Consumption and Saving Response to a Tax-Subsidized Saving Policy*

Sumit Agarwal†, Souphala Chomsisengphet‡, Pulak Ghosh § and Man Zhang **

Abstract

To incentivize households to increase private savings, the Indian government implemented in July 2014 a new tax-subsidized saving policy that allowed homeowners to exempt an additional 50,000 INR ($833) of the mortgage principal and interest payments from taxable income. We exploit the exogeneous policy change and assess the extent to which households reduce their consumption in order to finance a tax-favored saving instrument using a unique administrative panel data of consumer debit card and credit card spending transactions. We find that about 31% of households with a mortgage increase the principal repayment amount after the policy change; the median annual increase in principal repayment is about US$307, which is about 36.8% of the higher tax exemption limit. We estimate that households with a mortgage reduce their consumption by US$25 (5.2%) per month on average in order to finance the tax-favored saving account. For a one dollar increase in the income tax exemption limit on long-term savings, private saving increases by $0.23 for the treatment group. Relative to annual income, private savings for the treatment group increase by about 1.87% on average.

Keywords: Tax Preferred Saving Account, Tax Policy, Consumption, Saving, Debit Cards, Household Finance, Banks, Discretionary Spending, Fiscal Policy.

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† Department of Finance, National University of Singapore, Singapore, E-mail: ushakri@yahoo.com

‡ Office of the Comptroller of the Currency, 400 7th Street, SW, Washington DC 20219, E-mail: souphala.chomsisengphet@occ.treas.gov

§ Indian Institute of Management, Bangalore, India, Email: pulak.ghosh@iimb.ernet.in

** Department of Finance, University of Sydney, Australia, Email: man.zhang@sydney.edu.au

1. Introduction

Understanding households' decision to save is central to economics and has important policy implications. One critical debate in the public finance literature is the extent to which a tax-subsized saving policy can effectively induce households to save more. To take advantage of a tax-subsized saving policy, households can fund the tax-favored saving account by shifting contributions from the non-tax-favored saving accounts to the tax-subsidized saving account or by reducing consumption given the change in the intertemporal price of consumption. According to the classical life-cycle model, households should always optimize and exhaust the tax-preferred saving limit and increase private savings today in order to maximize lifetime utility (Ando and Modigliani, 1963). However, actual savings behavior of households is not consistent with the life-cycle model (Thaler, 1994). Individuals have bounded rationality (Simon, 1955 and 1979; Thaler, 1994; Kahneman, 1994 and 2003; Kahneman and Tversky, 2000), lack self-control (Thaler and Shefrin, 1981; Laibson, Repetto and Tobacman, 1998), or have time-inconsistent preference and hyperbolic discounting (Laibson, 1997). Thus, households may not be able or willing to entirely exhaust the exemption limit.

Much of the empirical studies extensively focus on the extent to which households fund a tax-favored saving account by simply reallocating contributions from other non-subsidized saving accounts to a tax-subsidized saving account, which implies a substitution between assets rather than a positive net effect on aggregate saving. Empirical evidence remains mixed. For example, Venti and Wise (1986 and 1990), Porterba, Venti and Wise (1995), Benjamin (2003), and Gelber (2011) analyze U.S. survey data on contributions to individual retirement accounts (IRAs) or 401(k) and find evidence supporting a positive net saving effects with zero or small crowd-out effect in other private saving accounts.[1] However, Gale and Scholz (1994) estimate that a very small to zero increase in net saving in response to an increase in annual IRA contribution limit and conclude that households largely finance the higher contributions simply by shifting balances from other taxable saving accounts.[2] One critical difficulty in the crowd-out effect of a tax-subsidized saving policy is data limitations (see Bernheim, 2002; Chetty, 2015). Researchers simply do not observe the entire portfolio of a household. Recently, Chetty, Friedman, Leth-Petersen, Nielsen, and Olsen (2014) use rich panel data on all private savings of Danish household and find that 85% of the individuals are passive savers who are unresponsive to subsidies and the other 15% of active savers who respond to tax subsidies by simply shifting assets across saving accounts.[3]

[1] Large net saving effects are also found in Denmark (Arnberg and Barlund, 2012) and in Canada (Engelhardt, 1996).

[2] Engen, Gale and Scholz (1996) explain that the estimated net saving response to higher IRA contribution limit by Venti and Wise (1986 and 1990) or Porterba, Venti, and Wise (1995) is too large because of the failure to account for unobserved differences in tastes for savings between contributors and non-contributers to the IRAs or for tge increase in household mortgage debt or home equity debt (which offsets the increase in U.S. household's 401(k) contributions).

[3] However, Arnberg and Barslund (2012) also study the crowd-out effect of Danish mandatory pension schemes for the renters. They find that for a given one Euro paid to the mandatory pension accounts, there is 0 to 30 cents reduction in other private savings depending on age. They attribute the low crowding-out effect on private savings to liquidity constraints. While Chetty et al. (2014) are able to directly measure private savings in other assets, Arnberg and Barlund (2012) derive private savings in other assets by subtracting pension wealth from total wealth.

More specifically on the extent to which households finance the tax-favored saving account through a reduction in consumption, empirical evidence is much more limited. In their study, Venti and Wise (1986) use the 1983 Survey of Consumer Finances (SCF) and estimate that 50 percent of the increase in IRA contributions came from reduced consumption, while only 10-20 percent came from household's other savings accounts. Venti and Wise (1990) use the 1980–1985 Consumer Expenditure Surveys (CEX) to estimate the effect of an incresase in the a IRA limit as proposed in the 1984 Treasury Plan. Overall, the estimate a positive increase in net saving, with 64 percent of the higher saving being financed by a reduced consumption. However, Gale and Scholz (1994) use the 1983-1986 SCF data to simulate the impact of a $1000 increase in annual contribution limit and estimate that only 2 percent of the increased in IRA contribution in response to the higher limit is financed by a reduction in consumption; 98% of the increased in IRA contribution is financed by a decrease in non-IRA private saving. Attanasio and DeLeire (2002) is the first to directly exploit household consumption information in the CEX to estimate the extent to which consumption declined for the households that became a new IRA contributor during the 1982-1986 period following the large IRA eligibility expansion in 1981 as well as during the 1987-1990 following the edibility restriction in the Tax Reform Act of 1986; they find that the consumption growth between households with a new IRA accounts relative to the households with an existing IRA accounts during these periods are statistically insignificant and the point estimates are economically small.

Our paper contributes to this literature by estimating household consumption response to an exogenous change in a tax-subsidized saving policy in India using administrative data on debit and credit card spending transactions to measure consumption. In July 2014, the Indian government raised the income tax exemption limit for long-term saving instruments by 50,000 Indian Rupee (INR) (US$833[4]) from 100,000 INR to 150,000 INR. The long-term saving instruments covered by the policy include fixed deposits of more than five years, health insurance, tuition fees, the public provident fund (PPF), as well as the principal portion of the equated monthly installment (EMI) of a home mortgage. Moreover, the new policy also raises the income tax exemption limit for the interest payment on a mortgage by 50,000 INR from 150,000 INR to 200,000 INR. However, given that the total income tax exemption limit only increases by 50,000 INR, a household with a mortgage on an owner-occupied primary residence could only exempt an additional 50,000 INR ($833) in principal and interest payments from taxable income.

The change in India's tax policy provides us with a quasi-experiment to identify the impact of a tax-subsidized saving policy on household consumption and saving. India is one of the few countries where households can exempt both the principal payment as well as the interest payment on a home mortgage. The 2014 tax-subsidized saving policy change targets homeowners with a home mortgage, and the relatively large mortgage subsidy on both the mortgage principal and interest payment creates huge financial incentives for households to respond to the policy change. Individuals holding a mortgage could simply reduce consumption in order to take advantage of the new tax-subsidized savings policy, especially because increasing mortgage loan principal repayment, in comparison to other saving vehicles, is less costly and more flexible for consumers due to the fact that other long-term savings instruments face lock-

[4] Our currency conversion is based on the exchange rate 60 India Rupee to US$1 as of July 2014.

in periods and minimum saving balance requirements. In addition, there is no cost (e.g., prepayment penalty) to make additional payment on the principal portion of a mortgage. Moreover, consumers holding a mortgage have less substitutable taxable savings instruments given that it is costlier to save and borrow at the same time since the rate of return on savings is lower than the rate on a mortgage loan.

Therefore, we argue that households with a home mortgages serve as a valid treatment group in identifying the effect of India's tax-subsidized saving policy on private savings. We employ a difference-in-difference (DID) empirical research design and estimate the consumption response of households with a mortgage (treatment group) relative to those who do not have a mortgage (control group) following the policy change using a unique administrative panel data of consumer spending transactions.

There are several advantages to our empirical approach. First, we measure consumption using a three-year panel data on debit card and credit card spending transactions from a bank with the largest customer market share in India. Therefore, our consumption measure has less measurement error as compared to survey data. Second, our data contain rich demographic details (such as income, gender, age, marital status and residential location district), which allows us to construct a control group that has very similar covariate distribution as the treatment group vis-a-vis a propensity matching approach, which helps to reduce the potential confounding effects and unobservable differences in the disposition to consume. Third, our setting allows us to directly test the consumption response to the policy change without the need for the full savings portfolio of households[5]. Most importantly, the panel data allows us to explicitly test the assumption that the treatment and control group have similar disposition to consume/save in the period before the policy change.[6] Moreover, we do not face the concern that the policy change may be endogenous to the disposition-to-save only for a subset of individuals because our policy change is applicable to all taxable individuals.

To preview our findings, about 31% of consumers with a mortgage increase the annual repayment on the principal portion of a mortgage possibly to take advantage of the higher income tax exemption limit. The median annual increase in the principal repayment amount is about US$307 (52%); this is equivalent to 36.8% of the higher tax exemption limit ($833). We estimate that, relative to consumers without a mortgage, consumers with a mortgage reduce their consumption by about US$25 per month; this is equivalent to 5.2% of monthly debit card spending. For a one dollar increase in the income tax exemption limit for the long-term savings, private saving increases by 23 cents for the treatment group. In addition, we find such reduction in consumption also persists in the following fiscal tax year FY 2015. Over a 20-month period after the policy announcement, consumers with a mortgage reduce their consumption by

[5] We would like to argue that incomplete saving data and incomplete consumption data have different impact on addressing the research question about whether the tax incentive can effectively increase the private saving rate. This is because the tax subsidized saving account and the non-tax subsidized saving account are substitutes to the households. Without observing all of the saving accounts, the estimation on the balance change of a subsample of saving accounts leads to inconsistent estimation. However, if there is no particular reason for the consumers to disproportionately reduce or increase consumption through the particular bank account we can observe in response to the tax benefit change, our estimation on change of consumption rate/saving rate is consistent.

[6] Despite best effort in matching by the previous research using survey data, researchers face a concern about the extent to which the treatment group and control group may have different disposition to save because such tests are not applicable.

about US$359 relative to consumers without a mortgage. Finally, our heterogeneity tests reveal that the consumption reduction is more pronounced among male, single, younger or lower income mortgage borrowers.

We further conduct two tests to validate our empirical design. We first divide the sample into whether or not a consumer with a mortgage indeed increases the repayment on the principal portion of the mortgage. In doing so, we find that a larger decline in consumption response for those consumers who increased their mortgage principal payment by more than US$167 (10,000 Indian Rupee). On the contrary, we do not find any significant differences in the consumption response of the consumers who hold a mortgage but had a smaller increase or no increase in the principal repayment amount. We also apply our matching approach and DID methodology to directly estimate the response of another long-term saving instrument (the public provident fund) that is also covered by the policy change. Under this setting, we find that the consumers with a public provident funds savings account increase its balance by US$255 (15,287 Indian Rupee) on average in the fiscal tax year FY 2014. However, we do not find any significant difference in consumption level between consumers who hold a PPF account and their control group following the policy announcement period. This is likely due to the fact that the PPF account holders in our sample, relative to the mortgage borrowers, are 10 years older and are not liquidity constrained since they have higher balance on their current account. It is possible that they may take advantage of the tax subsidy by simply shifting balance from other non-subsidized saving accounts.

We also conduct a series of additional robustness and placebo tests. First, we examine whether the relative decline in consumption of mortgage borrowers is due to some unknown seasonal trend by conducting the same analysis on the matched sample in one prior period before the policy change (FY 2013). We find that no statistically significant difference in the consumption response between the treatment and control group before the policy change. Second, to address the concern that consumers with a mortgage differ from consumers without a mortgage on unobservable characteristics, we completely drop consumers without a mortgage from our sample and perform the same tests by exploiting the heterogeneity in the loan principal repayment size, as well as investigate the robustness of our statistical inference-consistency in the standard errors by conducting our tests using alternative specifications. Our main results are robust under these alternative settings.

As discussed earlier, there are limited empirical evidence on the extent to which households fund a tax-favored saving account through a consumption reduction (e.g., Venti and Wise, 1986 and 1990; Gale and Scholz, 1994; Attanasio and DeLeire, 1994), largely due to data limitations. Our paper is the first to use consumer debit card and credit card spending transaction level panel data and directly test the extent to which households reduce consumption in order to finance a tax-favored saving account. Similar to Venti and Wise (1986 and 1990), we find that households finance tax-favored saving account by reducing consumption. That said, it may be difficult to precisely compare our 23% estimated consumption reduction to their 50-64% estimated consumption reduction. We believe we have a lower bound estimate of the reduction in consumption. This is because in our data consumers without a mortgage (control group) may also reduce their consumption in order to finance other tax-favored saving instruments that are eligible for

the increased income tax exemption limit. As a result, our DID estimator underestimates the reduction in consumption of the consumers with a mortgage (treatment group). Second, consumers without a mortgage (control group) may have a mortgage with another bank, which we cannot observe. Third, consumers may have debit and credit card accounts with other banks or consumption transactions are conducted in cash without going through the banking system. That said, the third issue is less of a concern to us given that the average monthly spending in our sample is similar with that of a survey data, and our data is from a bank in India that has the largest market share in consumer banking.

Our paper also complements the controversial empirical literature that focuses on the extent to which households shift balance from non-subsidized saving accounts to the tax-favored saving account (e.g., Venti and Wise, 1986 and 1990; Porterba, Venti and Wise, 1995; Engen and Gale, 1997; Engen, Gale and Scholz, 1994 and 1996; Benjamin, 2003; Gelber, 2011; and Chetty, Friedman, Leth-Petersen, Nielsen, and Olsen, 2014).[7] Our estimated reduction in consumption response to the tax-subsidized policy imply that households do not entirely shift contributions across savings account in order to take advantage of the tax-subsidized savings policy. Similarly, Beshears, Choi, Laibson and Madrian (2017) analyze administrative data from 11 U.S. firms that introduced a Roth 401(k) retirement plan between 2006 and 2010 and find that there's no significant reduction in the total 401(k) contribution rates following the introduction of the Roth 401(k) (deferred tax benefit). Their finding implies that the take-home pay declines and total retirement savings increases following the introduction of the Roth.[8]

With respect to the literature on tax subsidies to owner-occupied housing, our paper contributes to studies that directly focus on the impact of housing subsidies on household saving. Engelhardt (1996) study the effect of the cancellation of the Registered Home Ownership Savings Plan on private savings of renters (relative to homeowners) and finds that about 59-93 cents for each dollar contributed to the program for the treatment group. In addition, there is a stream of literature studying the effect of mortgage choice and its outcome on consumption. Coulibaly and Li (2006) look the consumption behavior of homeowners who paid-off their mortgage and find that homeowners increase their active savings as well as consumption of durable goods, but not of nondurable goods, after the last mortgage payment. On the other hand, Stephens (2008) exploits a predictable increase in discretionary income following the final payment of an auto loan and finds that a 10% increase in discretionary income leads to 2% to 3% increase in nondurable consumption. Gan (2007) finds that housing wealth has an effect on consumption such that for the majority of the households who do not refinance, consumption sensitivity appears to be due to reduction in precautionary saving. Using micro-level mortgage data, Gerardi, Rosen and Willen (2007)

[7] There is a also growing body of research document that households are behaving sub-optimally and household response to tax-preferred saving policies hampered by noneconomic (behavioral) factors. For example, 80 percent of Danish households are largely passive savers who are simply unresponsive to changes in tax subsidies (Chetty et. al., 2014) or 71 percent of 401(k) participants in the U.S. stick to the default option due to inertia (Madrian and Shea, 2001). A number of studies also document that automatic enrollment plans (Madrian and Shea, 2001; Choi, Laibson, Madrian, and Metrick, 2002) or a commitment to enroll program (Thaler and Benartzi, 2004) can significantly increase savings within retirement accounts.

[8] The authors also analyze additional survey data and attribute their finding largely to employee confusion or inattention about the tax properties of the Roth and behavior bias of partition dependence, rather than employee making an active calculated decision.

find that mortgage securitization, creating a less imperfect mortgage market since the early 1980s, has played an important role in smoothing consumption. Gruber, Jensen and Keleven (2017) find that mortgage interest deductions has an effect on household's choice of home size and home value. If the mortgage tax benefit is lower, households tend to buy a smaller home or a home with smaller appraisal value. Our results are consistent with their findings. For the home loan borrowers, given the higher mortgage tax benefit, households tend to save faster through holding more housing equity.

Our paper is also related to the studies of consumption and saving response using micro-level data. Recent studies use the micro data to examine 2001 tax rebates in the US, see e.g., Shapiro and Slemrod (2003), Johnson, Parker, and Souleles (2006), and Agarwal, Liu and Souleles (2007). Others have looked at the effect of the 2008 tax rebates on payday loans payments (Bertrand and Morse, 2009) and the 2001 and 2008 tax rebates on bankruptcy filing (Gross, Notowidigdo, and Wang, 2012).

The rest of the paper is structured as follows. In section 2, we provide institutional background on India's tax-subsidized savings policy. We lay out our empirical approach and develop our hypothesis in section 3. We describe our data and sample in section 4, and discuss our empirical results in section 5. We conduct robustness tests in section 6, and provide our conclusions in section 7.

2. India's Income Tax Policy Change

Income tax in India is enacted by the *Union Budget* for every fiscal tax assessment year on the total income earned in the previous year.[9] Taxable income or net income is obtained by subtracting the amount of income that can be exempted from the total gross income. India's tax policy has been adjusted quite frequently over the recent years. The trend has been to increase the income threshold within each tax rate band, to amplify the tax exemption limit, and to expand items claimable for income tax exemption (Gupta 2013). India's tax schedule varies by age groups, and within a given age group, income tax rates vary by net income level. Income is not taxable up to (a) 200,000 Indian Rupee (INR) limit for individuals below 60 years old; (b) 250,000 INR limit for individuals between 60 and 80 years old; (c) 500,000 INR for individuals above 80 years old. Up to the maximum limit, income tax rates vary by income brackets and range from 10% to 30% (FY 2013 – FY 2015). Under each income bracket, individuals can also reduce their taxable income up to a certain limit if they hold tax-exemptible instruments; the maximum limit is the same across all income brackets (200,000 INR in 2013). India's complete tax structure for FY 2013-FY2015 is summarized in Table A-1 in Appendix A.

India's domestic savings rate peaked at 34% in 2007 and has been declining since then, dropping to 31% in 2014. Likewise, household savings rate over GDP also dropped from 10% in 2010 to 5% in 2014. Given the wide belief that India's rapid economic growth over the past decades has been largely due to the high domestic savings rate, the recent trend became a great concern to the Indian policymakers. In

[9] Total income of a person includes five sections namely income from salaries, income from house property, profits and gains of business or profession, capital gains and income from other sources.

order to boost household savings rate for the fiscal tax year FY 2014 (April 1st, 2014 to March 31st, 2015), India made a surprise announcement to raise the income tax exemption limit on the long-term investment savings instruments. The news was announced on July 10th, 2014 by the Finance Minister Arun Jaitley. Since 1999, the union budget is usually announced on the last working day of February. But in the fiscal tax year FY 2014, the union budget was surprisingly announced in July, mostly because this was a general election year and so the announcement of the 2014 union budget was delayed from February to July. This implies that the FY 2014 union budget is the policy enacted by the new party in power, and as a result, the policy change is most likely unanticipated by the general population. Moreover, since the announcement date (July) was after the effective start date (April) of the fiscal year (FY), we could test the parallel trend assumption during the period from April to July and exclude the possibility that the results are driven by some unobservable fiscal year seasonal trend.

The document *Key features of budget 2014-2015*[10] provides details the change in India's fiscal policy. Specifically, personal income tax exemption limit was raised by 50,000 Indian Rupee (US$833) from 200,000 Indian Rupee (US$3,333) to 250,000 Indian Rupee (US$4,167) for the individual taxpayers below the age of 60 years. For senior citizens (ages 60 to 80), the total exemption limit was also raised by 50,000 Indian Rupee (equivalent to US$833) from 250,000 Indian Rupee (US$4,167) to 300,000 Indian Rupee (US$5,000). For the super senior citizens (age above 80), the total exemption limit did not change and remained at 500,000 Indian Rupee (US$8,333).

Moreover, there is a long list of income tax exemptible items that are classified into different categories, with an exemption limit for each category. Of particular interest to us is the category for long-term savings under Section 80C. The surprise policy announcement in July 2014 increased the exemption limit for long-term savings instruments under Section 80C by 50,000 India Rupee (INR) from 100,000 INR to 150,000 INR. Long-term investment instruments includes the public provident fund (PPF), long-term fixed deposit, health insurance, tuition fees, as well as the principal portion of the equated monthly installments (EMI) of a mortgage on an owner-occupied primary residence.[11] The inclusion of the principal portion of the EMI under Section 80C is in addition to India's traditional home mortgage interest deduction, which is covered in Section 24B. India is one of the few countries to allow households to exempt both the principal and interest payment of a mortgage. Furthermore, the income tax exemption limit for the interest payment (Section 24B) was also increased by 50,000 INR from 150,000 INR to 200,000 INR. However, given that the total income tax exemption limit only increases by 50,000 INR, a household with a mortgage on an owner-occupied primary residence could only exempt an additional of 50,000 INR ($833) in principal and interest payments from taxable income.

With respect to India's tax-subsidized saving policy change, one important question is whether the increase in the income tax exemption limit will be approved in the future fiscal years after FY 2014 ends

[10] http://indiabudget.nic.in/budget2014-2015/ub2014-15/bh/bh1.pdf

[11] The full list of 80C long-term savings instruments is provided in Appendix A.

or whether the policy will revert back after the FY 2014 ends (i.e., the next union budget will reduce the exemption limit back to the prior level). We confirm that there was no further major change on income tax exemption policy in FY 2015 and the income tax exemption limit remains at the FY 2014 level. In FY 2016, the Indian government further increased the total exemption limit. Given the recent expansionary trend overall, it is reasonable to believe that such expansionary fiscal policy is unlikely to revert back in the near future.

