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Designing Microfinance to Enable Consumption Smoothing: Evidence from India

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Abstract

[Excerpt] This paper focuses on a key aspect of microfinance contracts - repayment schedules - to determine the impact of greater flexibility in repayment schedules on clients' ability to smooth consumption as well as increase income by putting their loans in less liquid but higher return investments. Traditionally, microfinance repayment schedules are notoriously rigid, involving high frequency repayment in small installments beginning soon after loan disbursement, an important aspect of the lending model pioneered by earliest MFIs such as the Grameen Bank (Armendariz and Morduch 2005). However, in theory, clients are likely to be better off under more flexible repayment terms, which would give them greater ability to smooth consumption in the face of unanticipated shocks and encourage them to invest more of the loan in relatively illiquid but potentially higher return business investments (Field and Pande 2008). Through both of these channels, introducing flexibility in the timing of repayment by reducing repayment frequency could increase client long-run business income.

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Designing Microfinance to Enable Consumption Smoothing:
Evidence from India

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1 Introduction

The advent of microfinance programs a few decades ago was believed to be a major step towards helping the poor gain agency over their own financial lives by both improving their livelihood potential as well as their ability to smooth consumption. In theory, microfinance can help the poor invest in income-generating activities as well as cope more effectively with periods of illness, accidents, or natural disasters. Through one or both of these channels, microfinance may improve many of the aspects of poverty that development practitioners care about, such as household income and asset levels, health and nutrition, and education.

Empirically, however, whether and how microfinance loans have facilitated consumption smoothing and helped the poor maintain gainful employment remains debated. Recent experimental evidence indicates that traditional microfinance loans have limited impact on the average borrower (Banerjee et al., 2009; Karlan and Zinman, 2009). On the other hand, the results of several quasi-experimental studies have suggested that access to microfinance can improve client welfare (Pitt and Khandker 1998 and Morduch 1998). In addition, some of the features of microfinance that are traditionally emphasized, such as group liability, may be less important in reducing default than originally presumed (Gine and Karlan, 2006). Furthermore, media reports that over-indebtedness to microfinance institutions (MFIs) was causing mental distress among the poor in the Indian state of Andhra Pradesh have spurred the government to increase oversight and regulation of the MFI sector (Shylendra 2006).

These events and findings suggest a greater need to gather rigorous empirical evidence to better understand and test the underlying mechanisms of microfinance loans in delivering benefits to the poor. It also suggests a need to evaluate potential innovations to contract design that may further improve outcomes.

This paper focuses on a key aspect of microfinance contracts- repayment schedules- to determine the impact of greater flexibility in repayment schedules on clients' ability to smooth consumption as well as increase income by putting their loans in

less liquid but higher return investments. Traditionally, microfinance repayment schedules are notoriously rigid, involving high frequency repayment in small installments beginning soon after loan disbursement, an important aspect of the lending model pioneered by earliest MFIs such as the Grameen Bank (Armendariz and Morduch 2005). However, in theory, clients are likely to be better off under more flexible repayment terms, which would give them greater ability to smooth consumption in the face of unanticipated shocks and encourage them to invest more of the loan in relatively illiquid but potentially higher return business investments (Field and Pande 2008). Through both of these channels, introducing flexibility in the timing of repayment by reducing repayment frequency could increase client long-run business income.

We study the impact of increased flexibility in repayment schedules through a field experiment with a large MFI in Kolkata, India, in which we collect daily consumption data for 200 clients over 50 days by an innovative use of cell phone technology. Clients in the control group receive a loan with a repayment schedule that is standard in microfinance, which involves initiating repayment one week after loan disbursement and thereafter repaying in weekly installments. Meanwhile, clients who were randomly assigned to receive the treatment initiated repayment five weeks after loan disbursement and repaid every five weeks. [2] We examine the impact of this difference in debt structure by collecting detailed information about household income, expenditures, and business activities on a daily basis from both the microfinance client and her husband.

This paper shares much of the theoretical framework with its companion study authored by Field, Pande, Papp and Rigol (2011). Although the companion paper introduces repayment flexibility in the form of a two-month grace period prior to initiation of loan repayments (with both control and treatment groups repaying every two weeks once repayment started), the implications of the theoretical model are similar. In this study, by comparing clients who are repaying on a weekly basis and those who are repaying every five weeks, we introduce two potential sources of impact- the grace-period and the repayment frequency. Since treatment clients in this study do not commence repayment until five weeks after disbursement versus control clients who start one week after disbursement, one potential source for impact is the difference in grace period. Secondly, the difference in repayment frequency *after* the first loan payment is also a potential source of impact. Lengthening the time horizon until the next loan repayment should make relatively illiquid investments more viable. In turn, this should increase the average return on investments and therefore business profits and household income. In addition, the longer time horizon should allow for households to smooth consumption over expenditure and income shocks better than under the standard repayment schedule. Predictions about the impact of repayment flexibility on default are more

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[2] A small fraction of the treatment group was assigned to a 4-week repayment schedule as opposed to a five-week repayment schedule. The change to a five-week repayment schedule was made to better accommodate our MFI partner's logistical needs.

ambiguous and depend on the relationship between illiquidity, mean return, and variability of return of the investments available.

Our field experiment provides rigorous evidence that repayment flexibility increased both the level and variability of business income, investment in business inventory, and household expenditures. It also decreased mental stress about financial issues for clients, and both the level and variability of hours worked by household members other than the client and her husband. In contrast to the results of the companion paper, we do not see causal impact of a more flexible repayment schedule on default. The fact that we do not see default results here while we see significant increase in default in the companion paper may be due to either differences in the nature of the two samples or a direct effect of repayment frequency, which we discuss in more detail in section 8.5.

To the best of our knowledge, this is the first paper that shows how moving from a weekly to monthly repayment schedule impacts income levels and the ability of households to smooth consumption over time. The ideas we test in our paper is related to the literature that tests whether the Permanent Income Hypothesis (PIH) holds among poor households. However, our paper has more direct implications for policy since microfinance repayment contracts are set by NGOs or governments as opposed to "natural" shocks such as rainfall, catastrophic events, and illness that are typically used by development economists as a source of exogenous shock.

The paper is set out as follows. The next section reviews the literature relevant to consumption smoothing and microfinance, section 3 highlights some of the challenges to measuring consumption and steps we have taken to address those concerns, section 4 describes our MFI partner, section 5 explains our experimental design, and section 6 outlines our theoretical predictions. The next two sections describe our empirical strategy and our results. The last section concludes with policy implications.

2 Literature Review

The ability of poor households to smooth consumption in settings where incomes are low but variable has been the subject of a large literature in Economics. Large fluctuations in consumption of food and other basic necessities may have negative impacts not only in the short run but on a variety of long-run outcomes such as health, education attainment, and earnings potential. The concept of consumption smoothing is closely related to shocks, income variability and access to financial instruments (credit and savings) and by necessity our review of the relevant literature delves into these related topics. We have organized our literature review into three sections, working our way from a broader review of the theory and empirical evidence on the relationship between consumption smoothing and shocks (section 2.1), to a discussion about the relationship between microfinance and consumption smoothing (section 2.2) and finally, to an overview of the burgeoning

theoretical and empirical work on how repayment schedules of microfinance loans can affect consumption smoothing of microfinance clients (section 2.3).

2.1 Consumption smoothing and shocks

The idea of consumption smoothing is based on the assumption that individuals have relatively stable preferences over time and therefore prefer to maintain consistent levels of consumption if they can. It is closely linked to the permanent income hypothesis first formulated by Milton Friedman (1957) which posited that individuals do not make their consumption choices based on their current income but by their expectations of future long-term income. In this model, consumers classify income as "permanent" or "transitory" and individuals make their consumption decisions as a stable proportion of their permanent income. Most importantly, because agents are assumed to have access to both credit and savings markets, the permanent income theory predicts that transitory, short-term changes in income have little impact on consumption patterns when markets are complete. In other words, although empirical evidence shows that income in developing countries may be highly variable and subject to shocks (for example, see Townsend 1995), the permanent income hypothesis predicts that consumption levels should be stable.

As a result, one way to explore the relevance of the permanent income hypothesis in a particular setting is to estimate changes in consumption (if any) in response to shocks. The empirical literature testing the permanent income hypothesis in this manner has produced conflicting results that vary across time and space. On one hand, a number of studies in the context of Asian developing countries fail to reject the hypothesis that individuals are largely able to smooth consumption in the event of shocks. For example, Townsend (1994) looks at household-level consumption in three Indian villages and finds no evidence that year-to-year household consumption is influenced by idiosyncratic shocks (sickness, unemployment) once one controls for village-level consumption in the analysis. Jacoby and Skoufias (1998) use variations in rainfall as an exogenous shock on household income in a rural area of India, and find no evidence against the hypothesis that households are able to smooth consumption over year-to-year fluctuations in income. Paxson (1993) compares households in Thailand with different seasonal income patterns and estimates the responsiveness of seasonal consumption to seasonal income. Finding that households with different seasonal income patterns also have different consumption patterns that track income would provide evidence against the permanent income hypothesis. However, Paxson finds that households with different seasonal income patterns actually have similar consumption patterns over the year, suggesting that seasonal variation in consumption are due to seasonal variation in preferences or prices rather than variation in income. Chaudhuri and Paxson (2001) employ a similar strategy in three Indian villages and also reject that consumption patterns track seasonal variation in income.

However, other studies find empirical evidence suggesting that the ability to smooth consumption in the event of shocks is limited, in some cases severely. In response to the Townsend paper discussed above, Ravallion and Chaudhuri (1997) published a study in which they identify a number of methodological problems with the Townsend paper and provide evidence that these issues significantly influence the empirical estimates. In particular, they show that by running a more appropriate specification on the same data (e.g., accounting for year-specific effects and instrumenting for income sources unrelated to farm production), consumption responses to idiosyncratic income variation are large. Asfaw and Von Braun (2004) present evidence from rural Ethiopia that when the head of household moves from a healthy status to an unhealthy status, purchased food consumption and nonfood consumption declines significantly. They do not detect a significant effect on total food consumption, suggesting that households are substituting home-grown or home-made food for purchased food. Dercon and Krishnan (2000) also demonstrate within the rural Ethiopian context that, while average consumption across households is stable across years, idiosyncratic shocks such as rainfall and crop failure produce high variability in household-level consumption over seasons and years. Even in the Indian context, Rose (1999) presents evidence from rural India that favorable rainfall shocks (e.g., rainfall that does not result in flooding) increase the ratio of the probability that a girl survives to the probability that a boy survives. Assuming that a household's preference for daughters relative to sons is stable, it suggests that households may be constrained in some choices due to shocks even if not in ways that would be visible through measures of household consumption.

