A Nudge to Female Home Ownership and Mortgage Market Outcomes

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Abstract

We examine the impact of "Her Ghar," a housing loan scheme for women offered by India's largest lender, the State Bank of India. This scheme offered female borrowers a nudge in the form of a 5 basis point concession on the interest rate. Notwithstanding the small financial gain, the scheme increased the proportion of female borrowers by 20% within one year. Female loans made under the scheme had a lower default risk relative to male loans and were comparable in quality to female loans made prior to the scheme's introduction. During a COVID-19 moratorium policy that was instituted by the Reserve Bank of India, all female borrowers continued to repay their loans at a higher rate, consistent with better financial decision-making. Gender differences in repayment behavior are positively correlated with the level of gender equality across different regions. Our study suggests that a nudge can enhance women's financial bargaining power within the household and enhance the quality of financial decision-making of the household.

Keywords: gender equality, mortgage, nudge

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1. Introduction

Duflo (2012) presents evidence that women's empowerment has positive effects on the woman's own well-being and on family welfare. Property rights in the form of home or land ownership are an important dimension of such empowerment. However, homeownership by women lags behind men in most parts of the world. This gap is higher in emerging markets such as India. A World Bank survey on homeownership by women in India found that 10.6% of women owned a house individually and 15.3% of women owned a house jointly.[1]. Thus, increasing women's home ownership in India is an important policy goal due to low ownership levels. Additionally, the value of the home is approximately 70% of total assets for a typical household in India (Badarinza et al. (2019)). Given its importance in the household balance sheet, an increase in women's homeownership levels is likely to have a first-order effect on the empowerment of women in household financial decision-making.

Motivated by the above, we study increases in female home ownership due to a loan scheme targeting women introduced by India's largest lender, the State Bank of India (SBI). In December 2013, SBI announced a housing loan scheme named "Her Ghar" (meaning Her Home). This scheme provided a 5-basis point discount in the interest rate for home loans where a woman was the first applicant for the loan and also the first owner of the property.[2] The economic value of the discount is small; for the median loan size in our sample, which is Rs. 11.5 lakhs, this would result in savings of Rs. 35 (i.e. 0.57 US dollars) per month. Notwithstanding the small economic value of the scheme (therefore, a nudge), the policy led to an increase in female loans from 19% to 24% within one year of its introduction.

Did the large increase in female loans translate into greater bargaining power for women in household financial decision-making? On one hand, the Her Ghar scheme increased both property rights and liability for the loan to women applicants. These two factors create both the right and the incentive for women to be involved in household financial decision-making. On the other hand, the scheme could simply have resulted in tokenism in that a man could have put his wife's name as the first applicant to get the discount.

[1] Source:World Bank Group: Data Bank: Gender Statistics. These statistics apply to women in the age group between 15 and 49. It is derived from the Demographic and Health Survey in 2016, which is the closest to the time period of our data sample.

[2] We shall refer to all loans where a woman is the first applicant as female loans.

Using two unique datasets containing the universe of all residential mortgages from SBI, we test whether the increases in lending due to the Her Ghar scheme were driven primarily by tokenism or by bargaining. Our first data set consists of all home loans made by SBI in the years 2013 and 2014. The second data set we use contains the performance of these home loans from 2015 to 2023. Critically, the second data set contains all repayments and all defaults by the borrowers of these loans, which allows us to examine financial decision-making in detail.

Our first test examines the evidence for female involvement in household financial decision-making using default rates. Past literature has shown that loans where women are involved in financial decision-making will have a lower default rate, even after controlling for other observable measures of credit risk[3]. This is also true in our sample - female loans in 2013, prior to the introduction of the scheme, had a 0.35% lower default rate relative to male loans. If the increase in female loans was primarily driven by tokenism, female loans made under the Her Ghar scheme should have default risk similar to male loans. Thus, the male-female gap in default risk should decrease for loans made in 2014 relative to loans made in 2013. On the other hand, if female loans under the Her Ghar scheme continue to be loans where females had bargaining power, the male-female gap in default risk for loans in 2013 and 2014 should be similar. We find no evidence for the male-female gap in default risk changing in 2014 relative to 2013. Even several years after the loan origination, in a time period that includes the COVID crisis (2018-2023), the male-female gap in default risk persists. In fact, the default risk gap in this time period was 0.45%, which is larger in magnitude relative to the prior time period. To the best of our knowledge, we are the very first to document that intra-household decision-making by women can have strong positive effects during an unanticipated economic crisis. Thus, the results of the default analysis are consistent with increased bargaining power for female borrowers being the dominant effect of the Her Ghar scheme.

The previous tests are indirect in that financial decision-making is inferred from defaults. As an alternative direct test of household financial management, we examine repayment behavior of loans during the COVID-19 pandemic. As we shall argue below, the nature of a

[3] See Goodman et al. (2016),Agarwal et al. (2018), Chen et al. (2020) & Delis et al. (2022)

moratorium announced by the Reserve Bank of India during the COVID pandemic implied that only borrowers with severe financial difficulties should have availed of it. The details of the moratorium are as follows. On March 27, 2020, the Reserve Bank of India announced a moratorium with retrospective effect from March 1, 2020 for all loans, including home loans. The total time period of the moratorium was from March 1, 2020 to August 31, 2020. During this period, home loan borrowers could suspend all mortgage payments without any penalties or impact on their credit score. However, there was no waiver of interest or principal. Thus, a borrower who chose to suspend payments would incur higher interest costs, and the loan tenure would be extended. For borrowers facing genuine financial difficulties, the moratorium provided liquidity. However, for a borrower with the ability to pay, it would be suboptimal to suspend loan repayments due to higher future interest payments. Thus, conditional on being able to repay, borrowers with better financial decision-making should continue to repay more (i.e. avail of the moratorium less).

Our baseline result indicates that female borrowers were 6-8% less likely to stop repayments relative to male borrowers during the moratorium. This is consistent with better financial decision-making by female borrowers, which further supports the results on default rates. One concern is that the lower reduction in repayments mechanically arises on account of lower credit risk of female borrowers that we documented earlier. However, this is not the case, as the estimation reflects an increase in the repayment gap of male and female borrowers relative to the non-COVID period. Thus, differences in the credit quality of male and female borrowers cannot explain the repayment gap. A second concern may be that uncertainty in income is lower for female borrowers relative to male borrowers. To understand whether income uncertainty is a significant determinant in the above result, we focus on the gender gap in repayment for home loans taken by borrowers with government jobs. In India, government jobs are extremely sought after due to a high degree of job security. Even for this sub-sample, the gap in repayment behavior between female and male borrowers remains very similar to that of the full sample. Thus, unobserved income uncertainty cannot drive the male-female gap in repayment during COVID.

Thus far, our results are consistent with female borrowers having better financial skills and that the Her Ghar scheme resulted in higher bargaining power for women. Given these

results, it is of interest to understand if variation in intra-household bargaining power of female borrowers is linked to the magnitude of male-female gaps that we documented earlier. To test this, we stratify our sample based on whether the applicant for a female was a housewife or not. As housewives have little independent income, they tend to have lower bargaining power within the household. If we use the sub-sample of female loans taken by housewives and compare these to male loans, the male-female gap in default and repayment during COVID are both insignificant, consistent with tokenism being the main driver of these loan applications. To construct additional (indirect) proxies for intra-household bargaining power, we match the location of the borrowers with Prowessdx survey data at the district and state level.[4] Using this survey data, we construct two proxies for female bargaining power - relative income and relative education of women compared to their spouses. Both proxies have been widely used and validated in papers studying intra-household bargaining (Anderson and Eswaran (2009), Goldin and Olivetti (2013), Almås et al. (2018)). Lower relative income and lower relative education have a negative effect on the average repayment gap, both at the district and state levels, which is consistent with females with lower bargaining power having a lower impact on household financial decision-making.

We conduct a variety of robustness tests on the above. For example, the scheme could have attracted good-quality female borrowers from other banks. We find this is unlikely to be a driver of our results. Another possible explanation is that female borrowers did not suspend repayment during the COVID-19 pandemic despite financial difficulties due to higher risk aversion. If so, this should imply a higher default rate and a reversal of the higher repayment rates after the pandemic. We find no evidence for either of these in the data. Third, there is a possibility that the quality of male borrowers changed after the introduction of the Her Ghar scheme. We don't find evidence suggesting this.

Our work makes several contributions to the literature. Thaler and Sunstein (2021) frames nudges as an architecture for the presentation of choices. Support for the effectiveness of nudges has been found in various financial contexts - Karlan et al. (2016) for under-saving, Medina (2021) for credit card fees, and Carlin et al. (2023) for overdraft fees. However, demonstrating that mortgage choice architecture can enable women's financial

[4] Prowessdx is a specialized delivery of the Prowess database, developed by the Centre for Monitoring Indian Economy (CMIE), tailored for academic research.

decision-making, i.e., a nudge in one domain having an effect in another domain, is a novel finding that has not been documented widely. Our findings also highlight the positive impact of nudges whereas other work on mortgages shows that framing this is often used by financial institutions to encourage suboptimal choices (Gurun et al. (2016), Guiso et al. (2022)). Our cross-sectional results on the effectiveness of the nudge highlight the importance of existing cultural norms, which is also found in Guiso and Zaccaria (2023).

Second, our work contributes to the literature on women and home ownership. Bartscher (2023) found that prohibition of gender-based discrimination for mortgage applications in the US led to increases in homeownership of married couples and labor force participation of women. Hazan et al. (2019) document the effect of removal of coverture in the US on labor supply and investment in financial assets. In India, the Hindu Succession Act, which prohibited discrimination against females when dividing ancestral property, has been the subject of several studies which have documented both positive and negative effects.[5] In contrast to the above studies, which study the impact of legislative changes, we document that a 5 basis point nudge can have a large positive effect on female bargaining power.

Third, we contribute to the literature on the financial literacy of women. Several surveys document that women have lower financial knowledge than men (Lusardi and Mitchell (2014) and Lusardi and Mitchell (2023)). Klapper and Lusardi (2020) show this is also true in developing countries. In contrast, our paper suggests that women have a higher financial literacy than men. One factor that distinguishes our work from the above papers is that it is based on actual financial decisions that are relevant and salient to the household. There are a few papers that show that women are better are financial decisions. Eckel and Füllbrunn (2015) shows that women generate fewer bubbles and achieve more rational pricing in experimental asset markets. Likewise, Hsu (2016) documents that women increase their financial literacy as they approach widowhood, documenting the important role of incentives. In our case, the liability for the housing loan, coupled with increased property rights, creates both the incentive and the ability for women to have a larger say in household financial decision-making. This results in higher financial literacy and involvement in financial decisions at a much earlier stage in life.

[5] Positive effects are documented in Deininger et al. (2013), Mookerjee (2019) and Heath and Tan (2020) while Roy (2015) & Bhalotra et al. (2020) highlight some negative effects of the Hindu Succession Act.

Lastly, our results also have implications for financial regulation. Our finding of lower defaults on female housing loans implies a benefit that accrues to the household - on account of lower personal bankruptcy costs, and the banking sector - due to lower loan losses and higher available funds for lending. The Central Bank of Mexico, for instance, used the lower default rate on loans to females as a justification for requiring lower loss provisions for such loans (Becerra-Ornelas et al. (2023)). Our finding of a lower default rate for female borrowers in India suggests that a similar policy would be appropriate for the Indian banking sector.

Our paper is organized as follows: Section 2 presents the institutional background of mortgage markets and women's rights in India, along with a discussion of regulatory actions during the COVID-19 pandemic. Section 3 develops the hypothesis in the context of related literature. We discuss the data and sample used for our tests in Section 4. Default and Repayment analysis is presented in Section 5. In Section 6, we present evidence on how variations in gender equality across states and districts are reflected in repayment rates. Finally, Section 7 concludes with a discussion of the policy implications of our findings.

2. Institutional Background

In this section, we provide a background of economic rights of women in India, which provides the context for the introduction of the Her Ghar scheme. We then highlight important features of mortgage lending in India. Lastly, as an important part of our study involves comparing male and female loan payments during COVID, we summarize important regulatory actions announced by the Reserve Bank of India during this time period.

2.1. Women's Economic Rights in India and Her Ghar Scheme

India ranked 108 out of 145 countries in the Global Gender Gap Report 2015.[6] Female labor force participation was also low and declined from 34.1% in 1999-2000 to 27.2% in 2011-2012, which is puzzling as India had strong economic growth, falling fertility, and increasing educational attainment for women after 1990. Typically, the above factors are associated with higher labor force participation.[7] Thus, the reduction in the effective eco-

[6] The situation has changed little in recent years - India has a rank of 129 out of 146 in the Global Gender Gap Report 2024.

[7] See Chowdhary and Verick (2014).

nomic status of women despite positive economic development was a matter of concern to Indian policymakers.