3. Methodology

India's exogenous policy change in the income tax exemption limit for long-term savings instruments provides us with a quasi-experiment identification strategy[12] to quantify the causal effect on household private savings. The policy affects all taxable individuals below the age of 80. For our quasi-experimental setting, everyone below 80 is eligible for the new increased income exemption limit. And while households with or without a home mortgage can respond to the policy in the same manner, we argue however that households with a mortgage have greater incentive and can optimize their tax-savings benefit by reducing consumption. Mainly, the new tax-preferred savings policy allows a household with a mortgage on an owner-occupied primary residence to exempt a maximum of 50,000 INR ($833) of both principal payments (under Section 80C) and interest payments (under Section 24B) from taxable income.[13] This implies that households with a mortgage can substantially benefit from the higher exemption limit by increasing the principal repayment portion. Thus, India's new tax-subsidized saving policy significantly incentivizes homeowners with a mortgage to respond to the policy change.

Moreover, households with a mortgage can maximize the higher exemption limit and increase principal payment by simply reducing consumption. This is because increasing mortgage loan principal repayment, in comparison to other saving vehicles, is less costly and more flexible for consumers. For example, pension fund and fixed deposit require at least 15 years and 5 years lock-in periods respectively and they also have the minimum saving requirements. Many households no longer have the exposure to the saving channels such as life insurance, tuition fee and national saving certificates. In contrast, households can increase any repayment amount of the principal portion of their mortgage with no cost (e.g., prepayment penalty). Moreover, consumers holding a mortgage have less substitutable taxable savings instruments given that it is costlier to save and borrow at the same time since the rate of return on savings is lower than the rate on a mortgage loan. Mortgage loan borrowers are more likely to cut on consumption instead of switching non-tax subsidized savings to increase the mortgage principle payment. Therefore, we apply a difference-in-difference (DID) analysis to compare the spending response of the treatment group (i.e., consumers with a mortgage) relative to that of the control group (i.e., consumers without a mortgage) following the policy change.

[12] There are other potential alternative identification strategies to evaluate the causal impact of the policy. For example, eligibility based one age, eligibility based on income level and different utilization levels of income tax exemption limit. We argue that these strategies are neither appropriate nor applicable in our context. The detailed explanation can be found in Appendix B-5.

[13] Starting in November 2011, the bank that provided us with the data waived the mortgage loan prepayment penalty. Therefore, households with a mortgage could increase repayment on principal part of the loan without incurring an extra cost.

3.1 Difference-in-Difference Model

To estimate consumer consumption response to the higher income tax exemption limit, we adopt the difference-in-difference methodology (see e.g., Agarwal et. al. 2007, Agarwal and Qian 2014) as follows:

$$Y_{i,t} = \alpha_0 \times HMB_i \times 1_{post\ m0} + \gamma_t + \gamma_i + \epsilon_{i,t} \quad (1)$$

Where $Y_{i,t}$ represents a measure of consumption. HMB_i represents the dummy variable that equals 1 if the individual *i* has a home mortgage; 0 otherwise. $1_{post\ m0}$ takes the value of one for the months in the post policy change and zero otherwise. m_0 refers to one month before the policy announcement month. γ_t represents the year-month fixed effect. γ_i represents the individual fixed effect. $\epsilon_{i,t}$ is the white noise error term. The key assumption underlying the methodology is that the disposition to consume/save would be the same for the treatment and control group without the exogenous policy change.

To increase the precision of the estimate, we need to ensure that the distribution of covariates (ones that determine an individual's disposition to consume) between the treatment and control group is similar. To do so, we adopt the propensity score matching approach to match the treatment group with the control group on the dimensions of gender, annual income, age, marital status and residential location district.

3.2 Distributed Lag Model

We also study the dynamics of spending using the following distributed lead and lag model:

$$Y_{i,t} = \sum_{t=-\tau}^{-1} \alpha_t \times HMB_i \times 1_t + \sum_{t=1}^{T} \alpha_t \times HMB_i \times 1_t + \gamma_t + \gamma_i + \epsilon_{i,t} \quad (2)$$

Where $Y_{i,t}$ represents a measure of consumption. HMB_i represents the dummy variable that equals 1 if the individual *i* has a home mortgage; 0 otherwise. $-\tau$ to -1 refers to the t^{th} month before the policy announcement month and 1 to T refers to t^{th} month after the policy announcement month. γ_t absorbs the year-month fixed effect and γ_i absorbs the individual fixed effect. $\epsilon_{i,t}$ is the white noise.

The coefficients α_1 to α_T measure the additional monthly marginal response from months 1 to T after the policy announcement. The coefficients $\alpha_{-\tau}$ to α_1 capture the monthly differential consumption response between the treatment group and the control group during the pre-treatment period. To gauge the expansionary impact of the fiscal policy, we define the cumulative coefficients $C_s = \sum_{t=0}^{s} \alpha_t$ to describe the cumulative response in spending after ***s*** months. The coefficient a_s captures the cumulative response of the spending starting from month 0. On the other hand, $C_{-\tau}$,… C_1 measure the cumulative differential spending response between the treatment group and the control group from month τ to 1 before the policy announcement month, and we expect them to be economically and statistically insignificantly different from zero. Furthermore, we also study the heterogeneity in the response to the income tax exemption limit policy change by subsample grouping based on income, gender, age and marital status.

4. Data and Sample

To conduct our empirical analysis, we use a unique administrative panel data of an individual customer's detailed banking transaction records. The data was provided to us by a commercial bank in India with the largest market share in retail banking. Our data set contains three critical components, which we describe in more detail below.

4.1 Mortgage Data

In our first data, there are over 812,00 individuals who have a mortgage at three snapshots: September 2013, September 2014, and September 2015. For each mortgage loan, we know its total approved loan limit, loan terms, repayment starting date, value of primary security and its address at province-district level. For each snapshot of loans, we know its end of day balance, total interest payment up to date, floating interest rate and delinquency status. For each mortgage loan borrower, we have data on age and marital status. We obtain the total principal repayment and interest payment during FY 2013 by simply differencing the end-of-day balance and total interest payment in September 2014 and in September 2013. Similarly, we can also calculate the total principal repayment and interest payment in September 2015 and in September 2014. Given that the policy change took place in July 2014, we consider September 2013 to September 2014 as the pre-event period and September 2014 to September 2015 as the post-event period.

4.2 Debit Card Transactions

In addition to the mortgage data, we also have data on debit card spending transactions from April 2013 to April 2015, which includes two full fiscal tax years (FY2013 and FY 2014). Therefore, we can test the common trend identifying assumption in FY 2013 before the policy change year and estimate the cumulative effect up to the end of policy affected fiscal tax year FY 2014. We clean the data in the following manner. We exclude the individuals with no account origination date as well as accounts that were originated after April 1st, 2013, which is the starting point of our sample period. We also exclude customers who do not have available valid income data[14] as well as customers without available residential location district information. We exclude inactive accounts (i.e., account with zero debit card transactions over a period of six consecutive months). Our final sample includes a total of 84,764 consumers (12,670 consumers have a mortgage and 72,094 consumers do not have a mortgage). We use two types of spending transactions to measure consumption: (1) cash withdrawal from branch and cash withdrawal via ATM; (2) point-of-sale (P.O.S) transactions using debit card. For all accounts included in the sample, the transaction level data are winsorized at 1% and 99% level.

Each debit card account has an indicator to identify whether or not the debit account holder has a home mortgage. Unfortunately, the debit card data cannot be merged with the detailed mortgage data previously described. So we do not know any additional information about the home mortgage that is held by the

[14] Our debit card panel data includes 205,783 individuals in total. There are 25,233 individuals have mortgage loans. If we restrain the sample to be individuals with non-missing income data, we are left with 72,137 individuals which is about 30% of the total sample. To confirm that the results are not driven by the individuals with available income data, we re-conduct the main tests by keeping all the consumers with missing income data and the results remain. The sample characteristics and all the test results are reported in the Appendix B-7

debit card holder. To construct the control group with similar covariates as the treatment group, we perform the propensity score matching on the dimensions of gender, age, annual income, marital status and residential location district. To ensure the robustness of our estimator, we choose nearest one neighborhood matching without replacement and caliper equal to 0.001.

4.3 Debit Card and Credit Card Transactions

We also have a third panel data set that contains two types of monthly spending transactions: (1) debit card transactions (cash withdrawal from ATM and P.O.S transactions); (2) credit card spending. This data is different from the debit card data described above. Compared to the debit card data, this data has three advantages and one disadvantage. The first advantage is that this panel data ranges from April 2014 to February 2016, which allows us to examine whether the effect is persistent in one additional fiscal year FY 2015. Second, with the credit card spending, we have better and more complete measure of consumption. Third, this data set can be merged with the mortgage data previously described. Hence, for those identified mortgage borrowers, we can directly observe whether they indeed increase the principal repayment in response to the policy change. The disadvantage of this data is that we do not have the annual income data; therefore, we can only match on the dimensions of gender, age, marital status and residential location district, but not annual income. We clean the data set in a similar manner. We exclude the observations with missing or invalid demographical data, as well as exclude inactive accounts (i.e., account with zero debit and credit card transactions over a period of six consecutive months).

[insert Table 1 here]

Table 1 reports summary statistics of three data sets. Panel A is the summary statistics of the mortgage loan data. We have a total of 812,169 mortgages that were mostly originated between 2006 and 2012, with an average origination loan amount of 826,059 INR (US$13,767). The median loan term is 180 months (15 years). The average value of the primary residence securing the loan is 1,401,918 INR (US$23,365). Most of the mortgages have adjustable rate, with the average interest rate at 11% as of September 2014. The average primary mortgage borrower is 53 years old, and 62% of them are married.

Panel B is the summary statistics of the debit card panel data. We report summary statistics of the treatment and control group for both before and after the propensity score matching. The treatment group consists of the individuals with a mortgage and the control group consists of those without a mortgage. From the entire sample without matching (top of Panel B), the pairwise t-tests indicate that the treatment and control groups have significantly different demographic covariates. To obtain more precise estimations, we match the two groups on the dimensions of age, gender, marital status, annual income and residential location district by applying the propensity score matching separately for the metro and rural area and for the different income groups. We restrict the matching to be nearest 1 neighborhood without replacement and caliper width of 0.001. After matching, the pairwise t-tests indicate that the matched treatment and control group are statistically indifferent on key demographics, while any differences in covariates on average are relatively small in magnitude. While we have less available current account and savings account balance data, the matched control group has significantly higher savings than the

treatment group. The evidence is consistent with our arguments that consumers with a mortgage have less closely substitutable savings to finance the tax deductible saving accounts in comparison to consumers without a mortgage.

The matched control group withdraws on average about 391 INR (US$6.52) per month more than the matched treatment group in the pre-treatment period, and about 1,706 INR (US$28.43) per month more than the matched treatment group in the post-treatment period. In addition, the matched control group spends (via debit card P.O.S transactions) about 300 INR (US$5) per month more than the matched treatment group on average in the pre-treatment period, and about 493 INR (US$8.22) per month more than the matched treatment in the post-treatment period. In Figure 1, the unconditional average monthly spending over the entire sample period provides preliminary evidence of a reduction in consumption level by that the treatment group, relative to the control group, in the post-treatment period.

[insert Figure 1 here]

Panel C provides summary statistics on the debit card and credit card transactions for the matched treatment and control group. Given that we do not have annual income data, we perform the propensity score matching on age, gender, marital status and residential location district. The matched treatment and control group have statistically similar demographics, and any demographics that are statistically different between the two groups is quite small in magnitude. Similarly, for the cash withdrawal and P.O.S transactions in the pre-treatment period, the matched control group on average withdraws 4,547 INR less than the treatment group and this number reduces to 3,417 INR in the post-treatment period.

5. Results

We first test the relationship between a borrower's characteristics and the propensity to repay the principal portion of the mortgage in section 5.1. We report the average and dynamic spending response from the debit card spending transactions in section 5.2, and the heterogeneity in response across different individuals in section 5.3. Following that, we report the average and dynamic spending response from the debit and credit card spending transactions in section 5.4. Finally, we conduct robustness tests and report the results in section 5.5.

5.1 Change in the repayment of the principal portion of the mortgage

To maximize the tax benefits, Indian households with a mortgage can increase the amount of the repayment towards the principal portion of their home mortgage. In this section, we first examine the extent to which households indeed increase the repayment of the principal amount. We restrict mortgage sample by excluding a mortgage with insufficient remaining principal balance (below 50,000 INR) by September 2013 and excluding a mortgage with loan term less than 3 years or more than 30 years. To avoid misleading outliers, we cut the sample at 1% and 99% based on mortgage loan approved credit limit. Moreover, if the principal payment in the pre-treatment period is less than 100,000 INR (which is below the old exemption limit) or if the principal payment in the pre-treatment period is greater than 200,000

INR (which is higher than the new limit), then we exclude theses mortgage borrowers because their decision to change the principal payment will unlikely be affected by the policy change.

In the end, we have a sample of 626,796 mortgages. We divide mortgages into three groups based on the change in annual total mortgage repayment. Summary statistics are reported in Table 2. In Panel A, we report results based on a sample that includes the 41% of consumers who has a mortgage but *do not* significantly increase the total repayment of the principal and interest amount between FY 2013 and FY 2014. According to a mortgage amortization schedule, the repayment of the principal portion increases overtime, while the repayment of the interest portion decreases. For these mortgage holders, the average increase in the principal payment is 4,781 INR (US$80), which is only about 12% of the principal repayment amount in the base year. In Panel B, we report the summary statistics for the 31% of consumers with a mortgage who significantly increase the total repayment of the principal and interest amount. The average increase in repayment for the principal portion is 78,138 INR (US$1,302), which is about 190% of the principal repayment amount in the base year. The median increase in repayment for the principal portion is about 18,434 INR (US$307), which is equivalent to 52% of the principal repayment amount in the base year. Comparing with Panels A and B, we argue that the significant increase in principal repayment in Panel B is *not* simply due to the typical increase in the principal repayment amount based on the amortization schedule; a larger portion of the increase in the principal repayments is triggered by the tax-subsidized savings policy incentive. In Panel C, we report results based on a sample that only includes the 27% of consumers who reduce the total repayment of the principal and interest amount. Perhaps due to adverse income shocks or otherwise, many of these consumers are not repaying the same amount minimum principal and interest payment amount as required in the previous year; therefore the repayment on the principal amount is substantially lower in the subsequent year. The median reduction in principal repayment amount is only about 4,418 INR (US$73), which is equivalent to 13% of the principal repayment amount in the base year.

It is worth noting that for the increase in the tax exemption limit to generate a positive financial benefit, one necessary condition is that the current existing balance on a saving account must be below the new/higher exemption limit; otherwise, the policy is a pure income tax cash rebate. For more than 90% of the consumers in our sample used in Table 2 Panels A, B and C, the principal repayment amount during 2013:09 to 2014:09 is below the new (higher) maximum exemption limit.

[insert Table 2 here]

To investigate who responded to the policy change, we regress the propensity to increase the principal repayment of the mortgage on borrower and loan characteristics. The results are reported in Table 3 below. To control for the remaining loan amount due and the number of months required to pay down the mortgage loans, the fixed effects we imposed in columns (1) to (3) is the interaction of the principal balance observed as of September 2014 and months to maturity. Controlling for all the other loan characteristics, we find that married and older households are less likely to increase the principal payment. To further control for the required amount of payment, the fixed effect we impose in columns (4) to (6) is

principal balance at September 2014 times months to maturity times interest rate at September 2014. The findings remain the same. These results suggest that the younger and single household borrowers are more likely to increase the principal payment in the post policy period.

[insert Table 3 here]

5.2 Spending response by debit card transactions

In Table 4, Panel A reports the average spending response estimated using the regression equation (1) with the entire unmatched sample, while Panel B reports the spending response using the matched treatment and control groups. Our discussion will mainly focus on the matched sample results reported in Panel B. The key explanatory variable of interest is the interaction term between the treatment group dummy and the post-policy announcement dummy. The estimated coefficient captures the spending response after the policy announcement relative to the pre-announcement period of the treatment group relative to the control group. The first two columns in Panel B show that the average total monthly spending (cash withdrawal and P.O.S. spending) of the treatment group is US$25 less than that of the control group in the post-treatment period, which is about 5.2% of the total monthly spending on average. Columns (3) and (4) show that the average total monthly cash withdrawal of the treatment group is US$22 less than the control group, which is about 5.6% of total monthly cash withdrawal on average. In addition, the number of cash withdrawals by the treatment group is also reduced by 0.13 times on average. Columns (6) and (7) show that on average total monthly P.O.S. spending by the treatment group is US$3.22 less than that of the control group, which is about 7.6% of the total monthly P.O.S. spending on average. The estimated spending responses are both statistically and economically significant.

[insert Table 4 here]

To further investigate on the dynamic behavior of the mortgage borrowers relative to its control group, we estimate the distributed lead-lag model specified in equation (2) and report the results in Table 5. In this analysis, we use June 2014 as the base month, which is absorbed in the constant variable. The variable of interest is the interaction between the treatment dummy and the calendar month dummy variables. The estimated coefficients for months March to May reflect differences in the monthly consumption response between the treatment and control group during the pre-treatment period. Almost all of the coefficients are statistically insignificant and economically small. Thus, our sample test does not reject the parallel trend assumption of the DID methodology[15].

From July 2014 until the end of the sample period April 2015, which is ten months after the policy announcement, we find a significant reduction in consumption by the treatment group relative to the control group. Mostly, the reduction in consumption starts from the 5th month (November 2014) after the policy announcement and the magnitude of the reduction steadily grows larger thereafter. Our results are

[15] We also test the pre-treatment parallel trend assumption by exhausting the entire sample period from April 2013 to June 2014. The results are reported in the Appendix B-6.

consistent with the findings in the existing literature that consumers tend to delay consumption response to tax-deductible saving policies until the end of the tax cycle (Summers, 1986; Engen, Gale and Scholz, 1994, Berheim, 1994 and 2002).

[insert Table 5 here]

The cumulative response estimated using equation (2) and its corresponding confidence interval are reported in Figure 2. Consistent with the marginal effect, the estimated cumulative spending response in the pre-treatment period are also statistically insignificant and small in magnitude. However, the estimated cumulative spending response in the post-treatment period by the treatment group is significant and monotonically declines overtime. On average, the treatment group spends US$193 less than the control group by the end of fiscal tax year FY 2014 (m_9 = March 2015). Therefore, the lower bound of the average increase in private savings by consumers with a mortgage is about US$193 dollars for the fiscal tax year FY 2014. Our estimation implies that a US$1 dollar increase in the income tax exemption limit resulted in a 23 cents increase in private saving on average by the treatment group.

[insert Figure 2 here]

5.3 Heterogeneity of spending response across mortgage loan borrowers

As documented in the extant literature, the effectiveness of a tax-preferred savings policy on private savings behavior is generally heterogeneous across the population. For example, Chetty et al. (2014) find that consumers who are wealthier and more financially sophisticated are more likely to respond to tax-incentivized savings policies and exhaust the beneficial limit, while people in the lower income distribution are more passive to such policy change. Given the rich array of demographics of the consumers in our data, we can also study the heterogeneous consumption response of consumers in greater depth. In the following sub-sections, we estimated regression equation (2) for each sub-sample. To save space, we do not report the marginal effects[16]; instead we report in Figure 3 the estimated cumulative consumption response and its corresponding confidence interval.

A. Income

We classify consumers into four income categories in accordance with the income tax schedule for individuals below the age of 60 as reported in India income tax policy: consumers with annual income[17] <= 200,000 INR are income group 1, between 200,001 and 500,000 INR are in income group 2, between 500,001 and 1,000,000 INR are in income group 3, and greater than 1,000,000 INR are in income group 4. In Figure 3-A, we plot the cumulative spending responses and their corresponding confidence intervals by income group. For the lower income groups 1 and 2, we find a significant decline in the log transformed total spending of the treatment group relative to the control group. On the other hand, the spending response is not significant for the two higher income groups 3 and 4. By the end of fiscal year 2014 (March

[16] The marginal effect results are reported in Appendix Table B-8.
[17] We can only capture the salary part of the annual income but not the total annual income for income tax purpose.

2015), the cumulative reduction in consumption of the treatment group belonging income groups 1, 2, and 3 is respectively US$386 (122%), US$424 (91%), and US$223 (40%) less than that of the control group. We attribute our findings to the fact that consumers from lower income groups are relatively more financially constrained, and therefore, need to reduce consumption in order to finance the tax deductible saving accounts. Unlike the finding in the existing literature that low income households are passive responders, we find low income households actively responds to take advantage of the financial benefits provided by the tax-saving policy.

B. Gender

We estimate the cumulative spending responses to the policy change based on gender. Male represent the majority (87%) of the consumers in our sample. Plots of the estimated cumulative consumption response and their corresponding confidence intervals are provided in Figure 3-B. By the end of fiscal tax year FY 2014 (March 2015), the cumulative reduction in consumption response of the treatment group compared with their control group is on average US$290 (74%) and US$332 (58%) for male and female, respectively. With the log transformation of the total spending measure, the reduction in consumption for the female is not statistically significant.

C. Age

We also estimate the consumption response by age groups given that financial decisions vary over the life-cycle (Agarwal, Driscoll, Gabaix and Laibson, 2009). To have a more balanced sample size of the sub-samples, we cut the sample by three age groups: age below 40, age between 40 and 50, and age above 50. In Figure 3-C, we plot the estimated cumulative spending response and their corresponding confidence intervals for each sub-sample. For consumers who are below the age of 40 and those between 40 and 50 years old, we find a significant reduction in total spending by the treatment group. By the end of fiscal tax year FY 2014 (April 2014 to March 2015), the cumulative reduction in consumption by the treatment group is US$469 (117%) and US$370 (76%), respectively, for consumers below the age of 40 and consumers between 40 and 50 years old. However, there is no reduction in total spending by the treatment group in the greater than 50 years old category. Given that the older population is wealthier and less liquidity constrained, it is unlikely that they have to reduce consumption in order to take advantage of the higher tax exemption limit policy. Our results do not contradict with the literature documenting that the young and less wealthier invidiuals are less responding to saving tax incentives. The policy experiment in Chetty et. al. (2015) and some other studies is the change of tax concession rate. If the policy change is the increase in tax concession rate, the intension to treat households are those who are not binding by the total tax exemption limit. The policy change we utilize in India is the increase in income tax exemption limit. In our context, the increase in total income tax exemption limit should potentially affect the households who are binding by the old lower tax exemption limit. The intention to treat households are those who have exhausted the tax benefit before the policy change. Hence, our results do not contradict with the literature as the intention to treat population are two distinct groups of people.

D. Marital Status

Finally, we also estimate the cumulative spending responses due to the savings policy change by marital status. Plots of the cumulative spending response and their corresponding confidence intervals for each sub-sample are provided in Figure 3-D. By the end of fiscal tax year FY 2014 (April 2014 to March 2015), the cumulative reduction in consumption of the treatment group is on average US$264 (60%) and US$327 (117%), respectively, for the married and single households. Single consumers tend to be younger, less wealthy, and more liquidity constrained, and therefore, likely has to reduce consumption in order to increase the saving balance of the tax-preferred longer-term saving account. These findings are consistent with those results by the income and age groupings.