The discussion above suggests that households are able to smooth consumption over shocks to some degree but not completely. To understand why consumption smoothing may be incomplete and why we observe variation in ability to smooth consumption, it is important to understand the mechanisms used to smooth consumption. Households can smooth consumption in the event of a shock by: (1) utilizing income stabilization (ex ante diversification of production or making conservative employment choices), (2) engaging in intertemporal transfers (borrowing/ lending, stockpiling of goods, accumulation/ sale of assets), and (3) making inter-household transfers or risk-pooling (insurance policies, informal state-contingent transfers, "disguised" insurance in labor or credit contracts). A similar list of methods is outlined by Morduch (1995). Although these methods of smoothing income are not equally efficient, if one method is not available (for example, there may exist constraints on how much households can save securely), households may rely more heavily on a less efficient method, which has welfare costs. For example, in the absence of credit markets, households may choose to protect themselves against shocks by making conservative production or employment decisions, which are likely to have large efficiency costs. Liquidating assets to finance consumption smoothing can also be very inefficient compared to other methods. Households may also de-prioritize important investments with high long-term returns, such as their children's education, in order to use school fees and perhaps the child's labor to maintain a steady level of consumption in the household (Edmonds 2008).

A number of papers provide evidence that each of these channels is used in developing countries to smooth income to some extent. In the case of savings, Paxson (1992) shows that when households in Thailand receive a positive income shock (using rainfall as a proxy), they tend to save more with the implication that this saving would allow for smooth consumption in times of a negative income shock. With respect to adjusting labor supply, Kochar (1999) finds that in response to crop income shocks, male adults of households in rural India increase off-farm labor hours. Although a reduced-form regression reveals no significant effect of shocks on consumption, she shows that once hours of work are controlled for, crop income shocks negatively impact consumption.

With regard to assets, Chaudhuri and Paxson (2001) find evidence from three Indian villages that households tend to accumulate assets in seasons of stable income and deplete them in seasons of low or negative income. Furthermore, they find that this is a more important channel than borrowing to smooth consumption in the event of shock. Using the same dataset, Rozensweig and Wolpin (1989) show similar behavior across years, where households accumulate animal stock and mechanical agricultural assets in stable years and liquidate them in order to smooth consumption in response to economic shocks. They conclude that there is substantial underinvestment in animal stock as a result of the constraints on farmers' abilities to smooth consumption via the credit market. Liquidating assets may aid in smoothing consumption, but it comes at the cost of productive efficiency. Chetty and Looney (2005) provide further evidence that individuals deplete productive investments in response to shocks. They show that in both the US and Indonesia, food consumption falls only about ten percent when individuals become unemployed. In contrast to households in the US however, Indonesians seem to smooth their consumption through methods that are more costly in the long-run such as reducing human capital investment.

Having children work is another method that some households employ to maintain consumption levels in the event of shocks. In many poor households of developing countries, children are an important source of income. For example, Menon, Pareli, and Rosati (2005) estimate children contribute about 11 percent of the total agricultural production in Nepal. Psacharopoulos (1997) estimates that income from child labor can contribute up to 13% of total household income in Bolivia. There is evidence that this reliance increases in times of negative income shock. Beegle, Dehejia, and Gatti (2006) find that in Tanzania, self-reported negative crop shock is correlated with higher rates of child labor. Duryea, Lam, and Levison (2007) find that among urban Brazilian households, when the male head becomes unemployed, the probability that the child of the household enters the labor force increases. Furthermore, there is empirical evidence which suggests that the impact of negative shocks on child labor is even greater in an environment of constrained credit. Dehejia and Gatti (2002) use cross-country data to show that greater level of credit constraints are correlated with greater incidence of child labor, even after controlling for a wide range of variables. In the previously mentioned study by

Beegle, Dehejia and Gatti (2006), the impact of negative income shock on child labor is particularly pronounced on households with low levels of assets. Reliance on child labor in events of shock may very well have a range of negative outcomes for the children in the long-run in terms of health and education. Psacharopoulos (1997) estimates that children in wage work in Bolivia have nearly one year less completed schooling than nonworking children. This difference is 2 years in Venezuela. Kassouf, McKee, and Mossialos (2001) find that Brazilians who start working at an earlier age have worse self-reported health as an adult. O'Donnell, Doorslaer, and Rosati (2005) show that individuals in Vietnam who worked in agriculture as children have higher self-reported morbidity rates as young adults. They attempt to instrument for child labor with land holdings. Although not all of these studies employ an experimental design and hence we cannot definitely rule out biases in their measurement of the impact of child labor on long-run outcomes, they do strongly suggest that the families utilizing child labor in response to negative income shocks do so at the expense of longer-run benefit.

Finally, there is evidence that even marriage markets may be influenced by the consumption-smoothing behavior of households. Rosenzweig and Stark (1989) show that in rural India, marriage of daughters into households that are geographically further away contribute significantly to a reduction in variability of household food consumption. They also show that farm households with greater variability in crop profits tend to marry their daughters into households that are a greater distance away, suggesting that households in rural India use the marriage market as a way to help smooth consumption. Since income risk is spatially correlated in rural India (e.g., households that farm land close to each other are subject to similar weather-related risks, and therefore income risk), Rosenzweig and Stark interpret their findings as evidence that households in this context use the marriage of daughters to manage income risk from farming. By marrying off daughters to more distant villages with different weather patterns and risks, the authors posit that households engage in implicit contracts of risk-sharing through the marriage market. Furthermore, methods for smoothing income can also differ by economic class. For example, Townsend (1995) shows from a field study of villages in northern Thailand that relatively wealthy households tend to smooth consumption through the depletion of assets while the relatively poor tend to increase labor supply to finance consumption smoothing.

In theory, a Pareto optimal outcome would be for households to pool their consumption risk and insure one another. Even if formal financial markets are thin, there are reasons to believe that informal insurance arrangements could sufficiently mitigate income risk that households face. Arnott and Stiglitz (1991) develop a theoretical framework where locally-based informal institutions such as credit cooperatives and rotating savings/credit schemes could overcome moral hazard problems faced by formal financial entities by having better information about the individuals involved (called "peer monitoring"). However, even if the challenges of moral hazard are overcome, if enforcement capacity is limited, theory suggests that

consumption-smoothing through informal arrangements for risk-sharing will be incomplete (Coate and Ravallion 1993).

The above examples suggest that even if individuals are able to smooth consumption to a moderate degree in response to shocks, they often are forced to do so in a way that has repercussions for their livelihoods in the longer term (especially the liquidation of productive assets and investments). Hence, this literature indicates that consumption smoothing and sustainable livelihoods are closely linked, and interventions to improve outcomes in one can also impact the other. If financial markets were more complete, individuals could in theory smooth their consumption without having to liquidate their inventories. Indeed, Dupas and Robinson (2008) show through a field experiment that providing savings accounts resulted in substantial, positive effects on productive investment levels for women. They also present some evidence that having a savings account enabled female entrepreneurs to cope with shocks without having to liquidate their inventories. One could also imagine that the provision of more complete credit markets could have a similar effect, allowing households to borrow to smooth consumption over shocks rather than liquidate assets. Hence, it is reasonable to believe that microfinance could positively impact consumption smoothing as well as longer-term livelihoods by shifting the means by which individuals finance consumption smoothing to more efficient methods.

2.2 Overall impact of microfinance on consumption smoothing

Although theory indicates that microfinance should help clients smooth consumption in more efficient ways by improving access to credit, the impact of microfinance on the ability of the poor to cope with shocks has been documented by very few studies. Below, we present two quasi-experimental studies that measure the impact of microfinance services on households' ability to smooth consumption in the event of a shock. We refer to these studies as "quasi-experimental" since they lack the key ingredient to a true experiment testing for a causal relationship between two or more variables- random assignment to treatment or control. While random assignment gives greater confidence that treatment and control groups are similar along all the important dimensions, quasi-experimental studies are forced to use econometric and statistical tools to address potential selection bias in their treatment assignment. Using the tools available to quasi-experimental studies, both papers described below find that access to financial services significantly reduced the likelihood of a household decreasing consumption in the event of illness or other major difficulties. Although typically a Randomized Control Trial (RCT) design is considered the most rigorous test for a causal association, to the best of our knowledge, no one has attempted to establish a causal relationship between microfinance services and consumption smoothing using a RCT design.

Kaboski and Townsend (2005) use the presence of a banking institution (formal or MFI) in the villages of four provinces of rural Thailand as an instrument for membership in a banking institution. In a cross-sectional survey, households were asked whether they needed to reduce consumption "in a bad year" as a measure of ability to smooth consumption over shocks. They estimate the impact for each type of banking institution, and find that banking institutions that provide savings services and emergency services significantly reduce the likelihood that a household needs to reduce consumption in a bad year. Gertler et al (2009) uses a similar strategy in Indonesia, using distance to a MFI branch office as exogenous variation for the treatment. The paper focuses on the relationship between change in consumption and change in health status in Indonesia. The paper finds that greater access to a MFI branch (e.g., closer in distance to a MFI branch) results in greater ability to maintain consumption levels in response to declines in health experienced by working-age adults in the household.

Although to the best of our knowledge there have been no RCT studies conducted to directly measure the impact of microfinance on consumption smoothing, we present two studies here which utilize an RCT design and provide some relevant and interesting evidence supporting the hypothesis that microfinance increases the ability of households to smooth consumption. First, Karlan and Zinman (2008) have some secondary outcomes in their study that are relevant. They ran an experiment in South Africa in which they randomly assigned applicants who were initially deemed "marginally un-creditworthy" to either receive credit (Treatment) or not (Control). Several months after credit was extended to the treatment group, they measured the impact of the treatment on a wide range of outcome variables. Among other conclusions, they find that applicants in the treatment group were significantly less likely to experience hunger, more likely to retain their job over the study period and more likely to increase income. Although not a direct measure of consumption, the fact that those with access to credit were less likely to report hunger indicates a more steady level of food consumption over the study period, and hence is evidence of the impact of financial services (though not microfinance, per se) on consumption-smoothing.

Feigenberg et al (2010) study the impact of increasing the frequency of group meetings for typical Grameen-style microfinance clients on the breadth and depth of their social networks, using measures such as frequency of meeting with loan group members outside of repayment meetings, frequency of financial transfers to friends and relatives outside of their immediate family, and level of trust of other group members as indicated by survey. In addition, the study authors use an innovative lottery game where clients could increase their chance of winning the lottery but only by sharing the tickets with other group members. Using these measures, they find strong evidence that more frequent meetings expanded and strengthened the social networks of clients, increasing transfers and presumably improving risk-sharing among clients. Although they did not directly measure consumption smoothing, the results indicate that, by strengthening social networks, microfinance

services enabled greater risk-sharing across group members and therefore increased the ability to smooth consumption.

Lastly, there is some evidence that "vulnerability" or inability of a household to smooth income may itself directly impede a household's ability to engage in higher-yield activities in developing countries. Pearlman (2007) presents a model in which vulnerability leads households to opt for lower-yield/lower-risk enterprises. She also presents empirical evidence that lends support for her model by using data from a set of microfinance clients in Peru. She also shows that microfinance may mitigate the negative impact of vulnerability on entrepreneurial activity, by showing that households participating in microfinance services dedicate more resources to high-yield, high-risk projects.