In this backdrop, the Indian government passed the Companies Act in 2013, which was one of the first globally to mandate that a certain fraction of the board of directors in listed companies be women. In October 2013, Arundhati Bhattacharya was appointed as the first female chairman of the State Bank of India (SBI). After she took office, in December of the same year, SBI introduced a new mortgage scheme known as "Her Ghar." This prscheme offered female mortgage borrowers a concession of 5 basis points on the interest rate of their loan. The eligibility criteria were as follows: (1) The applicant must be an Indian female resident aged between 18 and 70. (2) She must be an independent mortgage applicant, or the first co-applicant (primary borrower) for loans with multiple applicants. (3) The property must be solely in the name of the female applicant, or she must be the first owner, for properties jointly owned. Under Indian regulation, the order of the applicants does not matter in terms of liability for the loan - both the primary applicant and all co-applicants are individually liable for all repayments required on the loan. At the same time, the primary borrower needs to sign various documents. The loan repayment deduction is usually made through the primary borrower's banking account. SMS messages are sent to the phone number of the primary borrower. The Her Ghar scheme has not had any substantive changes to the present date.

SBI was the first bank to introduce loan discount policies specifically for women.[8] Notably, India's second-largest mortgage lender, HDFC, publicly announced that it would not follow SBI's lead and would only consider credit risk in the pricing decisions for mortgage loan applications. However, by 2015, both HDFC and ICICI bank, India's largest private sector banks had matched the 5 basis point concession offered by SBI.[9]

2.2. Mortgage Loans in India

Commercial banks serve as the primary mortgage providers in the country. According to a 2013 RBI report, commercial banks held 61% of all outstanding residential mortgages.

[8] Bharatiya Mahila Bank (BMB) was an Indian financial services banking company predominantly for women, which commenced operations on November 2013. The establishment of this bank did not meet significant demand, and later in 2017, it was merged into SBI.

[9] See Times of India, April 15, 2015 and India TV News April 23, 2015

Furthermore, the 2015-16 annual report of the State Bank of India (SBI) highlighted that SBI was the largest home loan provider, commanding a 25.5% market share. SBI is India's largest bank and financial service organization with over 22,542 domestic branches. It currently serves over 500 million customers. Therefore, our data sourced from SBI offers substantial coverage and representativeness.

About 95% of home loans in India are based on a floating interest rate linked to a base rate. The payment schedule for most loans follows an equal annuity schedule typically known as EMI (Equated Monthly Installments). When the base interest rate changes, if the consumer does not request the bank to adjust the EMI, the EMI will remain the same, but the loan tenure will be extended accordingly. There are no penalties for prepayment. [10] In general, the rules for prepayment of home loans with SBI offer a high degree of flexibility, without imposing restrictions on the number of times or the maximum amount that can be prepaid.

2.3. Moratorium Policy in 2020

In early 2020, the global coronavirus pandemic had a significant impact on the economy of India. The first national lockdown in India was announced on the evening of 24 March 2020 and was implemented for 21 days as a preventive measure against COVID-19 pandemic. To mitigate the burden of debt servicing brought about by disruptions on account of COVID-19, Reserve Bank of India (RBI) announced new regulatory measures on 27 March 2020 with retrospective effect (See "COVID-19 – Regulatory Package" RBI Circular, 27 March, 2020. All lending institutions were to allow deferment of all mortgage payments due from 1 March to May 31, 2020.Post-moratorium, the repayment schedule and remaining loan duration was extended by three months. Interest would accumulate on the term loans' outstanding balance during this period. This policy did not involve any waiver of interest or principal payments. During the moratorium period, no penalties could be imposed for non-payment of the EMI. Credit Rating agencies and banks were given explicit instructions that the credit score of any consumer that availed of the moratorium was not to be impacted. All bank boards were required to approve the moratorium with immediate effect and to communicate

[10] Prepayment penalties on home loans were abolished for housing loans based on floating interest rates since 2012. See Home Loans-Levy of fore-closure charges/pre-payment penalty, RBI Circular, June 5 2012

the scheme to all their staff. Banks were also given full capital relief on loans that were with a non-payment status in this period, i.e., the loans were to be treated as standard loans for capital purposes.

Following changes in RBI's policy, SBI provided nearly all non-defaulted consumer loan holders the option to postpone their repayments. SBI notified all consumers about this choice through text messages. For loans with automatic repayment setup, consumers wishing to defer payments would have needed to inform the bank; otherwise, EMI deductions would proceed as usual. Conversely, for consumers who made their payments manually, there was no need to contact the bank if they chose to suspend repayments. During the moratorium period, the scheduled required repayment amount for the mortgage loans was set to zero. For a consumer who availed of this option to reduce or make no payments, the EMI would increase at the end of the moratorium period due to accrued interest. Due to the impact and persistence of COVID-19, on 23 May 2020, an extension of the moratorium period for another three months was announced till 31 August, 2020. This was also reported a few days earlier in the press.[11] On 7 August, 2020, RBI announced that the moratorium would not be further extended.

3. Hypothesis Development

Jayachandran (2015) provides strong evidence for religious and cultural preferences for males in South and East Asian countries. She argues that economic development and rights do not necessarily increase women's rights and highlights India and China as notable examples of large countries that are consistent with such preferences. She provides evidence that the bias against women in the US, when it was at a comparable stage of development as India and China are today, was significantly lower. Thus, the Her Ghar scheme, notwithstanding the large increase in female loans, may have resulted in tokenism, resulting in women becoming co-owners of property without any increase in property rights. This was also implied by a news article reported in a leading newspaper. *The Hindu.*[12] On the other hand, several studies cited earlier in the introduction do find a positive impact of property

[11] See RBI may extend moratorium on loans by 3 more months, Times of India, 19 May, 2020.

[12] "Better for women to apply for loan instead of men," The Hindu, Oct 2, 2015. It reported that several men who heard about the scheme withdrew their loan applications to reapply in their wife's name.

rights on female bargaining power after the passage of the Hindu Succession Act.[13] This implies that increases in homeownership due to the Her Ghar scheme should increase the actual bargaining power of women in intra-household financial decision making.

Thus, the large increase in the volume of loans in 2014 may be driven by two factors: (1) Households where the Her Ghar scheme resulted in an increase in female involvement in household decision-making (bargaining applicants) and (2) households where the man wields all the financial decision-making power (tokenist applicants), and the man views the scheme as an extra freebie without any loss of bargaining power in the household. In contrast, women who applied as the first applicant in 2013 are more likely to have been those who had bargaining power.[14]

If the Her Ghar scheme primarily attracted tokenist female applicants, a large fraction of the loans in the post-2014 period would be loans where men are the true decision-makers. This implies that Her Ghar loans should be more similar to male loans, and different from pre-2014 female loans. On the other hand, if the scheme resulted in female applicants having greater bargaining power, Her Ghar loans should be significantly different from male loans in the post-2014 period and should not significantly differ from female loans in the pre-2014 period.

The above two arguments (tokenism versus bargaining) will be tested along two dimensions - default on loans and repayment behavior during COVID. We will interpret differential default rates on loans as evidence of greater involvement of women in household decision-making. This is based on a large amount of literature in other credit markets showing that women have lower default rates. For example, using data from over 70 countries, D'espallier et al. (2011) find lower defaults and losses to microfinance institutions that lend more to women. Delis et al. (2022) find that female entrepreneurs in a set of European countries are less likely to default. Chen et al. (2020) find similar effects in peer-to-peer lending in China. Agarwal et al. (2018) document lower personal bankruptcy risk for women in Singapore.[15]

[13] See Heath and Tan (2020), Deininger et al. (2013) and Mookerjee (2019).

[14] For tax reduction purposes, women may be listed as the primary owners of properties purchased using their husband or father's money. Thus, there is a possibility of tokenist female applicants prior to the Her Ghar scheme. Santosh Anagol (2023) provide evidence on misreporting prices in real estate transactions in India for tax avoidance.

[15] The reason for lower default rates of female borrowers has been the subject of much research. Higher risk aversion for women is a prominent explanation (Falk et al. (2018)). Ke (2021) finds strong evidence for

In fact, the lower default rate of lending to women across a variety of countries was documented by the Government of Mexico, whose Central Bank lowered the loan loss provisions for personal loans to women by 4% due to the lower risk (Becerra-Ornelas et al. (2023)).

Repayment behavior during COVID will be a second test of financial decision-making. As was explained in Section 2.3, the normal penalties associated with default were removed during this period. A borrower could suspend payments completely without any impact on the credit score or bank late fees. However, a key component of this moratorium is that there was no forgiveness of interest or principal. Thus, a borrower would pay additional interest for the remaining life of the loan if he or she used this moratorium.

For a borrower with genuine financial difficulties, this scheme offered liquidity in a time of crisis. However, for borrowers who were able to repay, any suspension or reduction in repayment would be suboptimal. An important additional advantage of using repayment during COVID is that default is driven both by financial planning as well as unanticipated changes in household financial circumstances. In contrast, the repayment decision in COVID is a short-term decision and one where the husband and wife were likely involved, as both spouses likely spent most time at home due to movement restrictions. As such, this is a novel way to test for female participation in household financial decisions.

To the extent that there is increased bargaining, existing literature has documented substantial heterogeneity in the bargaining power. For instance, Gu et al. (2024) employs a structural model of intra-household bargaining using data from Australia, the U.S., and Germany. Their analysis reveals that approximately half of household investment decisions can be attributed to differences in education, income, and risk attitudes. However, since education and income are themselves shaped by gendered norms, the study suggests that the true influence of gender on bargaining power is likely larger. they estimate that the true effect of gender is larger. We will also conduct cross-sectional tests using state and district-level gender gap measures in education and income.

this using stock market participation. Other explanations that have been proposed for the difference are trustworthiness, emotions, and biological differences (Croson and Gneezy (2009)).

4. Data and Sample

Our empirical analysis is performed with three datasets. First, we use loan origination data, which provides detailed information on loan terms and borrower characteristics. Second, we use loan performance data, which has information on repayments, prepayments, delinquency, and default; both of these datasets are sourced from the State Bank of India. Finally, we incorporate district-level demographic data from the Center for Monitoring the Indian Economy (CMIE), a widely used survey dataset that provides a comprehensive range of demographic and economic indicators across India. This dataset includes information on population demographics, labor force participation, income levels, employment trends, household consumption, and various socioeconomic variables. We outline the steps for cleaning the original data, removal of observations with missing variables and elimination of erroneous entries in Appendix A.0.1. Variable definitions for all three datasets are provided in Appendix A.0.2.

The dataset (after applying the above filters) includes 2,187,342 observations for all mortgage loans sanctioned between 2010 and 2019.[16] Our primary tests focus on loans originated within a year of the introduction of the Her Ghar program. i.e., loans sanctioned in 2013 and 2014. Relative to the full sample till 2019, 14.2% were sanctioned between 2013 and 2014. The advantage of this approach is that any positive spillover effects of this scheme and its feedback effects are likely to be limited. To the extent that such effects exist, the measured effects are an underestimate of the true economic impact of the Her Ghar scheme. Additionally, other women's welfare schemes at later dates may confound the effects of a longer time period sample. We verify that all results are robust to the inclusion of the full sample of loans until 2019. These results are available on request.

4.1. Loan Origination Data

The loan data sample for 2013 and 2014 consists of 310,600 loans. We observe the primary borrower's sex, age, interest rate, loan tenure, loan amount, collateral value (underlying home's value), monthly mortgage installment (EMI), and the loan-to-value ratio. Summary statistics are reported in Table 1 Panel A. 78% of the borrowers are male. The average

[16] Very few loans were sanctioned in 2020 due to COVID-19 restrictions.

age of borrowers is 42 years, with an average initial interest rate of 7.5%. The median loan tenure is 20 years, and the average loan-to-value ratio is 57%. The average equated monthly installment (EMI) is 12,000 INR.

Note that only the identification of the primary borrower is available in the data set. Thus, we cannot observe if there was any co-borrower or not, and do not have any information on the characteristics of the co-borrower if present. However, to the extent that female loans disproportionately have a second co-borrower male, and thus have a lower credit risk, this implies that the interest rates of these loans should be significantly lower. As we shall later see, before the introduction of the Her Ghar scheme, female loans had a 1 bp higher interest rate relative to male loans, which goes against the notion that female loans had a larger fraction of co-borrowers relative to male loans. In fact, using U.S. data from FHA, Park (2022) finds that female-only loans and female-male loans have a similar default risk to each other, and both groups have a lower default risk relative to male-only loans.

4.2. Mortgage Loan Repayment Data

The loan performance data consists of repayment and default data on a monthly basis from May 2015 to March 2023. We report the summary statistics of the loan performance records from April 2015 to March 2023 for all loans sanctioned between 2013 and 2014 in Table 1 Panel B. The average monthly delinquency rate is 18%. The average monthly default rate is 0.2%. The delinquency and default indicators are defined according to the bank's criteria.[17] The prepayment indicator shows whether the borrower has repaid more than the scheduled amount by a given month. The average prepayment amount is 109,000 INR, which is about 7% of the initial loan outstanding.