[insert Figure 3 here]

Moreover, these findings are also consistent with findings with the mortgage loan sample (reported in Table 2). We find that the younger and single households are more likely to increase the principal repayment in response to the savings policy change. Consistently, the younger and single households cut more on the consumption in the post policy period relatively to their control group.

5.4 Spending response by debit and credit card transactions

Using another data set consisting of the consumers who have both debit card and credit card spending transactions with the bank, we first estimate the average monthly spending response based on equation (1) and report the results in Table 6. In Panel A, we report the spending response via *cash withdrawals and P.O.S.* transactions for the entire sample period from 2014:01 to 2016:02 and spending response via *credit card spending* transactions for the period from 2014:04 to 2016:02. Again, the variable of interest is the interaction between the treatment dummy and the post-policy announcement dummy. From columns (3) and (4), we find that the treatment group reduces monthly cash withdrawals and P.O.S. transactions by US$20 on average, which is about 10.1% of the total monthly cash withdrawals and P.O.S. transactions. The estimated reduction in spending in this data is similar to the finding using only the debit card transactions data. However, we do not find a significant reduction in spending on credit card, as shown in columns (5) and (6). It is worth noting that credit card penetration in India is low as most consumers still rely on cash for spending; therefore, the monthly credit card spending is small in magnitude relative to spending via cash withdrawals and P.O.S. transactions. In columns (7) and (8), we examine the relative change in the end-of-month balance of the debit card. As reported in Panel A, there is no significant change in the end-of-month balance of the debit card of the treatment and control group, even though the monthly cash withdrawal is significantly reduced. The reduction in cash withdrawal is used to pay down the mortgage balance, and therefore does not result in an increase in balance of debit card for mortgage holders.

The longer-term effect of the tax-subsidized savings policy is also important to understand. With the debit and credit card spending transactions, we are able to examine the extent to which the estimated consumption reduction in FY 2014 persists in the next fiscal tax year FY 2015. Given that there is no further policy change in the total income tax exemption limit and there is also no category level limit

change in FY 2015, we have a clean setting to examine the persistence of the estimated consumption reduction by the treatment group in FY 2014. In Table 6 Panel B, we report the estimated spending response using the regression equation (1) for the entire post-policy announcement period from 2014:07 till 2016:02. The *Post* variable takes the value of 1 for the months after 2015:04 which is the starting month of FY 2015, and 0 otherwise. From this analysis, we do not find any significant increase or decline in spending of the treatment group for both cash withdrawal, P.O.S. transactions and credit card spending. The economic magnitude of the interaction variable is also quite small. Hence, the reduction in consumption of treatment group relative to that of their control group remains unchanged in FY 2015. The positive effect of the higher tax-subsidized saving limit on private savings is persistent in the following fiscal tax year for the treatment group.

[insert Table 6 here]

Similarly, we also estimate the dynamic spending response by estimating regression equation (2). Instead of reporting the marginal effects, we only report the estimated cumulative spending response and its corresponding confidence interval in Figure 4. In the pre-treatment period, the cumulative coefficient is small and statistically insignificant. In the post-treatment period, however, the estimated cumulative spending response is significantly negative and the decrease continues to amplify as time passes. Within 9 months after the policy announcement, total spending by the treatment group relative to the control group declined by US$115 on average, which is about 54% of total amount of the monthly spending. By the 20th month (February 2016), the reduction in the total spending of the treatment group relative to the control group grows to about US$359, which is about 134% of total amount of the monthly spending. Therefore, we conclude that the average increase in private savings of the treatment group in response to the increase in the limit of the tax subsidized saving is about US$155 per year and such positive effect on private saving is persistent in the next fiscal tax year FY 2015.

[insert Figure 4 here]

As previously discussed in Section 4.3, one advantage of the debit and credit card transactions data is that it can be merged with the detailed mortgage data. With the detailed mortgage data, we are able to identify which consumers actually increase the repayment of the portion of the principal amount in response to the policy change. Thus, we can provide additional evidence that consumers with a mortgage who increase the principal repayment amount indeed reduce consumption. We separately estimate the spending response using regression equation (1) for the consumers who hold a mortgage and increase the principal repayment amount in FY 2014 relative to those consumers who hold a mortgage but do not increase the repayment of the principal portion of the mortgage. The results are reported in Table 7, where Panel A reports results for our matched sample consisting of only the consumers who hold a mortgage and who increase the principal repayment amount by *more than* 10,000 INR[18] from FY 2013 to FY 2014.

[18] The cut off is chosen based on the results reported in Table 2. Table 2 Panel A reports the mortgage loan borrowers who do not increase total loan payment from FY 2013 to FY 2014. Therefore, their increase in the principal payment can be used as a reference for the amount of principal payment increase due to amortization schedule. The 90 percentile increase in principal

For both total spending and cash withdrawal and P.O.S. transactions, the treatment group with a large increase in payments towards the principal portion of the mortgage reduced their spending by $40 per month in response to the policy change. In Panel B, our matched sample includes only consumers who hold a mortgage and increase the principal repayment amount by *less than* 10,000 INR from FY 2013 to FY 2014. Here we do not find any significant difference in spending level of the treatment group relative to the control group. These findings that households with a larger principal repayment has a larger spending reduction further reinforces our earlier results.

We also report in Figure 5[19] the estimated cumulative spending response and its corresponding confidence interval with the dynamic model for the two sub-samples of mortgage borrowers who significantly increase their principal repayment amount in comparison to those mortgage borrowers who do not significantly increase their principal repayment amount. The graphical pattern of the cumulative spending response further confirms our findings in Table 7.

[insert Table 7 here]

[insert Figure 5 here]

5.5 Consumers holding an alternative long-term saving account

As previously explained, in addition to the principal repayment on a mortgage, other long-term saving instruments under Section80C which that can benefit from the higher tax exemption limit include the public provident fund (PPF). In this section, we want to focus on those consumers who do not hold a mortgage but only hold a long-term saving instrument such as the PPF, and estimate the differential spending response between consumers who simply hold a PPF saving account (treatment group) relative to those consumers who do not hold a PPF saving account (control group). Essentially, our analysis using those consumers who only have a PPF account (without holding a mortgage) serves two purposes. First, it is a placebo test to further validate our identification strategy. Second, we also report what we find for the PPF account deposit behavior to provide a more complete picture on the impact of the policy change.

In our data, there are about 10,000 PPF accounts with monthly deposits. We begin our analysis by plotting the unconditional average monthly deposit into a PPF account for FY 2013 and FY 2014 in Figure 6. There is a spike in the month of September 2014 (two months after the policy announcement in July) and the average monthly deposit in FY 2014 is constantly higher than that in FY 2013 during the months after September 2014. We report the summary statistics and the test results in Table 8. As reported in Panel A, the average monthly deposit increases from 35,346 INR (US$594) in FY 2013 to 50,632 INR (US$844) in FY 2014; the average increase in annual total deposit is 15,287 INR (US$255). Using the

repayment is about 10,000 INR. For the mortgage borrowers who increase the principal repayment by more than 10,000 INR, they are more likely driven by policy incentive.

[19] Since we do not find any significant decline in credit card spending, we drop the credit card spendings for the test results reported in Figure 5 becasue the total debit card spending has longer pre-treatment period (6 months). The pre-treatment period in Figure 5 is thus 3 months longer than Figure 4.

same propensity score matching method, we obtain a matched control group for the group of consumers who hold a PPF account. The summary statistics by the treatment and control groups are reported in Panel B. The treatment and control group are statistically indifferent on the dimensions of age, gender, marital status, current account balance and saving account balance. Further, we estimate the spending response of the treatment group by regression equation (1) using the debit card transactions from 2014:03 to 2015:04, and the results are reported in Panel C. The coefficient estimate for the interaction term between the PPF account holders and the post-policy announcement dummy is statistically indifferent from zero and very small in economic magnitude, which supports the validity of our identification strategy.

[insert Figure 6 here]

[insert Table 8 here]

6. Robustness Tests

To conduct robustness tests, we first re-estimate equation (1) and shift the sample period one fiscal year back (2013:04-2014:04) to examine differences in the disposition to spend by the treatment and control group prior to the policy change. The results are reported in Table B-1 in Appendix B. The *Post* variable is the binary variable taking the value of 1 for the period after July 2013 as an analogy, and 0 otherwise. For all the spending measures, we do not find any significant differences in the spending behavior of the treatment and control group and the estimated coefficient for the interaction term is small in magnitude. Figure B-1 reports the cumulative spending response and its confidence interval. All throughout the sample period, the cumulative spending response is insignificantly different from zero. Thus, our sample tests do not reject the assumption that the treatment and control group have quite similar disposition to consume/save in the pre-treatment period.

To address the concern that consumers with a mortgage and consumers without a mortgage are fundamentally different, we exclude the consumers without a mortgage and reconstruct the control group by exploiting the variation in mortgage principal repayment amount. With the debit card and credit card monthly spending data, we redefine the treatment group to be consumers with a mortgage and have an annual principal payment from 100,000 to 150,000 INR and the control group to be consumers with a mortgage and have an annual principal repayment amount greater than 150,000 INR. Given that the control group's annual total principal repayment amount exceeds the new higher exemption limit, the policy change should not incentivize them to change their principal repayment behavior. In this setting, we only have 654 individuals in the treatment group and 788 individuals in the control group. With a small sample, we have limited statistical power. The results showing the estimation of equation (1) are laid out in Table B-2 in Appendix B. Panel A provides results for the entire sample period and Panel B provides results for the pre-treatment period. Consistent with our prediction, mortgage borrowers making annual principal repayment amount within the tax exemption limit reduce their spending in response to the policy change, albeit not statistically significant due to the limited power of a small sample size.

There is one concern related to the confounding effect of rising interest rate on the required amount of principal payment of the adjustable rate mortgages prevalent in our sample. Unfortunately, we neither observe separately the required or actual mortgage payment towards the principal or interest for each month. However, it is reasonable to assume that mortgage payments follows the equated monthly installment scheme and the bank adopts this conventional way of calculating the equated monthly installment (EMI) amount. The formulas are presented in Appendix B-3-1. The interest payment is the loan balance times the monthly interest rate and the difference between the EMI and the interest payment is the required amount of principal payment. We retrieve the time series mortgage loan interest rate data from the bank and plot them in Appendix B-3-2. From the graph, we can see that the interest rate generally declined over our sample period. For the results presented in Table 4 (over the March 2014 to April 2015 period) , there was no interest rate change for the loan amount below 300,000 INR and the interest rate slightly drops from 10.3% to 10.15% for men and 10.25% to 10.1% for women. The decline in interest rate results in a reduction in the EMI and interest payments, but the change of principal part ambiguous. We explicitly compute the change of principal part due to interest rate change in Appendix B-3-3 for the mortgage in our sample. The change in the principal amount at the 90th percentile is only 565 INR, which is about 9 US dollars increase. For the results in Table 6 (April 2014 to Feb 2016), there was a larger interest rate reduction from 10.3% to 9.55%. In the similar manner, we compute its impact on the principal portion for each mortgage in our sample; the change in the principal payment amount is negative. This implies that if there is a larger interest rate decline, the reduction in interest payment is less than the decrease in EMI, and therefore the principal payment also declines. Although our estimation is not precise, it is conducted in a conservative manner. Moreover, the largest reduction in home mortgage interest rate is less than 0.8% during the sample period, which has little impact on the required principal payments for most of the loans in the sample.

By far, we would like to argue that the mortgage interest rate change during the sample period either increased the required amount of principal payment in a negligible amount or reduced the required amount of principal payment. Thus, our results are not driven by the increase in the required principal payment. Moreover, the general decline in interest rate lowers the EMI, and thus leaves the households more disposable income to increase spending. This works against our finding of reduction in consumption.

Another issue about the impact of the policy is to what extent only people from a particular region respond to the policy change. In order to address this question, we plot the percentage of mortgage loan borrowers who increase the total loan payment from FY 2013 to FY 2014 by district in India in Appendix Graph B-4-1.[20] The darkest blue regions, for example, indicates that about 37% to 48% mortgage borrowers increased the total loan payment from FY 2013 to FY 2014. If we assume the required mortgage loan payment is in equated monthly installment, then the increase in total loan payment implies an increase in the principal payment portion. Moreover, we plot the district level median change of principal payment in Appendix Graph B-4-2. Compared to the overall median level change of principal payment of 18,434 INR (as reported in Table 2 Panel B), the geographical distribution shows that there is a wide range of

[20] We exclude the regions with fewer than 50 mortgage loan observations.

regions with similar or higher median change of principal payment (indicated in the darkest and second darkest blue regions). Together, the two graphs suggest that the increase in the home mortgage principal payment by households in responses to the policy change is not concentrated in any particular regions.

Finally, one of the natural questions is that whether the people who increased the principal payment amount are actually the same people who reduced their consumption. The results presented in Figure 5 show that the reduction in consumption by the treatment group are only amongst the mortgage borrowers who actually increased the principal payment; we do not find significant difference in spending response by the mortgage borrowers did not increase the principal payment. The results suggest that those who increased principal payment on their mortgage loans and those who cut down consumptions are the same group of people. Moreover, the fact that the mortgage borrowers who did not increase the principal payment have similar consumption pattern with their control group also mitigates the concerns of the confounding effect from property price. If there is confounding effect from housing price on consumption, we should observe differential consumption response between the mortgage borrowers who do not increase principal payment and the control group.

7. Conclusion

Empirical evidence on the extent to which households fund a tax-favored saving account through consumption reduction is limited and controversial. For example, Venti and Wise (1986) estimate that 50 percent of the net savings in IRA contributions came from reduced consumption; however, Attanasio and DeLeire (2002) find no evidence that households reduced their consumption in order to finance their IRA contributions. Our paper contributes to the literature by directly estimating household consumption response to a tax-subsidized saving policy change in India. In July 2014, the Indian government increased the income tax exemption limit by 50,000 Indian Rupee (US$833) for long-term savings instruments (e.g., mortgage principal repayment). We exploit the exogeneous policy change and test the extent to which Indian households reduce consumption in order to fund their tax-favored saving account. Using a unique administrative panel data of consumer spending transactions, we find that about 31% of households with a mortgage responded to the policy change by increasing the annual repayment on the principal portion of a mortgage; the median annual increase in principal repayment is about US$307 (52%), which is equivalent to 36.9% of the higher tax exemption limit ($833). Moreover, we find that relative to households without a mortgage, households with a mortgage reduce their consumption by about US$25 per month; this is equivalent to a 5.2% reduction in monthly debit card spending The reduction in consumption is larger among male, single, younger or lower income households. For one dollar increase in the income tax exemption limit for the long-term savings, private saving increases by 23 cents for the treatment group. Our estimate is smaller than the 50 percent estimate in Venti and Wise (1986); we believe we have a lower bound estimate due to data limitation.

Our empirical findings also contribute to the extensive and controversial debate on the extent to which a tax-subsidized savings policy induces households to finance the tax-favored saving account using other non-taxed favored saving account or other financial asset (e.g., Venti and Wise, 1986 and 1990; Porterba,

Venti and Wise, 1995; Engen and Gale, 1997; Engen, Gale and Scholz, 1994 and 1996; Benjamin, 2003; Gelber, 2011; Arnberg and Barslund; 2012; Chetty, Friedman, Leth-Petersen, Nielsen, and Olsen, 2014; Beshears, Choi, Laibson and Madrian; 2017). In our study, we estimate a $193 reduction in household consumption by the treatment group in the first year in response to the higher income tax exemption on a long-term saving instruments. Relative to the treatment group's average annual income of $10,310 (618,618 INR) in FY 2014, this implies that private savings for the treatment group increase by about 1.87% on average. Our results imply that households do not entirely shift contributions across savings account in order to take advantage of the tax-subsidized savings policy**.**

Our study is limited in several dimensions. First, given that we only have two years of data, our estimated effects are relatively short-term. Second, the increase in private savings we estimate is a lower bound. Third, the effect of the policy is limited to a sub-group of the population who has a mortgage. We do not have a cleaner setting to examine whether the rest of the population also increase their private saving in response to the tax-subsidized savings policy change. Fourth, our study cannot address the question on whether the increase in tax-subsidy on saving accounts improves the total social welfare.

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Table 1: Summary Statistics

This table reports the summary statistics of the three data sets. Panel A is the summary statistics of the mortgage data; the approved credit limit and value of primary security are reported in India Rupee (INR). Panel B is the summary statistics of the debit card spending transactions data, by the treatment and control group, for both before and after the propensity score matching. The treatment group consists of individuals who have a mortgage with the bank; the control group consists of those who do not have a mortgage with the bank. We drop infrequently used accounts and individuals with many missing or invalid demographic data. Both demographics (age, gender, marital status, annual income) and account-level financial information are reported. For the current account balance and saving account balance, we only have the data at the end of February 2015. The summary statistics on the monthly spending behavior are separately reported for the pre-treatment period (2014:03-2014:06) and post-treatment period (2014:07-2015:04). *Monthly cash withdrawal* ($Cash) is computed by summing the monthly ATM cash withdrawals for each individual. *Monthly number of ATM debit card transactions* (#ATM) measures the total number of ATM cash withdrawals per month. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. *Monthly P.O.S. transactions* (#P.O.S.) measures the total number of transactions per month through point-of-sale machines. All spending data are reported in INR. To convert to US$, the exchange rate of 60 INR to US$1 as of July 2014 is used. The column *Diff* reports the pairwise t-tests testing for a mean difference between the treatment group and control group. ***, **,* denote statistical significant at 1%, 5% and 10%, respectively. Panel C reports the summary statistics of the debit and credit card spending by the treatment and control group. *Monthly cash withdrawal & P.O.S.* is the total amount withdrew in cash and spent via point-of-sale machines for each month. The sample range is 2014:01-2016:02, and we separately report the statistics for the pre-treatment period 2014:01-2014:06 and the post-treatment period 2014:07-2016:02. *Monthly credit card spending* is the total monthly credit card spending for each individual. For this variable, the sample period is 2014:04-2016:02.

Panel A: Mortgage Data

	N	Mean	p10	p50	p90	Std.
Loan amount	812,169	826,059	259,125	600,000	1,700,000	651,425
Loan term (in months)	812,169	195	120	180	240	45
Repayment starting year	812,169	2009	2006	2009	2012	3
Value of primary property	773,583	1,401,918	280,000	1,000,000	2,841,226	9,562,589
Interest rate	811,719	11	8	11	13	1.9
Borrower age	812,169	53	37	49	65	20
Borrower marital status (=1 if married)	812,169	0.62	0	1	1	0.48

Panel B: Debit Card Spending Data

	Unmatched Treatment Group			**Unmatched Control Group**			**Diff**
	N	Mean	Std.	N	Mean	Std.	
Age	12,670	45	9	72,094	52	12	7.198***
Gender (male=1, female=0)	12,670	0.87	0.34	72,094	0.80	0.4	-0.068***
Marital status (married=1,single=0)	12,670	0.76	0.43	72,094	0.70	0.46	-0.059***
Annual income	12,670	620,556	570,602	72,094	1,482,365	2.20E+08	861,809
Current acct balance (2015:02)	8,036	106,653	2,068,619	51,873	223,555	771,712	116,902***
Saving acct balance (2015:02)	12,078	104,989	1,704,130	38,138	572,425	1,496,357	467,436***
Monthly cash withdrawal (2014:03-2014:06)	50,680	25,733	32,365	288,376	23,389	29,643	-2,344***
Monthly cash withdrawal (2014:07-2015:04)	126,700	24,390	30,132	720,940	23,590	29,872	-800***
Monthly #ATM debit transactions (2014:03-2014:06)	50,680	4.9	4.6	288,376	4	4.1	-0.871***
Monthly #ATM debit transactions	126,700	4.5	4.2	720,940	3.8	4.0	-0.665***

(2014:07-2015:04)							
Monthly P.O.S. transaction (2014:03-2014:06)	50,680	2,653	8,107	288,376	2,711	8,217	57.56
Monthly P.O.S. transaction (2014:07-2015:04)	126,700	2,910	8,225	720,940	3,190	9,023	280.732***
Monthly #P.O.S. transactions (2014:03-2014:06)	50,680	1.1	2.5	288,376	1.1	2.5	-0.058***
Monthly #P.O.S. transactions (2014:07-2015:04)	126,700	1.2	2.6	720,940	1.2	2.6	-0.018***
	Matched Treatment Group			**Matched Control Group**			**Diff**
	N	Mean	Std.	N	Mean	Std.	
Age	12,515	45	9	12,515	45	9.9	-0.008
Gender (male=1, female=0)	12,515	0.87	0.34	12,515	0.87	0.34	0.004
Marital status (married=1,single=0)	12,515	0.75	0.43	12,515	0.75	0.43	-0.002
Annual income	12,515	618,618	571,797	12,515	618,645	702,101	26.56
Current acct balance (2015:02)	7,904	107,560	2,085,661	7,904	194,003	509,108	86,443***
Saving acct balance (2015:02)	11,925	105,934	1,714,973	6,983	377,687	895,395	271,753***
Monthly cash withdrawal (2014:03-2014:06)	50,060	25,794	32,440	50,060	26,185	30,676	390.54**
Monthly cash withdrawal (2014:07-2015:04)	125,150	24,447	30,199	125,150	26,152	30,582	1705.58***
Monthly #ATM debit transactions (2014:03-2014:06)	50,060	4.9	4.6	50,060	4.6	4.3	-0.253***
Monthly #ATM debit transactions (2014:07-2015:04)	125,150	4.4	4.2	125,150	4.3	4.1	-0.122***
Monthly P.O.S. transaction (2014:03-2014:06)	50,060	2,647	8,076	50,060	2,947	8,450	300***
Monthly P.O.S. transaction (2014:07-2015:04)	125,150	2,915	8,244	125,150	3,408	9,173	493.18***
Monthly #P.O.S. transactions (2014:03-2014:06)	50,060	1.1	2.5	50,060	1.2	2.8	0.112***
Monthly #P.O.S. transactions (2014:07-2015:04)	125,150	1.2	2.6	125,150	1.4	2.9	0.142***

Panel C: Debit Card & Credit Card Spending Data

	Matched Treatment Group			**Matched Control Group**			**Diff**
	N	Mean	Std.	N	Mean	Std.	
Age	12,596	46	9.4	12,596	46	9.5	0.005
Gender	12,596	0.83	0.37	12,596	0.83	0.38	-0.003
Marital status (single=1,married=0)	12,596	0.13	0.33	12,596	0.12	0.33	-0.001
Monthly cash withdrawal & P.O.S. (2014:01-2014:06)	75,576	27,465	37,296	75,576	22,918	33,607	-4,547***
Monthly cash withdrawal & P.O.S. (2014:07-2016:02)	226,728	28,478	36,039	226,728	25,060	36,392	-3,417***
Monthly credit card spending (2014:04-2014:06)	75,576	1,720	7,096	75,576	1,357	6,362	-363***
Monthly credit card spending (2014:07-2016:02)	226,728	4,116	11,090	226,728	3,337	10,039	-778***

Table 2: Changes in Annual Mortgage Principal Payment

This table reports changes in the annual mortgage principal payment amount over all mortgages in the sample. For each mortgage, we have three snapshots of a loan repayment status at 2013:09, 2014:09 and 2015:09. At each observation month, we observe the outstanding unpaid principal balance (b) and total interest payment (i) up to date. For FY 2013, we derive the change in the annual principal payment amount (p_1) and annual interest payment amount (i_1) by taking the difference in the outstanding unpaid principal balance (b_1) and total interest payment observed between 2014:09 and 2013:09. The total annual mortgage repayment amount for FY 2103 (t_1) is therefore $t_1 = p_1 + i_1$.Using the same algorithm, we derive p_2, i_2 and t_2 for FY 2014 (2014:09 to 2015:09). Panel A reports the summary statistics for the accounts $|t_2 - t_1| \approx 0$, which means the total annual repayment is approximately the same between FY 2013 and FY 2014. Panel B reports the summary statistics for the accounts with $t_2 - t_1 > 0$, which means the total annual repayment increased from FY 2013 to FY 2014. Panel C reports the summary statistics for the accounts with $t_2 - t_1 < 0$ which means the total annual repayment is reduced from FY 2013 to FY 2014. All the reported data are in India Rupee, which can be converted to US$ using the exchange rate 60 Indian Rupee (INR) to US$1 as of July 2014.

