers, borrowers in the Scheduled Repaid group have higher incomes, smaller loans, and shorter contract tenures relative to the sample population. The All Repaid group is more reflective of the All borrower group and includes a larger sample size (762 observations relative to 135 in the Scheduled Repaid group).

To estimate foregone savings income from early payments, we incorporate interest rates on lending and savings accounts provided by the bank. Data on savings interest rates by month were not accessible prior to December 2009 or after December 2016. To estimate interest rates for savings accounts in the early years in our sample, we utilize data on deposit interest rates (excluding zero markup accounts and interbank borrowing) for all private banks, as reported by the State Bank of Pakistan Statistics and Data Warehouse Department. We

calculate the ratio of our bank's rates to average rates for all private banks in Pakistan from December 2009 to December 2016. We then multiply this ratio by average interest rates for all private banks for missing periods to estimate our bank's rate.

Throughout the paper, we apply a fixed conversion rate of 85.7 Pakistan Rupees (PKR) to 1 US Dollar (USD) to allow for consistent conversions between currencies. This conversion reflects the average monthly PKR to USD exchange rate between January 2004 and June 2018 using data from the International Monetary Fund, accessed through the UN Monthly Bulletin of Statistics Online. We note that due to high inflation, the exchange rate at the end of our sample period was much higher (PKR 121 to $1 USD), but we believe using the average rate allows for both consistency and a reliable representation of the costliness of early payments in dollar terms that is more understandable to most readers.

In addition to repayment data, we conducted a survey with a sample of 63 borrowers with a *diminishing musharakah* loan from our bank. The bank provided phone numbers for a convenience sample of 100 current borrowers from one urban location. Research assistants called borrowers on the list to invite them to participate in a short phone survey. Seven additional people completed the survey but are excluded from our analysis because they reported that they had not ever held a *diminishing musharakah* loan. Since 10% of the responding sample (7 out of 70) did not have *diminishing musharakah* loans, we also exclude 10% of the non-respondents to calculate an adjusted response rate of 70% (63 out of 90). To encourage honest responses, the survey was anonymous. Subjects were told that the survey was for academic purposes only and their individual responses would not be shared with the bank. Subjects were not compensated for participating.

3 Results

In this section, we establish key facts about early payment behavior among *diminishing musharakah* borrowers using data from the bank sample.

Fact 1: Early payments are frequent and sizeable: at least 40% of borrowers make early payments, and the average early payer repays 85 months early.

In Panel A of Table 2, we find that 40% of all borrowers make an early payment over the observable period. This figure is likely an underestimate because some borrowers in the sample have a portion of their loan outstanding and may make an early payment before the loan ends. When we restrict to only borrowers were scheduled to fully repay their loans within the sample period, 35% of subjects make early payments. This lower proportion may be due to differences in the sample that was scheduled to repay by June 2018 relative to the overall sample. Borrowers in this "Scheduled Repaid" group had much shorter loan tenures, so may have felt their loan was reasonably close to full repayment without the need for an accelerated timeline.

Table 3 provides additional details about the size and frequency of early payments. Across the full sample, borrowers make 3.3 early payments over the course of their loan and repay 85 extra units early. Each early payment includes an average of 25.7 extra units, which is equivalent to paying off around two years of the loan tenure with one payment. Among early payers who have completely repaid their loans, borrowers make an average of 4.1 early payments and repay 108 units early, which aligns with our prediction that the "All Repaid" sample overweights early payers making large payments. Among early payers scheduled to repay their loans by June 2018, subjects make 2.9 payments and repay 42 units early. This finding also aligns with expectations because the "Scheduled Repaid" group have smaller loans overall and fewer total units to repay.

Fact 2: Early payments can be financially harmful, costing borrowers an average of PKR 354,155 ($4,132 USD) in the sample.

To estimate the financial impact of early payments, we consider three contributing factors for each payment:

1. The fee of 3% of the unit of principal charged for making an early payment.

2. Foregone savings income from repaying principal early rather than keeping capital in a savings account until the end of the loan, using it to make the last month(s)' payment and keeping any accumulated interest income. We assume annual compounding.

3. Reduction in interest (rent) charged on the unit of principal from the time of purchase until the last period of the loan.

The impact of each individual payment will depend on the interest rate on savings and lending at the time of purchase, as well as the months remaining in the loan tenure. To understand conceptually how these factors interact, we first conduct a simulation of early payments made at different times and in different interest rate environments.

In Figure 1, we plot the financial cost to a hypothetical consumer from repaying one month of principal (one "unit") at each month in a 20 year loan tenure. The figure highlights that early payments are most costly early in the loan tenure because the cost of foregone savings is highest when savings income has the most time to compound. At average interest rates, a single extra unit purchased at the start of the loan would result in cost equal to PKR 52,965 ($605) over the course of the loan. In the third quarter of loan tenure, payments are much less costly and may even be financially beneficial under certain interest rates. An extra unit purchased in the 170th month of the loan would result in a gain of PKR 4,306 ($50 USD). Early payments increase in costliness in the fourth quarter because there are few savings on interest (rental) payments but the borrower is still charged the 3% early fee.

With the simulation as a conceptual foundation, we estimate the cost of actual early payments made by borrowers in our sample. We employ the same estimation methodology used in the simulation, but utilize interest rates on savings and lending available at our bank, described more fully in Section 2. In Table 3, we show that the average extra unit purchased

by borrowers in our sample results in a cost of PKR 3,869 ($45 USD). In total, early payers increase their cost of borrowing PKR 354,155 ($4,132 USD) on average by making early payments.

When restricting to only the sample of early payers who were scheduled to repay by June 2018, the average impact of early payments is actually positive. Borrowers save an average of PKR 1,636 ($19 USD) per unit repaid early, or PKR 15,191 ($177) over the course of their loan. Since borrowers in the Scheduled Repaid group had much shorter loan tenures, this finding is not surprising given how the simulation demonstrated that early payments made within 10 years of full repayment are often weakly positive.

In the All Repaid sample, the cost per repaid unit is similar to the full sample: subjects lose PKR 3,365 ($39 USD) per extra unit repaid. Since borrowers in this group likely pay more units on average, the overall cost is higher than the full sample. Subjects in this group increase their borrowing costs by an average of PKR 519,526 ($6,062 USD) by making early payments, relative to keeping funds in savings and repaying on the normal timeline.

To contextualize the size of these payments, we convert them into months of principal using the average loan size for our entire sample. In the full sample, subjects lose about one-fifth of a principal installment for each unit of principal they repurchase early. Over the course of the loan, borrowers lose 17.6 months of principal from early payments, which shows that they could have saved almost a year and a half of principal installments if they had kept money in savings and repaid on a normal schedule.

As highlighted in the simulation, the cost of each payment varies by the time remaining until full repayment, since this will dictate how long funds would have to compound in a savings account. In Figure 2 we display the cost of an average unit purchased by quarter of loan tenure for the full sample. Similar to the simulation, payments are most costly at the beginning of the loan and least costly around the third quarter of loan tenure. The average unit re-purchased in the first quarter costs borrowers an average of PKR 5,967 ($70 USD), while the average unit purchased in the third quarter costs an extra PKR 1,070 ($13 USD).