In the broader research agenda of measuring the impact of microfinance on client outcomes, recent RCT studies have revealed two important new findings: First, microfinance services have heterogeneous impact on different types of clients with different implications for consumption and profit-generation. Second, features of microfinance that have been strictly emphasized in the past may not be as important in making microfinance activities sustainable (e.g., maintaining low rates of default) than previously believed. Banerjee et al (2009) illuminates the heterogeneous impact of microfinance services across different sub-groups of clients. This paper used random assignment to designate which slums in Hydrabad, India would receive a MFI branch. For the overall sample they found that the treatment (access to microfinance services) had no significant impact on total household expenditure per adult. However, the paper goes further to split the sample into "present business owners", "likely entrepreneurs", and "not likely to be entrepreneurs" by predicting on demographic variables not affected by treatment. When they measured impact for these different groups, those "not likely to be entrepreneurs" show large and significant increase in nondurable spending which were not detectable in the overall sample. Those who were "present business owners" or "likely entrepreneurs", however, showed increase in investment in business assets as well as a slight decline in nondurable consumption. Karlan and Gine (2010) show through a RCT conducted in the Philippines that loan groups with individual liability did not have higher levels of default relative to loan groups with group liability.

With recent research indicating that microfinance has heterogeneous impact on clients and that traditional design of the microfinance contract may not be optimal, we turn to the question of whether another aspect of the traditional Grameen-style microloan contract- the strict weekly repayment schedule starting immediately after loan disbursement- can be modified to improve client outcomes especially with regards to consumption smoothing.

2.3 Flexibility in repayment schedules and consumption smoothing

Economic theory gives two possible predictions for how more flexible repayment schedules could impact consumption smoothing. On one hand, if microfinance clients are rational actors, a more flexible loan repayment schedule (for instance, lower frequency repayment installments) should improve clients' ability to smooth consumption when faced with income shocks relative to a traditional weekly repayment schedule. However, if clients are not time-consistent or have self-control or intra-household issues that make saving difficult, repayment flexibility may actually increase the volatility of their consumption.

Akerlof (1991) applies the time-inconsistent, present-biased model of individual behavior to a diverse set of situations and shows how this pattern of behavior can lead to general procrastination, under-savings, drug use, and other "pathological behaviors". Every day, the cost of executing on the target task (saving money for repayment or stopping the use of drugs for example) seems greater than the cost of doing it in the future. Under these assumptions, this behavior often leads to problematic outcomes. In the context of microfinance loans, more flexible repayment schedules (for example, monthly repayment rather than weekly) means that individuals will have more time to procrastinate in gathering money for repayment and the consequences for failing to gather the repayment sum will be greater since each payment is larger. In a similar vein, Heidhues and Koszegi (forthcoming) show that non-sophisticated present-biased borrowers tend to overborrow, pay the penalties and back-load repayment. In this course of events, these individuals suffer large welfare losses. Fischer and Ghatak (2010) present a model in which more frequent repayment decreases default rates for present-biased individuals. When individuals are present-biased, smaller and more frequent repayments decrease temptation to default for immediate gain. However, the welfare effects of more frequent repayment are ambiguous in this model since frequent repayments are costly for both clients and MFIs. Finally, by not considering the possibility that greater flexibility in repayment may allow for more optimal project choice and hence greater profits, the authors shut out another channel of potential economic gain (and improvements in long run ability to smooth income).

On the other hand, even with time-inconsistent preferences, individuals may be sophisticated enough to use financial tools in order to control outcomes for future selves. For example, Basu (2009) presents a model in which sophisticated but time-inconsistent borrowers use loans to provide incentives for future selves to not over-consume. He presents this model as one possible explanation of why people are often both borrowing and saving at the same time. By borrowing in the present rather than using cash in savings, individuals are establishing large costs for future selves to over-consume.

Empirical evidence on the effect of repayment frequency on client welfare is ambiguous and limited. A number of large MFIs have experimented over the last few years with more flexible repayment schedules only to revert back due to emerging evidence that the MFI believed showed that flexible repayment led to increase in delinquencies (Fischer and Ghatak 2010 and Armendariz and Morduch 2005). In

contrast, McIntosh (2007) ran a quasi-experimental study in Uganda which used geographical variation in loan administration by the partner MFI. In some branches, groups of clients were allowed to choose repaying loans every week to every two weeks. He found that the shift caused none of the predicted negative effects (e.g., no increase in default rate), and instead found that dropout fell by 10 percentage points and repayment performance slight improved. In line with McIntosh, the authors of this paper have conducted a RCT experiment with a partner MFI organization in India where we allowed an extra "grace period" of two months before commencing repayment. Our preliminary results show that clients who were given a grace period were significantly more likely to default. They were, however, also more likely to make riskier but higher return activities. Whether this behavior led to better consumption smoothing in the long run is an open question. Finally, further evidence that flexibility in repayment can help smooth consumption comes from Shoji (2010), who studies the effect of allowing microfinance clients in Bangladesh to reschedule their repayments after a nation-wide flood in 2004. He finds that clients who did not reschedule their payments increased their likelihood of skipping a meal by 2.48% for female clients and 0.53% for male clients.

In summary, the empirical evidence suggests that, although the poor in developing countries have some recourse to smooth their consumption in the event of shocks, in many cases consumption smoothing is incomplete. Moreover, the methods used to finance consumption smoothing are often inefficient and can have detrimental effects on long-term earnings for the household. In theory, access to credit through microfinance should both allow for better smoothing of consumption as well as a shift away from more inefficient ways to finance consumption smoothing. Existing studies (for example, Karlan and Zinman 2008 and Dupas and Robinson 2010) provide some evidence that microfinance services increase ability to smooth consumption and/or shift the ways in which consumption smoothing is financed to more efficient means. With emerging evidence that microfinance has heterogeneous effects on sub-segments of clients as well as evidence that traditional elements of the microfinance contract may not be the optimal, one natural question to ask with regards to consumption smoothing is whether the traditional, strict weekly repayment schedule is best. The theoretical literature gives somewhat ambiguous predictions for how flexible repayment schedules will impact consumption smoothing. If clients are rational actors or if they are "sophisticated", more flexible repayment schedules should allow clients to smooth consumption at least as well as under a traditional weekly schedule and should provide them with significant consumption-smoothing benefits in the event of shocks. If on the other hand, clients are present-biased and "unsophisticated" flexible repayment schedules may result in potentially more volatile consumption patterns. Since rigorous empirical evidence to give credence to one theory versus another is limited, we hope to help fill that gap by analyzing our unique dataset of daily consumption patterns from our RCT experiment in India which uses random assignment of loan groups to monthly (e.g. more flexible) versus weekly (e.g. traditional) repayment schedules.

3 Measuring Consumption

In order to truly understand consumption smoothing and liquidity constraints among the poor, one needs data that accurately measures consumption levels, income, and assets of households over time. Particularly for consumption data, several potential sources of reporting error have been documented in the Economics literature, the most important of which are recall mistakes, inability to capture total household consumption, and level of aggregation of consumption categories (Beegle et al, 2010). In our project, we have attempted to mitigate the risks posed by each while keeping logistical demands and costs of surveying reasonably low through a novel survey implementation strategy that leverages cell phone technology available in our study region.

Firstly, recall error, or the misreporting of true consumption by the respondent over the period of recall due to faulty memory, has been documented by several studies to be a major source of bias in consumption survey data. More specifically, longer recall periods tend to be associated with greater under-reporting of consumption. For example, the experiments conducted by Scott and Amenuvegbe (1990) with households from the Ghanaian Living Standards Survey concluded that reported expenditures fell at an average of 2.9 percent for every day added to the recall period. Since the focus of our study is not only the average level of consumption but also its fluctuation over time, high-frequency data is even more critical to ensure accurate and precise measurements. As Samphantharak and Townsend (2010) write, "high frequency data is necessary for the analysis of liquidity, the short-term smoothing of consumption, the protection of investment from cash flow fluctuations, and the financing of cash flow budget deficits."

A second important source of error is the inability of the survey respondent to account for total household consumption. Individual consumption, particularly by other adult members of the household, may occur outside the knowledge of the survey respondent and may not be captured in the consumption survey. For example, Beegle et al (2010) compare several different methods for collecting consumption data among households in Tanzania using a randomized experimental design. In one treatment arm, each household was given a household consumption diary while in another treatment arm, each adult member of each household was given a personal consumption diary. The first treatment arm produced mean consumption measures that were 19 percent lower than the second, providing evidence that the traditional approach of relying on one adult respondent under-estimates consumption activities for the household. Similar results were found in experiments with personal and household consumption diaries in Russia (World Bank 2005)

The last source of potential error is the level of aggregation of consumption categories. On one hand, it is necessary to disaggregate consumption to some extent to get reasonably accurate responses about total expenditure levels (Deaton 1997). Moreover, there is evidence that reducing the number of categories into which consumption is disaggregated lowers total expenditure reported (Deaton 1997).

However, longer questionnaires often entail higher survey costs, more time, and risk of greater non-response and survey attrition.

Due to the high cost and logistical complexity of collecting accurate and detailed consumption data on a real-time basis, empirical data on day-to-day consumption patterns of the poor in developing countries have been limited. Previous studies have largely relied on questions that risk the noise and bias of imperfect recall, often over long reference periods (e.g., "how many times have you run out of food in the last year?") or on datasets that provide detailed consumption data but from a very small sample size over short time periods.

A major innovation of our project is to produce a dataset that contains detailed information about daily expenditures and consumption from 200 Indian households over 50 days using cell phone technology. We call this effort the Daily Consumption Survey (DCS) project. The DCS survey was administered to each client via cell phone every other day for a total of 25 times, covering a time period of 50 days in total. Each DCS participant was offered the option of taking two pre-purchased CDMA phones, one for the client and one for her husband, locked with a pre-determined service provider. In total, 350 phones were distributed, 200 to respondents and 150 to husbands. Air time for surveys was pre-paid by the experiment. To provide incentives to participate in the survey and to ensure that the phones were returned at the end of the survey period, participating clients were offered Rs. 5 for every call answered by them or their husband, deliverable upon the return of the cell phones at the end of the survey period.

Each time a client was surveyed, she was asked questions about her own earnings, transfers received and sent, and loans. She was also asked about the household's expenditure on food, housing, education, healthcare, loan repayment, and savings installments. Lastly, she was asked about the time she spent working and her level of mental stress related to loan repayment and finances. Each time a client was surveyed, her husband was also surveyed and asked about his earnings, transfers received and set, and loan payments. He was also asked about time spent working and his level of mental stress related to loan repayment and finances. Each administration of the survey took on average 12 to 13 minutes and 90% of surveys took less than 25 minutes. Response rates were very high, with only two survey administrations missing from the 5000 total surveys that were collected (200 clients with 25 surveys each).

In addition to contributing a unique dataset to the economic development field, the DCS addresses many of the potential sources of bias in the collection of consumption data outlined above. First, by contacting the respondent household every 48 hours, we capture a nearly real-time view of consumption activity of the household, mitigating the potential for recall bias. Another major benefit of our data collection strategy is to use enumerators to collect data as opposed to relying on self-reporting in consumption diaries, in which the frequency and consistency of reporting is difficult or impossible to monitor. By making use of cell phone technology, we were

able to employ a relatively costly approach (enumerators) in a cost effective manner. This approach also helped cut down on non-response and non-participation because it was also lower cost for clients to participate relative to the hassle and recall problems of having to fill out a daily consumption diary.