Panel A: 41.31% home mortgage borrowers who did not increase annual total repayment (principal + interest)

	N	mean	p10	p50	p90	Std.
Principal payment 1 (p1: 2013:09-2014:09)	258,936	41,088	14,277	31,612	80,844	30,575
Principal payment 2 (p2: 2014:09-2015:09)	258,936	45,870	15,729	35,376	90,720	34,507
Change of principal payment (Δp: p2-p1)	258,936	4,781	936	3,908	10,782	6,046
% change of principal payment (Δp/p1)	258,936	12%	5%	13%	17%	16%

Panel B: 31.01% home mortgage borrowers who increased annual total repayment (principal + interest)

	N	mean	p10	p50	p90	Std.
Principal payment 1 (p1: 2013:09-2014:09)	194,400	45,615	14,283	33,951	94,343	35,614
Principal payment 2 (p2: 2014:09-2015:09)	194,400	123,753	22,961	62,530	271,493	191,358
Change of principal payment (Δp: p2-p1)	194,400	78,138	4,026	18,434	208,579	178,935
% change of principal payment (Δp/p1)	194,400	190%	14%	52%	520%	380%

Panel C: 27.67% home mortgage borrowers who *reduced* annual total repayment (principal + interest)

	N	mean	p10	p50	p90	Std.
Principal payment 1 (p1: 2013:09-2014:09)	173,460	55,260	15,956	40,866	120,140	42,154
Principal payment 2 (p2: 2014:09-2015:09)	173,460	37,028	6,295	31,177	87,715	48,184
Change of principal payment (Δp: p2-p1)	173,460	-18,231	-54,569	-4,418	4,446	46,397
% change of principal payment (Δp/p1)	173,460	-29%	-80%	-13%	11%	63%

Table 3: Who increased the principal repayment?

The table reports the regression results testing the propensity to increase the principal repayment conditional on characteristics of the loan and borrower. The dependent variable takes the value of 1 if the mortgage borrower increased the principal repayment between FY 2013 and FY 2014 and zero otherwise. The explanatory variables include whether the individual is married or single, the borrower's age, the loan term in number of months, the loan amount, the interest rate observed as of September 2014, the primary collateral value and the ratio of loan amount over primary collateral value. For columns (1) to (3), the imposed fixed effect is the principal balance value observed as of September 2014 times months to maturity. For columns (4) to (6), the imposed fixed effect is the principal balance value observed as of September 2014 times months to maturity times the interest rate observed as of September 2014. The standard error is clustered at the same group specified as the fixed effect. The standard errors are reported in parentheses under the coefficients estimates, and ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Married	-0.00821***	-0.00887***	-0.00901***	-0.00879***	-0.00994***	-0.0104***
	(0.00181)	(0.00182)	(0.00196)	(0.00210)	(0.00212)	(0.00227)
Age	-0.000599***	-0.000741***	-0.000803***	-0.000402***	-0.000428***	-0.000504***
	(0.000110)	(0.000111)	(0.000117)	(0.000125)	(0.000127)	(0.000135)
Loan term	3.18e-05	-0.000106***	-5.27e-05	0.000286***	0.000160***	0.000228***
	(3.85e-05)	(3.88e-05)	(4.19e-05)	(5.09e-05)	(5.15e-05)	(5.56e-05)
Loan amount	-2.15e-07**	-2.56e-07**	-2.34e-07**	-2.18e-07*	-2.46e-07**	-2.55e-07**
	(1.09e-07)	(1.04e-07)	(1.04e-07)	(1.14e-07)	(1.09e-07)	(1.17e-07)
Interest rate	0.0148***	0.0131***	0.0130***	0.0168***	0.0109***	0.0113***
	(0.000532)	(0.000524)	(0.000570)	(0.00400)	(0.00407)	(0.00434)
Primary collateral value		0	-4.15e-09**		1.22e-09**	-4.69e-09**
		(5.81e-11)	(1.80e-09)		(5.96e-10)	(2.07e-09)
Loan amount/primary collateral value			-0.0366***			-0.0398***
			(0.00742)			(0.00877)
Constant	0.347***	0.404***	0.412***	0.274***	0.355***	0.385***
	(0.0830)	(0.0798)	(0.0810)	(0.0959)	(0.0937)	(0.102)
Principal balance X Months to maturity fixed effect	Y	Y	Y			
Principal balance X Months to maturity X Interest rate fixed effect				Y	Y	Y
Observations	433,390	413,579	376,431	356,018	340,097	309,718
R-squared	0.149	0.156	0.169	0.189	0.196	0.212

Table 4: Average Spending Response from Debit Card Transactions

This table reports the average spending response of the treatment group relative to the control group over the 2014:03-2015:04 period based on the regression specification given in equation (1). Panel A reports the response for the entire unmatched sample, while Panel B reports the response for the propensity score matched sample. Spending response is captured using eight different measures of spending transactions, and is represented in each column. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawals from ATM for each individual. *Monthly number of ATM debit card transactions* (#ATM) measures the total number of ATM cash withdrawals per month. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. *Monthly P.O.S. transactions* (#P.O.S.) measures the total number of transactions per month through point-of-sale machine. The monetary value of each spending behavior is measured in US$ using the July 2014 exchange rate (60 Indian Rupee to US$1). *HMB* is an indicator variable taking the value of 1 if the individual has a home mortgage and 0 otherwise. *Post* is an indicator variable taking the value of 1 for the months after 2014 July (Policy Announcement Date) and 0 otherwise. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard errors are reported in parentheses under the coefficients estimates, and ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

Panel A: Entire Unmatched Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$ Total Spending	ln($ Total Spending)	$ cash	ln($ cash)	# cash withdrawal	$ POS	ln($ POS)	# POS
HMB*Post	-29.46***	-0.0993***	-25.74***	-0.0796***	-0.215***	-3.719***	-0.119***	-0.0424***
	(3.579)	(0.0202)	(3.379)	(0.0211)	(0.0234)	(0.801)	(0.0223)	(0.0140)
constant	403.1***	8.227***	363.7***	7.837***	3.993***	39.34***	2.630***	1.034***
	(1.491)	(0.0100)	(1.406)	(0.0105)	(0.00983)	(0.391)	(0.0104)	(0.00591)
Fixed Effect	individual, year-month							
No. of Obs	1,186,696	1,186,696	1,186,696	1,186,696	1,175,951	1,186,696	1,186,696	1,175,951
R squared	0.375	0.447	0.379	0.481	0.589	0.275	0.406	0.605

Panel B: Matched Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$ Total Spending	ln($ Total Spending)	$ cash	ln($ cash)	# cash withdrawal	$ POS	ln($ POS)	# POS
HMB*Post	-25.14***	-0.0521**	-21.92***	-0.0558**	-0.132***	-3.218***	-0.0759**	-0.0298
	(4.525)	(0.0265)	(4.263)	(0.0275)	(0.0303)	(1.075)	(0.0296)	(0.0191)
constant	443.4***	8.588***	402.8***	8.265***	4.569***	40.60***	2.760***	1.129***
	(2.903)	(0.0169)	(2.752)	(0.0179)	(0.0192)	(0.697)	(0.0192)	(0.0113)
Fixed Effect	individual, year-month							
No. of Obs	350,420	350,420	350,420	350,420	350,420	350,420	350,420	350,420
R-squared	0.385	0.467	0.386	0.491	0.584	0.290	0.418	0.614

Table 5: Dynamic Monthly Spending Response from the Debit Card Transaction

This table reports the estimated spending response from the debit card transactions using the distributed lag model as specified in equation (2) for the matched sample over the period of 2014:03-2015:04. Spending response is captured using eight different types of transaction outcomes. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawals from ATM for each individual. *Monthly ATM debit card transactions* (#ATM) measures the total number of ATM cash withdrawals per month. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. *Monthly P.O.S. transactions* (#P.O.S.) measure the total number of transactions per month through point-of-sale machine. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The constant absorbs the month 2014:06 (m_0), which is one month before the policy announcement month of 2014:07. *Pre* m_{-i} is a binary variable that is equal to one for the i^{th} month before m_0. *Post* m_i is a binary variable that is equal to one for the i^{th} month after m_0. *HMB* is an indicator variable taking the value of 1 if the individual has a mortgage and 0 otherwise. *Post* is an indicator variable taking the value of 1 for the months after July 2014 (month of policy announcement) and 0 otherwise. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard errors are reported in parentheses under the coefficients estimates, and ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	$ Total Spending	ln($ Total Spending)	$ cash	ln($ cash)	# cash withdrawal	$ POS	ln($ POS)	# POS
HMB X Pre m-3	5.372	0.0397	7.370	0.0492	0.0222	-1.997	-0.0277	-0.00400
	(8.179)	(0.0290)	(7.692)	(0.0304)	(0.0532)	(2.188)	(0.0294)	(0.00760)
HMB X Pre m-2	0.702	-0.0127	3.385	-0.0155	-0.0340	-2.684	-0.0405	-0.0145*
	(8.105)	(0.0284)	(7.548)	(0.0294)	(0.0519)	(2.319)	(0.0300)	(0.00749)
HMB X Pre m-1	7.057	0.0600*	9.953	0.0469*	0.0930*	-2.896	-0.000951	-0.00301
	(7.779)	(0.0285)	(7.281)	(0.0278)	(0.0498)	(2.293)	(0.0296)	(0.00715)
HMB X Post m1	-16.77**	-0.0187	-10.45	-0.00670	-0.0384	-6.318***	-0.0528*	-0.00714
	(7.573)	(0.0264)	(7.066)	(0.0278)	(0.0490)	(2.263)	(0.0293)	(0.00718)
HMB X Post m2	1.002	0.00895	5.004	0.0111	-0.00352	-4.002*	-0.0428	-0.00565
	(7.851)	(0.0276)	(7.318)	(0.0288)	(0.0513)	(2.331)	(0.0309)	(0.00758)
HMB X Post m3	-4.315	0.0216	-0.154	0.0143	-0.0158	-4.161*	-0.0549*	-0.0160**
	(8.226)	(0.0290)	(7.687)	(0.0303)	(0.0532)	(2.292)	(0.0312)	(0.00778)
HMB X Post m4	-5.606	0.0372	-3.311	0.0242	0.0203	-2.295	-0.00601	0.00405
	(8.359)	(0.0292)	(7.701)	(0.0305)	(0.0537)	(2.578)	(0.0329)	(0.00814)
HMB X Post m5	-21.15**	-0.0207	-15.27**	-0.00520	-0.125**	-5.880**	-0.0965***	-0.0216***
	(8.314)	(0.0297)	(7.688)	(0.0311)	(0.0531)	(2.464)	(0.0315)	(0.00790)
HMB X Post m6	-34.39***	-0.0639**	-28.98***	-0.0668**	-0.137**	-5.405**	-0.0669**	-0.0211**
	(8.402)	(0.0304)	(7.837)	(0.0316)	(0.0544)	(2.349)	(0.0320)	(0.00821)
HMB X Post m7	-23.67***	-0.0275	-19.35**	-0.0320	-0.143***	-4.320*	-0.0483	-0.0127
	(8.727)	(0.0309)	(8.131)	(0.0323)	(0.0555)	(2.410)	(0.0320)	(0.00828)
HMB X Post m8	-44.21***	-0.0570*	-37.36***	-0.0543	-0.266***	-6.855***	-0.105***	-0.0181**
	(8.801)	(0.0321)	(8.210)	(0.0333)	(0.0557)	(2.347)	(0.0315)	(0.00814)
HMB X Post m9	-43.42***	-0.0947***	-37.05***	-0.101***	-0.265***	-6.377***	-0.0964***	-0.0161*
	(8.792)	(0.0317)	(8.267)	(0.0331)	(0.0567)	(2.360)	(0.0325)	(0.00847)
HMB X Post m10	-25.99***	-0.0507	-20.48**	-0.0583*	-0.140**	-5.512**	-0.0746**	-0.0177**
	(8.977)	(0.0317)	(8.449)	(0.0330)	(0.0570)	(2.386)	(0.0321)	(0.00854)
constant	474.5***	5.144***	426.8***	4.914***	4.685***	47.73***	1.487***	0.296***
	(2.852)	(0.0101)	(2.660)	(0.0105)	(0.0185)	(0.812)	(0.0106)	(0.00265)
Fixed Effect					individual, year-month			
No. of Obs	350,420	350,420	350,420	350,420	350,420	350,420	350,420	350,420
R-squared	0.385	0.489	0.386	0.508	0.584	0.290	0.422	0.576

Table 6: Average Spending Response from both Debit Card & Credit Card Transactions

This table reports the average spending response from the debit and credit card transactions using the regression specification given in equation (1) for the matched sample over the period of 2014:03-2015:04. Each column represents the estimation for its corresponding dependent variable indicated in the first row. Spending response is captured using eight different types of transaction outcomes, and is represented in each column. Total spending is the sum of the monthly cash withdrawal ($Cash), P.O.S. spending ($P.O.S.), and credit card spending ($Card). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawal from ATM for each individual. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. ($Card) is computed by summing the monthly credit card spending for each individual. $End of Month Balance is the amount of balance on the debit card current account at the last day of a calendar month. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. HMB is an indicator variable taking the value of 1 if the individual has a home mortgage and 0 otherwise. In Panel A, cash & P.O.S. is measured from 2014:01 to 2016:02, and total spending and credit card spending is measured from 2014:04 to 2016:02. Post is the binary variable taking the value of 1 for the months after 2014 July (policy announcement month) and 0 otherwise. In Panel B, the sample period is for the post-treatment period from 2014:07 to 2016:02. Post is the binary variable taking the value of 1 for the months after April 2015, which is the starting month of the fiscal year FY 2015, and 0 otherwise. The standard error is clustered at individual level. The standard errors are reported in parentheses under the coefficients estimates, and ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

Panel A: Matched Sample (2014:01/2014:04-2016:02)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Total Spending	ln ($Total Spending)	$Cash&POS	ln ($Cash&POS)	$Card spending	ln ($Card spending)	$End of Month Balance	ln ($End of Month Balance)
HMB*Post	-21.27***	-0.0892***	-19.91***	-0.101***	0.739	-0.0350*	33.25	0.0210
(post if after 2014:07)	(5.769)	(0.0200)	(4.318)	(0.0177)	(1.329)	(0.0185)	(36.33)	(0.0140)
constant	476.7***	4.812***	399.1***	4.576***	47.36***	1.659***	1,293***	5.584***
	(3.776)	(0.0123)	(3.038)	(0.0119)	(0.942)	(0.0117)	(17.82)	(0.00894)
Fixed Effect				individual, year-month				
No. of Obs	579,416	579,416	654,992	654,992	579,416	579,416	653,846	653,846
R squared	0.338	0.429	0.358	0.447	0.203	0.280	0.552	0.626
Panel B: Match Sample (2014:07-2016:02)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$ Total Spending	ln ($ Total Spending)	$ Cash&POS	ln ($ Cash&POS)	$ Credit card spending	ln($ Credit card spending)	$ End of Month Balance	ln ($ End of Month Balance)
HMB*Post	-1.285	-0.0124	-2.108	-0.0151	0.823	0.0171	29.52	0.0300**
(post if after 2015:04)	(4.863)	(0.0171)	(4.236)	(0.0166)	(1.184)	(0.0168)	(33.47)	(0.0131)
constant	460.2***	4.857***	407.7***	4.696***	52.57***	1.863***	1,390***	5.642***
	(3.495)	(0.0121)	(3.084)	(0.0120)	(0.880)	(0.0120)	(17.00)	(0.00875)
Fixed Effect				individual, year-month				
No. of Obs	503,840	503,840	503,840	503,840	503,840	503,840	503,486	503,486
R-squared	0.350	0.442	0.379	0.468	0.215	0.291	0.606	0.654

Table 7: Average Spending Response by Amount of Increase in Principal Repayment

This table shows the average spending response of the matched treatment group relative to the control group using debit card and credit card transactions. The regression specification is given in equation (1). Spending response is captured using four different types of spending transaction outcomes. Total spending is the sum of monthly ATM cash withdrawals, P.O.S. spending transactions ($Cash&POS) and credit card spending. Cash&POS is the sum of monthly cash withdrawal and point-of-sale spending transactions. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. Cash & POS. from 2014:01 to 2016:02, Total Spending is from 2014:04 to 2016:02. *Post* is the binary variable taking the value of 1 for the months after July 2014 (month of policy announcement) and 0 otherwise. *HMB* is the dummy variable taking the value of 1 if the individual has a home mortgage loan and 0 otherwise. Panel A reports the results on the subsamples with the home mortgage borrowers who increased the principal repayment amount betwee FY 2013 and FY 2014 by more than US$166.67 (10,000 Indian Rupee) and their matched control group. The definition of Δp is given in Table 2. Panel B reports the results on the subsamples of home mortgage borrowers who did not increase the principal repayment amount between FY 2013 and FY 2014 by more than US$166.67 (10,000 Indian Rupee) and their matched control group. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard error are reported in parentheses under the coefficients estimates and ***, **, * denote statistical significant at 1%, 5% and 10%, respectively.

Panel A: Change in the principal payment (Δp) > $166.67 (10,000 INR)				
	$ Total Spending	ln($ Total Spending)	$ Cash&POS	ln ($ Cash&POS)
HMB*Post	-39.74***	-0.126***	-40.34***	-0.147***
	(7.890)	(0.0267)	(6.002)	(0.0238)
constant	491.3***	4.784***	410.6***	4.554***
	(5.303)	(0.0164)	(4.146)	(0.0158)
Fixed Effect		individual, year-month		
No. of Obs	338,836	338,836	383,032	383,032
R squared	0.338	0.423	0.358	0.439
Panel B: Change in the principal payment (Δp) < $166.67 (10,000 INR)				
	$ Total Spending	ln($ Total Spending)	$ Cash&POS	ln ($ Cash&POS)
HMB*Post	4.743	-0.0372	8.871	-0.0369
	(8.329)	(0.0299)	(6.030)	(0.0266)
constant	456.0***	4.850***	382.8***	4.607***
	(5.184)	(0.0185)	(4.405)	(0.0178)
Fixed Effect		individual, year-month		
No. of Obs	240,580	240,580	271,960	271,960
R-squared	0.339	0.437	0.358	0.458

Table 8: Average Spending Response of Consumers with a PPF Saving Account

This table reports the summary statistics (Panel A) and average monthly spending response (Panel B) for 10,000 individuals who hold a PPF saving account from 2013:04 to 2015:03. Panel A summarizes the amount of deposit into a PPF account; the c*hange* in annual deposit is the difference between the total annual deposit between FY 2013 and FY 2014. Panel B reports the demographics and account information of matched treatment and control group of consumers. Current account balance and saving account balance can only be observed as of 2015:02, and are reported in Indian Rupee. Panel C reports the average spending response of consumers with a PPF saving account relative to their matched control group. Spending response is captured using eight different types of behavioral outcomes. Total spending is the sum of the monthly ATM cash withdrawal ($Cash) and P.O.S. spending transactions ($POS). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly ATM cash withdrawals for each individual. *Monthly P.O.S. transaction* ($POS) is computed by summing the monthly spending via point-of-sale machine for each individual. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. *PPF* is the dummy variable taking the value of 1 if the consumer holds a PPF saving account with the bank and 0 otherwise. *Post* is the binary variable taking the value of 1 for the months after July 2014 (month of policy announcement), and 0 otherwise. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard error are reported in parentheses under the coefficients estimates and ***, **, * denote statistical significant at 1%, 5% and 10%, respectively.

Panel A : Summary Statistics

	N	Mean	p10	p50	p90	Std.
Average monthly deposit (FY2013)	120,000	35,346	0	15,000	100,000	39,259
Average monthly deposit (FY2014)	120,000	50,632	500	25,000	150,000	55,234
Change in annual deposit	10,000	15,287	-18,000	3,000	51,000	39,960

Panel B: Matched Sample

	N	Mean	Std.	N	Mean	Std.	
	matched treatment group			matched control group			diff
Age	6,155	52	13	6,155	52	13	- 0.010
Gender (male=1, female=0)	6,155	0.72	0.45	6,155	0.72	0.45	0.0004
Marital status (married=1,single=0)	6,155	0.66	0.47	6,155	0.66	0.47	-0.001
Current account balance (2015:02)	6,155	243,189	2,498,573	6,155	254,936	1,114,744	11,747
Saving account balance (2015:02)	2,865	841,814	4,137,913	2,975	809,049	2,841,344	-32,765

Panel C: Diff-in-Diff Tests

	$ Total Spending	ln($ Total Spending)	$ Cash	ln($ Cash)	$ POS	ln($ POS)
PPFxPost	-2.344	0.0274	-2.118	-0.0263	-0.226	0.0640
	(5.837)	(0.0478)	(5.296)	(0.0478)	(1.716)	(0.0433)
Constant	314.3***	6.824***	273.0***	6.195***	41.29***	2.552***
	(3.754)	(0.0305)	(3.480)	(0.0312)	(1.095)	(0.0277)
Fixed Effect			individual, year-month			
No. of Obs	172,340	172,340	172,340	172,340	172,340	172,340
R-squared	0.419	0.474	0.422	0.519	0.306	0.394

Figure 1: Unconditional Average Monthly Debit Card Spending

These plots summarize the unconditional average monthly spending for the sample both before and after the propensity score matching. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawals from ATM for each individual. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The dotted vertical lines indicate the starting of the fiscal year 2014, the policy announcement month (July 2014) and the end of the fiscal year 2014, respectively.