5. Results

In this section, we first examine the response to the Her Ghar scheme by female applicants. Second, we test our main hypotheses on tokenism versus bargaining by examining default rates. Third, we examine the gender differences in response to the moratorium policy during

[17] Note that the delinquent and default amounts displayed in summary statistics are conditional on the loan being in delinquency or default status.

COVID-19 as an alternative test of the above two hypotheses. Lastly, we rule out a variety of alternative explanations for the results.

5.1. Response of Women to the Her Ghar Scheme

Figure 1 shows the monthly percentage of female loans throughout the sample period. Before the introduction of the Her Ghar scheme, the average percentage of female loans was approximately 19% and remained relatively flat. Following the introduction of the concession rate, there was a noticeable sharp increase; the average percentage of female loans rose to about 24% after the first quarter of 2014. After this point, the proportion of female loans gradually increased further every year, reaching approximately 28% in 2019.

Figure 2 shows the increase in the percentage of female loans by districts in India. The proportion shown in the figure represents the increase in female loans divided by the pre-period proportion of female loans in the same district. The figure suggests that there was substantial growth in the proportion of female loans across a wide range of regions. Thus, the increase was not limited to any particular geographical area within India. In particular, Southern states, which have been historically better at addressing women's rights, do not show show widely divergent growth patterns relative to other regions.

While the growth rate of female loans and the geographical area affected are substantial, the financial incentive is quite small. The summary statistics show that the typical loan rate in our sample is 7.5% with a median loan size of Rs. 11.5 lakhs. For a 20-year loan of median loan size at an interest rate of 7.5%, the EMI is Rs. 9,264. With the 5 bps concession, the EMI becomes Rs. 9,229, resulting in a monthly savings of only Rs. 35.[18] Based on the median monthly income of borrowers in 2013-2014 (which was Rs. 200,000), this monthly savings equals 0.02% of monthly income. Therefore, the Her Ghar represents a marginal financial incentive for the borrower, and it is reasonable to frame this scheme as a nudge.

Next, we present summary statistics by gender and the year of loan origination to understand the differences in female and male loans, as well as the differences in female loans before and after the introduction of the Her Ghar scheme. Table 2, Panel A shows the summary statistics for female and male loans originated in 2013. Panel B shows the summary statistics for female and male loans originated in 2014. For each year, we also compare the

[18] Based on the foreign exchange rate in January 2014, Rs. 35 is equivalent to 0.57 U.S. dollars.

loans over gender and report the t-stats in the last two columns. In both 2013 and 2014, female borrowers are younger, with mortgages that have larger loan amounts, higher collateral values and larger EMI. In 2013, the average interest rate on female loans was 1 bp higher than the average interest rate on male loans. In contrast, Alesina et al. (2013) shows that female borrowers pay 9-11 basis points more than males. This suggests that gender discrimination in terms of higher interest rates may be less prevalent at the State Bank of India. In contrast, female loans in 2014 had 6 bps lower interest rates than male loans. This provides preliminary evidence that SBI did provide a discount to female borrowers after the introduction of the Her Ghar scheme. Female loans in 2014 had larger loan amounts, larger collateral value, longer tenure, a higher EMI and slightly higher LTV ratios relative to female loans in 2013. These results continue to hold in the DID setting (Panel C, Table 2), which controls for trends in these variables for male loans. Thus, the change in interest rate differential of male and female loans in 2014 relative to 2013 (-6 bps versus 1 bp) may be driven by differences in loan contract terms and applicant profiles.

One concern regarding the above reduction in interest rate is that the actual loan rate that a given borrower is eligible for depends on a number of factors, including his or her credit score, past loan history with the bank, total outstanding loans, etc. Since the borrower does not have access to the bank's internal mechanisms for determining the loan rate, it is possible that a loan officer could increase the interest rate presented to a female borrower by 5 basis points and then reduce it so as to give the appearance of a discount. This does not appear to be the case. In unreported results, after matching female and male loans on loan characteristics and controlling for time and location fixed effects, we find that the average discount for a female loan was 4.59 basis points. This is very close to the 5 basis points concession rate promised by the bank for female borrowers.

5.1.1. Non Price differences of female and male loans

Does the Her Ghar scheme lead to more applications due to other non-price benefits of the loan contracts given to female borrowers? To understand this, we plot the average income and the EMI-to-income ratio for male and female loans sanctioned each quarter, as shown in Figure 3. Panel (a) plots the average income. The red solid line represents female

loans, while the blue dotted line represents male loans, with the vertical line indicating the start of the Her Ghar scheme. Overall, there is a consistent gender gap in income, as female loans are associated with lower income levels. This gap does not change significantly after 2014. Panel (b) plots the average EMI-to-income ratio. While female loans consistently have a higher EMI-to-income ratio, there is no significant change in this gender gap before and after the policy change.

Another non-price dimension of loans is the loan-to-value (LTV) ratio. A higher loan to value ratio would allow female borrowers to make a smaller down payment. We plot the average LTV by gender for loans sanctioned over time in Figure 4 Panel A. Prior to 2014, the average LTV for male and female loans was similar, with both moving in parallel. After the policy change, the average LTV ratio for female loans shifted upward. This gap is noticeable, though it shows a narrowing trend after 2018 and becomes less evident by 2019. To quantify the change in LTV and test whether the change in gap is statistically significant, we estimate the following regression equation.

$$LTV_{i,t} = \gamma_0 + \sum_{t=-3}^{t=6} \gamma_t \times SancYear_t \times Female_i + \mu \times Female_i + Controls_{i,t} + \epsilon_{it} \qquad (1)$$

where the dependent variable is the LTV for the loan i sanctioned in year t. We winsorize the LTV at 1 percentile. The γ_t represents the coefficient for the interaction term between loan sanction year dummy and the female loan dummy. Loans in 2010 are omitted as they form the base year for comparison. The control variables include the borrower's age, interest rate, loan amount, loan tenure, collateral value, and EMI. Fixed effects include the loan sanction quarter fixed effect and the district fixed effect. Standard errors are clustered at the district level.

We present the estimated γ_t and its 95% confidence interval in Figure 4 Panel B. The vertical dotted line separates the years before 2013 and the years after 2013. The estimated coefficients are statistically indistinguishable from zero in the pre-period, indicating that the LTV gap by gender remained unchanged during this time. Following the policy change, female loans exhibit an average LTV that is 0.5% higher, with this difference persisting until 2018 before becoming insignificant in 2019. In summary, from an income perspective, we

do not observe a significant change in the female loan pool relative to the male loan pool following the policy. However, the LTV ratio for the female loan pool increased, which suggests a relaxation of quantity constraints.

5.2. Defaults

Our first set of tests on tokenism versus bargaining are based on ex-post default rates. As the loan performance data extends till March 2023, we can observe the performance of loans from origination up to approximately 10 years after origination. We present the summary statistics on the loan default rate in Table 3.[19] In every single year, loans to female borrowers consistently show a lower default rate with the difference being above 0.2% for most years.[20] Next, we examine whether the probability of default for loans originated under the Her Ghar scheme (i.e., 2014 loans) differs from that of female loans in 2013. To do this, we estimate the following regression equation.

$$Logit(Default_{i,t}) = \gamma_0 + \gamma_{pf} \times Post_t \times Female_i + \mu \times Female_i + Controls_{i,t} + \epsilon_{it} \quad (2)$$

Where $Default_{i,t}$ is the dependent variable, taking the value of 1 if the mortgage loan i originated in year t has ever been in default for more than 3 or 6 consecutive months up to March 2023, and 0 otherwise. $Post_t$ is a binary variable that takes the value of 1 if the mortgage loan originated in 2014 and 0 otherwise. $Female_i$ is the binary variable that takes the value of 1 if the primary borrower is woman and zero otherwise. The control variables include the borrower's age, natural log of the loan amount, natural log of collateral value, loan tenure, loan-to-value ratio, EMI-to-income ratio and interest rate. We also impose the loan sanction quarter fixed effects and the district fixed effects. Standard errors are clustered at the district level. While we do not have the bank's internal credit score for a given borrower, we believe that the loan interest rate should control for the bank's information set, which

[19] The default indicator is an internal record from the bank. We also defined default based on the number of consecutive months of delinquency (e.g., 3 months, 4 months). Our results are robust to alternative definitions of default. This differs from the U.S. mortgage market. In India, a three-month delinquency does not necessarily result in a loan being marked as defaulted. Additionally, after several months under a default classification, a loan may still return to an active status. It is important to clarify that in our context, we use the term "default" to indicate a more severe state of repayment delinquency, rather than implying that the loan is entering foreclosure proceedings.

[20] Most loans default less in the initial years after origination. Thus, the low default rate in 2016 is due to this fact.

should include the credit score of the borrower, his or her or her relationship with the bank through loan or deposit account products, and any information relevant for credit risk.

We expect $Female_i$ to be negative and significant, in line with prior studies as well as the earlier univariate statistics. If the Her Ghar scheme resulted in a larger proportion of tokenism for female borrowers relative to 2013, we expect the estimated coefficient γ_{pf} to be positive. If the Her Ghar resulted in a larger fraction of female borrowers with more bargaining power, we expect a negative coefficient for the interaction coefficient. If the scheme did not affect the composition of the cohort of applicants, then we expect the interaction to be insignificant.

The results are reported in Table 4. The estimated coefficient for the interaction term between loans in 2014 and the female dummy is not statistically significant. These results indicate that there was no substantial change in credit risk for female loans in 2014. This is consistent with the new applicants under the Her Ghar scheme having a similar bargaining power as 2013 applicants. Nonetheless, the increase in female loan volume does point to a strong benefit as a larger number of females have a greater say in household financial decision-making on account of the Her Ghar scheme.

Consistent with the average statistics reported in Table 3, female loans have a significantly lower default rate. with a point estimate between 0.3% and 0.38%, which is consistent with the univariate difference. The interest rate, which should capture the entire information set used by the bank to evaluate the credit risk of the loan, is highly significant as expected. The EMI-to-income ratio, which is negatively related to repayment capacity, has a strong positive effect on defaults. Larger loan amounts are associated with a lower default likelihood consistent with the bank granting larger loans to more credit-worthy borrowers.

One empirical limitation of the results in the above section is that we have only the primary borrower's characteristics. It is possible that all female loans also have a co-applicant, in which case, the lower default risk is due to a higher family income. If this were the case, female loans should have significantly lower interest rates relative to male loans, as the bank would price in the reduced likelihood of default. However, the results on interest rates show no such difference. The rate of female loans in 2013 was 1 basis point higher, and in 2014, it was 5 basis points lower.

5.2.1. Credit Risk during COVID

As a further stringent test of female bargaining, we estimate the above default model using only the period around the COVID crisis. Given that COVID was not predicted globally, it is of interest to examine whether the previous findings—showing that female loans have lower default risk—continue to hold during and after the COVID period. The time range for this test is January 2018 to March 2023.

$$Logit(Default_{i,t}) = \gamma_0 + \gamma_t \times PostCOVID_t \times Female_i + \gamma_f \times Female_i + Controls_{i,t} + \epsilon_{i,t} \quad (3)$$

where the dependent variable $Default_{i,t}$ takes the value of 1 if the loan i default in a given month t and 0 otherwise. The $PostCOVID_t$ takes the value of 1 if it is from the beginning of 2021 to March 2023 and zero otherwise. We estimate the model both with and without the inclusion of the year 2020 to account for the fact that the COVID year might be unusual in terms of defaults. The $Female_i$ indicator takes the value of 1 for female loan i and zero otherwise. The control variables are the same as Equation 2. We also impose the year-month fixed effects, district fixed effects, and loan sanction quarter fixed effects. The standard error is clustered at the district level.

The results are reported in Table 5. The estimated coefficient for the interaction term is not statistically different from zero, both with and without the inclusion of the year 2020. Relative to the entire sample, the gap in default rates for female and male loans is larger during the period around the COVID crisis - female loans have 0.45% lower likelihood of default during this time period, relative to the baseline model in Table 4, where this was between 0.3%-0.38%. Furthermore, in the post-COVID period, there is no reversal of this result, suggesting that households with higher bargaining power for females were better at financial decisions - both during normal economic conditions and during an unanticipated global health and economic crisis caused by COVID.

5.3. Repayment Behavior during COVID

In the previous subsection, we found that the gap in default rates between male and female loans widened around the years of the COVID crisis. In this section, we use repayments during the COVID moratorium as an alternative test of women's financial decision-making.

To do this, we create a matched sample using propensity score with replacement, matching based on age, interest rate, loan amount, loan tenure, collateral value, and loan-to-value ratio, applying a caliper of 0.05 for mortgages sanctioned in the same quarter. The matching results are reported in Appendix Figure A.1.[21] The kernel density distributions of female loans and matched male loans by borrower's age, collateral value, interest rate, loan amount, loan-to-value ratio, and loan tenure show that the female and male samples are very similar. The graphs also display the average values and the results of pairwise t-tests, which indicate that there are no significant differences between the two samples of mortgage loans across all observable characteristics.