Finally, this method allowed us to interview multiple members of the household without having to return to the household at multiple times during the day, which gave us the possibility of surveying both husbands and wives without enormous added costs or selection of participating households. This aspect of our consumption survey is another major advantage to these data. That is, in addition to surveying the microfinance client, we also interviewed her husband for each survey, asking complementary but non-overlapping questions that would help produce a more complete picture of household consumption. Lastly, we balanced the need to get more detailed consumption data from respondents with the concern of survey fatigue by choosing 62 consumption categories to be included in the survey for clients (excluding questions about income or business investment).

4 Our MFI partner

Our project was implemented with our partner MFI, the Village Financial Services (VFS), which started operations in the Indian state of West Bengal in 1982. It is larger than the typical MFI in India, with nearly 60 offices, total assets of 30.1 million USD, and 184,000 active borrowers as of 2009, compared to the median Indian MFI which has 27 offices, 10.7 million USD and 65,000 active borrowers.

In light of the current debate on the impact of MFIs on clients' welfare in India, additional statistics on VFS' finances and operations may be of interest. Compared to a median Indian MFI, VFS clients carry a lower loan balance with the average loan balance per borrower/ GNI per capita at 12% for VFS versus 14% for the median Indian MFI. VFS also achieves a lower return on assets and return on equity, 1.1% and 7.1% respectively, compared to 1.8% and 10.5% for the median Indian MFI. VFS has a borrower to staff member ratio of 338 which is greater than the 75th percentile for all Indian MFIs and their cost per borrower, at 15 USD is equal to the median. The percentage of their portfolio at risk greater than 90 days is 0.54% compared to the median of 0.33% for all Indian MFIs (MIX Market 2011).

Despite being in an urban environment, VFS clients seem to have limited outside borrowing. In our baseline survey, only 6.2% of our entire sample report having taken out a non-VFS loan in the past two years.

5 Experimental Design

5. 1 Overall sampling and treatment design

The respondents participating in the DCS project were a subset of a larger sample of VFS microfinance clients who were participating in an experiment about the effect

of flexible repayment schedules. Between January and September 2008 we formed 148 five-member groups comprising of 740 clients. Loan sizes varied from Rs. 4000 to 12000 (~$90 to $260), with a modal loan size of Rs. 10000. After group formation and prior to loan disbursement, groups were randomly assigned to either a five-week repayment schedule or a weekly repayment schedule. Treatment status was assigned to batches of 20 groups at a time based on the timing of group formation.[3] For these 740 clients, we conducted baseline and endline surveys which contain information about consumption, household shocks, housing, assets and income, transfers, employment, business activity, and women's empowerment, among other topics.[4]

Clients assigned to five-week repayment schedules met and repaid their loans every five weeks, while clients assigned to the weekly repayment followed the traditional schedule of meeting and repaying every week. Other features of the loan contract were held constant across the two groups, including interest rates at 12%. Both groups had 45 weeks from the time of the loan disbursement to repay their loans in full. For the majority (nearly 90%) of clients in the DCS dataset, the first DCS survey was given at least 45 days after the loan disbursement.

Columns (1)-(4) of Table 1 provide a randomization check for the entire sample group. On average, weekly and five-week clients look similar at baseline across a wide range of observable characteristics. Four out of the 27 differences are statistically significant at the 10% level: whether a client is Muslim, literate, transfers reported into the household in the past year, and whether loan size was Rs. 7000. A monthly client was more likely to be Muslim on average, was slightly more likely to be literate, received more transfers into the household in the past year[5], and was more likely to have a loan size of Rs. 7000.[6]

5. 2 Sampling and methodology for the Daily Consumption Survey

Of the 740 clients participating in the larger VFS experiment, we selected 105 five-week clients and 105 weekly clients and invited them to participate in the DCS project. Due to a major festival scheduled to occur several weeks after the start of the DCS survey (Durga Puja), we had to choose the five-week clients from among the 21 five-week groups whose starting date would ensure that the DCS survey could

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[3] One exception is the first batch of treatment groups, which comprise of 12 groups assigned to a four-week repayment schedule as opposed to a five-week repayment schedule. The change to a five-week repayment schedule was made to better accommodate VFS' logistical needs.

[4] Appendix C discusses the decisions made regarding the experiment design in greater detail.

[5] The fact that monthly clients report receiving more transfers in the past year may suggest that monthly clients have better access to financial resources and/or that they need more financial help from others. However, the fact that we see no differential rate of incidence of shocks between monthly and weekly clients is one piece of evidence against the argument that monthly clients need more financial help.

[6] Note that when we measure loan size as a continuous variable, we see no difference between treatment and control. Comparing loan size as a series of dummy variables is a more conservative way to measure differences between the two groups.

run from one repayment to the next without interruption of this festival.[7] We randomly selected 105 clients from the 370 weekly clients in the larger experiment, resulting in 42 of the 74 weekly groups being represented in DCS. 23 of the 210 initial clients dropped out, 11 from control and 12 from treatment; hence, there is no differential attrition between weekly and five-week clients in terms of number of respondents. We randomly sampled from the remaining clients in the larger experiment to replace 6 clients in control and 7 clients in treatment for a final total of 200 clients participating in the DCS survey. In Appendix B Table 1, we compare clients who left the original sample versus those who make up the final sample along a range of traits- discount rates (measure of patience), income, and employment status. We find no evidence that those in the final sample are more patient than those who attrited, mitigating one potential concern regarding the external validity of our results. We do find evidence that suggests that those who attritted from the sample were slightly less likely to be working in the past week (90 percent versus 98 percent).

As is best practice in RCT studies, Columns (5)-(8) of Table 1 provide a randomization check for the DCS sample. On average, weekly and five-week clients look similar at baseline across a wide range of observable characteristics. Only two out of the 27 differences are statistically significant at the 10% level: whether a client is married and whether a client has a loan size of Rs. 5000. A monthly client was less likely to be married and to have a loan size of Rs. 5000. The first difference raise some concern that unconditional comparisons will produce biased experimental estimates due to the fact that unmarried clients are better able to smooth consumption due to residing in multiple-earner households (for instance, if they reside with their parents and siblings). The second difference raises the concern that that clients with larger loans are better able to smooth consumption due to the fact that they have more money to set aside in savings; however, comparing loan size as a continuous variable between weekly and five-week clients suggests that overall, there is no significant difference in loan size between the two groups. To account for these small differences between treatment and control groups, we always report estimates from regressions that include all the controls listed in Panel A of Table 1. Moreover, we report estimates from regressions that include all controls but the married dummy variable and the loan size variable in Appendix B Tables 3-8.

6 Predictions

There are many reasons to believe that access to credit should raise household incomes and enable consumption-smoothing among the poor. If the poor in developing countries are credit-constrained, microfinance programs should help them invest in profitable enterprises as well as cope with the negative shocks in their lives more effectively. However, as discussed in the literature review, the

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[7] It was important to avoid surveying around the time of this festival both because nonresponse would be high, and because consumption patterns would be highly irregular.

results of rigorous experimental studies conducted in recent years suggest that microfinance, as currently practiced, has zero to very small average effect on the welfare of the poor, including on household income (Banerjee et al 2009).

Our experiment is designed to explore this apparent paradox- if there are compelling theoretical reasons to believe that microfinance should help the poor, why do we not see more robust empirical results? We make two observations that we believe are relevant to this question: First, the microfinance model is remarkably uniform across the developing world, with nearly all microfinance organizations employing the group lending model with weekly repayment schedules starting almost immediately after disbursement. Secondly, when we compare microfinance programs in the developing world to small business loans in the US, we see that American small business loans offer significantly more flexibility in repayment schedules – for example, allowing a grace period before beginning repayment and mandating less frequent repayments. Small business loans in the US also experience much higher default rates – typically between 13-15% compared to 2-5% in microfinance (Glennon and Nigro 2005).

Can this difference in default rates and repayment schedules between American small business loans and microfinance help explain why current models of microfinance do not significantly impact household income? We hypothesize that the rigid repayment schedules commonly used in microfinance- weekly repayments beginning almost immediately after loan disbursement- inhibit clients' ability to invest in more profitable but also higher-risk business opportunities. With repayment beginning soon after disbursement, clients may be hindered in investing in the inventory, raw materials, and equipment that would yield higher returns. As a hypothetical example, consider an owner of a small hardware store in a developing country. He might know that buying and selling higher-quality light fixtures would yield more profits, but he cannot use his microfinance loan to buy this inventory because higher-quality light fixtures do not sell as quickly as lower-quality ones; hence, he will not have the money in time to make his first repayment if he invests in this more illiquid (but more profitable) inventory. Under a more flexible repayment schedule where he has a grace period before starting repayment and/or he repays every month instead of every week, this hypothetical client may be able to invest in the higher-quality inventory. However, this increases default risk as well, since in the case of a negative shock (for example, illness or accidents), the client will be less able to liquidate his investment in order to meet his unexpected costs as well as repayment obligations.

For the formal theoretical framework of this paper, please refer to the model presented in the companion paper by Field, Pande, Papp and Rigol (2011). Although the companion paper tests the impact of an extended grace period of 2 months prior to the commencement of loan repayment (a variation of flexibility in loan repayment), the basic predictions of the model are also applicable to a situation where loan repayment occurs every five weeks versus weekly. In the context of consumption smoothing, we can derive the following relevant predictions:

Prediction 1 *Moving from a weekly to a five-week repayment schedule will increase average client profits and the variance of profits.*
Similar to the reasoning in Field et al (2011), a client who has five weeks between loan repayments will increase her illiquid asset investment. This investment has higher expected return for the client. Variance of profits also increases in the amount invested in the illiquid asset investment.

Prediction 2 *Moving from a weekly to a five-week repayment schedule will increase the level of household consumption and decrease the variability in the level of consumption.*
Increased income from household businesses will increase the level of household consumption under the five-week repayment schedule. The variability in the level of consumption will also decrease because clients will have a longer time horizon to prepare for the next loan repayment, mitigating impact on consumption from shocks in expenditure or income.

Prediction 3 *Moving from a weekly to a five-week repayment schedule will increase default.*
Similar to the reasoning in Field et al (2011), a client who has five weeks between loan repayments will increase her illiquid asset investment, which is more likely to fail and force the client to default.

Prediction 4 *Moving from a weekly to a five-week repayment schedule will decrease mental stress if cost of saving to make larger repayments is lower than benefits from greater loan flexibility.*
The impact of moving from a weekly to a five-week repayment schedule is not clear *a priori*. On one hand, clients may experience less mental stress from increased income and smoother consumption. On the other hand, however, clients may incur some type of psychic cost in maintaining fiscal discipline in order to prepare a larger sum for repayment every five weeks.