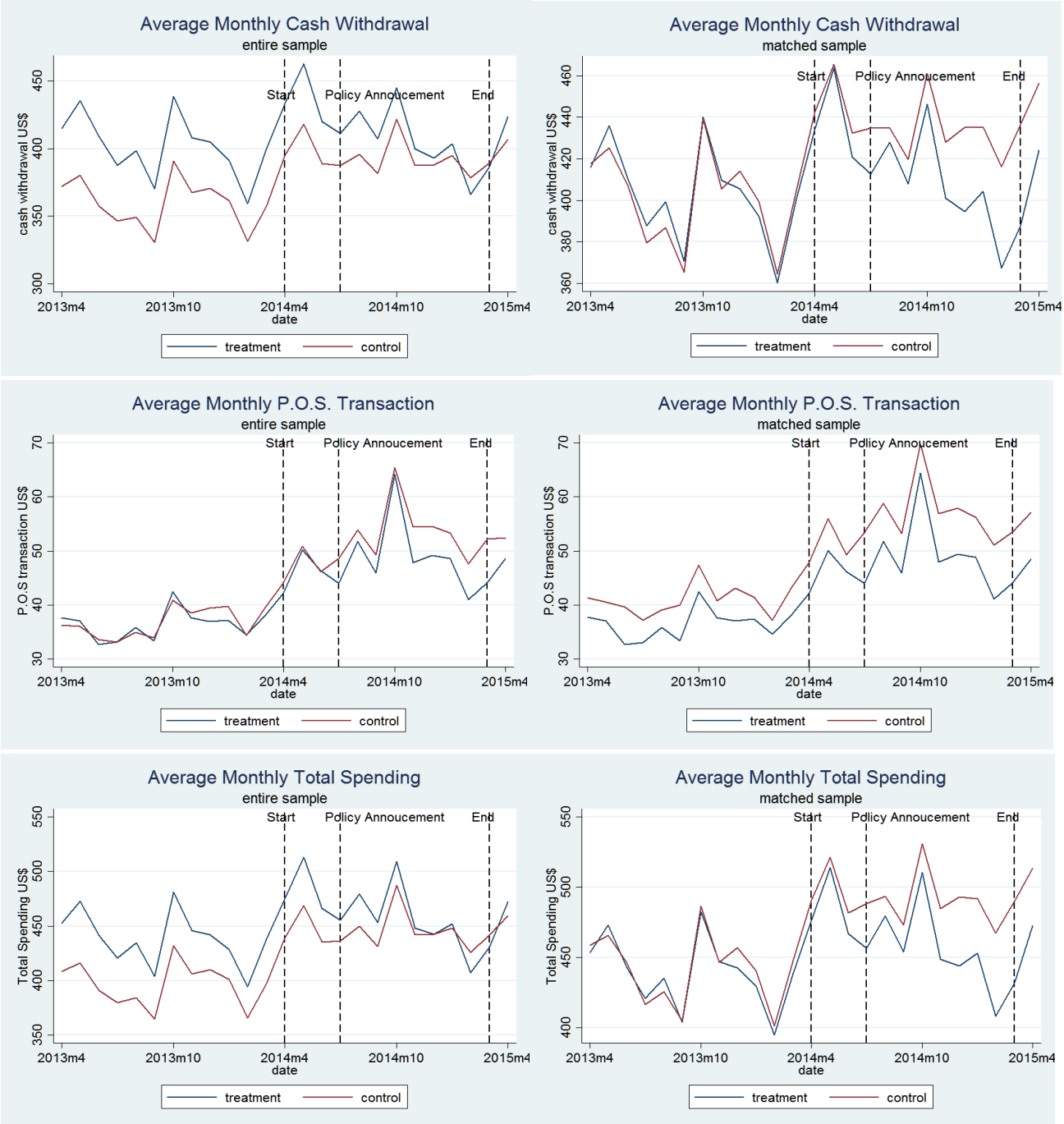


Figure 2: Estimated Spending Response Dynamics with Debit Card Transactions

These plots summarize the entire paths of the cumulative coefficients $b_{s,}$ s = (-3) to (-1) & 1 to 10 with their corresponding 95 percent confidence intervals of dollar value of cash withdrawal, total dollar value of spending, number of cash withdrawal transactions and number of P.O.S. transactions as estimated from equation (2). vertical blue line indicates m_0 (June 2014) which separates the pre- and post-treatment periods. The corresponding marginal effect coefficients are reported in Table 4. The y-axis is the dollar value response and the x-axis indicates the calendar months. The vertical blue line indicates m_0 (June 2014), which separates the pre- and post-treatment periods. The horizontal dotted line indicates 0.

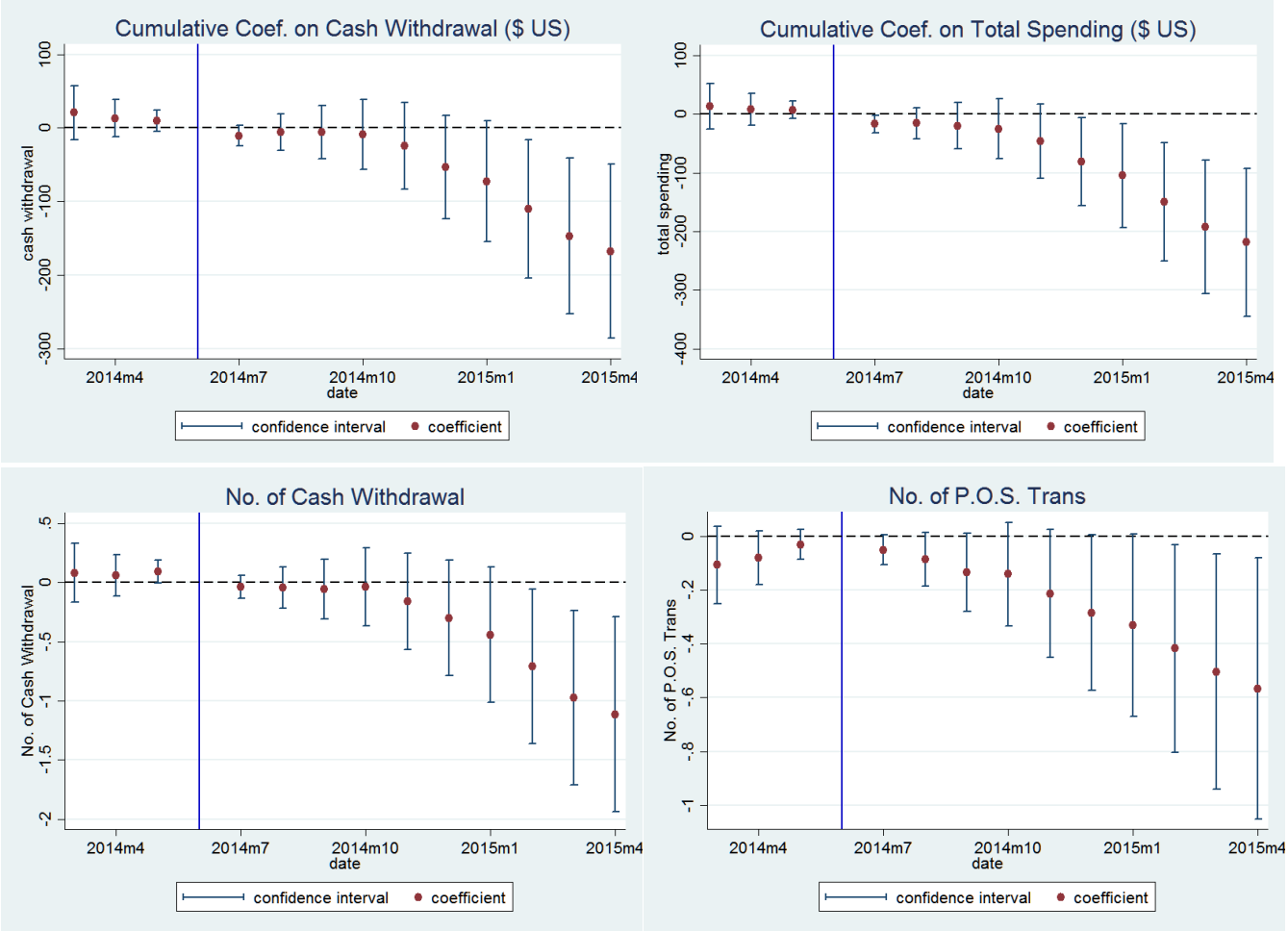
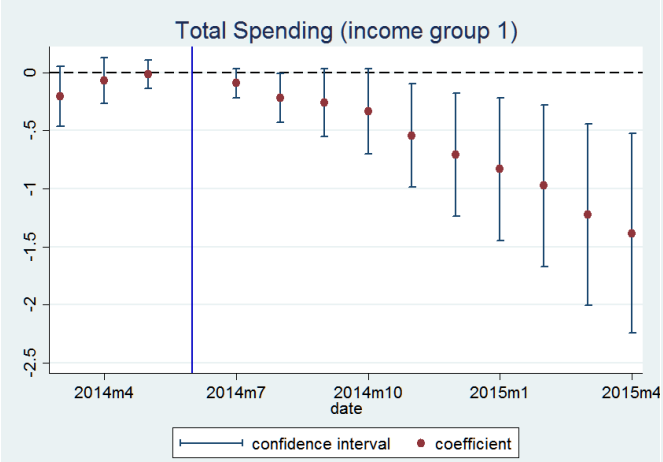
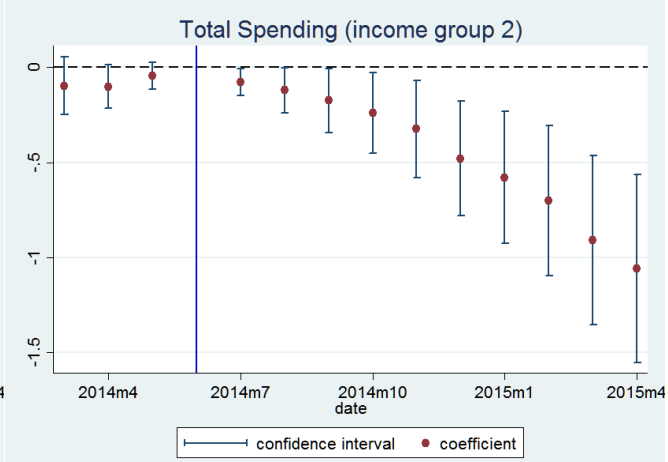


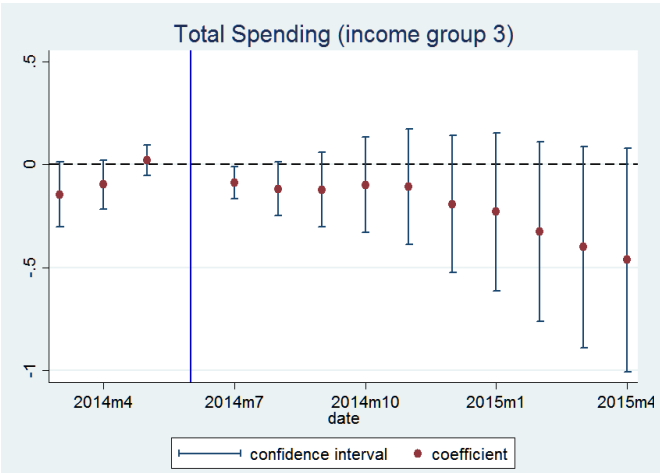
Figure 3: Heterogeneity in Spending Response

These plots summarize the entire paths of the cumulative coefficients b_s , s = (-3) to (-1) and 1 to 10 with their corresponding 95 percent confidence intervals of total dollar value of spending estimated from equation (2) by sociodemographic characteristics. The dependent variable is log transformed, and thus the y-axis indicates approximated percentage change. The vertical blue line indicates m_0 (June 2014) which separates the pre- and post-treatment periods. Consumers with annual income less than 200,000 Indian Rupee (US$3,333) are in group 1, from 200,001 to 500,000 (US$3,334 to US$8,333) Indian Rupee are in group 2, from 500,001 to 1,000,000 Indian Rupee (US$8,334 – US$16,667) are in Group 3, and above 1,000,001 Indian Rupee (US$16,667) are in group 4. Figure 3-A compares spending response of consumers by annual income groups as defined in the India income tax policy. Figure 3-B compares spending response of consumers by male and female consumers. Figure 3-C compares spending response of consumers by age groups, with age cut-off chosen at 40 and 50 to yield a more balanced sample size among three sub-samples. Figure 3-D compares spending response of consumers by marital status.

Figure 3-A: Heterogeneity in Spending Response by Income


Total Spending (income group 1)
0
-.5
-1
-1.5
-2
-2.5
2014m4
2014m7
2014m10
2015m1
2015m4
date
confidence interval
coefficient


Total Spending (income group 2)
0
-.5
-1
-1.5
2014m4
2014m7
2014m10
2015m1
2015m4
date
confidence interval
coefficient


Total Spending (income group 3)
.5
0
-.5
-1
2014m4
2014m7
2014m10
2015m1
2015m4
date
confidence interval
coefficient

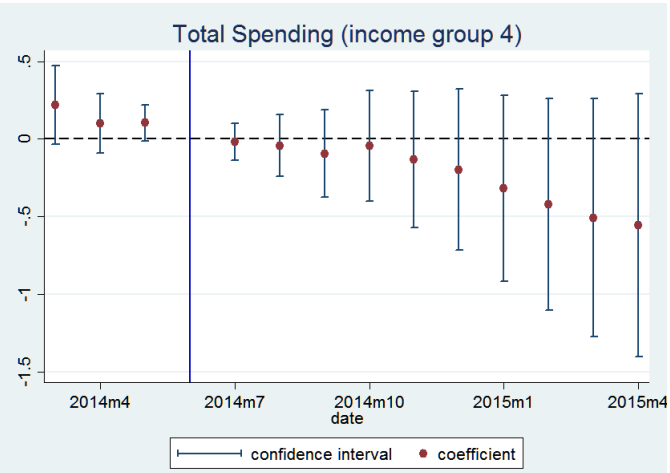

Total Spending (income group 4)
.5
0
-.5
-1
-1.5
2014m4
2014m7
2014m10
2015m1
2015m4
date
confidence interval
coefficient

Figure 3-B: Heterogeneity in Spending Response by Gender

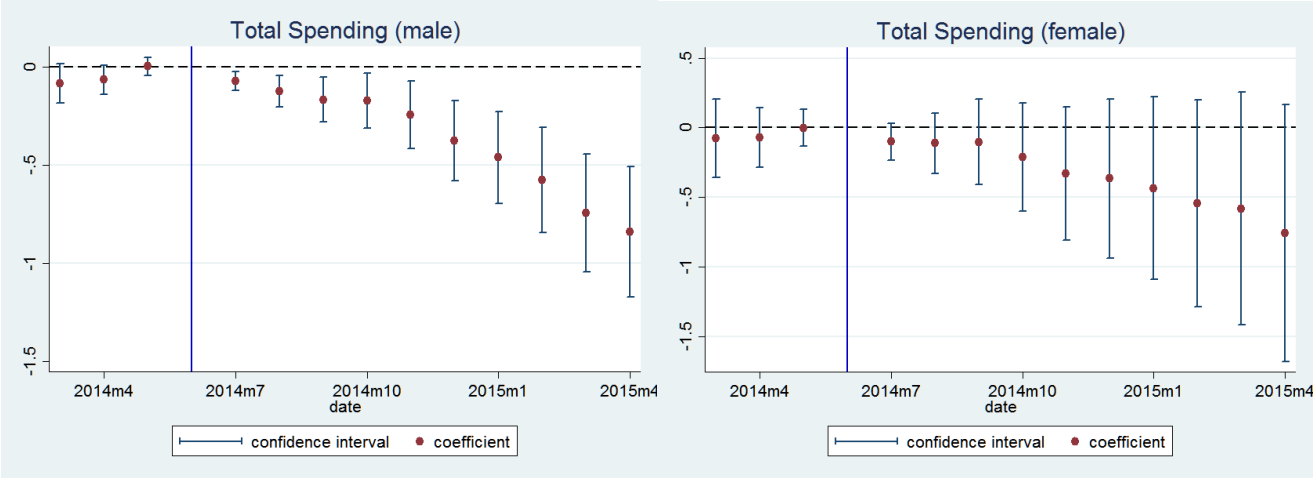
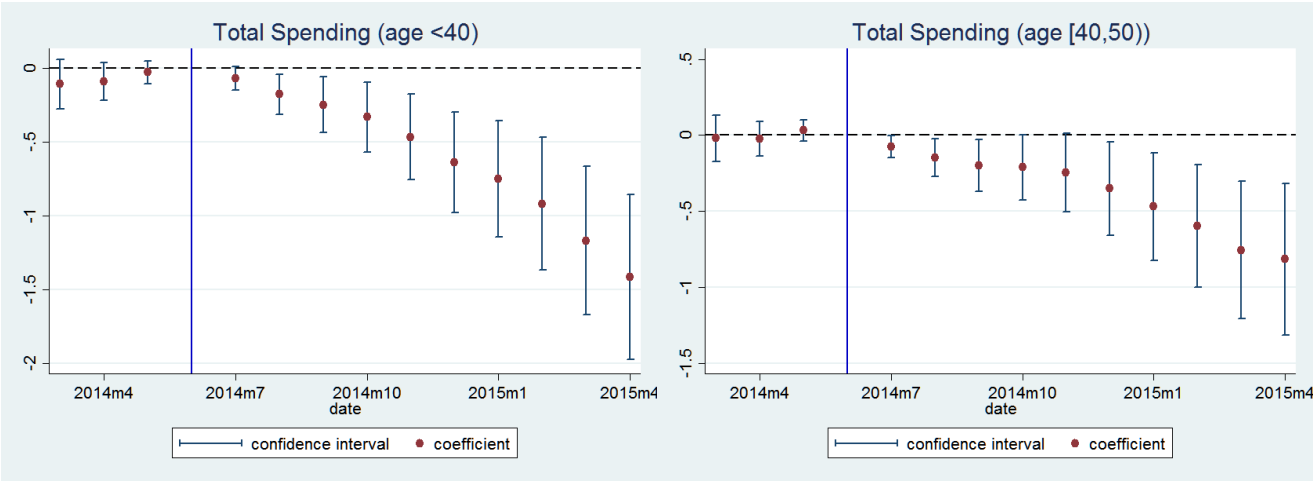


Figure 3-C: Heterogeneity in Spending Response by Age



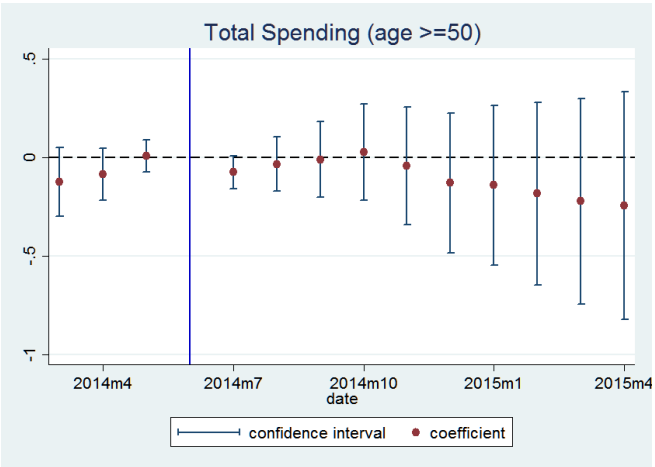


Figure 3-D: Heterogeneity in Spending Response by Marital Status

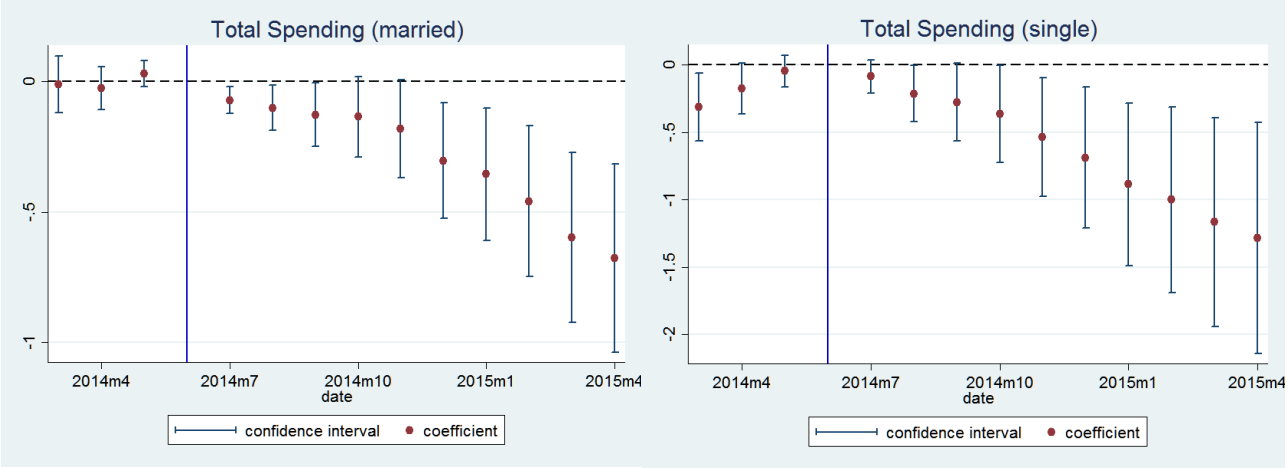


Figure 4: Dynamic Spending from Debit & Credit Card Transactions

These plots summarizes the entire paths of cumulative coefficients b_s, s = (-2) to (-1) and 1 to 20 with their corresponding 95 percent confidence intervals of total dollar value of spending (Panel A) and log of total dollar of spending (Panel B) as estimated from equation (2). In Figure 4-A, the monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The y-axis is the dollar value response and the x-axis indicates the calendar months. In Figure 4-B, the y-axis is the percentage change. The vertical blue line indicates m_0 (June 2014) which separates the pre- and post-treatment periods. The vertical brown line separates FY 2014 and FY 2015. The credit card spending data only starts from Aprial 2014, therefore for the total spending measure including credit card spending, there are only two estimates in the pre-treatment period.