Using the matched sample, we present the average monthly percentage of loans with missed repayments from January 2019 to March 2023. Panel (a) of Figure 5 shows that female loans consistently had a lower proportion of missed repayments compared to those held by male borrowers, with this gap widening notably during the moratorium period. As expected, the overall proportion of missed repayments increased during COVID. However, female borrowers were less likely to defer repayments during the moratorium. In the two and a half years following the moratorium's conclusion, the gap in missed repayments between male and female borrowers returned to pre-moratorium levels. To formally test whether female borrowers responded differently to the loan repayment deferment opportunity compared to male borrowers, we estimate the following conditional logit model.

$$Logit(MissingRepay_{i,t}) = \gamma_0 + \sum_{t=-3}^{t=12} \gamma_t \times Quarter_t \times Female_i + \gamma_f \times Female_i + Controls_{i,t} + \epsilon_{i,t} \tag{4}$$

The dependent variable $MissingRepay_{i,t}$ takes the value of 1 if the loan i's repayment in quarter t is missing and 0 otherwise. The variable of interest is the interaction term between the quarter dummy and a female loan dummy. The control variables include the borrower's age, interest rate, loan tenure, loan collateral value, and loan-to-value ratio. We include the year-month fixed effect with matched pairs. $Quarter_1$ takes the value of 1 for April and May 2020 and zero otherwise. This is the first phase of the moratorium period. [22] $Quarter_2$ takes

[21] We also conducted tests using an unmatched sample, and the results remained robust. However, due to space constraints, we do not report these findings.

[22] In the data provided by the bank, March 2020 is missing. One possible reason is that the moratorium policy

the value of 1 for June to August 2020 and zero otherwise. This is the second phase of the moratorium period. $Quarter_3$ takes the value of 1 for Sep to Dec 2020 and zero otherwise. $Quarter_4$ to $Quarter_{12}$ are the dummy variables representing the quarters from the first quarter of 2021 up to the first quarter of 2023. The second quarter of 2019 is omitted and serves as the comparison base. $Quarter_{-3}$ to $Quarter_{-1}$ are the dummy variables for the two quarters in 2019 and January to February in 2020 in the per-treatment period.

The estimated coefficients γ_{-3} to γ_{12} (odd ratio) and their 95% confidence intervals are reported in Figure 5 panel (b). During the first phase of the moratorium period, female loans are 6% less likely to miss repayments compared to similar male loans. In the second phase of the moratorium period, female loans are 8% less likely to miss repayments compared to their similar male counterparts. In other periods both before and after the moratorium, there is no significant difference between male and female loans in the likelihood of missing repayments. This further strengthens support for the notion that the increase in lending led to an increase in the bargaining power of females, as reflected in household financial decision-making. In the next subsections, we examine whether this result could be driven by other confounding factors.

5.3.1. Different Prepayment Patterns before and after the Moratorium Period

Do female borrowers have different prepayment patterns before or after the moratorium period? This could be one possible explanation for their different prepayment during the moratorium period. In Figure 6 panel (a), We plot the average prepayment as a percentage of the initial loan outstanding for male and female loans. In the pre-moratorium period, the prepayment patterns virtually overlap, so lower prepayments by female borrowers prior to the moratorium period cannot be an explanation for their higher repayments during the moratorium period. During the moratorium period, there was a steep increase in prepayments for both male and female loans. This is because the required repayment amount was zero - so any repayment made (for example, the regular EMI) would count as a prepayment. By the end of the moratorium period, there is a noticeable gap between female and male loans, which is along expected lines, due to the earlier documented results of higher prepay-

was announced on March 27, but its effective date was retroactively applicable from March 1. This may have caused some procedural difficulties in the classification of data for this month.

ments by female borrowers during the moratorium period (Figure 5). The key additional finding is that the higher prepayment for female borrowers during the moratorium period persisted for another two and a half years, i.e., until the end of the sample period. To test this formally, we estimate the following regression equation for prepayments.

$$(\frac{prepayment}{loan\_amt})_{i,t} = \gamma_0 + \sum_{t=-3}^{t=12} \gamma_t \times Quarter_t \times Female_i + \gamma_f \times Female_i + Controls_{i,t} + \epsilon_{i,t} \quad (5)$$

The dependent variable is the ratio of the prepayment amount to the original loan outstanding for loan i. The other explanatory variables are the same as equation 4. The estimated coefficients of γ_t and their 95% confidence intervals are displayed in Figure 6 Panel (b). Before the moratorium period, the coefficients are not statistically different from zero. During the moratorium period, female loans have significantly higher prepayments. This difference has an average value of 0.4% of the initial loan outstanding and this difference remains at the same level in the following two and a half years, without declining. This result shows that female borrowers did not reduce their average prepayment levels even after continuing their repayments during the moratorium period. Thus, differences in prepayment behavior prior to or after the moratorium cannot explain the differential repayment during COVID.

5.3.2. Differences in 2013 and 2014 Cohorts

Do the differences in repayment stem from changes in the cohort of applicants in 2013 and 2014? To test this, we first plot the average percentage of missing repayment for the loans sanctioned one year before (i.e. 2013) the introduction of 5 bps concession policy and one year after (i.e. 2014) by primary borrower's gender. The plots are displayed in Figure 7 Panel (a). The solid lines represent the loans originated in 2014 and the dashed lines represent the loans originated in 2013. Both the dashed lines and solid lines show no obvious differences over time in periods outside the moratorium. During the moratorium period, loans taken by women have a significantly lower percentage of missed repayments compared to those taken by men, indicating that female loans are more likely to continue repaying during this period. The gender gap in repayment differences is similar for both 2013 and 2014 loans, showing no signs of a reduced gender gap in 2014 loans. We estimate regression equation 4 for the

loans originated in 2013 and 2014 separately and report the estimated coefficients and their 95% confidence interval in Figure 7 Panel (b). Loans taken by women are significantly less likely to omit repayments during the moratorium period for both samples. This gender gap is similar for 2013 loans and 2014 loans, implying that differences in the cohort of loans pre and post Her Ghar cannot be the driver of the repayment results.

5.4. Alternative Explanations

In this section, we will examine alternative explanations for our main results and consider how these may influence the interpretation of our findings.

5.4.1. Income Uncertainty

Could differences in repayment by women and men during COVID stem from the differences in income stability during COVID-19? To understand the potential effect of this, we narrow the sample to include only borrowers with government jobs, i.e. those where the borrower has a job in state government services, services in public sector undertakings, central government services, or defense establishments. In India, government jobs are considered to have very good income stability. Thus, the likelihood of layoffs for people with government jobs is minimal. We report the results for the sample that includes only those with government jobs in Figure 8.

The absolute level of missed repayments is much lower for this sub-sample - in the pre-COVID period, the unconditional likelihood of missing a repayment is around 5% for this sample, compared to about 8% for the full sample (Figure 5). However, DID indicates that the gap in the repayment of women and men loans remains large (between 5% and 11%) and statistically significant. As with the full sample, there is no difference in the likelihood of repayment of female and male loans in the DID setting for most quarters outside the moratorium period.

5.4.2. Male Borrower Selection

Another potential concern may be due to selection by males. If men who opt to continue repayments during the moratorium period are also more likely to designate their wives as the primary borrower, the observed differences between male and female loans may stem more

from men's selection behavior and not from women's direct involvement in decision-making. If this were true, the composition of male loans in 2014 should include fewer individuals inclined to repay during the moratorium period, as many may have switched to what we classify as female loans. This would imply an increased share of men choosing deferred payment options. Accordingly, we would expect to see a higher proportion of deferred repayments among male loans in the post-period under the moratorium policy.

We test this hypothesis by comparing male loans originated in 2013 with those originated in 2014. The results are reported in Table 9. Panel (a) illustrates that the average missed repayment patterns between the two groups of male loans remain largely consistent across the entire sample period, including the moratorium period. There is no evidence indicating that the composition of male loans in 2014 includes a higher proportion of loans availing repayment deferment option. Panel(B) shows the comparison of default rates for the male loans sanctioned in 2013 versus those sanctioned in 2014. The default rates of these two groups of loans are also similar, indicating that their average repayment ability is comparable. Thus, there is no evidence to suggest that a portion of male loans had higher repayment ability or more inclined to maintain repayment behavior during the moratorium self-selected out of the male loan sample. Therefore, the hypothesis that male selection drives the results is unlikely to hold.

5.4.3. Consumers Shifting from other Lenders

Is the increase in the percentage of female loans driven by consumers switching from other banks? In India, the consumer mortgage market is segmented. SBI primarily lends to well-profiled middle-class borrowers. SBI typically requires thorough documentation and can offer competitive rates. Wealthier segments of the population are served by smaller private banks. Non-banking institutions also provide loans to the subprime market, which includes borrowers with relatively poorer credit and documentation. Therefore, a small financial incentive like 5 bps is unlikely to be a sufficient reason for a consumer to switch lenders. However, if this was a successful marketing campaign, it might attract consumers to switch from other banks. So, could our results be driven by loans where women were already the primary borrowers switching from other banks?

If the switching behavior is substantial, it is more likely to occur in areas where SBI's market share is smaller. In regions where SBI has a large market share and is the dominant bank, it is less likely there are borrowers would switch from other lenders. We use the data of all bank branches provided by the Reserve Bank of India to measure SBI's market share in each district. Then, we compare the change in the proportion of female loans in regions above the median (high SBI market share) to those below the median (low SBI market share). The results are reported in Figure 10. Our results show that the increase in the proportion of loans with women as primary borrowers is roughly the same across regions with different SBI market shares. Market share does not explain the difference in the growth of female loans. The volume of new loans has remained relatively stable over time across regions with varying SBI market shares. This evidence does not support the hypothesis that a significant number of female borrowers switched from other banks in response to the 5 basis point concession.

5.4.4. Women's Income or Wealth as Additional Collateral

Another possible explanation is that women, by becoming the primary borrower, may be more willing to contribute their own wealth (e.g., dowry) or income towards repayment. This increased repayment during the moratorium period could stem from women's actual financial contribution rather than their participation in decision-making. This is a possible explanation, and we argue that such an explanation is related to financial decision-making and is not exclusive. If women, by becoming the primary borrower, are more willing to contribute their own wealth or income to maintain repayment, it indicates that women's financial decision-making from her perspective has been altered by her role as a mortgage borrower.

5.4.5. Marital Status

We do not have the marital status of any applicant in the data set. If all the female non-housewife borrowers in the data are single women, one interpretation of the results is that the lower default risk and more optimal prepayment behavior is a woman versus man effect. This is unlikely in India. The percentage of single women between the ages of 30 to 50 (which is the 10th and 90th percentile of our applicant pool) is 2.44% based on the

Prowess data. There were no dramatic social changes in this time period that would induce women to stay single in 2014 relative to 2013. Thus, it is unlikely that there was a large increase in the percentage of single women in the female loan sample in 2014.

5.4.6. Credit Risk Difference

Does the difference in repayment decisions between men and women during the moratorium policy merely reflect their differences in credit risk? First, our empirical test controls for interest rate, which serves as a sufficient statistic for credit risk in mortgage loan pricing [23]. Second, the observed difference in repayment decisions between men and women during the moratorium period is estimated using a difference-in-differences (DID) approach. Prior to the moratorium, any repayment differences driven by credit risk were absorbed. The DID estimation captures the additional difference in repayment behavior during the moratorium period, relative to the pre-period. This additional difference cannot be explained by variations in credit risk.

Third, if credit risk differences had a differential impact on repayment behavior during the COVID-19 period, such that pre-COVID repayment differences could not fully absorb the influence of credit risk differences, we would expect the observed gender difference in repayment to persist or even increase after the moratorium period ended. This is because the moratorium period ended as a policy decision in August 2020, while the economic disruptions from COVID continued globally and in India. However, various results show that after the moratorium period ended (in August 2020), gender differences in repayment decisions immediately returned to pre-COVID levels. Therefore, the repayment decision differences observed during the moratorium period are unlikely to be explained by credit risk disparities. Instead, our findings indicate that these differences are more likely a reflection of variations in financial decision-making.

5.5. Discrimination against Women

Past literature has shown that bank officers discriminate against female borrowers(Alesina et al. (2013),Ongena and Popov (2016), Brock and De Haas (2023)). In this case, the interest rate charged for female loans systematically overestimates the credit risk of such loans. Thus,

[23] The relationship between credit scores and interest rates for mortgage loans in SBI is detailed in the table.

tests of default are biased in that they may partially reflect the effects of discrimination. We believe this to be unlikely in our sample. Prior to the Her Ghar scheme, the interest rate difference between female and male loans was only 1 basis point, suggesting little discrimination. Additionally, LTV and EMI-to-Income ratios for female loans are higher, which does not suggest discrimination. Thus, our preferred explanation is that SBI's model of credit risk does not have the sex of the borrower as an input. Incidentally, this would also be the case in most parts of the world for legal reasons. However, this omission results in the models not being able to incorporate the fact that female borrowers have better financial decision-making abilities. Thus, the observed gender difference in default and repayment behavior, even after controlling for interest rates, can be attributed to the overlooked gender factor.