7 Empirical Strategy

Randomization of repayment schedule implies that simple comparison of the average outcomes across clients assigned to the weekly versus five-week repayment schedules has a causal interpretation. Hence, for all outcome variables we estimate simple ordinary least squares regressions of the following form:

(1) $$y_{dig} = \beta_0 + \beta_1 T_g + B_g + P_{dig} + M_{dig} + W_{dig} + C_{dig} + \delta X_{ig} + \varepsilon_{ig}$$

where y_{dig} is the outcome of interest for client i in group g on day d and T_g is an indicator variable that equals one if the group was assigned to the five-week repayment schedule. All regressions include dummies for stratification batch (B_g), day of the week (P_{dig}), whether the survey was taken in the morning (M_{dig}), number of weeks since disbursement (W_{dig}), and the calendar week (C_{dig}). Throughout, we

report regressions with and without the nine controls (X_{ig}) listed in Panel A of Table 1 and loan officer fixed effects.[8] In all regressions, standard errors are corrected for clustering within loan groups.

In order to address potential serial correlation concerns, we also run regressions after aggregating outcomes at the weekly level and present these in Appendix A Tables 1-4.

For certain variables, we will attempt to focus on the two days immediately prior to the loan repayment, since it would be reasonable to believe that some outcomes (such as measures of mental stress or food consumption) would be more sensitive to repayment flexibility in the days immediately preceding the loan repayment. We do this by using two methods: Firstly, we "smooth out" our observations into daily values. Since we surveyed households every 48 hours, we create a daily measure of each variable by assigning half the income or expenditure reported in each survey to two consecutive days. For example, if the survey was taken in the morning of day X, half of the value for a given variable was assigned to day X-1 and the other half to day X-2. If the survey was taken in the afternoon of day X, half of the value for a given variable was assigned to day X and the other half to the day X-1. In cases where this leads to two different sets of values being assigned to the same day (for example, if a survey is given on the afternoon of day X and the next survey is given on the morning of day X+2, this would result in two values for day X), the two sets of values were averaged together. Secondly, we modify equation (1) to add an interaction term:

$$(2) \quad y_{dig} = \beta_0 + \beta_1 D_d * T_g + \beta_2 D_d + I_i + B_g + P_{dig} + M_{dig} + W_{dig} + C_{dig} + \delta X_{ig} + \varepsilon_{ig}$$

where D_d is a dummy variable (referred to "two days before" in the tables) that takes the value one if the observation is within two days of a loan repayment and 0 otherwise. We interact this with the treatment variable T_g to identify the effect of the treatment on a given outcome in the two days before a loan repayment. I_i is a vector of individual client-level fixed effects. All other variables are the same as in (1).

8 Results

We find that the five-week repayment schedule significantly impacted client outcomes in six categories: income, expenditures, investment in business inventories, hours worked, default, and mental health. [9],[10]

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[8] Loan officer fixed effects are dummy variables (one variable for each loan officer), that take the value of 1 if a given client has a loan administered by a given loan officer. This is to control for loan officer characteristics or practices that may affect client outcome.

[9] We also find that preference for frequency of repayment varies significantly among clients, with 43% reporting that they would like to repay in weekly or fortnightly installments, and more than 50% of clients reporting that they would like to repay at monthly or even longer intervals. Appendix B Table 2a shows the distribution of

8.1 Income

We start by presenting the evidence of impact on income in Table 2. As outlined in section 6, our previous paper on the impact of repayment flexibility on business outcomes of clients sets up a theoretical model in which flexible repayment allows clients to make investments in business opportunities with higher average profitability but more uncertainty (see Field, Pande, Papp and Rigol 2010). According to this theoretical model, greater flexibility in repayment should result in higher average profits from business but greater variability.

The results presented in Table 2 support Prediction 1. Column (1) shows that total income from business and wage sources were significantly higher for five-week clients, with five-week clients reporting 88% higher income from business and wage sources compared to the mean weekly client. This result is significant at the 5% level with and without controls. Columns (2) and (3) show that this gain is driven by increase in business income, with five-week clients reporting more than double the business income of weekly clients on average. In accordance with the model's predictions, the variability of business income is also significantly greater among five-week clients, as presented in Column (4).

8.2 Expenditures

Overall household expenditures appear to rise among five-week clients, as might be expected with higher average income, although the percentage increase in expenditures is lower than the percentage increase in income reported by five-week clients. As presented in Column (1) of Table 3, household expenditures are 10-24% higher among five-week clients than weekly clients. This result is significant at the 5% level without controls and is not robust to the inclusion of control variables.

Total household expenditures are composed of spending on food, house expenses (repairs, utilities, etc), education, health, transfers out of the household, repayment of non-VFS loans, and other items (clothing, festivals, etc). As shown in Columns (2)-(8), the increase in household expenditure seems to be primarily driven by increase in repayment to non-VFS creditors rather than an increase in spending on food, housing stock, education, health, transfers, or other items.

8.3 Investment in Business Inventory

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repayment frequency preferences and Appendix B Table 2b demonstrates that individual characteristics do not have a significant relationship with repayment frequency preferences.

[10] In order to ensure that the small differences between treatment and control for marriage rates and loan size are not driving the results, we report the same regression results in Appendix B Tables 3-8 but excluding the married and loan size control variables. As shown in the tables, the exclusion of these controls has little effect on the results.

Although we do not find evidence that flexibility in repayment impacted the level or pattern of investment in equipment or raw materials, the results do suggest that the five-week repayment clients were able to make larger investments in inventory. Column (2) of Table 4 indicates that five-week clients invested 70%-100% *more* in the inventory of their business compared to weekly clients. This result is significant at the 5% level without controls; it is not robust to the inclusion of controls.

8.4 Hours worked

While the aggregate number of hours worked by the client and the client's husband do not appear to be affected by the repayment schedule, the additional flexibility of the five-week repayment reduced the number of hours *other* household members work. Although the DCS did not explicitly ask who these other household members are, they are likely to be secondary earners. Column (2), Panels A and B of Table 5 show that non-client and non-husband members of five-week households worked on average 2.86 hours less compared to the members of weekly households. The point estimates imply between a 66% to 75% reduction from the mean number of hours worked among weekly households. This result is significant at a 1% level, and is robust to the inclusion of controls.

Furthermore, the variability of hours worked by non-client and non-husband household members was also lower in five-week households (not reported). This result is significant at the 5% level without controls and is not robust to the inclusion of controls although the point estimate remains negative.

8.5 Default

We used VFS administrative data to examine whether the repayment schedule had any impact on default rates. Using the most recent data available, we were able to measure default rates for all the clients in our sample at 12 weeks past the date when the entire balance of the loan should have been repaid (the due date), 16 weeks past the due date, and 20 weeks past the due date. In contrast with the companion paper which found that the grace period significantly increased default rates (Field, Pande, Papp and Rigol 2011), Table 6 shows that the five-weekly repayment schedule did not impact default rates. This finding holds when we limit the sample to DCS clients in Panel B of Table 6.

There may be two reasons contributing to this contrasting result. The first may be selection; this study was the third intervention we implemented with VFS, and a large fraction of clients had also participated in the second and first interventions. With each subsequent intervention, the clients who remained with VFS may be slightly wealthier or more fiscally responsible, leading to a sample in the third intervention that is less susceptible to default compared to the sample in the grace period experiment (administered as the second intervention). The second potential reason for the differing results may be repayment frequency. While the grace period experiment in the second intervention required both treatment and control groups

to repay every two weeks (starting immediately for the control group and after the two month grace period for the treatment group), the treatment group in this study repaid every five weeks throughout the loan cycle, allowing them more time to deal effectively with negative shocks between payments and avoid default.

8.6 Mental Health

Lastly, we find significant evidence from the DCS survey that flexibility in repayment decreased mental stress on clients. Table 7 presents the results: In Column (2), we find that five-week clients were 24-51% less likely to answer that they felt "worried, tense, or anxious" about paying their next loan on any given survey in comparison to weekly clients. This result is significant at the 5% level with controls and not statistically significant without controls, although both point estimates are large relative to the control mean and negative.

Column (3) shows that five-week clients were 39-54% less likely to report that they were not confident about repaying their next loan on any given survey. This result is significant at the 10% level without controls and significant at the 5% with controls.

Column (4) shows that, overall, five-week clients did not spend more or less time thinking about their loan. However, Panel C of Column (4) shows that in the two days preceding each loan repayment, five-week clients spent 3.2 minutes more thinking about the loan than weekly clients. This result is significant at the 10% level.

Lastly, Column (5) indicates that five-week clients were between 37-100% less likely to report arguing with their spouses about finances in the previous 48 hours. This result is significant at the 5% level without controls and is not robust to the inclusion of controls.

By interacting the treatment term with a dummy for two days before a loan repayment date, we are able to focus on changes occurring right before a loan repayment is due. Column (6) shows that five-week clients have considerably more negative savings in the two days before a loan is due, likely because the repayment amount is greater for five-week clients than weekly clients. Panel A and B results in Column (7) suggests that five-week clients receive more transfers from their husbands, with lower level of arguments about finances, potentially due to a higher level of cash flow from their business. This effect, however, does not appear to be concentrated in the days preceding a loan repayment.

8.7 Summary of Findings

The findings of our study provide evidence that increasing repayment flexibility in microfinance loan contracts allows clients to change patterns of investment in business inventory, resulting in higher business income and therefore, household income. We also provide evidence that repayment based on a five-week schedule

decreased mental stress over finances significantly for clients, with clients less likely to report being worried about money, lacking confidence in their ability to pay their next loan installment, or arguing about money with their husbands. Moreover, the number of hours worked by members of the household who were neither the client nor her husband was significantly lower and had lower variability in five-week households.

Although we do not find differences in default between clients with weekly and five-week repayment schedules, we interpret this finding cautiously in light of our previous studies on repayment flexibility. Field, Pande, Papp, and Rigol (2011) find that default rates more than double when clients are given a two-month grace period before commencing loan repayment. Feigenberg, Field and Pande (2010) ran an experiment very similar in design as the one presented in this paper, on first-time borrowers with VFS. They find that although default did not increase in the short-term (e.g., in the loan cycle of the experiment), it did increase among clients who were in the 4-week repayment cycle in the subsequent loan cycle even though the loan contract structures were exactly the same for all groups after the experiment. Other factors may also help explain why we do not see differential rates of default between our five-week and weekly repayment clients; for example, clients in this experiment were veteran VFS clients who had experienced more loan cycles. Another reason why we do not see default results in this study may be the fact that treatment clients had more time between all repayments, in comparison to Field, Pande, Papp, and Rigol (2001) where both treatment and control clients repaid every two weeks and only the grace period between disbursement and first repayment was varied. This additional time between repayments could have allowed treatment clients in our study more time to deal effectively with negative shocks between payments and avoid default.

9 Policy Implications

Our findings have immediate relevance to the ongoing policy debates in the microfinance field. Media reports of over-indebtedness among microfinance clients in the Indian state of Andhra Pradesh have spurred the government to take steps towards increased regulation of the Indian MFI sector and have sparked debates about the practices of MFIs more globally. The Reserve Bank of India has released a series of recommendations for next steps in regulation of the MFI sector and one of the most prominent of these recommended changes is the movement from a weekly to a monthly repayment schedule (Reserve Bank of India, 2011). This paper, along with the companion study by Field, Pande, Papp and Rigol (2011), suggests that client business income can be significantly raised by introducing greater flexibility in repayment schedules.

Our study also suggests that repayment flexibility can reduce the number of hours secondary earners spend in income-generating activities as well as reduce clients' mental stress over finances. However, this should be balanced by the potential

increase in default that MFIs may experience with allowing greater flexibility in loan repayment for clients.