(A) Total Spending (US$) **(B) Log of Total Spending (US$)**

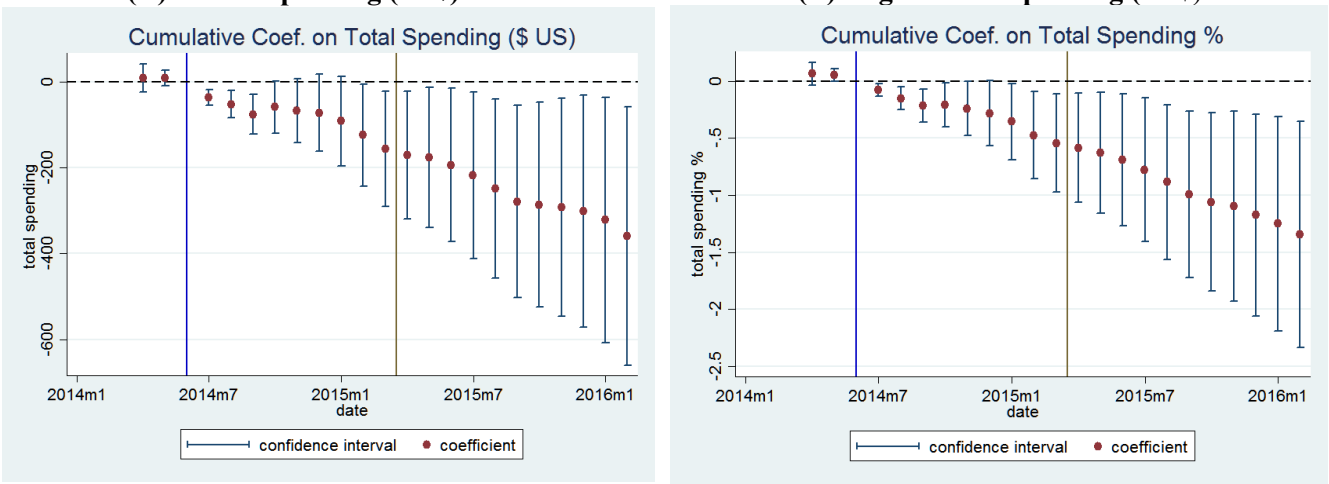


Figure 5: Dynamic Spending Response by Amount of Increase in Principal Repayment

These plots summarizes the entire paths of cumulative coefficients b_s , s=(-5) to (-1) and 1 to 20 with their corresponding 95 percent confidence intervals of Total Debit Card Spending (US$) (Panel A) and log of t Total Debit Card Spending (US$) (Panel B) as estimated from equation (2) for the subsample of consumers with a home mortgage and increased the principal repayment amount between FY 2013 and FY 2014 by more than US$166.67 (10,000 Indian Rupee), relative to their matched control group. The definition of Δp is given in Table 2. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The y-axis is the dollar value response and the x-axis indicates the calendar months. Figures 5.2 (Panel A and Panel B) report the spending response for the subsamples of consumers with a home mortgage but did not increase the principal repayment amount between FY 2013 and FY 2014 by more than US$166.67 (10,000 Indian Rupee), relative to their matched control group. The y-axis is the absolute change in Figure 5 Panel A and Figure 5.2 Panel A, and is the percentage change in Figure 5.1 Panel B and Figure 5.2 Panel B. The vertical blue line indicates m_0 (June 2014) which separates the pre- and post-treatment periods. The vertical brown line separates FY 2014 and F2015.

Figure 5.1: Response by mortgage borrowers who increased the principal payment (Δp > $166.67)

(A) Total Debit Card Spending (US$) **(B) Log of Total Debit Card Spending (US$)**

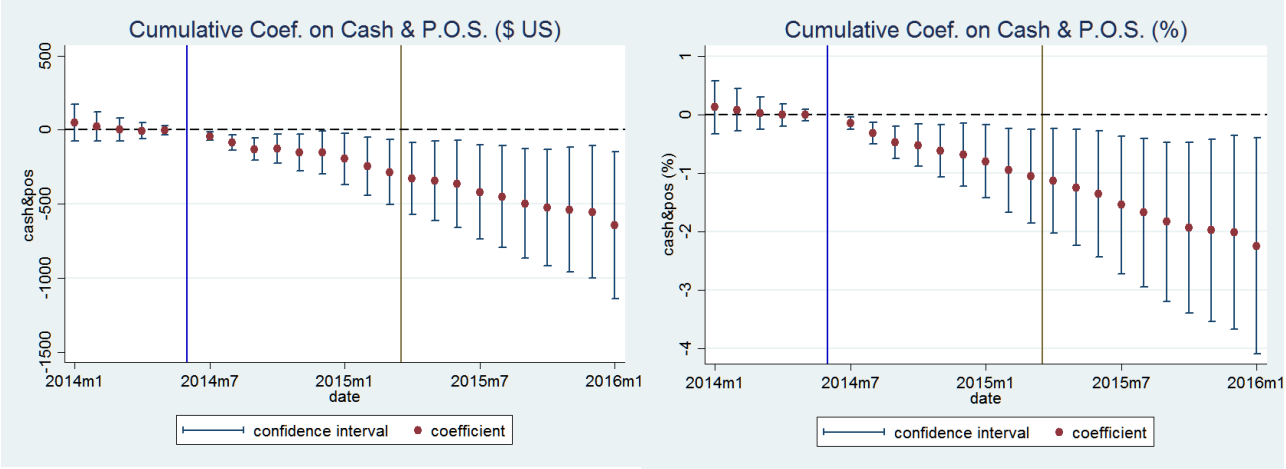


Figure 5.2: Response by mortgage borrowers who did not increase the principal payment (Δp < $166.67)

(A) Total Debit Card Spending (US$) **(B) Log of Total Debit Card Spending (US$)**

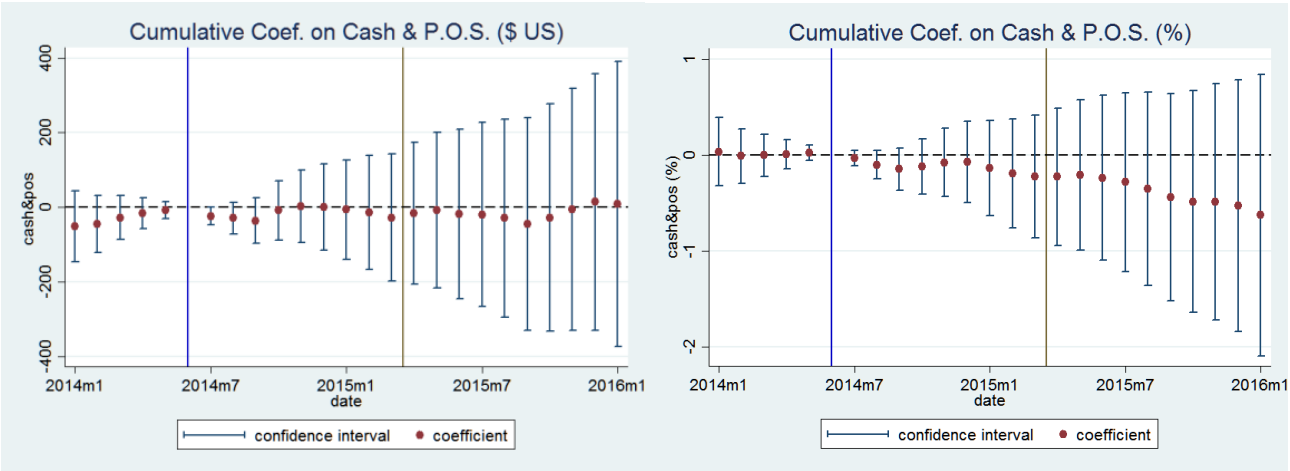
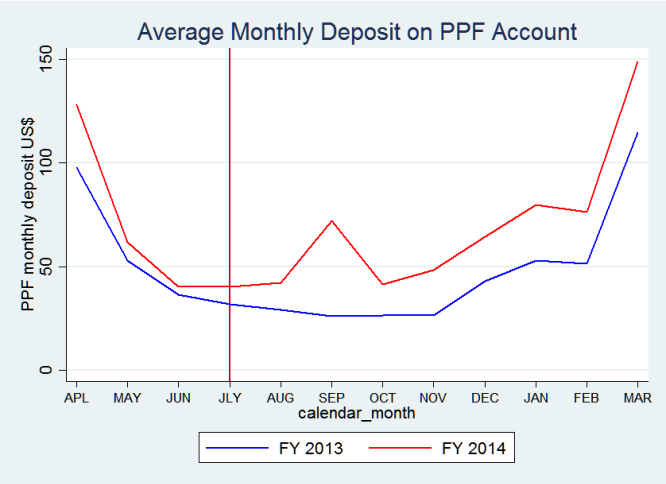


Figure 6: Average Monthly Deposit into a PPF Saving Account

The following plot provides the unconditional average monthly deposit for all 10,000 PPF accounts in our sample. The deposit amount is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The red vertical lines indicate the calendar month of July. The blue line is for FY 2013 and the red line is for FY 2014.



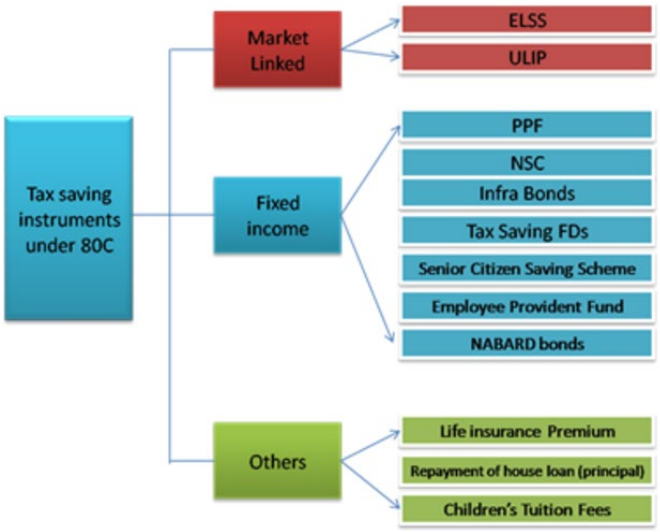
Appendix A: India's Income Tax Policy (FY 2013 to FY 2015)

Table A-1: Tax Rate and Tax Exemption Limit

This table summarizes the basic Indian income tax schedule for three fiscal tax years: FY 2013 (before policy change); FY 2014 (policy change); and FY 2015 (post policy change). Fiscal tax year is from April 1st to March 31st; for example, FY 2013 is from April 1st, 2013 to March 31st, 2014. India's income tax schedule varies by age group. Within each age group, tax rates also vary by net income level. The total exemption limit also varies by age group; however, total income exemption limit is raised by 50,000 Indian for all age, except individuals above 80 years old. This higher limit for age below 80 remains the same in the following fiscal tax year FY 2015. For the residents above the age of 80, there is no change of the total income tax exemption limit from FY 2013 to FY 2015.

FY2013			**FY2014**			**FY2015**
Age below 60						
Income Group	Tax Rate	Exemption Limit	Income Group	Tax Rate	Exemption Limit	Exemption Limit
<= 200,000 INR	0%	Rs. 200,000	<= 250,000 INR	0%	Rs.250,000	Rs.250,000
200,001-500,000 INR	10%		250,001-500,000 INR	10%		
500,001-1,000,000 INR	20%		500,001-Rs.1,000,000 INR	20%		
>= 1,000,001 INR	30%		>=1,000,001 INR	30%		
Age 60-80						
Income Group	Tax Rate	Exemption Limit	Income Group	Tax Rate	Exemption Limit	Exemption Limit
<= 250,000 INR	0%	Rs.250,000	<= 300,000 INR	0%	Rs.300,000	Rs.300,000
250,001-500,000 INR	10%		300,001-500,000 INR	10%		
500,001-1,000,000 INR	20%		500,001-1,000,000 INR	20%		
>=1,000,001 INR	30%		>=1,000,001 INR	30%		
Age >80						
Income Group	Tax Rate	Exemption Limit	Income Group	Tax Rate	Exemption Limit	Exemption Limit
<= 500,000 INR	0%	Rs. 500,000	<= 500,000 INR	0%	Rs. 500,000	Rs. 500,000
500,001-1,000,000 INR	20%		500,001-1,000,000 INR	20%		
>=1,000,001 INR	30%		>=1,000,001 INR	30%		

Figure A-1: Tax-saving Instruments under Section 80C of the Indian Income Tax Act FY 2014[21]



The July 2014 tax-subsidized savings policy increases the income tax exemption limit under Section 80C by 50,000 Indian Rupee (INR) from 100,000 INR to 150,000 INR for the following for long-term investment assets:

1. Provident Fund (PF): Any contributions to Provident Fund, Voluntary Provident Fund (VPF) or savings made in Public Provident Fund (PPF) are eligible for income tax deduction under section 80C of Indian Income Tax Act. Specifically related to the Public Provident Fund,

    - A minimum yearly deposit of 500 Indian Rupee (US$8.33) is required to open and maintain an active PPF account. A maximum deposit of 150,000 Indian Rupee (US$2,500) (w.e.f August 2014) can be made in a PPF account in any given financial year; any deposit of more than 150,000 Indian Rupee (US$2,500) per annum will neither earn any interest nor be eligible for rebate under Income Tax Act. The amount can be deposited in lump sum or in a maximum of 12 installments per year.
    - The government of India decides the rate of interest for the PPF account. As of March 2017, the current interest rate is 8.70% Per Annum (compounded annually) and has been effective since April 1st, 2013. Previously, the interest rate on the PPF account was 8.80%, which was effective since April 1st, 2012. Interest is paid on March 31st every year and is calculated based on the lowest balance observed between the close of the fifth day and the last day of every month.

      In general, if an individual deposits an amount of 100,000 Indian Rupee (US$1,667) every year for 15 years without any exception, then he would receive a total sum of more than 3,000,000 Indian Rupee (US$50,000). For an investment of 100,000 Indian Rupee (US$1,667) over a 15 year period, the interest earned more than 1,600,000 Indian Rupee (US$26,667), which has additional benefit of being non-taxable.

[21] Source https://www.bankbazaar.com/tax/deductions-under-80c.html

2. Life Insurance Premiums: Any Life Insurance premiums (for one or more insurance policies) paid by you for yourself, your spouse or your children is eligible under income tax deduction under section 80C of Indian Income Tax Act.
3. ELSS Equity Linked Saving Schemes: Any investment made in certain Mutual Funds called equity linked saving schemes qualifies for section 80C deduction. Please note that not all mutual fund investments are eligible for this deduction. Some examples of ELSS funds are: SBI Magnum Tax Gain, HDFC Tax Saver, HDFC Long-term advantage, etc.
4. ULIP (Unit Linked Insurance Plan): Investments made in certain ULIPs of Unit Trust of India and LIC of India are eligible for 80C deduction.
5. Bank Fixed deposits or Term deposits of > 5 years: According to a relatively new provision amount saved in fixed deposits of term at least five years is eligible for income tax deduction under section 80C of Indian Income Tax Act.
6. Tuition Fees: Amount paid as tuition fee for the education of two children of the assesse is eligible for deduction under section 80C of Indian Income Tax Act.
7. Other 80C deductions: Amount saved in National Saving Certificate (NSC), Infrastructure Bonds or Infra Bonds, amount paid as stamp duty and registration charges while buying a new home are eligible for income tax deductions under section 80C of Indian Income Tax Act.
8. Principal portion of the equated monthly installments (EMI) on mortgage for an owner-occupied primary residence: If you are paying EMI on a home mortgage, note that the EMI consists of two parts: principal part and interest part. The principal part of the EMI on your housing loan is eligible for income tax deduction under section 80C. However, the traditional home mortgage interest deduction is under Section 24B.

Under Section 24B, households can deduct interest on borrowed capital from income is allowed only in case of house property which is owned and occupied as a primary residence. The purpose of borrowing capital could be repair or renewal or reconstruction of the house or acquisition or construction of the house. In addition to the 50,000 INR increase in exemption limit from 100,000 INR to 150,000 INR for the principal payment on a mortgage (under Section 80C), the July 2014 policy also increased the income tax exemption limit for the interest payment (under Section 24B) by 50,000 India Rupee from 150,000 INR to 200,000 INR. However, for a household with a mortgage on an owner-occupied primary residence with maximum total exemption limit of 200,000 INR in FY 2013, there is only an additional 50,000 INR increase in the exemption limit because the total exemption limit in FY 2014 is 250,000 INR.

A-3 Coverage of the Consumption Measure

The India gross national saving rate is 31.43%[22] in 2014. The household raving rate is 21.9%[23] in 2012 to 2013. In the year 2015, the private consumption expenditure as a percentage of GDP is estimated to be 64%. In our matched sample as reported in Table 1, the average consumer consumption rate (cash withdrawal and POS transaction/annual income) is 44.9% and the median consumer consumption rate is 34.1%. Therefore, our sample covers a large proportion of the total individual consumption.

[22] Source: https://data.worldbank.org/indicator/NY.GDS.TOTL.ZS?locations=IN

[23] Source: https://www.livemint.com/Opinion/ZDgCdU87oxU6cPnClpc2yN/Improving-Indias-savings-rate.html

Appendix B: Robustness Tests

Table B-1: Placebo Tests of the Average Spending Response with Debit Card Transactions

This table presents the average spending response of the matched treatment group relative to the matched control group for FY 2013 (2013:04 to 2014:04). The sample range is one fiscal year before the policy announcement. The regression specification is given in equation (1). Each column represents the estimation for its corresponding dependent variable indicated in the first row and their definitions can be found in Table 1. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. *HMB* is the dummy variable taking the value of 1 if the individual has a home mortgage loan and 0 otherwise. *Post* is the binary variable taking the value of 1 for the months after July 2013 (as a placebo for the policy announcement month) and 0 otherwise. *$ Total Spending* is the summation of *$ cash* and *$ P.O.S.* whose definitions are given in Table 1. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard error are reported in parentheses under the coefficients estimates and ***, **, * denote statistical significant at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$ Total Spending	ln($ Total Spending)	$ Cash	ln($ Cash)	# Cash withdrawal	$ POS	ln($ POS)	# POS
HMB*Post	-4.066	-0.0319*	-4.150	-0.0246	-0.0116	0.0838	0.000512	-0.0223
	(4.688)	(0.0177)	(4.461)	(0.0180)	(0.0315)	(1.063)	(0.0150)	(0.0175)
constant	456.3***	4.940***	416.8***	4.771***	4.541***	39.49***	1.195***	0.900***
	(2.916)	(0.0105)	(2.763)	(0.0108)	(0.0191)	(0.731)	(0.00985)	(0.00998)
Fixed Effect				individual, year-month				
No. of Obs	325,390	325,390	325,390	325,390	325,390	325,390	325,390	325,390
R-squared	0.389	0.546	0.387	0.550	0.603	0.300	0.472	0.611

Table B-2: Average Spending Response for only Consumers with a Mortgage

This table shows the average spending response of the treatment group relative to the control group using the debit and credit card transactions data. The treatment group is defined to be the mortgage borrowers with annual principal payment (FY2013) between US$1,667 and US$2,500 (100,000-150,000 Indian Rupee) and the control group to be the mortgage loan borrowers with annual principal payment (FY2013) above US$2,500 (150,000 India Rupee). The regression specification is given in equation (1). Each column represents the estimation for its corresponding dependent variable indicated in the first row. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. *HMB_$PrinRepay* is the dummy variable taking the value of 1 if the mortgage holder has an annual principal repayment between US$1,667 and US2,500 (100,000-150,000 Indian Rupee), and 0 if the mortgage holder has an annual principal repayment amount greater than US$2,500 (150,000 India Rupee). Panel A is for the entire sample period from 2014:01 to 2016:02 and *Post* is the binary variable taking the value of 1 for the months after July 2014 (month of policy announcement) and 0 otherwise. Panel B focuses on the differential spending response in the pre-treatment period. Post is the binary variable taking the value of 1 for the period after 2014:05 for columns (1) and (2). Post is the binary variable taking the value of 1 for the period after 2014:03 for columns (3) and (4). *$ Total Spending* is the summation of *$ cash*,*$ P.O.S.* and credit card spending whose definitions are given in Table 1. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard error are reported in parentheses under the coefficients estimates and ***, **, * denote statistical significant at 1%, 5% and 10%, respectively.

Panel A: 2014:01/2014:04-2016:02

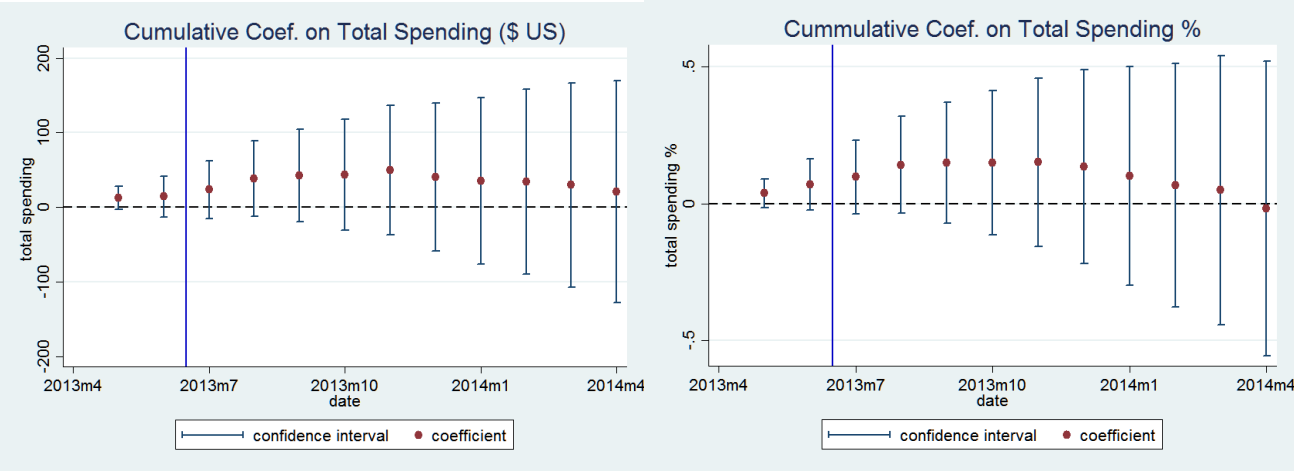
	(1)	(2)	(3)	(4)
	$ Total Spending	ln($ Total Spending)	$ Cash&POS	ln ($ Cash&POS)
HMB_$PrincRepayXPost	-26.77	-0.0283	-7.970	-0.0398
(Post is after 2014:07)	(24.17)	(0.0859)	(16.91)	(0.0747)
constant	539.9***	4.857***	445.6***	4.586***
	(15.20)	(0.0538)	(13.29)	(0.0512)
Fixed Effect		individual, year-month		
No. of Obs	33,166	33,166	37,492	37,492
R squared	0.307	0.426	0.343	0.448

Panel B: 2014:01/2014:04-2014:06

	(1)	(2)	(3)	(4)
	$ Total Spending	ln($ Total Spending)	$ Cash&POS	ln ($ Cash&POS)
HMB_$PrincRepayXPost	24.46	0.153	18.68	0.0277
(post if after 2014:03 or 2014:05)	(47.08)	(0.136)	(25.91)	(0.0955)
constant	539.9***	4.857***	445.6***	4.586***
	(13.81)	(0.0437)	(12.49)	(0.0452)
Fixed Effect		individual, year-month		
No. of Obs	4,326	4,326	8,652	8,652
R-squared	0.592	0.715	0.506	0.635

Figure B-1: Placebo Tests on Spending Response Dynamics with Debit Card Transactions

These plots summarizes the entire paths of cumulative coefficients b_s , s = (-2) to (-1) and 1 to 10 months from policy announcement month, with their corresponding 95 percent confidence intervals of total dollar value of spending and log of total dollar value of spending as estimated from equation (2). The sample period is 2013:04 to 2014:04 which one fiscal year before the policy affected fiscal year. The y-axis is the dollar value response and the x axis indicates the calendar months. The vertical blue line indicates m_0 (June 2013) which separates the pseudo pre- and post-treatment periods.