6. Cross-sectional Tests of Bargaining versus Tokenism

6.1. Cross-Sectional Effects

The dataset we have contains very limited information to infer intra-household bargaining power. The only potentially available variable is an indicator for a female applicant being a "housewife," which, in the Indian context, typically implies a lack of outside income. We examine whether the results for loans taken by housewives differ from other female loans, as these loans are more likely to be driven by tokenism. As a second (indirect) test, we use proxies the location of the borrower and construct proxies for female empowerment at the district and state levels.

6.1.1. Housewife Loans

We start by investigating whether the Her Ghar scheme led to an increase in the proportion of primary borrowers who list their profession as housewives.[24] In Figure 11, Panel (a), we present a plot showing the percentage of loans where the primary borrower listed "housewife" as their occupation, tracked over the loan sanction date. The results indicate a noticeable increase in the proportion of housewives as primary borrowers, rising from around 5.5% in the pre-policy period to 8.5% in the post-policy period.

[24] There is no marital status field in the data set. We assume that a female applicant who lists her profession as housewife is married and that she does not work outside the home in a formal or informal job.

Next, we compare the repayment behavior of housewife borrowers with that of their matched male counterparts during the moratorium period. If the gender gap in repayment deferment is influenced by female participation in financial decision-making, we would expect much lower gaps when the primary borrower is a housewife. To test this, we compare the average percentage of missed repayments between housewives and their matched male counterparts and present the findings in Figure 11, Panel (b). The gender difference in repayment behavior during the moratorium period disappears. Housewife loans consistently exhibit a slightly higher rate of missed repayments compared to their male counterparts, a pattern that persists throughout the moratorium period. Additionally, we estimate the likelihood of missing repayments using the same approach as in equation 4 and report the estimated coefficients and their 95% confidence intervals in Figure 11, Panel (c). None of the coefficients is statistically different from zero, suggesting that when the primary female borrower lacks sufficient intra-family bargaining power, the gender gap in repayment behavior during the moratorium period vanishes.

6.1.2. Geographical Differences in Female Bargaining

Next, we examine whether gender differences in repayment choices during the moratorium period are associated with women's intra-family bargaining power, where this is measured at the state and district levels based on the residence of the primary borrower. State and district-level household data are obtained from the Consumer Pyramids Dx Data, which is based on surveys conducted by CMIE. This survey, which began in January 2014, collects a variety of household information from more than 600,000 individuals in India on income, consumption, assets, and employment. We use the two datasets within the Consumer Pyramids Dx - "People of India" and "Income Pyramids" for our study. These surveys are conducted every 4 months. Importantly for us, the surveys also collect personal information, including gender. This information allows us to assess the status of gender equality at both the district and state levels.

Greater gender equality reflects higher intra-household bargaining power for women, meaning that women's preferences are more likely to influence household financial decisions. In regions where gender equality is lower, even when women are designated as the primary

mortgage borrowers for various reasons, this may represent tokenism rather than genuine involvement in household decision-making. As a result, the difference in repayment behavior between male and female borrowers should be less. Thus, differences between female and male loans should be lower in regions with greater gender inequality and higher in regions with lower gender inequality.

We test if the above differences in states or districts exist using the Prowess survey data at the beginning of 2014 to measure gender inequality. Ideally, we would prefer to have data from 2013 to measure pretreatment conditions - however, there is no comparable large sample survey available for the Indian economy prior to this date. Considering that gender equality is a slowly changing social characteristic, we believe that data at the beginning of 2014 would still reflect regional gender equality differences before the introduction of the Her Ghar scheme. We include households consisting of one husband and one wife. For each of these households, gender equality is assessed across three dimensions: workforce participation (i.e., housewife), the gender gap in education, and the gender gap in income. We present the average statistics at the state level in Table 6 [25]. The North Eastern States are aggregated into one single unit due to low population density. To ensure sufficient mortgage samples in smaller regions (states or districts), we retained all originated mortgage loans from 2010 to 2018 for these tests.

The states are ordered by the gender gap in income, which is defined as the ratio of the wife's total income to the combined total income of both husband and wife. Relative income has been robustly shown to be a determinant of female bargaining power in intra-household decisions.[26]. Even for states at the top (i.e., the lowest gender gap in income), such as Goa and Tamil Nadu, women's income share is at most 13%, reflecting the poor economic status of women in India as a whole. At the bottom, we have Bihar and Jharkhand, where female income share is less than 2% of the combined income. Other measures of inequality are quite correlated with the income measure that we use for ordering. For example, Tamil Nadu and Goa also have the lowest percentages of housewives, whereas Bihar and Jharkhand have the

[25] We also aggregate the survey data at the district level, covering approximately 300 districts in India where most people reside. We opt to report summary statistics at the state level to show variations in gender equality across regions, which also aligns with general public perceptions.

[26] See, for example, Anderson and Eswaran (2009), Luke and Munshi (2011) and Qian (2008).

highest percentage. The relatively low percentage of working women also highlights the low labor supply of females in India, consistent with Field et al. (2021), who document that poor economic status acts as an impediment to labor force participation by females.

On the other hand, the gender gap in education (roughly interpreted as the difference in number of years of schooling) is lowest for Kerla, where females have 0.25 years more than men. All other states have lower education for females relative to males. The largest gaps are observed in Jammu and Kashmir and Rajasthan where the gap is around 3 years of schooling. However, the gender gap in education for states is quite different from the gender gap in income, thus providing an alternative independent test for women's rights. As such,Goldin and Olivetti (2013) found that increases in female labor participation induced by World War II were concentrated only on females with above median education. Likewise, Banerjee et al. (2021) found that the impact of financial literacy on financial decision-making was larger for educated women.

We present the correlation across states in Figure 12. For each state, we estimate the gender gap in repayment during the moratorium period. The estimated gender gap, along with its 95% confidence interval, is plotted on the y-axis, while the x-axis represents the average gender inequality measures for each state. States are labeled with their respective abbreviations, which can be found in Appendix Table A.3. Additionally, we include conditional fitted lines in the figure[27].

Panel (a) illustrates that states with a higher proportion of housewife families exhibit a smaller gender gap in repayment propensity during the moratorium period. In Panel (b), we observe that states with a greater education disparity between wives and husbands are also associated with a smaller gender gap in repayment behavior. Conversely, Panel (c) demonstrates that when women's income share is higher, the gender gap in repayment propensity widens during the moratorium period. In all three conditional regressions, the estimated coefficients capturing the relationship between gender inequality and the gender difference in repayment behavior are statistically significant. To further validate these findings, we replicate the analysis at the district level, with the results reported in Table 7. The findings remain consistent, indicating that intra-household gender inequality significantly explains

[27] The fitted lines are estimated while controlling for state-level variables, including GDP per capita, population, percentage of female population, percentage of homeowners, and percentage of secondary school graduates.

the observed gender differences in repayment decisions during the moratorium period at state and district levels.

6.1.3. Differences due to Income Increases

Apart from participation in mortgage-related financial decisions, are there other socio-economic dimensions where women's empowerment has been enhanced as a result of the nudging policy aimed at promoting female property ownership? Since our mortgage data does not provide dynamic insights into other aspects, we utilize individual-level survey data to address this question.

We use the income from the first quarter and fourth quarter of the Prowess Dx survey data to test whether the growth in women's labor income over 2014 is correlated with the increase in the number of female mortgages across urban districts. In unreported results, we find that urban areas where the increase in female loans is large (defined as districts where the increase was in the top quartile) had an increase in income. Thus, some part of credit risk reduction may be driven by increases in income. However, the differences in repayment during COVID cannot be explained by the income effect. Thus, the Her Ghar scheme may have had a positive effect on woman's intra-household bargaining power both in a direct sense due to increases in property rights, and indirectly, by allowing women to earn a higher income. Due to difficulties in accessing individual-level income data, we are unable to separate out these two effects. However, the above effect is not found in rural districts consistent with a lower bargaining power of women in these areas.

7. Conclusion

Our paper studied the impact of Her Ghar, a scheme focused on giving loans to women by the State Bank of India. This scheme gave a 5 basis point reduction for home loans where the first applicant was a woman and she was also the first owner of the property. We find that the economic value of the discount was very small - often less than 0.02% of the monthly income of the borrower. Thus, the scheme can be characterized as a nudge. Yet, the scheme induced a large increase in loan applications by women within one year of its commencement.

One hypothesis was that these loans were induced by tokenism - that men, seeking to avail of the 5 basis point discount, put their wives' names first. Another was that the increase in loans established a genuine increase in bargaining power for women as reflected in household decision making. Using both default rates as well as repayment behavior of loans during COVID, we found that the Her Ghar scheme induced increases in intra-household bargaining power for women in terms of financial decision making. Lastly, consistent with prior research, we found that female loans have a lower default rate.

Our results imply that lower mandated capital charges for loans by women, which was mandated by the Central Bank of Mexico, could also be considered in the Indian context. Another policy implication is that nudges can also be effective in increasing female involvement in financial decision-making, whereas past studies focus on legislative actions. This points to the importance of non-state actors for increases in effective financial rights for women.

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Table 1: Summary Statistics

This table presents summary statistics of the variables used in the tests of the paper. Panel A shows the the characteristics for all mortgages originated between 2013 and 2014. 1 lakh is equivalent to 100,000. Panel B displays the summary statistics for mortgage repayment, focusing on loans originated between 2013 and 2014, with repayment data covering the period from April 2015 to March 2023. The variable definitions can be found in Appendix A.0.2.

Variable	**N**	**Mean**	**P25**	**Median**	**P75**	**SD**
Panel A: Mortgage Characteristics						
Male	310600	0.78	1	1	1	0.41
Age	310600	41.93	35.33	41.8	48.19	8.74
Interest Rate	310600	7.58	7.4	7.55	7.9	0.88
Loan Tenure	310600	219.93	180	240	241	57.15
Loan Amount (lakh)	310600	14.2	7.24	11.5	18	10.91
Collateral Value (lakh)	310600	28.16	13.85	21.43	33.95	29.4
EMI (000)	310600	12.14	6.47	9.8	15	9.25
Loan-to-Value Ratio	303620	0.57	0.41	0.6	0.74	0.21
Financial Benefit (000)	310600	4.72	2.17	3.63	6.03	3.97
Panel B: Mortgage Repayment						
Delinquent indicator	17678404	0.18	0	0	0	0.38
Delinquent amount (000)	3183801	17.6	4.06	9.65	19.44	38.92
Default indicator	17678404	0	0	0	0	0.04
Default amount (000)	20770	35.99	10.98	22.95	42.5	80.21
Repayment amount (000)	17678404	15.64	7.16	12	19	29.19
Prepay indicator	17678404	0.8	1	1	1	0.4
Prepay amount(000)	17678404	109.6	3.21	39.54	120.72	222.57
Prepayment to loan amount ratio	17678404	0.07	0	0.04	0.09	0.10

Table 2: Summary Statistics by Gender and Year of Loan Origination

This table presents the summary statistics of the mortgage loans by primary borrower gender and loan origination years. Panel A presents the summary statistics for the mortgages sanctioned in the year of 2013. Panel B presents the summary statistics for the mortgages sanctioned in the year of 2014. The columns labeled "Female" and "Male" correspond to the gender of the primary mortgage borrowers. The last two columns display the t-test results, comparing the loan characteristics of female borrowers with male borrowers for all mortgages sanctioned in either 2013 or 2014. Panel C reports the difference between loans originated in 2013 versus the loans originated in 2014 by gender. The last two columns report the estimated coefficients for the interaction term Female × YR14 and the corresponding t-statistics from a DID regression analysis. *** p<0.01, ** p<0.05,* p<0.1

Panel A: Loans originated in 2013								
	Female			Male			Diff (female-male)	t-stat
	N	Mean	Median	N	Mean	Median		
Age	30017	41.39	41.07	123424	41.8	41.7	-0.42***	-7.55
Interest rate	30017	7.6	7.55	123424	7.59	7.55	0.01**	2.08
Loan tenure	30017	219.83	240	123424	219.85	240	-0.02	-0.07
Loan amount (lakh)	30017	14.01	11.5	123424	13.7	10.8	0.31***	4.62
Collateral value (lakh)	30017	28.07	21.15	123424	27.01	20.31	1.05***	5.75
EMI (000)	30017	11.99	9.7	123424	11.72	9.4	0.28***	4.81
Loan-to-Value ratio	29267	0.57	0.6	120613	0.57	0.6	0	-1.22
Panel B: Loans originated in 2014								
	Female			Male			Diff (female-male)	t-stat
	N	Mean	Median	N	Mean	Median		
Age	36822	41.32	40.95	120337	42.39	42.35	-1.07***	-20.22
Interest rate	36822	7.52	7.4	120337	7.58	7.45	-0.06***	-10.75
Loan tenure	36822	222.9	240	120337	219.12	240	3.78***	10.57
Loan amount (lakh)	36822	15.91	12.8	120337	14.25	11.5	1.66***	24.77
Collateral value (lakh)	36822	31.24	24	120337	28.43	21.87	2.81***	15.57
EMI (000)	36822	13.49	11.08	120337	12.21	9.96	1.28***	22.62
Loan-to-Value ratio	35965	0.58	0.61	117775	0.57	0.6	0.01***	8.88
Panel C : Comparison by Loan Origination Year								
	Female			Male			Female × YR14	
	Diff (13-14)	t-stat		Diff (13-14)	t-stat		DID	t-stat
Age	0.06	0.98		-0.59***	-16.44		-0.650***	-8.49
Interest rate	0.08***	12.02		0.01	1.52		-0.0716***	-9.30
Loan tenure	-3.07***	-6.98		0.73***	3.14		3.803***	7.59
Loan amount (lakh)	-1.9***	-21.45		-0.55***	-12.66		1.348***	14.12
Collateral value (lakh)	-3.17***	-12.72		-1.42***	-12.24		1.754***	6.81
EMI (000)	-1.5***	-19.94		-0.49***	-13.27		1.005***	12.41
Loan-to-Value ratio	-0.01***	-4.65		0.01***	6.18		0.0131***	6.96

Table 3: Summary Statistics of Default Rate

The table presents summary statistics of the default rate by the gender of the primary borrower and by year for all loans sanctioned between 2013 and 2014. For each year from 2016 until March 2023, the table reports the average percentage of loans that defaulted. For the year of 2020, we exclude the COVID moratorium period from March 2020 till August 2020. A t-test is to compare the default rates between male and female primary borrowers, with the difference and corresponding t-statistics shown in the last two columns. Statistical significance at the 1% level is indicated by ***.