In the simulation, the third quarter payments had a weakly positive financial impact. The negative average impact in the actual sample is likely due to difference in lending and savings rates when payments were made as well as shorter loan tenures due to early payments. While the simulation analyzed payments in each month of a 20-year loan, the loan tenure of an early payer may end up being much shorter when they repay many units early. In Figure 2, a payment captured in the third quarter average may be made in year 15 of a 20 year loan, or in year 9 if a subject repaid their loan in 12 years. These changes in tenure would impact the cost estimates by affecting the years remaining until full repayment.

We believe these calculations reflect conservative estimates of costs for two reasons. First, our method of calculating foregone savings income (i.e. the opportunity cost of early payments) uses interest rates that are likely lower than those available to consumers. We use interest rates on term deposit savings accounts available through our bank because borrowers would face low transaction costs to open these accounts. It is probable, however, that other savings products in the market offer higher returns. Subjects could also achieve even greater returns by investing funds in the stock market. The opportunity cost of using money for early payments is therefore likely higher than what we calculate here, but since these alternate uses of funds would require additional assumptions about transaction costs and risk tolerance, we prefer to use our more conservative estimate of returns from savings accounts that are immediately accessible to our sample.

Second, our estimates do not account for fees associated with late payments. 430 subjects who made early payments in our sample repaid an installment at least 10 days late at some point in the loan, leading to small fees that may have been avoided by keeping funds in savings to repay on the normal schedule.[4] We do not account for these fees here because we believe these late payments were unexpected and thus these costs did not factor into the decision to make an early payment.

[4]Note that these fees are sometimes waived in practice, but they are stated in the loan contract.

Fact 3: Early payments are more common early in the loan tenure.

In Figure 3, we analyze the distribution of early payments in each quarter of loan tenure. We limit the sample to only subjects who have repaid loans fully in the sample period so we can observe all early payments they make throughout the loan tenure. In Panel A, we show the distribution of payments for this entire fully repaid sample of 736 early payers. The proportion of early payments declines with each quarter of loan tenure. 35% of payments are made in the first quarter relative to 12% in the fourth quarter. In Panel B we restrict to the 136 early payers who were scheduled to fully repay their loan prior to June 2018. The results are broadly similar, though more evenly distributed across quarters: 31% of early payments are made in the first quarter relative to 15% in the fourth quarter.

In Figure 4, we analyze the distribution of total units repaid in each period. The All Repaid sample resembles the distribution of early payments, but the Scheduled Repaid sample skews further to the early quarters in the loan. This finding suggests that in the latter sample, early payments contain more units on average when purchased earlier in the loan tenure.

Fact 4: Few early payments are made to fully close out a loan.

One reason people might seek to repay early is to reduce the stress and transaction costs from making monthly payments. Under this hypothesis, the benefit of early repayment arises only (or at least primarily) upon full repayment. If desire to fully close accounts drives early payments, we would expect to see many early payments made in the final installment, and an increase in early payments as the end of the loan tenure approaches.

In Figure 5, we examine the number of early payments made in each month during the last three years of loan tenure among all subjects who fully repay in the sample period. We find that the rate of early payments declines in the last two years of repayment. There is only a small spike in the final period, which represents payments made to fully close out the

loan. In Table 2 Panel B, we compare early payment rates at the end of the loan to rates during periods earlier in the loan tenure. In the All Repaid sample, early payers are about half as likely to make payments in the last three months relative to payments in the first three months of the loan. 3% of early payments are made in the last three months, relative to 6% in the first three months.

4 Model

In this section, we develop a model of consumer hedonics that attempts to explain the repayment facts established in the prior section. We start with a model that assumes people are not debt averse, but quickly establish that early payments cannot be rationalized under this formulation. We next test a model that includes a parameter of debt account aversion, i.e. a disutility from open debt accounts. We show that this model can explain the existence of early payments, but not the timing we established in Facts 3 and 4. We test a third model that includes a parameter for debt level aversion, i.e. a utility gain from the act of proactive repayment. We show that this model can rationalize all the repayment facts established above.

4.1 Model 1: No Debt Aversion

We begin with a three period model of utility. For simplicity, we assume linear utility, but will explore implications of relaxing this assumption later. In each period, a person starts with income w, which is assumed to be to be spent on consumption if not allocated to repayment. The person makes a regular mortgage payment m in each period, which allows them to fully repay a loan over three periods. Utility is discounted at rate $\delta = [0, 1]$ in each period. Our base case utility in model 1 is:

$$u_1 = w - m + \delta(w - m) + \delta^2(w - m)$$

The person faces the option to make an early payment in period 2, which would enable them to fully repay their loan in period 2. This option carries an additional fee f. The utility with an early payment in model 1 is:

$$u_{1e} = w - m + \delta(w - 2m - f) + \delta^2(w)$$

Under these assumptions, a person would prefer making an early payment to the base case utility if:

$$(-m - f) > \delta(-m)$$

If $f > 0$, i.e. making an early payment is financially costly, it is immediately apparent that under this model, early payments would never be rational. If consumers discount future consumption even slightly, they would never prefer to bring a painful payment forward one period, let alone pay an extra fee to do so. This model therefore cannot explain Fact 1, which showed many early payments made throughout the sample.

4.2 Model 2: Debt Account Aversion

We modify the model by adding debt account aversion, where a person faces rising disutility with each open debt account. For each period where the loan has not been fully repaid, we assume that the subject experiences disutility a. We assume payments are made at the start of the period, so in the period where the person makes a final repayment, they will not suffer a. The base case utility becomes:

$$u_2 = w - m - a + \delta(w - m - a) + \delta^2(w - m)$$

With an early payment, the person experiences utility:

$$u_{2e} = w - m - a + \delta(w - 2m - f) + \delta^2(w)$$

Comparing u_{b2} and u_{e2}, we see the person will prefer making an early payment if:

$$(-m - f) > (-a) + \delta(-m)$$

This formulation captures the notion that early payments may be rational when the disutility of having a debt account open for one more period outweighs the added expense of early payment fees and the disutility of moving an installment forward one period. If we assume the psychological costs of debt are high enough, we can thus reconcile Facts 1 and 2 (high rate of early payments despite financial costs) with Model 2.

In order to explore the timing of early payments in Facts 3 and 4, we must introduce an option for the person to make a one-unit early payment in period 1 instead of period 2. We model the utility with the first period early payment as:

$$u_{2ep1} = w - 2m - a - f + \delta(w - m) + \delta^2(w)$$

A subject will prefer to make an early payment in period 1 instead of period 2 if:

$$-m - f > \delta(-m - f)$$

Making an early payment in period 1 moves a painful payment forward one period without reducing stress from an open account because the loan is still repaid in period 2. Assuming the person is at least somewhat present biased (so $\delta < 1$), they would never choose to make early payments before the last period of the loan. With this model, we cannot explain Fact 3 and 4, which found that few early payments were made in the last quarter or last month of the loan tenure.