B-3-1 Mortgage Loan Payment Formula

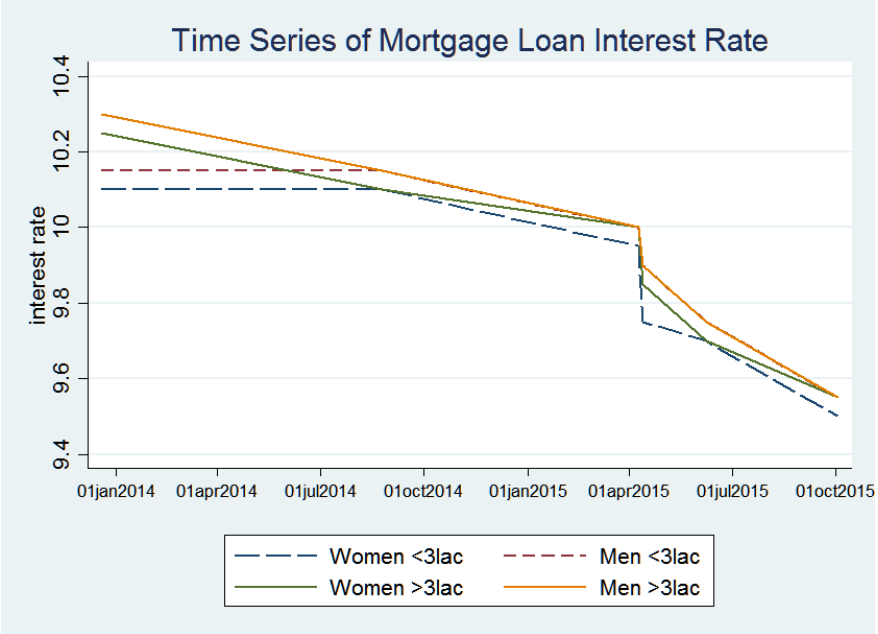
Assuming the mortgage account balance is B, the monthly interest rate is R, the number of months to maturity is N, and the mortgage is required to be paid on an equated monthly installment (EMI) scheme, then

$$\text{EMI} = \frac{B \times (R) \times (1+R)^N}{(1+R)^N - 1}$$

The required interest payment is BXR. The required principal payment is therefore EMI-BXR.

B-3-2 Time Series of Mortgage Loan Interest Rate around the Sample Period

The following graph plots the time series change of the home mortgage loan interest rate during the sample periods. The y-axis indicates the annual percentage of interest rate. The x-axis is calendar month. The home mortgage rates are different for men and women and for loans with different loan amounts. 1 Lakh = 100,000 INR. The four lines represent the interest rates for the four different combinations of gender and loan amount.



B-3-2: Impact of Declining Interest Rate on the Required Principal Payment Amount

The change in the principal payment amount is computed using the formula below.

$$\Delta\textbf{Principle}_{\boldsymbol{i}} = \{\left[\frac{B_i \times (R_L) \times (1+R_L)^{N_i}}{(1+R_L)^{N_i}-1} - B_i \times R_L\right] - \left[\frac{B_i \times (R_H) \times (1+R_H)^{N_i}}{(1+R_H)^{N_i}-1} - B_i \times R_H\right]\} \times 12$$

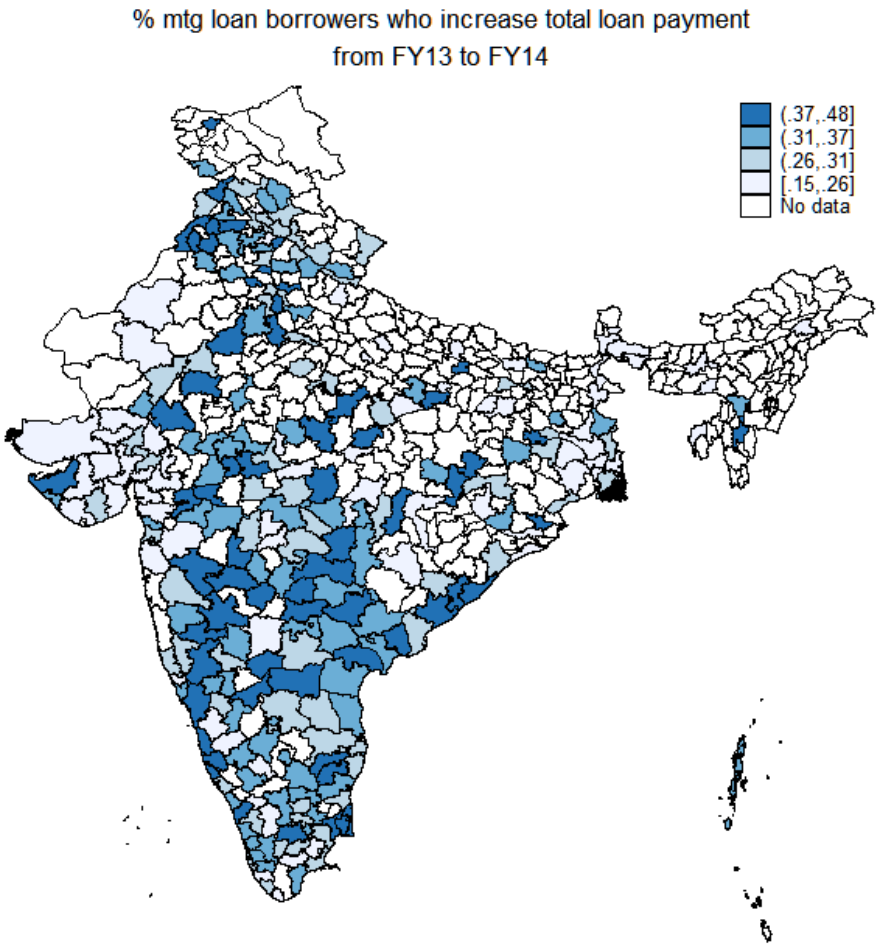
$\Delta\textbf{Principle}_{\boldsymbol{i}}$ is the change of principal part of payment due to interest rate change for each mortgage loan *i* in the sample. B_i represents the loan balance at September 2014. N_i represents the number of months to maturity. R_H and R_L represents the mortgage interest rate before and after the policy change.

Below are summary statistics for the mortgage loans as of September 2014 in our sample. The annual change in required amount of payment (R_H=10.3%, R_L =10.15%) refers to the change in the principal payment due to interest change ($\Delta\textbf{Principle}_{\boldsymbol{i}}$) given that $R_H = 10.3\%$ and $R_L = 10.15\%$. Similarly, the annual change in required amount of payment (R_H=10.3%, R_L = 9.55%) refers to the change in the principal payment due to interest change ($\Delta\textbf{Principle}_{\boldsymbol{i}}$) given that $R_H = 10.3\%$ and $R_L = 9.55\%$. All the values are in India Rupee.

	N	Mean	p10	p50	p90	Std.
Months to maturity (N_i)	811,123	132	67	129	205	53
Balance at September 2014 (B_i)	811,123	618,692	129,735	432,177	1359389	561,136
Annual change in required amount of payment (R_H=10.3%, R_L =10.15%)	811,123	272	68	203	565	226
Annual change in required amount of payment (R_H=10.3%, R_L = 9.55%)	811,123	-1,388	-2,884	-1,035	-347	1,150

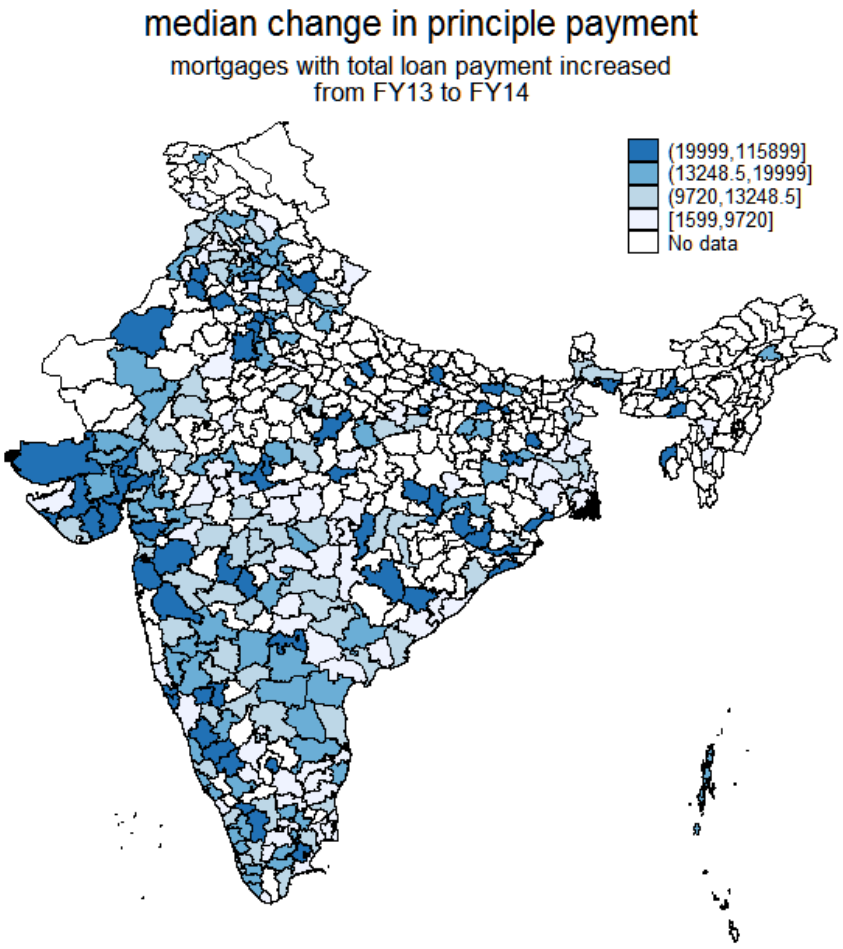
B-4-1 Percentage of Mortgage Loan Borrowers Who Increased Total Mortgage Payment from FY 2013 to FY 2014 by Districts

The following graph is based on the data described in Table 2. The mortgage data has a broad geographical coverage with the smallest geographical identifier as the district. If there are no more than 50 mortgage loans in a particular district, it is indicated as No data. The following graph captures the percentage of mortgage borrowers who increased the total mortgage repayment from FY 2013 to FY 2014 by districts.



B-4-2 Median Increased in Principal Payment Amount for Consumers Who Increased Total Mortgage Payment

The following graph is based on the data described in Table 2. The mortgage data has a broad geographical coverage with the smallest geographical identifier as the district. If there are no more than 50 mortgage loans in a particular district, it is indicated as No data. For mortgages with an increase total mortgage payment between FY 2013 and FY 2014, the following graph captures the median amount of the increase in mortgage principal payment by districts.



B-5 Alternative Identification Strategies

There are other potential alternative identification strategies which are either appropriate or applicable for the policy experiment and the research question we focus on. First, we may utilize the fact that the policy change is subject to age eligibility. The income tax exemption limit is not changed for the residents above the age of 80. If we adopt the random discontinuity design methodology to estimate the treatment effect based on age, the treatment group should include the individuals slightly below the age of 80. However, the research question is about the household's saving decisions which make the population around 80 not of research interest. Moreover, the average life expectancy is about 68 years old and the sample size is not large enough for the narrow age range around 80. Second, we may utilize the fact that the policy change is subject to income level. For the salaried workers whose annual income below 200,000 INR, the change of income tax exemption limit has no effect on them since they are paying zero income tax. However, we do not have an accurate measure of income accountable for the computation of income tax; therefore, the random discontinuity design is not feasible here. Moreover, the policy announcement date is before the income tax assessment date (i.e. at the end of fiscal year), income level can be endogenously determined and thus violate the RDD methodology assumption that the agents cannot manipulate the treatment status.

Lastly, households have different utilization levels of income tax exemption limit. Those who did not exhaust the old lower exemption limit, in comparison to those who have exhausted the old lower exemption limit, are unlikely to be motivated to change their saving behavior due to the policy change given their lower disposition to save. The treated households are those who have exhausted the old lower exemption limit, and their distance to the new higher exemption limit determines their treatment intensity. We agree that different utilization levels of income tax exemption limit provides another difference-in-difference setting. Unfortunately, we are not able to observe the income tax exemption utilization level. We have one test in spirit of the above idea (Table B-2). The treatment includes the mortgage borrowers whose principal repayment is between the old lower exemption limit and the new higher exemption limit. The control includes the mortgage borrowers whose principal repayment is above the new higher exemption limit. The signs of the estimated coefficients are consistent with our main findings, but they are insignificant due to the limited statistical power of a small sample.

B-6 Pre-treatment Parrllel Trend Test for the Entire Sample Period

Table B-6 : Dynamic Monthly Spending Response from the Debit Card Transaction

This table reports the estimated spending response from the debit card transactions using the distributed lag model as specified in equation (2) for the matched sample over the period of 2013:04-2015:04. Spending response is captured using eight different types of transaction outcomes. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawals from ATM for each individual. *Monthly ATM debit card transactions* (#ATM) measures the total number of ATM cash withdrawals per month. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. *Monthly P.O.S. transactions* (#P.O.S.) measure the total number of transactions per month through point-of-sale machine. The monetary value of each spending behaviour is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The constant absorbs the month 2013:03 (Pre m_{-14}), which is the first month of the sample period. m 0 refers to June 2014 which is one month before the policy announcement month July 2014. *Pre* m_{-i} is a binary variable that is equal to one for the i^{th} month before m_0. *Post* m_i is a binary variable that is equal to one for the i^{th} month after m_0. *HMB* is an indicator variable taking the value of 1 if the individual has a mortgage and 0 otherwise. *Post* is an indicator variable taking the value of 1 for the months after July 2014 (month of policy announcement) and 0 otherwise. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard errors are reported in parentheses under the coefficients estimates, and ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	$ Total Spending	ln($ Total Spending)	$ cash	ln($ cash)	# cash withdrawal	$ POS	ln($ POS)	# POS
HLB X Pre m-13	12.62*	0.0203	0.124	0.0372	0.0719	12.75*	0.0372	0.0420
	(7.186)	(0.0267)	(1.993)	(0.0264)	(0.0484)	(7.581)	(0.0258)	(0.0324)
HLB X Pre m-12	4.813	0.0445	-3.281	-0.0189	0.0175	1.532	0.0315	0.0237
	(7.504)	(0.0284)	(2.096)	(0.0265)	(0.0503)	(7.933)	(0.0275)	(0.0327)
HLB X Pre m-11	10.12	0.0260	-0.600	-0.00925	0.0476	9.517	0.0277	-0.0586*
	(7.419)	(0.0292)	(1.953)	(0.0270)	(0.0514)	(7.823)	(0.0282)	(0.0319)
HLB X Pre m-10	14.34*	0.0371	0.269	0.0363	0.0561	14.61*	0.0447	-0.0462
	(7.354)	(0.0295)	(1.974)	(0.0275)	(0.0517)	(7.769)	(0.0285)	(0.0331)
HLB X Pre m-9	7.147	0.0220	-2.958	0.000520	0.0348	4.189	0.00668	-0.00935
	(7.380)	(0.0304)	(1.980)	(0.0279)	(0.0522)	(7.783)	(0.0294)	(0.0321)
HLB X Pre m-8	2.637	0.00256	-1.262	0.0473*	0.0474	1.375	-0.00124	-0.0233
	(7.913)	(0.0301)	(2.118)	(0.0286)	(0.0549)	(8.319)	(0.0293)	(0.0324)
HLB X Pre m-7	5.657	0.0110	0.391	0.0228	0.0574	6.047	0.00198	0.0229
	(7.788)	(0.0309)	(2.017)	(0.0283)	(0.0543)	(8.221)	(0.0299)	(0.0316)
HLB X Pre m-6	-6.701	-0.0104	-2.438	-0.00560	-0.0397	-9.139	-0.0161	0.00176
	(7.788)	(0.0313)	(2.099)	(0.0286)	(0.0553)	(8.256)	(0.0305)	(0.0311)
HLB X Pre m-5	-5.294	-0.0397	-0.449	0.0226	-0.00376	-5.743	-0.0333	-0.0221
	(7.838)	(0.0314)	(2.014)	(0.0290)	(0.0549)	(8.257)	(0.0305)	(0.0308)
HLB X Pre m-4	-2.253	-0.0292	1.037	-0.00521	0.000719	-1.216	-0.0358	-0.0236
	(7.703)	(0.0321)	(2.075)	(0.0285)	(0.0534)	(8.122)	(0.0313)	(0.0300)
HLB X Pre m-3	-2.525	0.00681	-1.494	-0.0128	0.0187	-4.019	-0.0160	-0.0231
	(8.208)	(0.0324)	(2.073)	(0.0289)	(0.0572)	(8.632)	(0.0315)	(0.0291)
HLB X Pre m-2	-6.509	-0.0579*	-2.180	-0.0261	-0.0376	-8.690	-0.0684**	-0.0260
	(8.064)	(0.0320)	(2.158)	(0.0298)	(0.0565)	(8.515)	(0.0311)	(0.0300)
HLB X Pre m-1	0.0584	0.00446	-2.392	0.0138	0.0895	-2.334	0.00431	-0.0500*
	(8.353)	(0.0322)	(2.275)	(0.0308)	(0.0581)	(8.839)	(0.0312)	(0.0294)
HLB X Pre m 0	-9.895	-0.0424	0.504	0.0136	-0.00352	-9.391	-0.0557*	-0.0310
	(8.246)	(0.0329)	(2.285)	(0.0307)	(0.0575)	(8.737)	(0.0320)	(0.0275)
HLB X Post m1	-20.34**	-0.0489	-5.815***	-0.0382	-0.0419	-26.16***	-0.0744**	-0.0509*
	(8.142)	(0.0328)	(2.256)	(0.0306)	(0.0574)	(8.670)	(0.0318)	(0.0280)
HLB X Post m2	-4.891	-0.0313	-3.499	-0.0276	-0.00703	-8.389	-0.0468	-0.0355
	(8.190)	(0.0325)	(2.277)	(0.0315)	(0.0571)	(8.678)	(0.0316)	(0.0296)
HLB X Post m3	-10.05	-0.0281	-3.658*	-0.0401	-0.0193	-13.71	-0.0341	-0.0481
	(8.290)	(0.0337)	(2.197)	(0.0311)	(0.0582)	(8.773)	(0.0327)	(0.0308)
HLB X Post m4	-13.21	-0.0181	-1.792	0.00894	0.0168	-15.00*	-0.0186	-0.00655
	(8.242)	(0.0329)	(2.498)	(0.0328)	(0.0575)	(8.816)	(0.0319)	(0.0328)
HLB X Post m5	-25.17***	-0.0471	-5.377**	-0.0808**	-0.129**	-30.54***	-0.0764**	-0.0725**

	(8.062)	(0.0338)	(2.396)	(0.0316)	(0.0563)	(8.632)	(0.0328)	(0.0317)
HLB X Post m6	-38.88***	-0.109***	-4.901**	-0.0512	-0.141**	-43.78***	-0.120***	-0.0710**
	(8.149)	(0.0341)	(2.275)	(0.0320)	(0.0576)	(8.654)	(0.0331)	(0.0331)
HLB X Post m7	-29.25***	-0.0742**	-3.816	-0.0330	-0.147**	-33.06***	-0.0833**	-0.0469
	(8.342)	(0.0341)	(2.347)	(0.0319)	(0.0583)	(8.912)	(0.0332)	(0.0342)
HLB X Post m8	-47.25***	-0.0965***	-6.352***	-0.0906***	-0.270***	-53.60***	-0.113***	-0.0864***
	(8.365)	(0.0350)	(2.262)	(0.0315)	(0.0577)	(8.898)	(0.0340)	(0.0323)
HLB X Post m9	-46.94***	-0.143***	-5.873***	-0.0822**	-0.269***	-52.82***	-0.150***	-0.0855**
	(8.429)	(0.0351)	(2.225)	(0.0321)	(0.0591)	(8.913)	(0.0340)	(0.0343)
HLB X Post m10	-30.38***	-0.101***	-5.009**	-0.0602*	-0.144**	-35.38***	-0.106***	-0.0628*
	(8.450)	(0.0346)	(2.272)	(0.0319)	(0.0579)	(8.920)	(0.0336)	(0.0343)
constant	416.8***	4.777***	39.49***	1.209***	4.541***	456.3***	4.946***	1.193***
	(2.858)	(0.0114)	(0.752)	(0.0103)	(0.0199)	(3.016)	(0.0112)	(0.0107)
Fixed Effect	individual, year-month							
No. of Obs	625,750	625,750	625,750	625,750	625,750	625,750	625,750	625,750
R sqaured	0.324	0.472	0.250	0.400	0.545	0.327	0.458	0.553

B-7 Sample without Excluding Individuals with no Income Data.

Table B-7-1 reports the summary statistics for the sample without excluding the individuals with no income data. We perform the propensity score matching in the same way as we do with the main sample except that we can no longer match on the level of income. After matching, we have 21,788 observations in the treatment group and 21,788 observations in the control group. The sample size is doubled as compared with the sample reported in Table 1. Comparing Table 1 and Table B-7-1, the two sample presents similar features for all the variables. On average, the larger sample has lower monthly cash withdrawal and P.O.S transactions. The income data is from the consumers who deposit their salary to the bank providing the data. Therefore, these people may use this bank account as their main bank account and thus they have larger and more frequent transactions with the bank. The unconditional average monthly spending plots are reported in Figure B-7. Figure B-7 and Figure 1 presents similar patterns for the treatment and control groups. The dynamic consumption response estimations are reported in Table B-7-2 and we obtain similar results as Table 5.

In conclusion, with a larger sample without matching the income level for the treatment and control group, our main results reserve.