	Female		Male			
	N	Mean	N	Mean	Diff(female-male)	t-stat
2016	404491	0.29%	1397340	0.40%	-0.11%***	-9.71
2017	504741	0.74%	1815706	0.98%	-0.24%***	-15.61
2018	551388	0.56%	2007060	0.82%	-0.26%***	-19.26
2019	551388	0.56%	2007060	0.89%	-0.32%***	-23.67
2020	275694	0.56%	1003530	0.92%	-0.36%***	-18.31
2021	532877	0.81%	1939742	1.26%	-0.45%***	-26.84
2022	540432	0.78%	1967004	1.16%	-0.38%***	-24.24
2023	137847	0.78%	501761	1.10%	-0.32%***	-10.5

Table 4: Primary Borrower Gender and Loan Default Propensity

This table reports the results from estimating regression equation 2 The sample includes all loans originated between 2013 and 2014 for which we have observable loan repayment data. The explanatory variables include the interaction between the loan sanction period dummy *Post* and primary loan borrower gender indicator and all loan characteristics. *Post* takes the value of 1 if the loan originated in 2014 and zero otherwise. The data covers the loan performance period from April 2015 to March 2023. In column (1), a default event is defined as any consecutive default lasting more than three months. In column (2), a default event is defined as any consecutive default lasting more than 6 months. Standard errors are clustered at the district level and reported in the parentheses. *** p<0.01, ** p<0.05,* p<0.1.

	(1)	(2)
	>3 months	>6 months
Post × Female	0.0650	0.0762
	(0.136)	(0.179)
Female	-0.387***	-0.300**
	(0.0989)	(0.117)
Age	0.0150***	0.0135*
	(0.00507)	(0.00689)
ln(Loan amount)	-0.730***	-0.792***
	(0.124)	(0.156)
Loan tenure	6.66e-05**	8.56e-05**
	(2.66e-05)	(3.59e-05)
ln(collateral)	0.109	0.0816
	(0.113)	(0.138)
Loan to value ratio	-0.567	-0.845
	(0.752)	(0.923)
Interest rate	0.473***	0.519***
	(0.0377)	(0.0558)
EMI/Income	0.399***	0.395***
	(0.0990)	(0.134)
Loan Sanction Quarter Fixed Effect	Y	Y
District Fixed effect	Y	Y
Constant	-1.542	-0.759
	(1.268)	(1.571)
Observations	40,073	33,325
Pseudo R-squared	0.162	0.168

Table 5: Default and Gender of Primary Borrower

This table reports the results on default dynamics for the mortgage loans sanctioned between 2013 and 2014. The sample has been matched based on loan characteristics. The matching outcome is reported in Appendix Figure A.1. Column (1) includes mortgage repayment data from 2018 to March 2023, while Column (2) spans the same period but excludes the year 2020. The default indicator is based on the bank's definition of default. The *PostCOVID* dummy variable is set to 1 for periods after 2021 and 0 otherwise. Control variables include all available loan characteristics. Standard errors are clustered at the district level and shown in parentheses. *** p<0.01, ** p<0.05,* p<0.1.

	(1) with 2020	(2) w/o 2020
PostCOVID × Female	-0.0265	-0.0353
	(0.0947)	(0.106)
Female	-0.452***	-0.440***
	(0.0923)	(0.0963)
Age	0.0106	0.0124*
	(0.00694)	(0.00741)
Ln(loan amount)	-0.629***	-0.657***
	(0.147)	(0.144)
Interest rate	0.496***	0.493***
	(0.0519)	(0.0504)
Loan tenure	0.00231**	0.00279**
	(0.00115)	(0.00126)
Ln(collateral)	0.182	0.181
	(0.139)	(0.137)
Loan to value ratio	-1.912**	-1.920**
	(0.861)	(0.843)
EMI/Income	0.474***	0.469***
	(0.110)	(0.114)
year-month Fixed Effect	Y	Y
District Fixed Effect	Y	Y
Loan Sanction Quarter Fixed Effect	Y	Y
Constant	-4.556***	-4.242***
	(1.633)	(1.632)
Observations	2,711,332	2,240,074
Pseudo R-squared	0.171	0.170

Table 6: State Social Economics Statistics

This table presents the socioeconomic status of various states in India, using data from 2014. Definitions of the variables can be found in Appendix A.0.2. The percentage of housewives, gender gap in education, and gender gap in income are sourced from the CMIE survey. Population (Lakh), % of females, % of homeowners, % of secondary school graduates, and GDP per capita (000) are derived from the 2011 census data.The states are ordered by the gender gap in income variable, from largest to smallest.

State	% of housewife	Gender gap in education	Gender gap in income	Population (Lakh)	% of female	% of home owner	% of secondary school graduates	GDP per capita (000)
GOA	78.95%	-0.96	13.12%	14.59	49.32%	78.06%	62.20%	216.43
TAMIL NADU	75.35%	-1.29	12.52%	721.47	49.91%	63.23%	42.72%	118.09
ANDHRA PRADESH	78.43%	-1.93	11.81%	845.81	49.82%	67.86%	40.23%	48.13
PUDUCHERRY	77.59%	-1.48	10.34%	12.48	50.92%	30.20%	45.08%	153.61
MAHARASHTRA	82.10%	-1.83	10.18%	1123.74	48.17%	80.24%	45.62%	129.18
KARNATAKA	85.68%	-1.60	10.00%	610.95	49.31%	59.98%	39.14%	115.31
Northeast States	86.76%	-0.76	9.27%	457.72	48.96%	59.21%	30.51%	56.69
UTTARAKHAND	88.89%	-1.90	8.50%	100.86	49.06%	62.09%	45.30%	133.03
DELHI	86.10%	-2.70	7.90%	167.88	46.47%	76.56%	49.71%	234.04
KERALA	86.49%	0.25	7.60%	334.06	52.02%	-		120.57
HARYANA	87.23%	-2.47	7.49%	253.51	46.77%	82.98%	35.23%	137.08
PUNJAB	89.88%	-1.37	6.63%	277.43	47.23%	87.07%	43.05%	107.94
CHHATTISGARH	87.00%	-2.20	6.50%	255.45	49.76%	72.98%	31.58%	71.47
HIMACHAL PRADESH	86.79%	-1.80	6.33%	68.65	49.28%	62.79%	53.01%	120.69
JAMMU & KASHMIR	91.04%	-2.86	6.01%	3.81	46.69%	46.10%	47.80%	117.93
WEST BENGAL	92.27%	-1.15	5.15%	911.67	48.72%	83.45%	35.91%	61.26
ODISHA	93.45%	-1.68	4.59%	419.70	49.46%	74.86%	46.89%	63.35
GUJARAT	91.11%	-2.30	4.12%	604.40	47.90%	83.25%	39.85%	121.49
RAJASTHAN	93.08%	-3.37	4.01%	685.48	48.14%	79.73%	29.50%	70.93
MADHYA PRADESH	94.32%	-2.63	3.52%	726.27	48.21%	77.34%	34.57%	50.28
UTTAR PRADESH	96.28%	-2.85	2.49%	1998.12	47.71%	83.90%	31.49%	40.14
BIHAR	97.03%	-2.76	1.66%	1041.00	47.86%	89.46%	28.11%	25.90
JHARKHAND	97.00%	-2.77	1.61%	329.88	48.68%	77.58%	33.75%	50.27

Table 7: Gender Difference in Repayment during Moratorium Period and Gender Inequality
This table presents the regression results on district-level gender inequality and the gender disparity in repayment during the moratorium period. The dependent variable is the gender difference in missed repayments during the moratorium period, estimated at the district level. Gender inequality in each district is measured by the percentage of housewives, the gender education gap, and the gender income gap. We also control for other district-level demographics, including population, percentage of females, percentage of homeowners, and percentage of secondary school graduates. A district is included in the sample only if there are at least 1,000 mortgage loans and 30 valid survey responses. *** p<0.01, ** p<0.05,* p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Gender difference in repayment during moratorium period					
% of housewife	0.0494***	0.0465***				
	(0.0157)	(0.0172)				
Gender gap in education			-0.00542***	-0.00508***		
			(0.00171)	(0.00193)		
Gender gap in income					-0.0882***	-0.0837***
					(0.0269)	(0.0301)
Ln (population)		-0.00452**		-0.00375		-0.00451*
		(0.00228)		(0.00229)		(0.00229)
% of female		-0.159		-0.199		-0.161
		(0.154)		(0.153)		(0.157)
% of home owner		0.0188		0.0171		0.0192*
		(0.0117)		(0.0115)		(0.0115)
% of secondary school graduates		0.0365*		0.0404**		0.0383**
		(0.0186)		(0.0189)		(0.0188)
Constant	-0.0574***	0.0612	-0.0253***	0.0994	-0.00799***	0.108
	(0.0139)	(0.0889)	(0.00377)	(0.0870)	(0.00239)	(0.0836)
Observations	229	226	229	226	229	226
R-squared	0.057	0.102	0.047	0.093	0.048	0.094

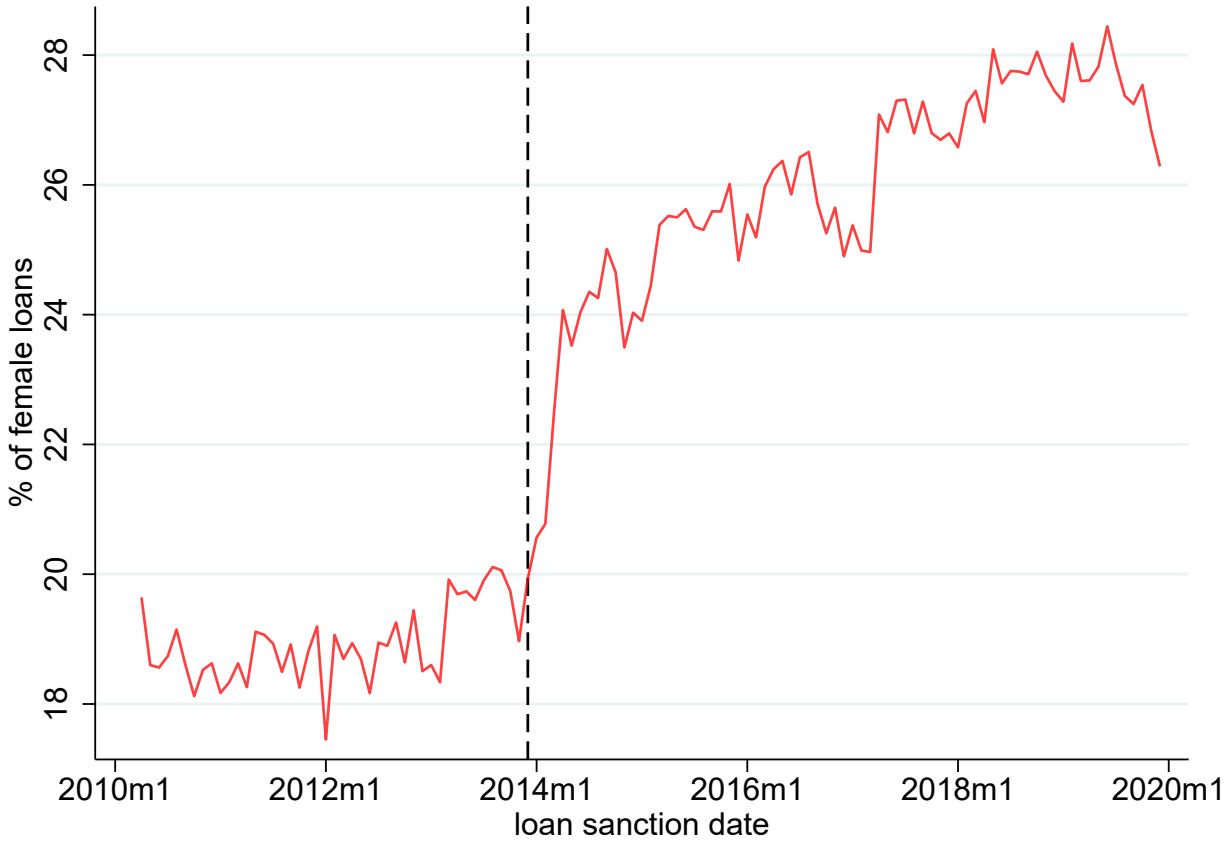


Figure 1: Proportion of Female Primary Borrowers
This figure presents the monthly distribution of the percentage of female primary borrowers for sanctioned mortgage loans. The red line represents the proportion of female primary borrowers, with the corresponding percentage values delineated on the left y-axis. The vertical dotted line indicates the announcement and implementation month of the 5 bps concession for female loans, which occurred in December 2013.