4.3 Model 3: Debt Level Aversion

We add to the model by allowing for debt level aversion, i.e. a boost in utility when an early payment is made and debt is reduced, rather than only when the account is closed. We capture this utility shock with parameter l in the period when an an early payment is made. We continue to allow for debt account aversion through parameter a. The base case has no early payments, so u_3 is equivalent to u_2:

$$u_3 = w - m - a + \delta(w - m - a) + \delta^2(w - m)$$

If an early payment is made in period 2, utility will be:

$$u_{3e} = w - m - a + \delta(w - 2m - f + l) + \delta^2(w)$$

In this scenario, a subject will make an early payment if:

$$(-m - f + l) > (-a) + \delta(-m)$$

Here, the person experiences positive utility from making the payment as well as earlier relief from the stress of an open account, making early payments even more favorable. Facts 1 and 2 on the frequency and cost of early payments are thus also consistent with Model 3. To test Fact 3 and 4 on the timing of payments in this new model, we derive utility for an early payment made in period 1:

$$u_{3ep1} = w - 2m - a - f + l + \delta(w - m) + \delta^2(w)$$

The person will prefer making an early payment in period 1 to period 2 if:

$$-m - f + l > \delta(-m - f + l)$$

For this inequality to hold with discounting, it must be the case that $l > m + f$, which is to say that the positive utility from making an early payment outweighs the negative utility of an extra month's principal and associated fees. If this is the case, the person would want to move the early payment forward to period 1. We thus need to assume that the positive utility from making an early payment is high in order for the model to align with Facts 3 and 4.

4.4 Implications

Though our model of debt level aversion seems consistent with the basic facts established in the prior section, it generates several implications that warrant further exploration and testing:

Implication 1: The utility increase from repaying early must be high.
The model suggests that people are driven to make early payments by both stress relief upon full repayment and the positive psychological from the act of paying early. These impacts must outweigh the extra financial costs and the pain of moving a payment forward, suggesting they must be sizable.

Implication 2: Debt level aversion is a separate preference from debt account aversion.
In the model, the parameters for debt account aversion and debt level aversion are fully separable, meaning a person could experience a high value for one and not the other. For example, a person could find debt stressful and thus be account averse, but not find enjoyment from the act of making an early payment, leading them to either not repay early or only make early payments at the end of their loan.

Implication 3: Early payments will be less frequent in periods when income is lower.
While this implication does not apply under linear utility, if we modify our assumptions to

make utility a concave function of total disposable income each period, it is apparent that extra payments will be less frequent in periods when income is lower.

5 Supporting Evidence

In this section, we provide supporting evidence for the model implications described in Section 4. Where possible, we conduct analyses using the repayment data. We also reference prior literature and incorporate evidence from a small survey of borrowers on their subjective perceptions of debt and early payments.

Implication 1: The utility increase from repaying early must be high.

To explore the relation between early payments and psychological effects, we ask our survey respondents a variety of questions about their perceptions of the mental impacts of debt and early payments. In Table 6, we show that 87% of early payers agree that debt causes stress relative to 67% of non-early payers. 100% of early payers say that debt makes them uncomfortable, relative to 76% of non-early payers. The high rate of agreement across both groups show that debt causes stress and discomfort a large majority of borrowers, and the higher proportion of agreement among early payers shows a positive correlation between negative psychological impacts of debt and demand for early payment.

Prior research also supports the idea that debt is stressful for many borrowers. In a quasi-experimental study of debt holders in Singapore, closing a debt account was associated with an 11% reduction in the likelihood of anxiety (Ong et al. 2019). Over-indebted individuals in particular have worse psychological outcomes, with causality appearing to run in both directions (Gathergood 2012). Collectively, this evidence suggests that the disutility of debt parameter a in our model is likely to be large for many subjects.

To assess the magnitude of debt level aversion, we ask respondents whether early payments are associated with positive psychological impacts like pride and relief. We find 80%

of early payers say repaying early makes them proud, relative to 70% of non-early payers. The connection here between debt repayment and pride may be especially strong because the *diminishing musharakah* loans are used as housing mortgages, and home ownership may be more important to borrowers than owning other assets. 80% of early payers say repaying early would make them relieved, relative to 88% of non-early payers. Evidently, most borrowers believe that there are positive psychological impacts from repaying debt early, supporting a positive value for parameter l in the model. We don't find agreement to be tied strongly to whether a respondent has made an early payment in the past, suggesting that perceived positive effects of early payments may not be the main determinant of who makes an early payment and who does not.

Implication 2: Debt level aversion is a separate preference from debt account aversion.

In the modeling section, we argue that debt account aversion alone cannot explain the repayment behavior we observe, specifically the timing of most early payments in the loan tenure. To reconcile the model with our repayment facts, we introduce a parameter for debt level aversion, i.e. a utility gain from the act of repaying proactively. This formulation, however, requires additional testing to understand whether debt account aversion (as captured in prior studies) and debt level aversion are separable preferences and which factor appears most related to the decision to make early payments.

To compare our results with earlier studies more directly, we measure debt account aversion using a one period version of the debt management game from Amar et al. (2011) and compare it to self-reported experience with early payments. We present our survey sample of *diminishing musharakah* borrowers with six debt accounts with varying balances and interest rates, which mirror the accounts in Amar et al. (2011) but presented as PKR instead of USD. As in Round 1 of the debt management game, we tell subjects they have PKR 5,000 to spend on debt repayment this month. We ask how they would choose to allocate it across the accounts. By design, the amount is large enough to close off the smallest balance

account but would only pay down a fraction of the account charging the highest interest. The subject must choose between paying off a small account (perhaps maximizing satisfaction or motivation) or paying off the highest interest account (minimizing cost) or selecting an alternate strategy (such as paying off a fraction of all accounts).

In Table 4, we analyze the strategies of subjects in our survey and compare them to self-reported early repayment behavior. We find that 40% of subjects choose to close out the smallest account, compared to 12% of subjects in Round 1 of Amar et al. (2011). Respondents who reported that they had made an early payment on their *diminishing musharakah* loan were 31% less likely to take this approach, significant at the 0.01 level. Conversely, early payers in the sample were 17% more likely than non-early payers to allocate the full PKR 5,000 to the account with highest interest, though this result was not significant. Minimizing costs by paying down high interest loans would allow subjects to repay debt fastest by leaving more money for principal repayment instead of interest. In this way, the strategy preferred by early payers seems to align with the impact of early payments in that they demonstrate a preference for speedy repayment.

These findings suggest that debt account aversion in earlier studies may be distinct from the debt aversion we observe in our context through early payments, which supports the representation of debt level aversion as a separate parameter. It is important to note, however, that our study does not negate the findings of prior research on the importance of debt account aversion. In our context, subjects are charged a 3% fee on early payments, which was highly salient to borrowers we interviewed and may suppress early payments at the end of a loan when full relief seems proximate. Furthermore, prior studies have examined repayment across several open accounts and found evidence of debt account aversion in people's preference to close small accounts first. In our study, we cannot see if borrowers have additional debt accounts outside of a housing loan, which is likely their highest balance account. We therefore would not expect to observe debt level aversion as captured by other studies. Our findings thus do not suggest that debt account aversion does not exist, but rather that a

broader conception of debt aversion is needed to capture a preference for paying down debt even when the account remains open.

Implication 3: Early payments will be less frequent in periods when income is lower.

Liquid resources are required to make an early payment, so availability of these funds may help explain who makes early payments and when these payments are made. If short-term liquidity appears highly predictive of early payments, it is possible that the demand for repaying early is higher than it appears in the data because some borrowers would want to repay faster but lack the capital to do so. Unfortunately, we lack access to savings account information to know whether non-early payers possess the cash resources for early payments but choose not to make them. We can, however, analyze the aggregate rate of early payments during times when borrowers are likely to have more or less cash on hand to get a general sense of the importance of short-term liquidity for predicting early payments.