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Table 1: Weekly vs. 5-week Randomization Check

	3rd intervention				DCS only			
Client-level variable	Weekly mean	5-week mean	Diff	N (control/treat)	Weekly mean	treatmean	Diff	N (control/treat)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Controls								
Age	35.16	34.55	-0.593 (0.573)	360/353	34.97	33.40	-1.543 (1.141)	98/100
Married	0.906	0.912	0.00713 (0.0204)	360/354	0.929	0.870	-0.0815** (0.0389)	98/100
Household_Size	4.256	4.226	-0.0298 (0.140)	360/354	4.247	4.060	-0.184 (0.257)	97/100
Muslim	0.00306	0.0677	0.0630** (0.0270)	327/310	0	0.0125	0.0104 (0.0103)	88/80
Literate	0.871	0.919	0.0464* (0.0268)	356/345	0.866	0.930	0.0828 (0.0541)	97/100
Has Savings	0.144	0.151	0.0133 (0.0279)	369/370	0.100	0.140	0.0274 (0.0513)	100/100
Shock in last month (illness, death, flood)	0.497	0.481	-0.0213 (0.0389)	366/368	0.465	0.475	0.00868 (0.0861)	99/99
Has Household Business	0.388	0.430	0.0394 (0.0525)	369/370	0.260	0.460	0.139 (0.0977)	100/100
Total Asset Value (Rs.)	18347	21420	3,086 (2,729)	368/367	13564	17512	3,745 (2,564)	100/100
Loan size (continuous)	8420	8400	-60.71 (174.95)	369/370	8570	8500	48.79 (330.85)	100/100
Panel B: Other client characteristics								
No. of times surveyed	-	-	-	-	25	24.99	-0.00748 (0.00727)	100/100
Average length of DCS interview (mins)	-	-	-	-	12.23	12.70	0.610 (1.391)	2439/2437
Years of Education	6.970	6.976	0.000917 (0.312)	328/338	6.739	6.857	0.0829 (0.651)	88/98
Weekly discount rate	379.5	327.9	-51.51 (47.02)	354/357	342.6	349.4	-39.65 (77.04)	95/100
Educ Expenses in last year (Rs.)	6005	6614	570.1 (586.8)	365/368	5692	5958	320.3 (1,134)	100/100
Health Expenses in last year (Rs.)	5187	5076	-79.61 (851.8)	365/368	3797	4671	702.6 (1,146)	100/100
Homeowner	0.807	0.852	0.0529 (0.0389)	280/257	0.793	0.873	0.0444 (0.0635)	87/79
Transfers into HH in last year (Rs.)	803.3	1308	507.7** (196.2)	359/364	712.1	1124	337.3 (293.1)	99/98
Transfers out of HH in last year (Rs.)	1646	1698	16.21 (197.8)	359/364	1458	1417	-60.88 (276.6)	99/98
Financial Control	0.824	0.844	0.0232 (0.0325)	358/365	0.755	0.770	-0.0146 (0.0682)	94/100
HH monthly income	9787	14327	4,070 (3,154)	369/370	8548	7303	-1,324 (1,109)	100/100
Loan size 5000	0.00542	0.00811	0.00286 (0.00602)	369/370	0.140	0.0800	-0.0879* (0.0461)	100/100
Loan size 6000	0.138	0.0973	-0.0407 (0.0266)	369/370	0.0400	0.0800	0.0507 (0.0494)	100/100
Loan size 7000	0.0623	0.0973	0.0354* (0.0212)	369/370	0.0400	0.0500	-0.00351 (0.0347)	100/100
Loan size 8000	0.0650	0.0757	0.0103 (0.0288)	369/370	0.190	0.300	0.0834 (0.0752)	100/100
Loan size 9000	0.179	0.219	0.0584 (0.0389)	369/370	0.0700	0.0300	0.0315 (0.0291)	100/100
Loan size 10000	0.0542	0.0270	-0.0277 (0.0272)	369/370	0.520	0.460	-0.0742 (0.0999)	100/100

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) Weekly discount rate calculated from series of hypothetical questions about preferences between different sums of money at time of survey versus a week from time of survey. Financial Control is a dummy for whether client answered "yes" to the following question: "If a close relative like your parents or siblings fell sick and needed money would you be able to lend money to that relative, if you had the exta money?". HH monthly income is the sum of all employment income of household members and rental income.

(2) Differences reported in Columns (3) and (7) is the coefficient on the dummy for 5-week repayment schedule, in a regression of the client-level variable on stratification of group formation fixed effects and standard errors adjusted for within group correlation.

(3) All variables listed in Panel A are included in each regression in Tables 2-7 specified as including controls. Variables listed in Panel B are not used as controls.

Table 2: Repayment and Income

	Total Income	Business income	Wage income	Variability of business income	Variability of wage income
	(1)	(2)	(3)	(4)	(5)
Panel A					
5-week	561.3**	614.9**	-53.59	367.3**	-7.7
	(278.9)	(286.2)	(38.04)	(152.1)	(23.9)
Controls Used	No	No	No	No	No
Panel B					
5-week	535.8**	569.1**	-33.33	310.6**	-11.2
	(222.9)	(223.8)	(41.51)	(131.2)	(31.1)
Controls Used	Yes	Yes	Yes	Yes	Yes
Observations	4,999	4,999	4,999	4,999	4,999
Mean for Weekly Repayers	634.1	469.3	164.9	137.6	35.4

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) Total business income is the sum of the personal business earnings from the last 48 hours reported by the client and by her husband in separate surveys. Total wage income is the sum of personal wage/ salary income from the last 48 hours reported by the client and by her husband in separate surveys. Total Income is the sum of Total business income and Total wage income from the last 48 hours.
(2) Standard errors adjusted for within loan group correlation in parenthesis.
(3) Each regression marked as using controls used all the variables found in Panel A of Table 1.
(4) All regressions include stratification of group formation fixed effects, dummies for day of week, dummy for whether the survey was given in the morning, dummies for weeks since loan disbursement and dummies for the calendar week. Control equations also include loan officer fixed effects.
(5) In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.
(6) Variability is measured by square of the deviation from the individual client mean. For variability outcomes only, the treatment effect, mean, and standard error are reported in tens of thousands.

Table 3: Repayment and Expenditures

	Total Household Expenditures	Food expenditures	House expenditures	Education expenditures	Health expenditures	Transfers out of HH	Payment to non-VWS loans	Other expenditures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A								
5-week	99.94**	-1.070	8.888	5.813	-9.160	4.641	70.63**	20.20
	(47.62)	(17.44)	(9.607)	(5.729)	(6.320)	(4.952)	(34.30)	(16.40)
Controls Used	No	No	No	No	No	No	No	No
Panel B								
5-week	43.41	-1.924	5.902	2.700	-7.758	5.663	40.97	-2.142
	(60.32)	(17.00)	(13.75)	(5.772)	(8.554)	(5.549)	(45.61)	(18.05)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,999	4,999	4,999	4,999	4,999	4,999	4,999	4,999
Mean for Weekly Repayers	414.05	184.71	32.65	17.96	20.64	10.96	73.23	73.89

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) Total Household Expenditures is the sum of Food expenditures, House expenditures, Education expenditures, Health expenditures, Transfers out of HH, Payment to non-VWS loans, and Other expenditures, each of which is described in more detail in footnotes below.

(2) Food expenditures is the sum of all the food expenditures reported by the client (purchase of vegetables, meat/fish, milk, sweets, tea, snacks, all other non-perishables, street food, restaurant food, alcohol, tobacco, and other food) and all food expenditures reported by the husband (purchases of the same categories excluding non-perishables that was eaten away from the household without his wife). Client was instructed not to include any food eaten by her husband out of the house without her. All expenditures are from the last 48 hours.

(3) House expenditures include repairs, utilities bills, new items for house, house rent, house taxes/ neighborhood fun reported by the client (husband was not asked questions about expenditures for the house) from the last 48 hours.

(4) Education expenditures include school tuition, tuition for a tutor, books/pencil/paper/ uniform, and other expenditures for education reported by the client (husband was not asked questions about education expenditures) from the last 48 hours.

(5) Health expenditures include money spent for medicine/ at a pharmacy, doctor/ clinic visit, tests, homeopathic medicine, and other health-related spending reported by the client (husband was not asked questions about health expenditures) from the last 48 hours.

(6) Transfers out of HH include transfers to relatives not living in the household and friends reported by the client (husband was not asked about transfers out of the HH) from the last 48 hours.

(7) Payments to non-VWS loans include payments to banks, other MFIs, moneylenders, stores, spouse, child, other household member, other relatives, friends, and village funds (husband was not asked about loan repayment) from the last 48 hours.

(8) Other expenditures include spending on entertainment, festivals/ special events, charity/ religious contribution, non-food expenditures on guests, clothing, phone, and transport reported by the client (husband was not asked about these other categories) from the last 48 hours.

(9) Outside food expenditures is the sum of expenditures reported by the client and husband on street food and restaurant food. Tobacco and Alcohol expenditures is the sum of spending on tobacco and alcohol reported by the client and husband.

(10) Footnotes (2)-(5) in Table 2 also apply to each regression in this table.

Table 4: Repayment and Business Investment (summed at weekly level)

	Total Business Investment and Expenditures	Investment in Inventory	Investment in Equipment	Investment in Raw Materials
	(1)	(2)	(3)	(4)
Panel A				
5-week	1,711	504.8**	141.8	991.3
	(1,113)	(227.6)	(99.57)	(1,137)
Controls Used	No	No	No	No
Panel B				
5-week	960.5	348.1	117.7	483.3
	(658.0)	(225.2)	(90.50)	(672.1)
Controls Used	Yes	Yes	Yes	Yes
Observations	1,599	1,599	1,599	1,599
Mean for Weekly Repayers	759.55	477.05	29.25	237.33

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) Total Business Investment and Expenditures is the sum of all the business-related investment in inventory, raw materials, equipment and other expenditures (maintenance, wages, rent, and utilities) as reported by the client and her husband on their respective surveys.

(2) Investment in Inventory is the sum of spending on saris, readymade clothing, mosquito nets, bedsheets, bedcover, cosmetics, small shop/ grocery inventory, fish, and other inventory reported by the client and her husband on respective surveys.

(3) Investment in Equipment is the sum of spending on vegetable cart, livestock, tools, equipment for catering or selling fish, machines, rickshaws, boats, tractors or other equipment reported by the client or her husband on their respective surveys.

(4) Investment in Raw Materials is the sum of spending on raw materials for agriculture (seeds, fertilizer, livestock feed, etc), cane, bamboo, sewing materials, wood, and other raw materials reported by the client or her husband on their respective surveys.

(5) Footnotes (2)-(6) in Table 2 also apply to each regression in this table.