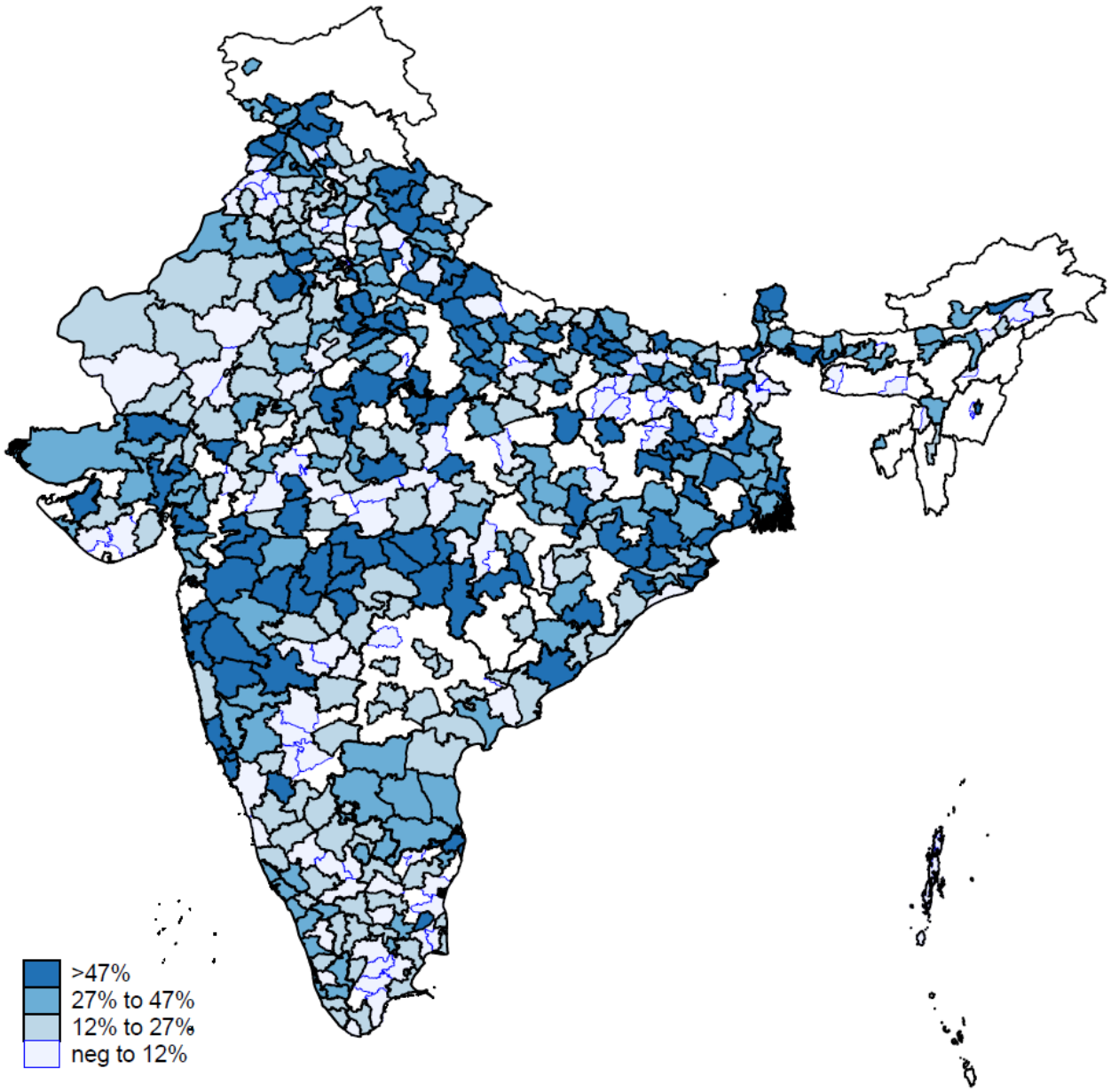
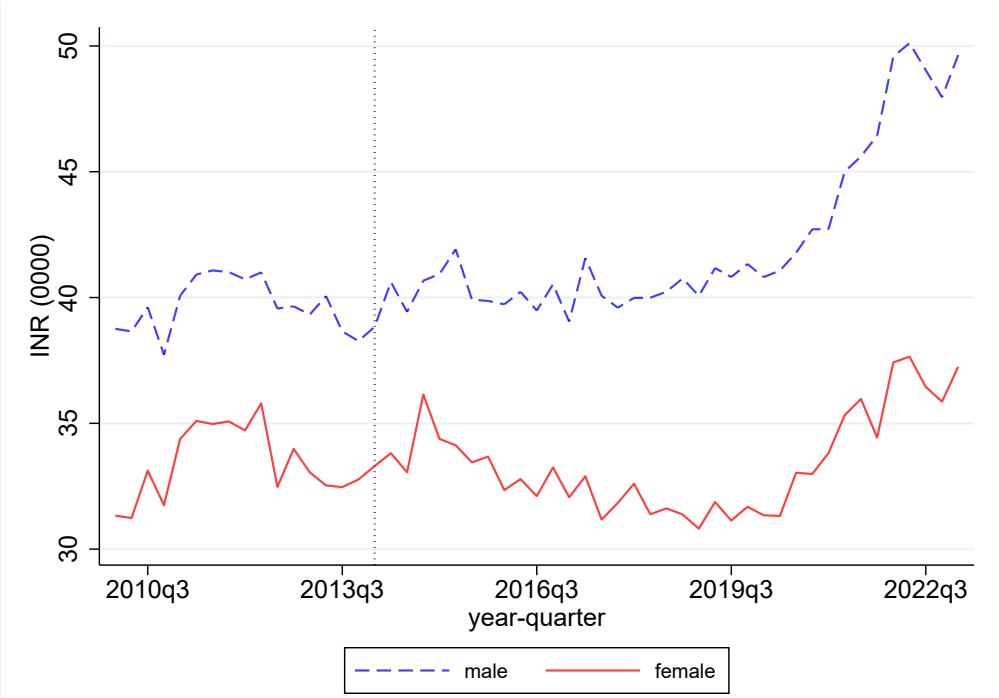
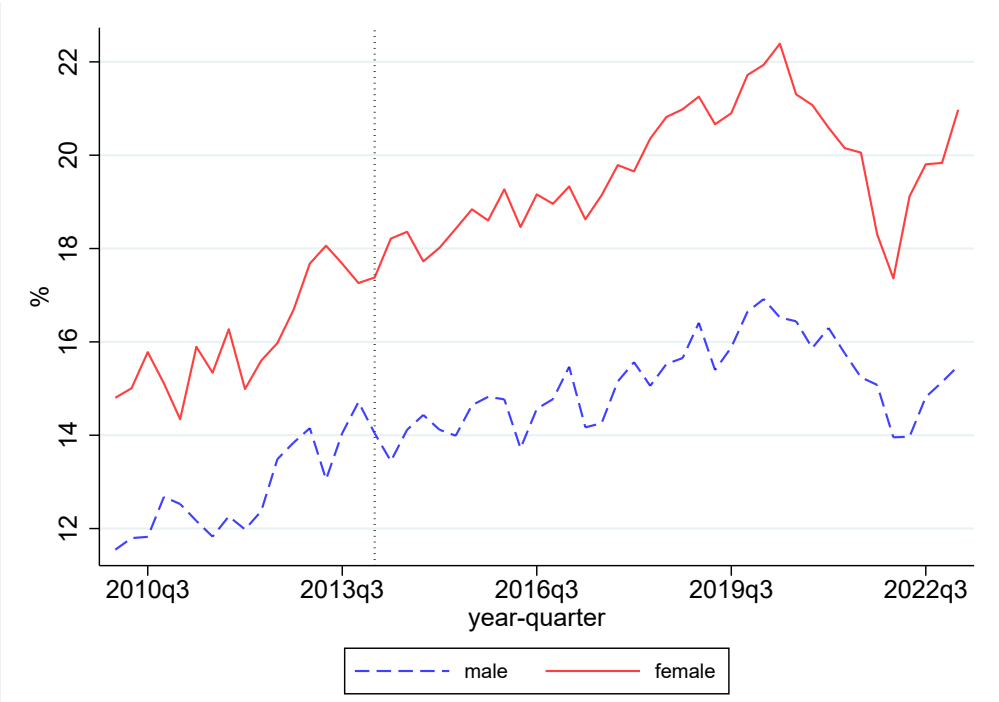


Figure 2: Pan-India Impact on the % of Female Primary Borrowers

Figure 2 shows the change of % of female loans by districts in India. For each district, $\%Female_{pre}$ represents the percentage of mortgage loans with female primary borrowers from 2010 to 2013. $\%Female_{post}$ represents the percentage of mortgage loans with female primary borrowers from 2014 to 2015. We only retain the data from the two years after the policy change, as this better reflects the increase in female loan driven by the 5 bps concession. We drop the districts if they do not have at least 50 loans issued in the pre or post periods. The map shows the value of $(\%Female_{post} - \%Female_{pre})/(\%Female_{pre})$ meaning the change of % of female loans relative to the pre-treatment period condition. The darkest areas indicate a growth in the proportion of female loans higher than 47%. Other colors and the corresponding increase ratios are indicated in the legend. The white areas are the regions where we lack sufficient mortgage loan data.