We first analyze how the rate of early payments vary depending on the timing of monthly installments. The day in the month when installments are due depends on the day that each individual begins using the property tied to their loan.[5] Due to unexpected delays in the legal processes to purchase a house, there is wide variation between when the loan is approved and when possession occurs (from one day to several months), so we argue that installment dates are assigned quasi-randomly. Borrowers can then make payments at any point in the month preceding their due date, but in practice most repay in the week leading up to the due date. The quasi-exogenous assignment of installment dates is important because it may impact a user's liquidity at the time of payment. Prior research has found that financial shortfalls are more frequent when there is a greater timing mismatch between receiving income and making expenditures (Baugh and Wang 2018). Conversely, households spend more following increases in liquid holdings (Olafsson and Pagel 2018). Most subjects in our sample are paid on the first of the month, so people with installment dates towards the end of the month

[5]Note that this feature is somewhat unique to the musharakah loan model. In a standard mortgage loan, installments are typically due on the first of the month from when the sale closes.

will likely have less cash to spare when their payments are made.

In Table 7, we predict early payments using the week in the month when installments are made. In Column 1, we find that a payment is 0.2 percentage points (11%) less likely to include an early payment if the installment is due in the last week of the month (from day 22 onwards), significant at the 0.01 level. Payments are not significantly more or less likely in any other week of the month. To better understand this finding, we predict different size payments in Columns 2-3. We find the coefficient on fourth week is only significant when predicting "small" early payments of six months or less, which represents the bottom 25th percentile of early payments in terms of extra units purchased. This finding supports the idea that early payments are influenced by short-term liquidity at the time of payment, since liquid resources equivalent to more than six months of principal may not vary from the first to the fourth week of the month.

We also test whether early payments are more common in months when liquidity is likely to be higher for many borrowers. In Table 8, we predict early payments by month of year and find that payments are most frequent in January-April. January is the most common times for workers to receive raises, which can be substantial in Pakistan's high inflation environment. Between 2004 and 2018, Pakistan averaged 8.8% annual inflation, so workers whose pay mirrors inflation might expect substantial nominal raises. Since expenses are unlikely to grow as discretely, borrowers are likely more cash flush soon after receiving a raise. The monthly frequencies of early payments thus support the idea that early payments are more likely when short-term liquidity is higher.

These analyses provide suggestive evidence that liquid resources are an important precondition to early payments. Because we cannot analyze short-term liquidity at the individual level, it is impossible to say whether cash constraints prevent non-early payers from expressing a similar underlying preference for faster repayment.

6 Alternative Explanations

In this section, we explore alternative explanations for our repayment facts. We rely on tests with the repayment data where possible, in addition to findings from the borrower survey.

6.1 Religion

Given the religious framing of the *diminishing musharakah* product as well as the broader importance of religion in Pakistan, it is important to test whether religious pressure explains the high rate of early payment. We investigate the impact of religion in our data by examining the rate of early payments during two periods of religious salience: the holy month of Ramadan and the month leading up to Hajj, the pilgrimage to Mecca that all Muslims are expected to make at least once in their lifetimes. Ramadan is the most sacred month in the Islamic calendar, and a period where religious observance is likely to be highest (Ahmad et al. 2012). Approximately 97% of Pakistanis are Muslim (Hussain n.d.), so virtually all borrowers in our sample would identify as Muslim and observe Ramadan. We note that liquidity during this period may be lower due to celebratory expenditure, but if early payments are motivated primarily by religious sentiment, we would still expect to see a higher rate of payments made during this month. Hajj is observed by relatively fewer Muslims each year, but participants are specifically directed to clear their debts before the pilgrimage begins. We therefore examine early payments made in the month leading up to the start of Hajj.

In Table 5, we report the results of OLS and logit regressions for whether a monthly repayment includes an early repayment, predicted on whether a payment occurs during Ramadan or during the month before Hajj. Off a baseline of 1.8% of installments having early payments, we find that payments are 0.5 percentage points (28%) less likely to include an early payment during Ramadan and 0.2 percentage points (11%) less likely in the month before Hajj. The logit results confirm the directionality and significance of these findings. Importantly, the timing of Ramadan and Hajj are based on the Islamic lunar calendar,

which is 10-11 days shorter than the civil calendar. This divergence means that the timing of these events cycle through the calendar year, so these findings are unlikely to represent seasonal trends in payments. In addition to testing whether religion explains the timing of early payments, we also explore whether differences in religious identity correlates with who makes early payments. While all people in our sample are likely to identify as Muslim, they may differ in their degree of observance and interpretation of religious directives around debt. In our small survey sample, we ask borrowers whether they agree with the statement that "People should avoid debt for religious reasons." In Table 6, we do not find a meaningful difference in agreement based on early payment experience: 57% of early payers agree with this statement, compared to 55% of non-early payers.

From this suggestive evidence, we cannot conclude that religion is not an important factor in influencing debt repayment. In interviews, we often found that Islamic rules about debt were top of mind for borrowers and influenced overall attitudes towards loans and repayment. These beliefs, however, have little power to explain who makes early payments and when these payments occur.

6.2 Commitment Savings

The high rate of early payments established in Fact 1 may be driven by a desire to protect earnings from one's own superfluous spending, which prior research has referred to as sophisticated present bias (O'Donoghue and Rabin 1999). Rather than keeping cash accessible where they might be tempted to spend it unnecessarily, people may prefer to place it in a restricted account (sometimes called a commitment savings account) that would charge them a penalty for accessing the funds too soon. In field tests of these accounts in the Philippines, around 30% of clients preferred commitment savings to a standard savings account (Ashraf et al. 2006). This preference was correlated with to lab-based measures of present bias. Demand for commitment devices may also be driven by concerns that excess cash may be subject to "kinship taxation" by friends and family who might ask to borrow it (Goldberg

2017, Squires 2017). Some borrowers may view debt repayment as an even more restricted form of commitment savings because funds used to repay loans early can only be reclaimed by taking out a new loan.

To test whether demand for commitment savings explains our early payment facts, we first explore the availability of alternative commitment savings options for borrowers in our sample. If borrowers have easy access to profitable, restricted accounts, they would be unlikely to incur the costs documented in Fact 2 in order to use early payments as a commitment savings vehicle. We visit the websites of the five largest banks in Pakistan and find that all offer "term deposit" accounts that makes withdrawals more costly. Users commit to keeping money in these accounts for a designated period and are typically charged a fee and/or receive less interest (called "profit") earnings if they withdraw early, which provides the commitment device that prevents users from using funds for gratuitous purposes. At the bank providing our data on *diminishing musharakah* loans, people receive 3.3 percentage points higher interest earnings on average with a term deposit commitment of 5 years. As part of their loan disbursal, all loan recipients are automatically given a basic savings account which they can easily convert to a term deposit account, so the transaction costs to opening a commitment savings account is low. If borrowers have a strong desire to protect savings from their future selves or others, it would be much more profitable for them to keep money in a fixed deposit account until the end of their loan rather than using that money to make an early payment. In our small survey, we also test whether agreement with statements tied to commitment savings correlates with self-reported early payments. We find that few respondents believe they would be tempted spend savings unnecessarily and that there is not a significant difference between early payers and non-early payers: 17% of early payers agreed relative to 9% of early payers. Relatively more respondents said that friends and family would ask to borrow some of the savings but early payers were less likely to agree: 47% of early payers agreed relative to 61% of non-early payers.

The availability of alternate accounts and consistent responses from early and non-early

payers does not rule out definitively that demand for commitment savings does not contribute to a demand for early payments. Across this analysis as well as in borrower interviews, we do not find evidence that concern about superfluous spending or kinship taxation are major forces driving borrowers to make early payments.