Table 5: Hours worked

	Hrs worked (client and husband)	Hrs worked- other HH members (non-client, non-husband)	Hrs worked- other HH members (Only HHs with children under 18)
	(1)	(2)	(3)
Panel A			
5-week	-0.926	-2.863***	-3.726**
	(1.232)	(0.997)	(1.30)
Controls Used	No	No	No
Panel B			
5-week	0.727	-2.531***	-3.569**
	(1.347)	(0.864)	(1.26)
Controls Used	Yes	Yes	Yes
Panel C			
Two days before	0.0214	0.0311	0.0654
	(0.0953)	(0.0370)	(0.0431)
5-week * two days before	-0.234	-0.203**	-0.162*
	(0.234)	(0.0970)	(0.0853)
Observations	4,999	4,209	3051
Mean for Weekly Repayers (over 48 hours)	17.087	3.816	2.732

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) "Hrs worked (client and husband)" is the sum of the number of hours worked in the last 48 hours as reported by the client and her husband in their respective surveys.

(2) "Hrs worked - other HH members (non-client, non-husband) is the total number of hours the client reports that other household members besides the client and her husband have worked in money-earning activities over the past 48 hours. This question was not asked in the survey for the husband.

(3) For the specification with interaction terms, each observation (which covered a period of 48 hours) was "smoothed out" into daily observations. This was done by splitting the value of the outcome between the day of the survey and the previous day if the survey was administered in the afternoon. If the survey was administered in the morning, the value of the outcome was split between the previous day and the day before that. Where we had more than one daily observation for a given day using this method, we took the average.

(4) Specification with interaction terms is identical to the main specification, with the exception of the inclusion of the dummy variable "Two days before", the inclusion of the "5 week * two days before" interaction term, and the replacement of the 5-week dummy treat variable with individual fixed effect dummies.

(5) Footnotes (2)-(6) in Table 2 also apply to each regression in this table.

Table 6: Repayment and Default

	Default at 12 weeks past due date	Default at 12 weeks past due date	Default at 16 weeks past due date	Default at 16 weeks past due date	Default at 20 weeks past due date	Default at 20 weeks past due date
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Entire Sample						
5-week	-0.000756	-0.000470	-0.000756	-0.000470	-0.000756	-0.000470
	(0.0218)	(0.0182)	(0.0218)	(0.0182)	(0.0218)	(0.0182)
Controls Used	No	Yes	No	Yes	No	Yes
Observations	737	737	737	737	737	737
Mean for Weekly	0.024	0.024	0.024	0.024	0.024	0.024
Panel B: DCS Sample only						
5-week	-0.0114	-0.0106	-0.0114	-0.0106	-0.0114	-0.0106
	(0.0115)	(0.0109)	(0.0115)	(0.0109)	(0.0115)	(0.0109)
Controls Used	No	Yes	No	Yes	No	Yes
Observations	200	200	200	200	200	200
Mean for Weekly Repayers	0.010	0.010	0.010	0.010	0.010	0.010

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) "Default at X weeks past due date" is a dummy variable taking on the value of 1 if according to VWS' transaction data, a client's loan balance had not reached 0 by X weeks past the due date. The due date is assumed to be 45 weeks past the loan disbursement date for all clients.

(2) Footnotes (2)-(5) in Table 2 also apply to each regression in this table.

Table 7: Repayment and Mental Health

	Mental Stress Index	Worried about money	Not confident about repaying loan	Minutes spent thinking about loan	Argue about money	Net Savings	Transfers from Husband to Client
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A							
5-week	-0.0934**	-0.0794	-0.140*	-5.143	-0.0127**	36.05	125.1*
	(0.0442)	(0.0647)	(0.0805)	(4.472)	(0.00591)	(34.71)	(70.95)
Controls Used	No	No	No	No	No	No	No
Panel B							
5-week	-0.135***	-0.167**	-0.196**	-7.552	-0.00457	21.21	124.7*
	(0.0471)	(0.070)	(0.0876)	(6.286)	(0.00426)	(37.45)	(71.00)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C							
Two days before	-0.00255	0.00353	-0.0110*	-0.773	-0.000173	4.726	0.857
	(0.00319)	(0.00438)	(0.00563)	(0.542)	(0.00220)	(9.066)	(9.228)
5-week * two days before	-0.00181	0.00123	-0.0116	3.154*	-0.000173	-26.84	19.44
	(0.00772)	(0.0104)	(0.0171)	(1.758)	(0.00233)	(18.85)	(55.61)
Observations	4928	4917	4925	4,558	3,821	4,999	4,999
Mean for Weekly Repayers	0.256	0.3260	0.3588	15.6302	0.0121	33.297	115.691

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) Mental Stress Index is an equally-weighted average of "Worried about Money", "Not confident about repaying loan", a dummy for whether response for minutes spent thinking about loan is in top 75 percentile of all responses, and "Argue about money".
(2) "Worried about money" is a dummy variable that takes the value 1 if client answered that they are currently feeling "a little" or "very" worried, anxious, or tense about the next loan repayment.
(3) "Not confident about repaying" is a dummy variable that takes the value 1 if client did not answer that they are "confident I will have the money" for the next loan repayment.
(4) "Thinking about loan" is the number of minutes the client reported spending thinking about repaying the loan in the previous 48 hours.
(5) "Argue about money" is a dummy variable that takes the value 1 if client answered that her and her spouse argued over finances that day.
(6) Net savings is total savings in last 48 hours minus withdrawals from savings in the last 48 hours.
(7) Transfers from Husband to Client is the transfers from husband to client in the last 48 hours as reported by the client.
(8) For the specification with interaction terms, each observation (which covered a period of 48 hours) was "smoothed out" into daily observations. This was done by splitting the value of the outcome between the day of the survey and the previous day if the survey was administered in the afternoon. If the survey was administered in the morning, the value of the outcome was split between the previous day and the day before that. Where we had more than one daily observation for a given day using this method, we took the average.
(9) Footnotes (2)-(5) in Table 2 also apply to each regression in this table.

Appendix A Table 1: Repayment and Income (Aggregated at Week-level)

	Total Income	Business income	Wage income	Variability of business income	Variability of wage income
	(1)	(2)	(3)	(4)	(5)
Panel A					
5-week	1,715*	1,887**	-172.5	1562**	-51.4
	(911.5)	(934.6)	(118.4)	(764.3)	(81.5)
Controls Used	No	No	No	No	No
Panel B					
5-week	1,634**	1,747**	-112.5	1369**	-65.1
	(726.2)	(729.8)	(134.7)	(588.7)	(94.3)
Controls Used	Yes	Yes	Yes	Yes	Yes
Observations	1,599	1,599	1,599	1,599	1,599
Mean for Weekly Repayers	1984.2	1468.4	515.8	640	106

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) Footnotes (1)-(6) in Table 2 also apply to this table, with the exception that variables are aggregated at a weekly level.

Appendix A Table 2: Repayment and Expenditures (Aggregated at Week-level)

	Total Household Expenditures	Food expenditures	House expenditures	Education expenditures	Health expenditures	Transfers out of HH	Payment to non-VWS loans	Other expenditures	Prepared Food Expenditures	Tobacco and Alcohol Expenditures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A										
5-week	310.1**	-1.383	23.29	18.71	-28.65	13.80	226.1**	58.24	12.65**	10.49**
	(146.2)	(54.24)	(27.03)	(19.34)	(19.92)	(15.91)	(110.4)	(53.16)	(5.721)	(5.074)
Controls Used	No	No	No	No	No	No	No	No	No	No
Panel B										
5-week	131.4	-6.536	22.16	9.022	-23.58	16.90	128.9	-15.47	10.76**	15.43**
	(188.6)	(53.15)	(45.94)	(18.81)	(26.95)	(18.02)	(142.3)	(58.93)	(4.837)	(5.884)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599
Mean for Weekly Repayers	1295.5	577.9	102.2	56.2	64.6	34.3	229.1	231.2	27.3	25.2

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) Footnotes (1)-(10) in Table 3 also apply to this table, with the exception that variables are aggregated at a weekly level.

Appendix A Table 3: Hours worked (Aggregated at Week-level)

	Hrs worked (client and husband)	Hrs worked (client and husband)	Hrs worked-other HH members (non-client, non-husband)	Hrs worked-other HH members (non-client, non-husband)
	(1)	(2)	(3)	(4)
5-week	-3.175	2.154	-8.603***	-8.402***
	(3.819)	(4.273)	(2.699)	(2.591)
Controls Used	No	Yes	No	Yes
Observations	1,599	1,599	1,599	1,599
Mean for Weekly Repayers	53.5	53.5	10.0	10.0

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) Footnotes (1)-(3) in Table 5 also apply to this table, with the exception that variables are aggregated at a weekly level.

Appendix A Table 4: Repayment and Mental Health (Aggregated at Week-level)

	Fraction Worried about money	Fraction Not confident about repaying loan	Total number of minutes thinking about loan	Fraction Argue about money	Net Savings	Transfers from Husband to Client
	(1)	(2)	(3)	(4)	(5)	(7)
Panel A						
5-week	-0.0836	-0.144*	-18.4	-0.0116**	111.3	331.1*
	(0.0643)	(0.0795)	(12.6)	(0.00457)	(113.9)	(187.4)
Controls Used	No	No	No	No	No	No
Panel B						
5-week	-0.174***	-0.202**	-28.12*	-.00693*	49.36	332.0*
	(0.0681)	(0.0839)	(17.14)	(0.000629)	(122.0)	(197.4)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,599	1,599	1,599	1,599	1,599	1,599
Mean for Weekly Repayers	0.321	0.366	39.460	0.009	104.183	360.539

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) Footnotes (1)-(9) in Table 7 also apply to this table, with the exception that variables related to mental health are summed at a weekly level then divided by number of surveys in the week. Hence "Fraction Worried about money" is the fraction of responses in a given week where client answered that she was worried about the next loan repayment.

Appendix B Table 1: Attrition check

	Weekly Discount	Total Income	Employment income	Has worked in past 7 days	Has worked in past month
	(1)	(2)	(3)	(4)	(5)
Attritted	269.15	8429	7338	0.909	0.954
	(119.43)	(1375)	(1026)	(0.062)	(0.045)
N	20	22	22	22	22
Final sample	345.01	8046	7195	0.979	0.994
	(40.49)	(562)	(338)	(0.010)	(0.005)
N	192	197	197	197	197
T-stat	-0.577	0.219	0.134	-1.93	-1.89

Appendix B Table 2a: Distribution of Repayment Frequency Preferences

	Percent
Weekly	31.6
Fortnightly	12.6
Monthly	52.5
Bi-Monthly	0.6
Every three months	0.3
Annual	0.3
At end of loan cycle	0.9
Other	0.6
N	648

Appendix B Table 2b: Predicting Repayment Frequency Preferences

	More than Fortnightly Preferred
Waged	0.0591
	(0.0403)
Homeowner	-0.0823
	(0.0565)
Weekly Discount Rate	0
	0
Years of Education	0.00506
	(0.00642)
Muslim	0.0788
	(0.0928)
Has Business	0.0369
	(0.0533)
N	644

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) "More than Fortnightly Preferred" is a dummy that takes the value 1 if client responded that she preferred a repayment period of monthly or longer. The variable takes the value 0 if she prefers a repayment period of weekly or fortnightly.

(2) In cases where the independent variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.

(3) Standard errors adjusted for within loan group correlation in parenthesis.

(4) All regressions include stratification of group formation fixed effects and loan officer fixed effects.