Table B-7-1 Summary Statistics for the Sample with Missing Income Data

This table reports the summary statistics for the sample without excluding the consumers with missing income observation. The table is the summary statistics of the debit card spending transactions data, by the treatment and control group, for both before and after the propensity score matching. The treatment group consists of individuals who have a mortgage with the bank; the control group consists of those who do not have a mortgage with the bank. We drop infrequently used accounts and individuals with many missing or invalid demographic data. Both demographics (age, gender, marital status, annual income) and account-level financial information are reported. For the current account balance and saving account balance, we only have the data at the end of February 2015. The summary statistics on the monthly spending behaviour are separately reported for the pre-treatment period (2014:03-2014:06) and post-treatment period (2014:07-2015:04). *Monthly cash withdrawal* ($Cash) is computed by summing the monthly ATM cash withdrawals for each individual. *Monthly number of ATM debit card transactions* (#ATM) measures the total number of ATM cash withdrawals per month. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. *Monthly P.O.S. transactions* (#P.O.S.) measures the total number of transactions per month through point-of-sale machines. All spending data are reported in INR. To convert to US$, the exchange rate of 60 INR to US$1 as of July 2014 is used. The column *Diff* reports the pairwise t-tests testing for a mean difference between the treatment group and control group. ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

	N	Mean	Std.	N	Mean	Std.	Diff
	treatment group			**control group**			
age	25,223	44	9.1	180,560	50	13	6.74***
gender (male=1, female=0)	25,223	0.85	0.35	180,560	0.74	0.44	-0.11***
marital status (married=1,single=0)	25,223	0.75	0.43	180,560	0.68	0.47	-0.068***
current account balance (2015:02)	17,179	85,899	1,459,200	136,097	241,116	1,139,578	155216***
saving account balance (2015:02)	24,067	91,501	1,324,002	87,901	717,328	2,238,433	625827***
monthly cash withdrawal (2014:03-2014:06)	100,892	20,993	32,040	722,240	18,451	29,295	-2542***
monthly cash withdrawal (2014:07-2015:04)	252,230	19,549	29,281	1,805,600	18,731	29,643	-818***

monthly #ATM debit transactions (2014:03-2014:06)	98,027	4.1	4.5	681,940	3.3	4	-0.797***
monthly #ATM debit transactions (2014:07-2015:04)	244,107	3.7	4.1	1720946	3.1	3.9	-0.593***
monthly P.O.S. transaction (2014:03-2014:06)	100,892	2,258	7,440	722,240	2,431	8,026	172***
monthly P.O.S. transaction (2014:07-2015:04)	252,230	2,444	7,752	1,805,600	2,882	8,794	437***
monthly #P.O.S.transactions (2014:03-2014:06)	98,027	1	2.3	681,940	1	2.4	0
monthly #P.O.S.transactions (2014:07-2015:04)	244,107	1.1	2.5	1720946	1.1	2.6	0.048***
	N	Mean	Std.	N	Mean	Std.	Diff
	matched treatment group			**matched control group**			
age	21,788	44	9.2	21,788	44	9.3	-0.023
gender (male=1, female=0)	21,788	0.86	0.35	21,788	0.85	0.35	-0.001
marital status (married=1,single=0)	21,788	0.75	0.43	21,788	0.75	0.43	0.002
current account balance (2015:02)	17,166	85,842	1459680	17,166	183,379	592,845	97537***
saving account balance (2015:02)	20,842	94,896	1416068	10,558	453,276	1311744	358380***
monthly cash withdrawal (2014:03-2014:06)	87,152	21,112	30,681	87,152	20,423	29,391	-688***
monthly cash withdrawal (2014:07-2015:04)	217,880	19,767	28,363	217,880	20,685	30,087	918***
monthly #ATM debit transactions (2014:03-2014:06)	87,152	4.1	4.4	87,152	3.7	4.3	-0.336***
monthly #ATM debit transactions (2014:07-2015:04)	217,880	3.7	4	217,880	3.5	4.1	0-.136***
monthly P.O.S. transaction (2014:03-2014:06)	87,152	2,399	7,643	87,152	2,599	8,029	200***
monthly P.O.S. transaction (2014:07-2015:04)	217,880	2,593	7,968	217,880	3,000	8,654	407***
monthly #P.O.S. transactions (2014:03-2014:06)	87,152	1	2.3	87,152	1.1	2.6	0.074***
monthly #P.O.S. transactions (2014:07-2015:04)	217,880	1.1	2.5	217,880	1.2	2.8	0 .123***

Table B-7-2 Dynamic Monthly Spending Response from the Debit Card Transaction

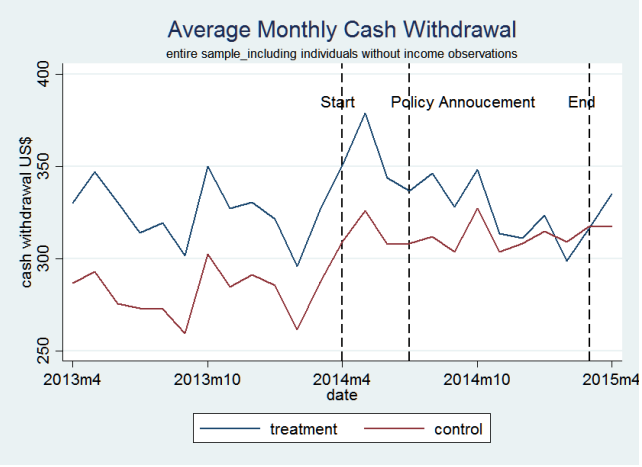
This table reports the estimated spending response from the debit card transactions using the distributed lag model as specified in equation (2) for the matched sample over the period of 2014:03-2015:04. The table is the same as Table 5 with the sample including the individuals with no income data available. Spending response is captured using eight different types of transaction outcomes. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawals from ATM for each individual. *Monthly ATM debit card transactions* (#ATM) measures the total number of ATM cash withdrawals per month. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. *Monthly P.O.S. transactions* (#P.O.S.) measure the total number of transactions per month through point-of-sale machine. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The constant absorbs the month 2014:06 (m_0), which is one month before the policy announcement month of 2014:07. *Pre* m_{-i} is a binary variable that is equal to one for the i^{th} month before m_0. *Post* m_i is a binary variable that is equal to one for the i^{th} month after m_0. *HMB* is an indicator variable taking the value of 1 if the individual has a mortgage and 0 otherwise. *Post* is an indicator variable taking the value of 1 for the months after July 2014 (month of policy announcement)

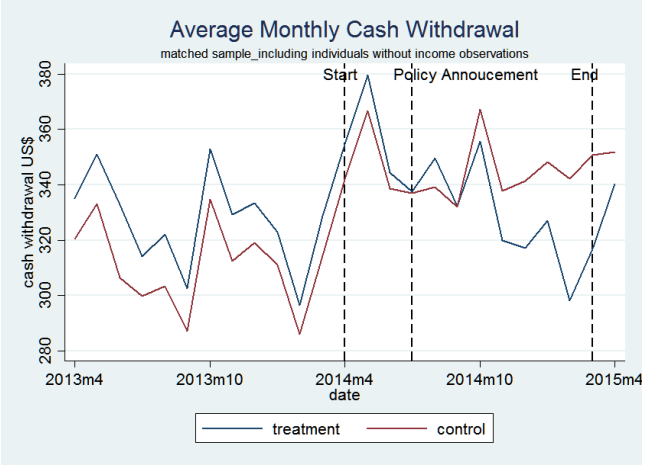
and 0 otherwise. For all the regressions, individual fixed effects and year-month fixed effects are imposed. The standard error is clustered at individual level. The standard errors are reported in parentheses under the coefficients estimates, and ***, **,* denote statistical significant at 1%, 5% and 10%, respectively.

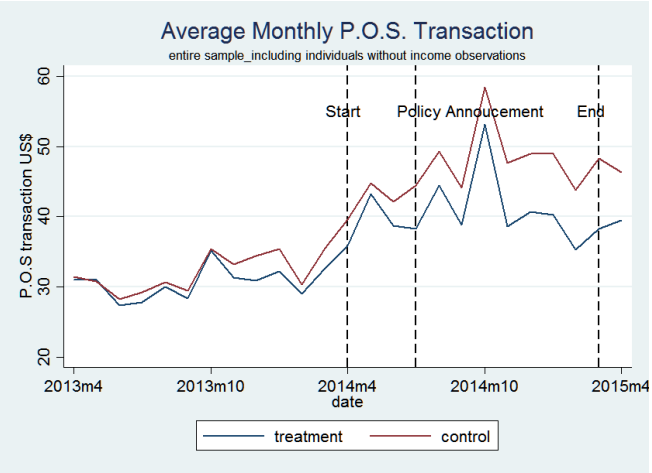
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	$ Total Spending	ln($ Total Spending)	$ cash	ln($ cash)	# cash withdrawal	$ POS	ln($ POS)	# POS
HLB X Pre m-3	8.126	0.0448*	-1.514	-0.0102	0.0589	6.612	0.0371	-0.0272
	(5.406)	(0.0250)	(1.580)	(0.0218)	(0.0382)	(5.775)	(0.0244)	(0.0224)
HLB X Pre m-2	6.767	-0.0141	-1.054	-0.0169	0.0175	5.713	-0.0143	-0.0326
	(5.345)	(0.0246)	(1.596)	(0.0223)	(0.0374)	(5.720)	(0.0241)	(0.0216)
HLB X Pre m -1	6.968	0.0367	1.121	0.0524**	0.0855**	8.089	0.0556**	0.0246
	(5.084)	(0.0230)	(1.610)	(0.0220)	(0.0356)	(5.447)	(0.0225)	(0.0208)
HLB X Post m1	-5.383	-0.0179	-2.846*	-0.0226	-0.0252	-8.229	-0.0278	-0.0212
	(4.871)	(0.0229)	(1.557)	(0.0218)	(0.0349)	(5.223)	(0.0224)	(0.0211)
HLB X Post m2	4.498	-0.00170	-2.375	-0.0208	-0.00606	2.123	-0.00389	-0.0280
	(5.134)	(0.0242)	(1.659)	(0.0231)	(0.0369)	(5.528)	(0.0239)	(0.0226)
HLB X Post m3	-5.936	-0.0165	-3.013*	-0.0451*	-0.0422	-8.949	-0.0390	-0.0332
	(5.407)	(0.0252)	(1.671)	(0.0233)	(0.0384)	(5.821)	(0.0248)	(0.0233)
HLB X Post m4	-17.57***	-0.0448*	-2.667	-0.0399	-0.0608	-20.24***	-0.0595**	-0.0476*
	(5.516)	(0.0256)	(1.810)	(0.0245)	(0.0392)	(5.975)	(0.0252)	(0.0246)
HLB X Post m5	-24.00***	-0.0962***	-3.518**	-0.0705***	-0.185***	-27.52***	-0.115***	-0.0566**
	(5.340)	(0.0259)	(1.706)	(0.0234)	(0.0385)	(5.778)	(0.0254)	(0.0242)
HLB X Post m6	-30.11***	-0.117***	-4.243**	-0.0553**	-0.222***	-34.35***	-0.115***	-0.0826***
	(5.451)	(0.0263)	(1.711)	(0.0238)	(0.0395)	(5.904)	(0.0259)	(0.0258)
HLB X Post m7	-27.17***	-0.0904***	-4.104**	-0.0654***	-0.217***	-31.28***	-0.115***	-0.0500*
	(5.652)	(0.0266)	(1.727)	(0.0239)	(0.0401)	(6.093)	(0.0263)	(0.0269)
HLB X Post m8	-50.28***	-0.174***	-4.870***	-0.110***	-0.340***	-55.15***	-0.198***	-0.0890***
	(5.793)	(0.0271)	(1.689)	(0.0237)	(0.0402)	(6.195)	(0.0268)	(0.0254)
HLB X Post m9	-39.84***	-0.176***	-7.010***	-0.120***	-0.313***	-46.85***	-0.209***	-0.102***
	(5.836)	(0.0273)	(1.731)	(0.0245)	(0.0409)	(6.256)	(0.0270)	(0.0271)
HLB X Post m10	-17.37***	-0.111***	-3.415**	-0.0791***	-0.190***	-20.79***	-0.131***	-0.0741***
	(5.771)	(0.0274)	(1.717)	(0.0239)	(0.0408)	(6.178)	(0.0269)	(0.0270)
constant	341.6***	4.180***	42.57***	1.386***	3.842***	384.1***	4.450***	1.086***
	(1.853)	(0.00868)	(0.570)	(0.00788)	(0.0133)	(1.990)	(0.00855)	(0.00808)
Fixed Effect				individual, year-month				
No. of Obs	610,064	610,064	610,064	610,064	610,064	610,064	610,064	610,064
R-sqaured	0.424	0.563	0.290	0.408	0.607	0.423	0.541	0.585

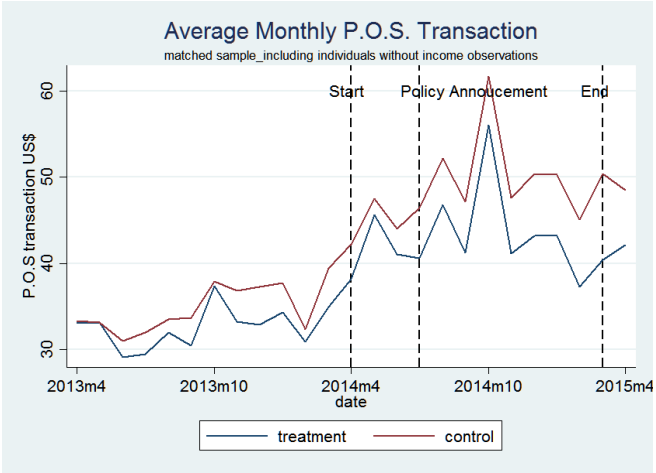
Figure B-7: Unconditional Average Monthly Debit Card Spending

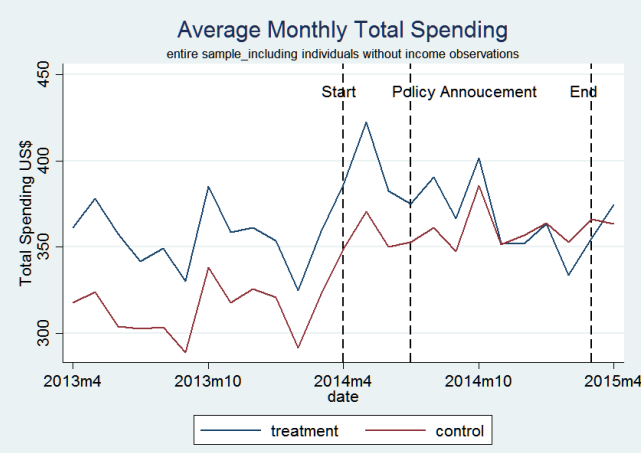
Theses plots are the same as Figure 1 with the sample without excluding the individuals with no income observations. These plots summarize the unconditional average monthly spending for the sample both before and after the propensity score matching. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.). Monthly *cash withdrawal* ($Cash) is computed by summing the monthly cash withdrawals from ATM for each individual. *Monthly P.O.S. transaction* ($P.O.S.) is computed by summing the monthly spending via point-of-sale machine for each individual. The monetary value of each spending behavior is measured in US$ using the exchange rate 60 Indian Rupee to US$1 as of July 2014. The dotted vertical lines indicate the starting of the fiscal year 2014, the policy announcement month (July 2014) and the end of the fiscal year 2014, respectively.

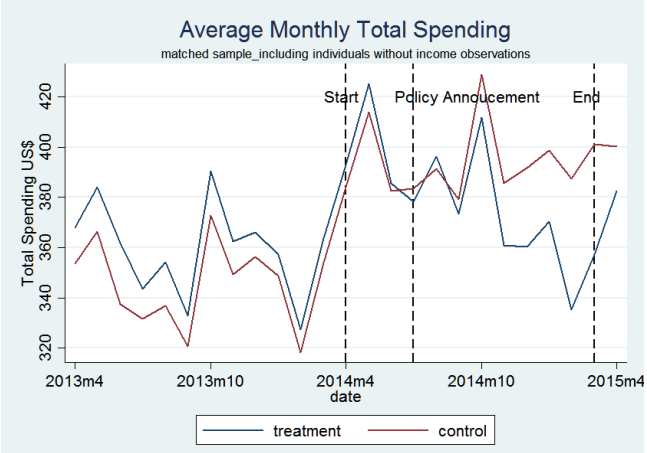












B-8 Regression Results for the Heterogneity Tests

Table B-8 Heterogeneity Test on Dynamic Monthly Spending Respons from the Debit Card Transactions

This table reports the estimated spending response from the debit card transactions using the distributed lag model as specified in equation (2) for the matched sample over the period of 2014:03-2015:04 by splitting the sample based on consumer demographics characteristics. Panel A is by income level. Penal B is by gender. Panel C is by age groups and Panel D is by marital status. The dependent variable is total spending for all the regression estimations. Total spending is the sum of monthly cash withdrawals ($Cash) and P.O.S. spending ($P.O.S.).

Panel A: By income level					**Panel B: By gender**		
	(1)	(2)	(3)	(4)		(1)	(2)
	income	income	income	income			
VARIABLES	slab 1	slab 2	slab 3	slab 4	VARIABLES	male	female
HLB XPre m-3	-11.87	-1.071	-14.65	7.449	HLB XPre m-3	-7.342	2.770
	(14.69)	(10.49)	(9.869)	(17.50)		(6.590)	(16.12)
HLB XPre m-2	-17.55	-19.55*	-0.172	-7.925	HLB XPre m-2	-8.135	-28.68*
	(15.68)	(10.56)	(10.26)	(18.11)		(6.820)	(15.93)
HLB XPre m-1	-21.61	-4.904	-5.846	16.41	HLB XPre m-1	-4.551	-3.183
	(16.88)	(10.85)	(11.03)	(18.50)		(7.049)	(18.60)
HLB XPost m1	-36.36**	-24.65**	-37.19***	-8.150	HLB XPost m1	-28.78***	-24.22
	(15.58)	(9.924)	(11.19)	(16.63)		(6.706)	(17.29)
HLB XPost m2	-12.72	-18.04*	-11.90	13.17	HLB XPost m2	-10.14	-12.49
	(17.08)	(10.48)	(10.42)	(17.34)		(6.822)	(16.83)
HLB XPost m3	-22.70	-33.14***	-4.366	5.645	HLB XPost m3	-15.19**	-19.59
	(15.47)	(11.18)	(10.55)	(17.60)		(6.986)	(16.30)
HLB XPost m4	-45.67***	-37.61***	-9.967	42.17**	HLB XPost m4	-12.02*	-51.75***
	(15.51)	(10.56)	(11.55)	(18.93)		(7.113)	(17.78)
HLB XPost m5	-63.25***	-49.34***	-12.58	-10.51	HLB XPost m5	-31.29***	-41.56**
	(15.39)	(10.31)	(11.14)	(18.46)		(6.965)	(16.40)
HLB XPost m6	-41.95***	-82.21***	-28.99***	-2.134	HLB XPost m6	-47.79***	-32.24*
	(16.08)	(10.40)	(11.04)	(18.51)		(6.901)	(18.53)
HLB XPost m7	-21.23	-53.18***	-18.38	-43.99**	HLB XPost m7	-35.42***	-32.96*
	(17.94)	(11.04)	(11.52)	(18.73)		(7.268)	(19.37)
HLB XPost m8	-64.10***	-69.28***	-45.56***	-38.77**	HLB XPost m8	-53.40***	-71.17***
	(17.36)	(11.21)	(11.38)	(19.75)		(7.308)	(19.51)
HLB XPost m9	-74.01***	-63.92***	-46.71***	-34.34*	HLB XPost m9	-56.18***	-45.74**
	(18.96)	(11.16)	(11.28)	(18.73)		(7.379)	(17.95)
HLB XPost m10	-71.21***	-45.77***	-24.42**	-16.15	HLB XPost m10	-35.06***	-53.78***
	(18.45)	(10.83)	(11.79)	(19.95)		(7.389)	(19.75)
Constant	353.3***	404.5***	476.6***	538.9***	Constant	449.3***	397.9***
	(2.329)	(1.502)	(1.541)	(2.440)		(0.981)	(2.379)
Fixed Effect		Individual, year-month			Fixed Effect	Individual, year-month	
Observations	88,400	224,050	218,900	94,400	Observations	546,600	79,150
R-squared	0.275	0.262	0.345	0.379	R-squared	0.327	0.311

Panel C: By age				**Panel D: By marital status**		
	(1)	(2)	(3)		(1)	(2)
VARIABLES	<40	40-50	>50	VARIABLES	married	single
HLB XPre m-3	17.17*	-10.41	-25.96**	HLB XPre m-3	1.850	-44.69**
	(10.35)	(10.14)	(11.16)		(6.930)	(18.32)
HLB XPre m-2	-5.018	-6.073	-21.44*	HLB XPre m-2	-6.202	-24.08
	(10.45)	(10.00)	(12.21)		(7.165)	(18.00)
HLB XPre m-1	-11.71	6.885	-9.809	HLB XPre m-1	3.257	-12.23

	(11.23)	(10.59)	(12.45)		(7.517)	(18.91)
HLB XPost m1	-39.14***	-29.03***	-16.70	HLB XPost m1	-23.72***	-47.43***
	(10.45)	(10.13)	(11.89)		(7.243)	(18.37)
HLB XPost m2	-29.82***	-19.33*	18.19	HLB XPost m2	-9.294	-19.27
	(10.62)	(10.38)	(11.86)		(7.339)	(18.08)
HLB XPost m3	-43.36***	-16.37	11.63	HLB XPost m3	-12.80*	-17.15
	(10.26)	(11.39)	(11.58)		(7.524)	(17.48)
HLB XPost m4	-47.81***	-18.56*	14.38	HLB XPost m4	-14.51*	6.745
	(10.47)	(11.21)	(12.48)		(7.684)	(19.22)
HLB XPost m5	-56.93***	-43.81***	3.410	HLB XPost m5	-25.50***	-35.23*
	(10.25)	(10.70)	(12.30)		(7.465)	(18.92)
HLB XPost m6	-64.83***	-54.26***	-18.08	HLB XPost m6	-45.49***	-44.76**
	(10.42)	(11.38)	(11.61)		(7.632)	(17.87)
HLB XPost m7	-51.09***	-53.95***	1.284	HLB XPost m7	-29.51***	-47.79***
	(11.38)	(11.11)	(12.84)		(7.865)	(18.21)
HLB XPost m8	-58.10***	-74.37***	-32.46**	HLB XPost m8	-52.64***	-59.21***
	(11.58)	(11.12)	(12.88)		(8.016)	(18.44)
HLB XPost m9	-81.73***	-67.24***	-15.13	HLB XPost m9	-50.31***	-62.42***
	(10.84)	(11.11)	(13.41)		(8.005)	(18.55)
HLB XPost m10	-72.50***	-34.18***	-7.137	HLB XPost m10	-32.19***	-39.95**
	(11.98)	(11.27)	(12.75)		(8.019)	(19.77)
Constant	388.3***	457.8***	478.8***	Constant	444.7***	475.4***
	(1.494)	(1.542)	(1.666)		(1.060)	(2.501)
Fixed Effect		Individual, year-month		Fixed Effect	Individual, year-month	
Observations	196,500	225,950	203,300	Observations	471,500	79,950
R-squared	0.301	0.323	0.335	R-squared	0.328	0.338