6.3 Misunderstanding of Costs

We document in Fact 2 that early payments can be extremely costly, but it is unclear whether borrowers understand or pay attention to these costs. Since some early payments do generate small positive returns, people may believe that they are saving money by making early payments, making the trade-off between psychological and financial costs more ambiguous. To test for awareness that payments can be costly, we ask subjects in our sample whether they believe that early payments are "responsible" even if they are charged a fee. Eighty-seven percent of early payers agree compared to 88% of non-early payers, showing that most borrowers believe early payments should be made despite financial consequences. Differences in this belief does not appear to explain who makes payments and who does not.

We also ask respondents to identify the maximum fee that they would be willing to pay to make an early payment in a hypothetical scenario. On average, early payers would accept a fee of 6.0%, which is twice as large as the actual fee charged by the bank. Thirteen percent of early payers would accept a fee of 25% or greater, which was the maximal bucket allowed in the question.[6]

Finally, we explore whether borrowers may be learning about costs over time, leading to the reduction in early payments over the loan tenure that we observe in Fact 3. Most early payers do make multiple early payments over the course of their loan, suggesting that learning from the first early payment does not typically suppress future early payments. Furthermore, we observe in our cost simulation that payments made between the third and

[6]Note that only 49 out of 63 survey respondents answered the survey question on fees they would accept. While we informed respondents that their answers were for research purposes and would not be shared with the bank, it is possible that some non-respondents believed we would use their answers to charge them higher fees in the future and thus declined to respond.

fourth quarter of the loan have a small financial benefit. If subjects have learned more about costs over the course of the loan, we would expect to see an increase in payments during this period, which we do not observe. Last, anecdotal feedback from borrowers suggests that learning may in fact lead to more early payments in the future because first-time early payers observe how easy it is to make payments and they experience positive mental benefits, making them more likely to do so in the future.

Collectively, these findings show that borrowers are generally aware that early payments carry financial costs and many people are willing to pay them. While people seem to understand the directionality of the financial impact of early payments, we cannot determine if they have accurately calculated the magnitude of these costs. We therefore cannot rule out definitively that underestimating costs contributes somewhat to the high rate of early payments that we observe.

7 Conclusion

Debt holders often face large financial and psychological costs to carrying debt. In this project, we exploit an early payment feature of an Islamic finance loan to show that borrowers may accept large financial penalties in exchange for psychological benefits. This project highlights the magnitude of the mental burden on debtors, which seems to be especially high early in the loan tenure. This burden seems reduced by proactively paying down debt, even if an account is not fully closed.

From a policy perspective, our findings suggest that mechanisms to reduce the psychological burden of debt may often be valued more by consumers relative to efforts to reduce borrowing costs. In the *diminishing musharakah* case for instance, consumers might benefit from a designated savings account tied to their loan where they can store cash for future payments but accumulate interest savings rather than making an early payment. This account could also provide a cushion for borrowers facing income shortfalls in the future to

avoid penalty fees. Creating a closer tie between the savings and debt accounts would encourage borrowers to group them into the same mental account. This might grant them the positive sentiments of relief and pride through savings in the account, whereas previously they needed to make an official early payment to gain these psychological benefits.

This project also highlights the need for further research on the mental burdens of debt. Most prior work focuses on repayment across several low balance accounts, particularly credit cards, and find a strong preference to fully close accounts. We study housing mortgages and find benefits to faster repayment, even when an account is not fully closed. Further research is needed to determine whether our findings generalize to other assets and loan sizes, as well as other contexts. With access to data on consumers' full debt portfolios and savings accounts, future studies can compare whether debt account aversion in prior studies and debt level aversion we document are related and better test how liquid resources impact revealed preferences.

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Table 1: Descriptive Statistics

	All Borrowers	Non-Early Payers		Early Payers		
		All	*Sched/All Repaid*	*All*	*Sched Repaid*	*All Repaid*
	(1)	(2)	(3)	(4)	(5)	(6)
Annual Income (PKR)	5,851,114	5,827,782	4,642,998	5,886,350	6,233,590	5,651,787
	(21,018,242)	(16,108,844)	(12,670,067)	(26,784,077)	(21,690,425)	(30,505,467)
Log Annual Income	14.53	14.57	14.32	14.47	14.40	14.39
	(1.33)	(1.32)	(1.26)	(1.35)	(1.34)	(1.31)
Loan Size (PKR)	5,074,546	5,491,406	2,999,461	4,445,020	2,910,787	3,335,170
	(9,253,708)	(10,543,035)	(4,183,875)	(6,817,262)	(3,844,202)	(3,983,514)
Log Loan Size	14.82	14.85	14.34	14.78	14.40	14.59
	(1.02)	(1.06)	(1.02)	(0.95)	(0.92)	(0.88)
Loan Interest Rate	0.12	0.12	0.14	0.13	0.14	0.14
	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)
Contract Tenure	16.38	16.21	8.21	16.63	8.59	15.68
	(5.27)	(5.63)	(5.41)	(4.67)	(2.65)	(5.07)
Observations	3,705	2,229	255	1,476	135	762

Notes: This table summarizes average background and loan characteristics for the borrower sample. Standard deviations are shown in parentheses. Log annual income is the logged gross individual income before taxes in PKR for the primary borrower. Log loan size is the logged size of the loan principal. Log loan size is the logged amount of loan principal in PKR. Loan Interest Rate is the average interest rate charged to the individual over the sample period, which varies by individual based on credit background. Contract Tenure is the loan tenure in years agreed in the original loan contract. Actual loan tenure is shorter if subjects make early payments. Column 1 shows average characteristics for all borrowers in the sample. Columns 2-3 restricts to subjects who did not make an early payment in the sample period. Column 2 includes all non-early payers, and Column 3 includes those who were scheduled to fully repay their loan within the sample period, which is the same sample as all non-early payers who have fully repaid. Column 4-6 restricts to borrowers who made at least one early payment in the sample period. Column 4 includes all early payers, Column 5 includes those scheduled to fully repay their loan within the sample period, and Column 6 includes early payers who fully repaid in the sample period, regardless of whether their original loan tenure fell within the sample period.

Table 2: Proportion of Subjects Making Early Payments

	All	Scheduled Repaid	All Repaid
Panel A: Full Sample	(1)	(2)	(3)
Any point in sample period	0.40	0.35	0.72
Observations	3,705	390	1,062
Panel B: Early Payers Only			
First quarter of loan	-	0.64	0.61
Second quarter of loan	-	0.47	0.58
Third quarter of loan	-	0.36	0.36
Fourth quarter of loan	-	0.19	0.20
First 3 months of loan	-	0.19	0.19
First year of loan	-	0.53	0.44
Last year of loan	-	0.24	0.22
Last 3 months of loan	-	0.05	0.09
Observations	-	135	762

Notes: Values show the proportion of subjects in the column-designated sample who made an early payment in the row-designated time period. Panel A includes all subjects, and Panel B restricts to subjects who make at least one early payment over the sample period. Column 1 includes all subjects for the panel sample. Column 2 restricts to subjects who have fully repaid and were scheduled to fully repay their loans based on their original loan contract. Column 3 includes subjects who have fully repaid, including those whose original contract tenure extended beyond the sample period. Quarters are defined by realized loan tenure, rather than the loan tenure in the original contract.