Appendix B Table 3: Repayment and Income- Excluding Married and Loan Size

	Total Income	Business income	Wage income	Variability of business income	Variability of wage income
	(1)	(2)	(3)	(4)	(5)
5-week	495.1**	531.7**	-36.54	285**	-10.6
	(224.5)	(227.6)	(38.79)	(133)	(30)
Controls Used	Yes	Yes	Yes	Yes	Yes
Observations	4,999	4,999	4,999	4,999	4,999
Mean for Weekly Repayers	634.1	469.3	164.9	137	35.5

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) Total business income is the sum of the personal business earnings from the last 48 hours reported by the client and by her husband in separate surveys. Total wage income is the sum of personal wage/ salary income from the last 48 hours reported by the client and by her husband in separate surveys. Total Income is the sum of Total business income and Total wage income from the last 48 hours.
(2) Standard errors adjusted for within loan group correlation in parenthesis.
(3) Each regression marked as using controls used all the variables found in Panel A of Table 1, excluding Married and Loan Size
(4) All regressions include stratification of group formation fixed effects, dummies for day of week, dummy for whether the survey was given in the morning, dummies for weeks since loan disbursement and dummies for the calendar week. Control equations also include loan officer fixed effects.
(5) In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.
(6) Variability is measured by square of the deviation from the individual client mean. For variability outcomes only, the treatment effect, mean, and standard error are reported in tens of thousands.

Appendix B Table 4: Repayment and Expenditures- Excluding Married and Loan Size

	Total Household Expenditures	Food expenditures	House expenditures	Education expenditures	Health expenditures	Transfers out of HH	Payment to non-VWS loans	Other expenditures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5-week	49.95	-5.390	8.209	2.072	-8.391	4.213	52.70	-3.459
	(55.52)	(17.08)	(13.33)	(5.849)	(8.627)	(5.042)	(37.39)	(18.28)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,999	4,999	4,999	4,999	4,999	4,999	4,999	4,999
Mean for Weekly Repayers	414.1	184.7	32.7	18.0	20.6	11.0	73.2	73.9

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) Total Household Expenditures is the sum of Food expenditures, House expenditures, Education expenditures, Health expenditures, Transfers out of HH, Payment to non-VWS loans, and Other expenditures, each of which is described in more detail in footnotes below.

(2) Food expenditures is the sum of all the food expenditures reported by the client (purchase of vegetables, meat/fish, milk, sweets, tea, snacks, all other non-perishables, street food, restaurant food, alcohol, tobacco, and other food) and all food expenditures reported by the husband (purchases of the same categories excluding non-perishables that was eaten away from the household without his wife). Client was instructed not to include any food eaten by her husband out of the house without her. All expenditures are from the last 48 hours.

(3) House expenditures include repairs, utilities bills, new items for house, house rent, house taxes/ neighborhood fun reported by the client (husband was not asked questions about expenditures for the house) from the last 48 hours.

(4) Education expenditures include school tuition, tuition for a tutor, books/pencil/paper/ uniform, and other expenditures for education reported by the client (husband was not asked questions about education expenditures) from the last 48 hours.

(5) Health expenditures include money spent for medicine/ at a pharmacy, doctor/ clinic visit, tests, homeopathic medicine, and other health-related spending reported by the client (husband was not asked questions about health expenditures) from the last 48 hours.

(6) Transfers out of HH include transfers to relatives not living in the household and friends reported by the client (husband was not asked about transfers out of the HH) from the last 48 hours.

(7) Payments to non-VWS loans include payments to banks, other MFIs, moneylenders, stores, spouse, child, other household member, other relatives, friends, and village funds (husband was not asked about loan repayment) from the last 48 hours.

(8) Othe expenditures include spending on entertainment, festivals/ special events, charity/ religious contribution, non-food expenditures on guests, clothing, phone, and transport reported by the client (husband was not asked about these other categories) from the last 48 hours.

(9) Outside food expenditures is the sum of expenditures reported by the client and husband on street food and restaurant food. Tobacco and Alcohol expenditures is the sum of spending on tobacco and alcohol reported by the client and husband.

(10) Footnotes (2)-(5) in Appendix B Table 3 also apply to each regression in this table. As in Appendix B Table 3, controls exclude Married and Loan Size.

Appendix B Table 5: Repayment and Business Investment (summed at weekly level)- Excluding Married and Loan Size

	Total Business Investment and Expenditures	Investment in Inventory	Investment in Equipment	Investment in Raw Materials
	(1)	(2)	(3)	(4)
5-week	787.2	367.7*	121.4	290.5
	(634.0)	(206.7)	(98.11)	(630.4)
Controls Used	Yes	Yes	Yes	Yes
Observations	1,599	1,599	1,599	1,599
Mean for Weekly Repayers	759.6	477.1	29.3	237.3

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) Total Business Investment and Expenditures is the sum of all the business-related investment in inventory, raw materials, equipment and other expenditures (maintenance, wages, rent, and utilities) as reported by the client and her husband on their respective surveys.

(2) Investment in Inventory is the sum of spending on saris, readymade clothing, mosquito nets, bedsheets, bedcover, cosmetics, small shop/ grocery inventory, fish, and other inventory reported by the client and her husband on respective surveys.

(3) Investment in Equipment is the sum of spending on vegetable cart, livestock, tools, equipment for catering or selling fish, machines, rickshaws, boats, tractors or other equipment reported by the client or her husband on their respective surveys.

(4) Investment in Raw Materials is the sum of spending on raw materials for agriculture (seeds, fertilizer, livestock feed, etc), cane, bamboo, sewing materials, wood, and other raw materials reported by the client or her husband on their respective surveys.

(5) Footnotes (2)-(5) in Appendix B Table 3 also apply to each regression in this table. As in Appendix B Table 3, controls exclude Married and Loan Size.

Appendix B Table 6: Hours worked- Excluding Married and Loan Size

	Hrs worked (client and husband)	Hrs worked- other HH members (non-client, non-husband)
	(1)	(2)
5-week	-0.329	-2.124**
	(1.400)	(0.849)
Controls Used	Yes	Yes
Observations	4,999	4,209
Mean for Weekly Repayers (over 48 hours)	17.1	3.8

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) "Hrs worked (client and husband)" is the sum of the number of hours worked in the last 48 hours as reported by the client and her husband in their respective surveys.

(2) "Hrs worked - other HH members (non-client, non-husband) is the total number of hours the client reports that other household members besides the client and her husband have worked in money-earning activities over the past 48 hours. This question was not asked in the survey for the husband.

(3) Footnotes (2)-(5) in Appendix B Table 3 also apply to each regression in this table. As in Appendix B Table 3, controls exclude Married and Loan Size.

Appendix B Table 7: Repayment and Default- Excluding Married and Loan Size

	Default at 12 weeks past due date	Default at 16 weeks past due date	Default at 20 weeks past due date
	(1)	(2)	(3)
Panel A: Entire Sample			
5-week	0.000861	0.000861	0.000861
	(0.0184)	(0.0184)	(0.0184)
Controls Used	Yes	Yes	Yes
Observations	737	737	737
Mean for Weekly	0.024	0.024	0.024
Panel B: DCS Sample only			
5-week	-0.0111	-0.0111	-0.0111
	(0.0111)	(0.0111)	(0.0111)
Controls Used	Yes	Yes	Yes
Observations	200	200	200
Mean for Weekly Repayers	0.010	0.010	0.010

Notes:
* significant at 10% level ** significant at 5% level *** significant at 1% level
(1) "Default at X weeks past due date" is a dummy variable taking on the value of 1 if according to VWS' transaction data, a client's loan balance had not reached 0 by X weeks past the due date. The due date is assumed to be 45 weeks past the loan disbursement date for all clients.

(2) Footnotes (2)-(5) in Appendix B Table 3 also apply to each regression in this table. As in Appendix B Table 3, controls exclude Married and Loan Size.

Appendix B Table 8: Repayment and Mental Health - Excluding Married and Loan Size

	Worried about money	Not confident about repaying loan	Minutes spent thinking about loan	Argue about money	Net Savings	Transfers from Husband to Client
	(1)	(2)	(3)	(4)	(5)	(6)
5-week	-0.164**	-0.208**	-7.563	-0.00766*	20.41	101.3
	(0.0668)	(0.0900)	(6.197)	(0.00441)	(37.18)	(70.40)
Controls Used						
Observations	4917	4925	4,558	3,821	4,999	4,981
Mean for Weekly Repayers	0.3	0.4	15.6	0.0	33.3	115.7

Notes:

* significant at 10% level ** significant at 5% level *** significant at 1% level

(1) "Worried about money" is a dummy variable that takes the value 1 if client answered that they are currently feeling "a little" or "very" worried, anxious, or tense about the next loan repayment.

(2) "Not confident abot repaying" is a dummy variable that takes the value 1 if client did not answer that they are "confident I will have the money" for the next loan repayment.

(3) "Thinking about loan" is the number of minutes the client reported spending thinking about repaying the loan in the previous 48 hours.

(4) "Argue about money" is a dummy variable that takes the value 1 if client answered that her and her spouse argued over finances that day.

(5) Net savings is total savings in last 48 hours minus withdrawals from savings in the last 48 hours.

(6) Transfers from Husband to Client is the transfers from husband to client in the last 48 hours as reported by the client.

(7) Footnotes (2)-(5) in Appendix B Table 3 also apply to each regression in this table. As in Appendix B Table 3, controls exclude Married and Loan Size.

Appendix C: Experimental Design

1. **Sample size:** We ran a pilot in 2006-2007 with 100 clients, using the same treatment, survey instrument, and survey implementation methods. We saw from the pilot results that this sample was too small. Taking into account the constraints of the length of period surveyed (minimum of six weeks), frequency of surveying (no less frequent than every 48 hours), and funding availability, we decided on a sample size of 200 households for the Daily Consumption Survey.

2. **Treatment assignment:** Households in the sample were randomly assigned to treatment or control, in batches of 20 groups. The batches were formed in order of loan group formation (e.g., the first 20 loan groups that formed constituted the first batch, the next 20 loan groups the second batch, etc) in order to help ensure that treatment assignment was evenly distributed across loan groups that formed at different times.

3. **Treatment design:** The goal of our experiment was to test whether added flexibility in loan repayment would improve clients' ability to smooth consumption and/or make productive investments. One way to do this is to decrease the frequency of repayment from weekly to monthly. As documented in footnote 3, we started by giving treatment clients a four-week repayment plan but switched early in the experiment to a five-week repayment schedule to better accommodate our partner organizations' logistical needs.

4. **Survey implementation:** In order to measure impact of treatment on consumption smoothing, we needed to capture consumption and income information on a very frequent basis. Moreover, we needed this data to be accurate and precise as possible. Previous surveys of consumption smoothing activities among the poor in developing countries tended to be either collected too infrequently (e.g., asking households about their consumption and income every month) or raised concerns about accuracy (in the use of consumption diaries where respondents recorded their own financial activities, for example).

   We leveraged cell phone technology to dramatically improve on both dimensions. Using cell phones reduced travel time and costs for each survey, allowing the direct collection of information by surveyors every 48 hours.