Table 3: Average Early Payment Number, Size, and Cost for Early Payers

	All Early Payers	Scheduled Repaid	All Repaid
	(1)	(2)	(3)
Number of early payments	3.3	2.9	4.1
	(3.9)	(3.7)	(4.5)
Total units paid early	85.0	42.0	108.2
	(56.9)	(30.3)	(56.7)
Cost per unit paid early (PKR)	-3,869	1,636	-3,365
	(16,646)	(5,669)	(14,288)
Cost per unit paid early (months)	-0.2	0.1	-0.2
	(0.8)	(0.3)	(0.7)
Total cost of early payments (PKR)	-354,161	15,191	-519,537
	(1,592,160)	(499,490)	(1,870,161)
Total cost of early payments (months)	-17.6	0.8	-25.7
	(78.9)	(24.8)	(92.7)
Observations	1,476	135	762

Notes: This table provides average early payment characteristics across three groups of early payers. Standard deviations are shown in parentheses. Column 1 includes all subjects who made at least one early payment during the observed sample period, including subjects who have not finished repaying their loan and who may make additional early payments in the future. Column 2 includes only early payers who have fully repaid and were scheduled to fully repay their loans based on their original loan contract. Column 3 includes all early payers who have fully repaid, including those whose original contract tenure extended beyond the sample period. All statistics are calculated by first identifying the relevant figure for each subject and then averaging across individuals. To calculate average cost per unit, for instance, we first calculate the total cost of early payments to each individual divided by the total units that subject purchased. We then average this statistic across all early payers to identify the average cost per unit. This approach weights statistics by individual, rather than by extra unit as would be calculated by dividing total costs across all subjects by total units. Costs are reported first in PKR and then in average months of principal, which divides costs by the average principal amount due in each installment, weighted again by individual.

Table 4: Early Payments During Periods of Religious Salience

	All Observations		Early Payers Only	
	OLS	*Logit*	*OLS*	*Logit*
	(1)	(2)	(3)	(4)
Month of Ramadan	-0.005***	-0.295***	-0.011***	-0.287***
	(0.001)	(0.057)	(0.002)	(0.058)
Month before Hajj	-0.002**	-0.120**	-0.006**	-0.139**
	(0.001)	(0.056)	(0.002)	(0.056)
Constant	0.018***	-3.975***	0.047***	-3.014***
	(0.000)	(0.016)	(0.001)	(0.016)
Observations	275,671	275,671	108,650	108,650

Notes: This table reports results for regressions on an indicator variable for whether a monthly installment includes an early payment. Standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Column 1-2 use the entire sample of monthly repayments between 2005 and June 2018. Columns 3-4 restrict the sample to only monthly installments from borrowers who make at least one early payment within the sample period. Month of Ramadan is an indicator variable for whether the installment was made during the Islamic calendar month of Ramadan. Month before Hajj is an indicator variable whether the installment was made during the 30 days preceeding the start of Hajj, the annual pilgrammage to Mecca.

Table 5: Early Payments By Week in Month of Installment

	Any Early Payment	Small Early Payment	Medium Early Payment	Large Early Payment
	(1)	(2)	(3)	(4)
Second Week	-0.0007	-0.0003	0.0002	-0.0006
	(0.0008)	(0.0005)	(0.0006)	(0.0004)
Third Week	0.0009	-0.0004	0.0009**	0.0003
	(0.0006)	(0.0003)	(0.0004)	(0.0003)
Fourth Week	-0.0020***	-0.0014***	-0.0002	-0.0004
	(0.0007)	(0.0004)	(0.0005)	(0.0003)
Constant	0.0182***	0.0056***	0.0081***	0.0045***
	(0.0004)	(0.0002)	(0.0003)	(0.0002)
Observations	275,671	275,671	275,671	275,671

Notes: This table reports results for OLS regressions where the dependent variable is an indicator of whether a monthly installment included an early payment. Standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). In Column 1, the indicator is for any early payment. In Columns 2-4, the indicator is for an early payment of a specific size. Small payments are less that 7 units (bottom 25th percentile), medium payments are between 7 and 36 units (25th-75th percentile), and large payments are greater than 36 units (top 25th percentile). Covariates include indicator variables for the week in the month in which installments are regularly due, which is fixed and quasi-exogenous for each subject. First week reflects payments due within the first seven days of the month. Fourth week includes payments due from day 22 until the end of the month. Includes all years and observations.

Table 6: Subjective Agreement with Survey Statements

	Early Payers	Non-Early Payers	Difference
	(1)	(2)	(3)
Panel A: Psychological Impact			
Debt causes me stress	0.87	0.67	0.200*
			(0.106)
Debt makes me uncomfortable	1.00	0.76	0.242***
			(0.080)
Repaying early makes me proud	0.80	0.70	0.103
			(0.111)
Repaying early makes me relieved	0.80	0.88	-0.079
			(0.093)
Panel B: Alternate Explanations for Early Payments			
People should avoid debt for religious reasons	0.57	0.55	0.021
			(0.127)
Early payments are responsible, despite fee	0.87	0.88	-0.012
			(0.085)
My friends/family would ask for my savings	0.47	0.61	-0.139
			(0.127)
I would be tempted to spend savings unnecessarily	0.17	0.09	0.076
			(0.085)
Observations	30	33	63

Notes: This table summarizes the proportion of survey respondents who marked strongly agree or agree for the listed statement. Column 1 includes subjects who self-reported that they had made an early payment in the past on a musharakah loan. Column 2 includes subjects who have or have had a musharakah loan but who did not report having made early payments. Column 3 shows the difference in proportion of early payers who agree relative to non-early payers. The standard deviation is indicated in parentheses, and stars indicate significance where *** p<0.01, ** p<0.05, * p<0.1. $\hat{p}$

Table 7: Strategies in Debt Aversion Game

	Close Smallest Account	Pay Down Highest Interest
	(1)	(2)
Early Payer	-0.312***	0.170
	(0.119)	(0.126)
Observations	63	63

Notes: This table summarizes the results of an OLS regression of whether early payers are more likely to prefer two types of debt averse strategies to repaying multiple debts in a survey. Standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). The dependent variable in Column 1 is the strategy where subjects say they will first pay off the smallest balance account, even though it does not have the lowest interest. This strategy represents *debt account aversion* as defined by Amar et al 2011. The dependent variable in Column 1 is the strategy where subjects prefer to pay down the highest interest account first, which would allow them to repay fastest. All survey respondents have held or currently hold a musharakah loan. Early payers are respondents who self-reported that they had made at least one early payment on their loan.

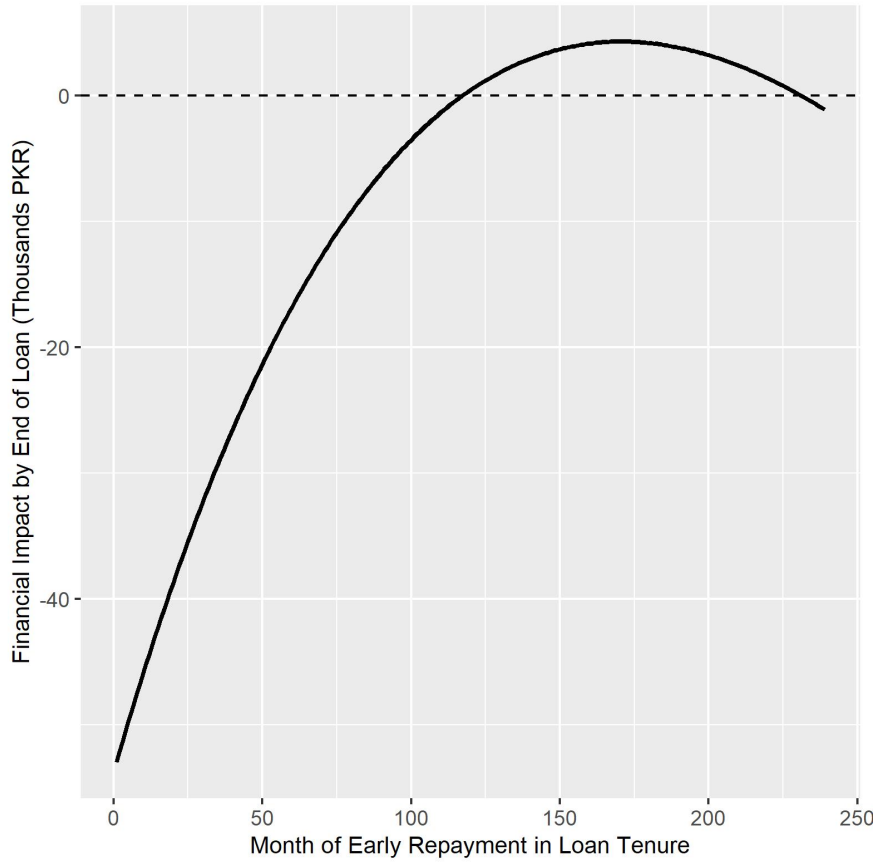
Table 8: Early Payments By Month of Installment

	Any Early Payment	Small Early Payment	Medium Early Payment	Large Early Payment
	(1)	(2)	(3)	(4)
Jan	0.003**	0.001	0.002*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Feb	0.003**	0.001	0.001	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
Mar	0.003**	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Apr	0.004***	0.000	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
May	0.001	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Jun	-0.001	-0.000	-0.000	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Jul	0.002	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Aug	0.000	0.001	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Sep	0.001	0.001	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Oct	0.001	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Nov	-0.000	-0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.017***	0.005***	0.008***	0.004***
	(0.001)	(0.000)	(0.001)	(0.000)
Observations	275,671	275,671	275,671	275,671

Notes: This table reports results for OLS regressions where the dependent variable is an indicator of whether a monthly installment included an early payment.Standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). In Column 1, the indicator is for any early payment. In Columns 2-4, the indicator is for an early payment of a specific size. Small payments are less that 7 units (bottom 25th percentile), medium payments are between 7 and 36 units (25th-75th percentile), and large payments are greater than 36 units (top 25th percentile). Covariates include indicator variables for the month in which installments are regularly due, which is fixed and quasi exogenous for each subject. Includes all years and observations.

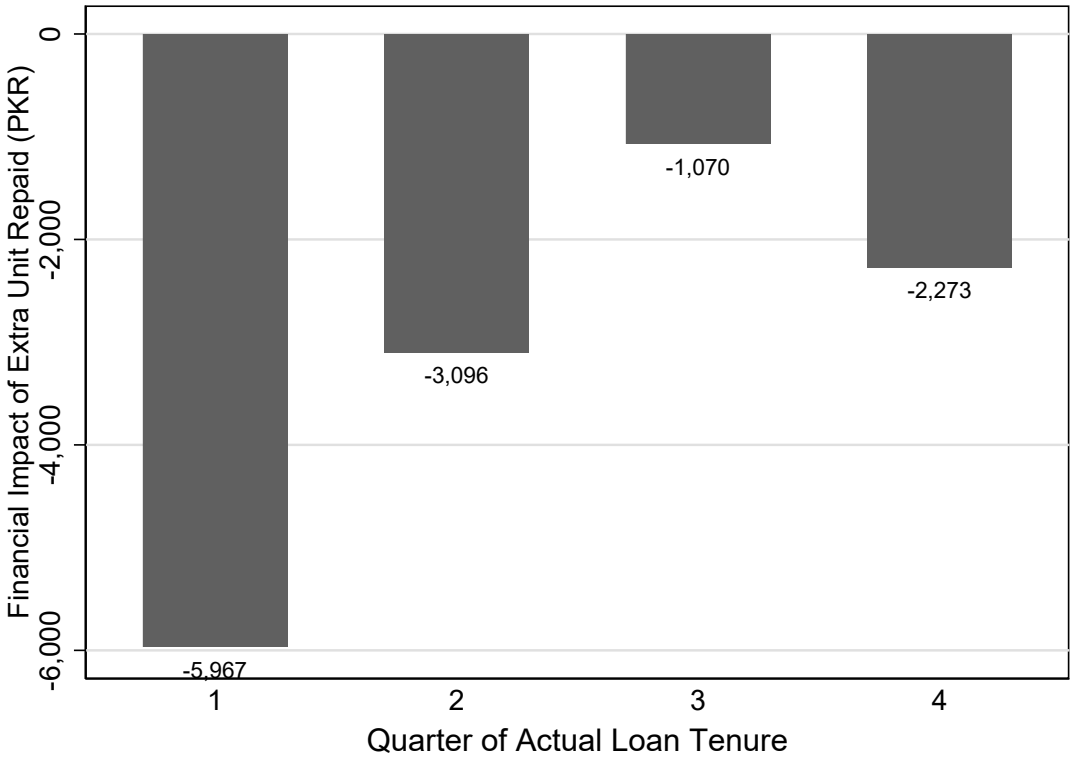
Figures

Figure 1: Simulated Cost of One Extra Unit Repaid at Each Month of Loan Tenure



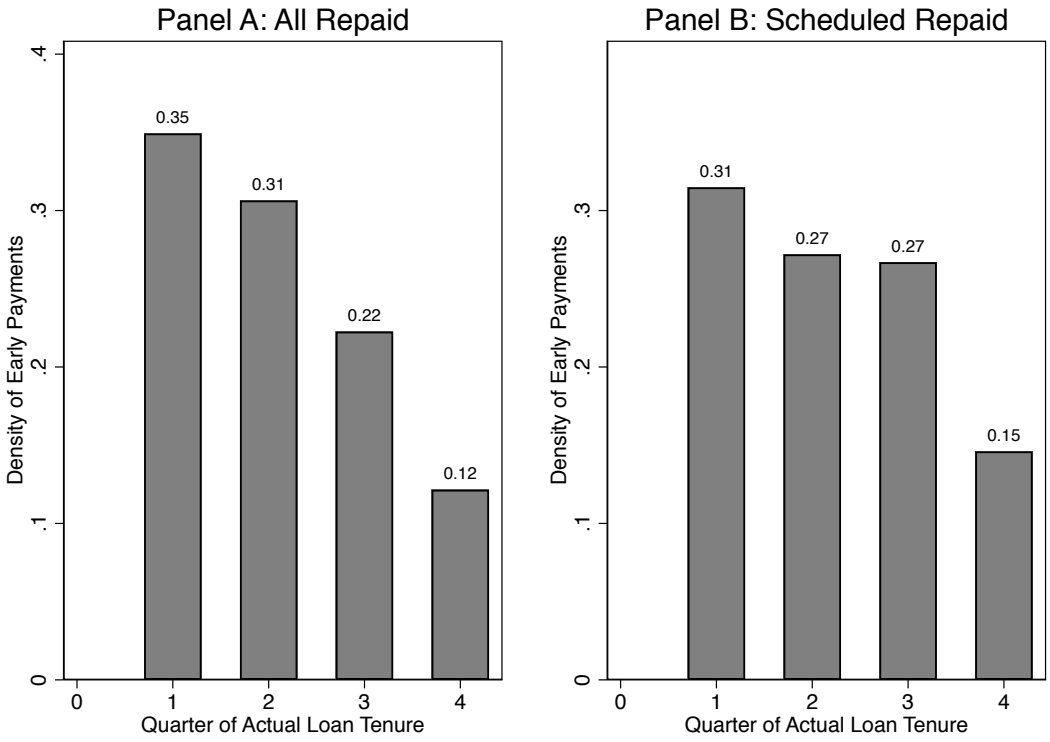
Notes: Cost reflects foregone savings interest, 3% added fee, and reduced interest on loan for one additional unit purchased at each month in loan tenure. Uses average interest rates on lending (12%) and savings (8%) throughout sample period and modal 20 year (240 month) loan period.

Figure 2: Cost of One Extra Unit Repaid by Quarter



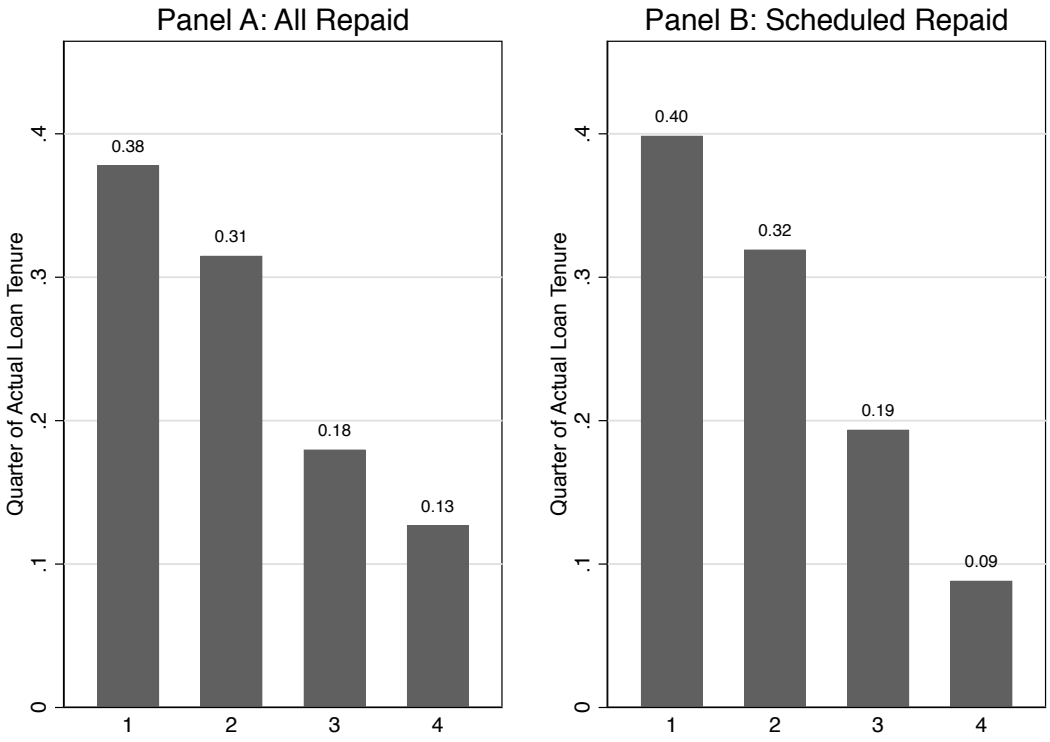
Notes: Reflects the average cost per unit for all extra units (months) repaid in each quarter. Quarter uses realized loan tenure, which in the case of early payments is shorter than scheduled loan tenure at time of disbursal.

Figure 3: Distribution of Early Payments by Quarter



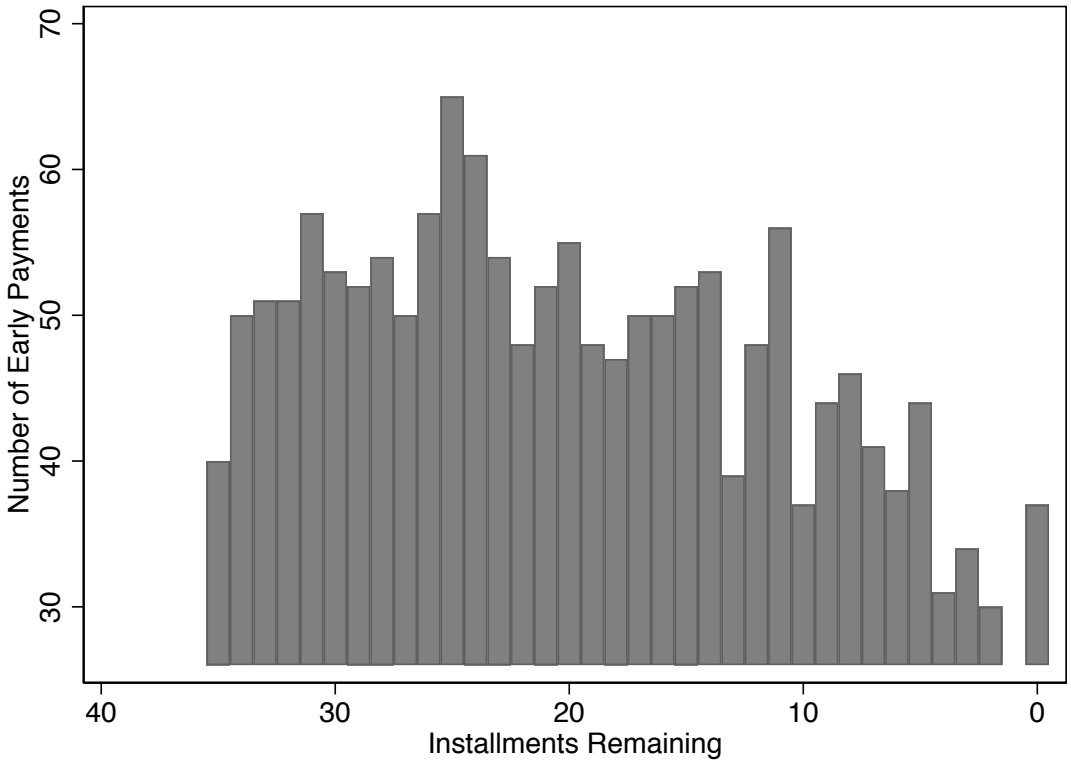
Notes: The figures reflect the distribution of early payments made by quarter of loan tenure. Panel A includes observations from all subjects who completely repaid loans during the sample period. Panel B includes observations from subjects who were scheduled to repay by June 2018. Quarter uses realized loan tenure, which in the case of early payments is shorter than scheduled loan tenure at time of disbursal.

Figure 4: Distribution of Units Repaid Early by Quarter



Notes: The figures reflect the distribution of total units repurchased in quarter of loan tenure. Panel A includes observations from all subjects who completely repaid loans during the sample period. Panel B includes observations from subjects who were scheduled to repay by June 2018. Quarter uses realized loan tenure, which in the case of early payments is shorter than scheduled loan tenure at time of disbursal.

Figure 5: Early Payments in Final 36 Months



Notes: The figure shows the number of early payments made by borrowers in the sample in the final 36 months of loan tenure. The X-axis shows installments remaining until full repayment, so payments made at 0 months are payments to fully close the loan. The sample includes only subjects who have fully repaid their loans, i.e. subjects for whom the final 36 months are observable.