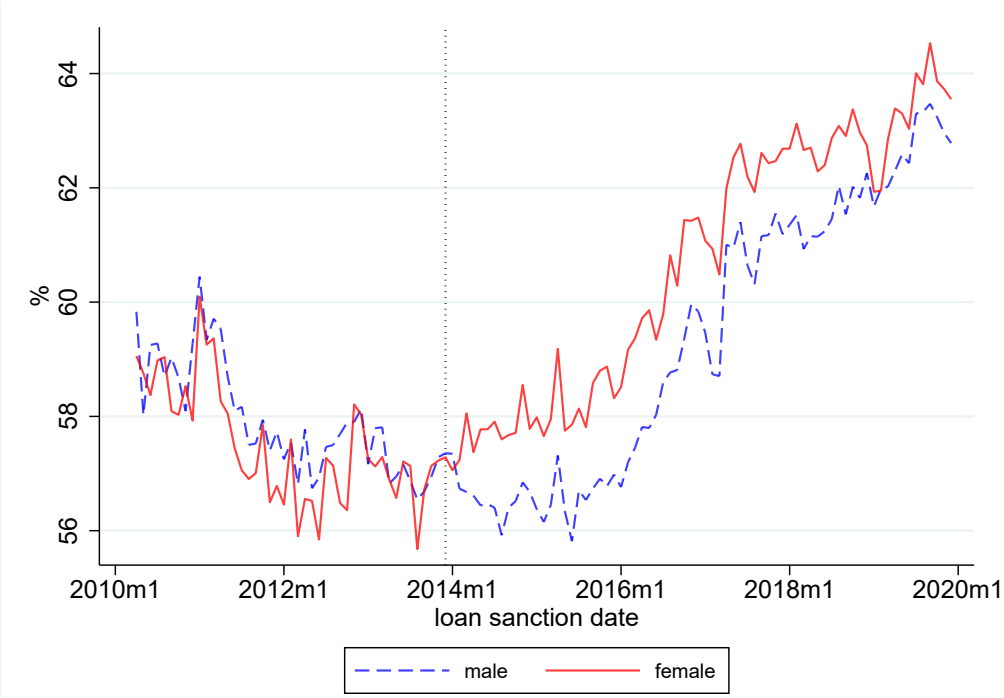
(a) Average Income



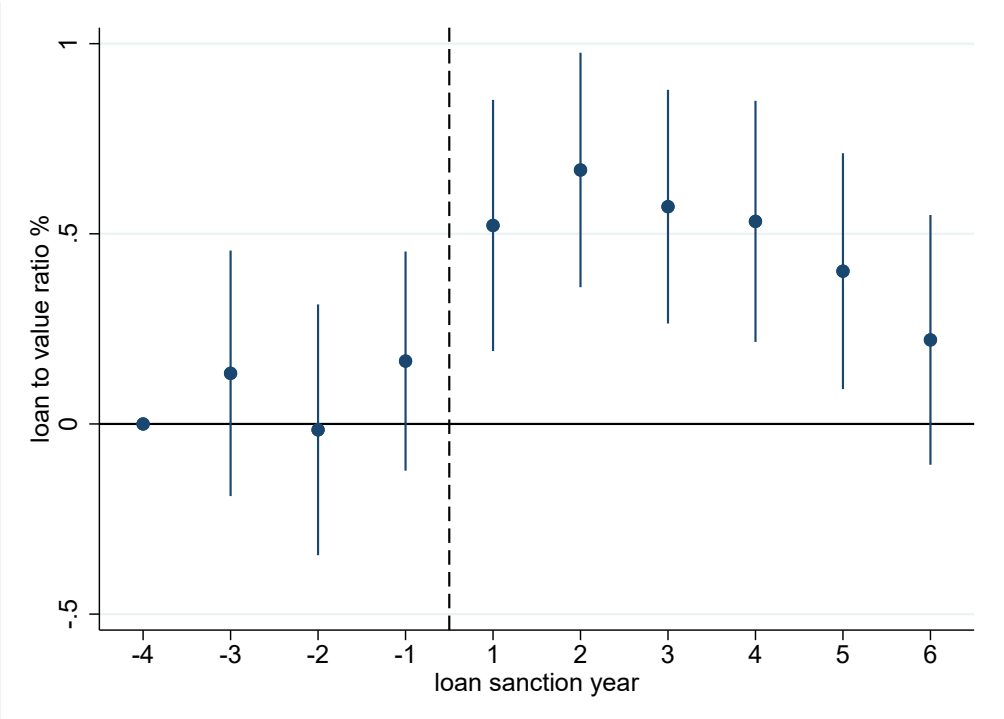
(b) Average EMI to Income Ratio

Figure 3: Average Income and Primary Borrower Gender

Figure (a) plots the average income in 10 thousand India Rupee by primary borrower gender over quarters when the loans were sanctioned. The vertical dotted line indicates the announcement and implementation month of the policy change, which occurred in December 2013. Figure (b) shows the average EMI to income ratio by primary borrower gender over quarters when the loans sanctioned.



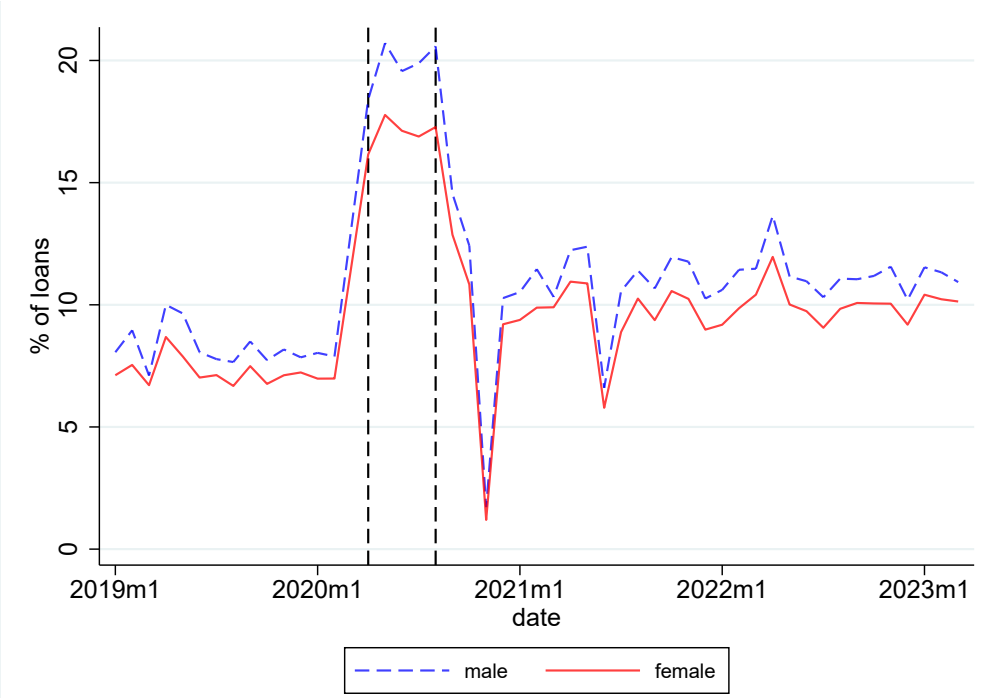
(a) Loan-to-Value ratio by Gender



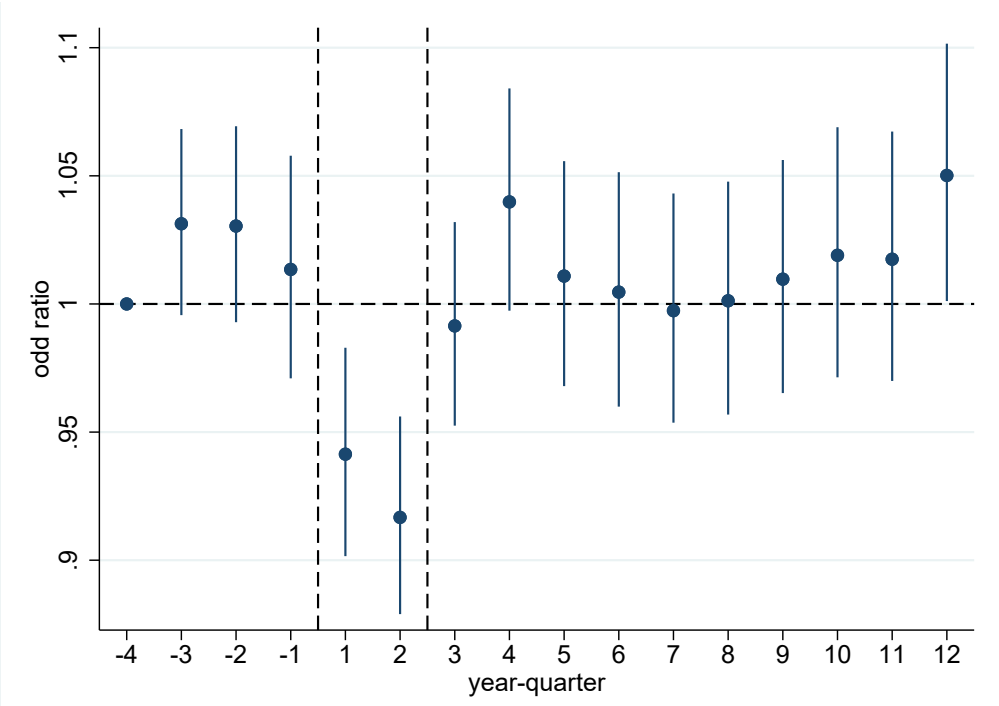
(b) Change in Loan-to-Value ratio for Female Loans

Figure 4: Loan-to-Value ratio and Primary Borrower's Gender

Figure (a) displays the average loan-to-value ratio for male and female loans by the month each loan was sanctioned. The vertical dotted line indicates the announcement and implementation month of the policy change, which occurred in December 2013. Figure(b) shows the estimated coefficients and their 95% confidence interval from regression equation 1 The vertical dotted line separates the pre- and post- treatment loan sanction years.



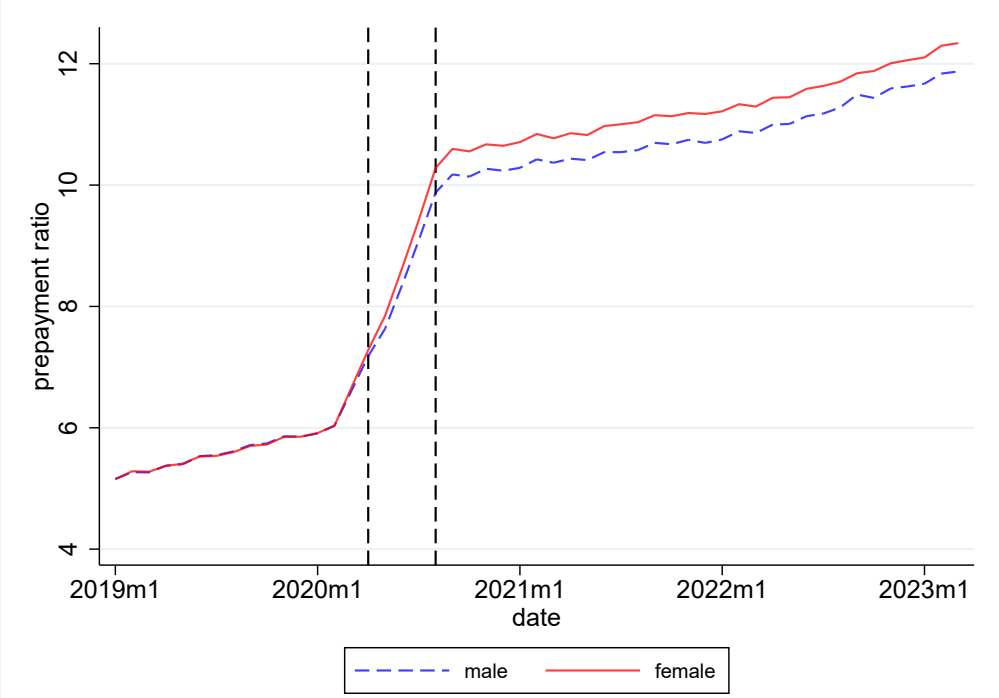
(a) Missing Repayment during Moratorium Period



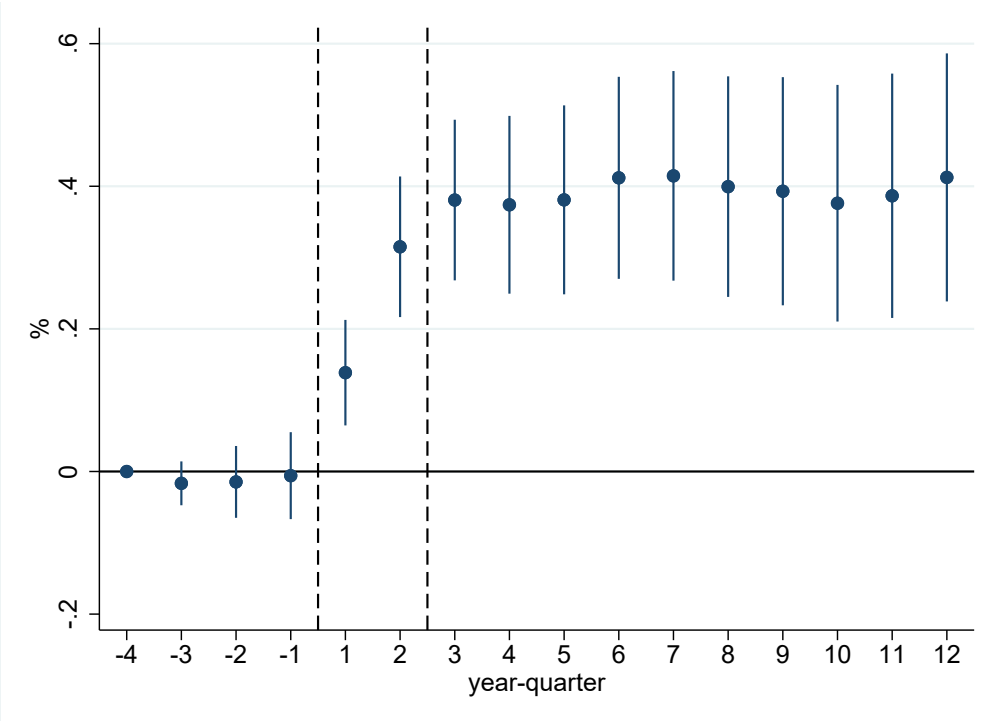
(b) Change in Gender Difference in Missing Repayment

Figure 5: Missing Repayment and Primary Borrower Gender

Figure (a) reports the % of loans with zero repayment from January 2019 to March 2023 which is the end of the sample period. The two vertical lines indicate the moratorium period starting from March 2020 till August 2020. The results presented are derived from the matched sample. Figure(b) shows the estimated coefficients and their 95% confidence interval from regression equation4.



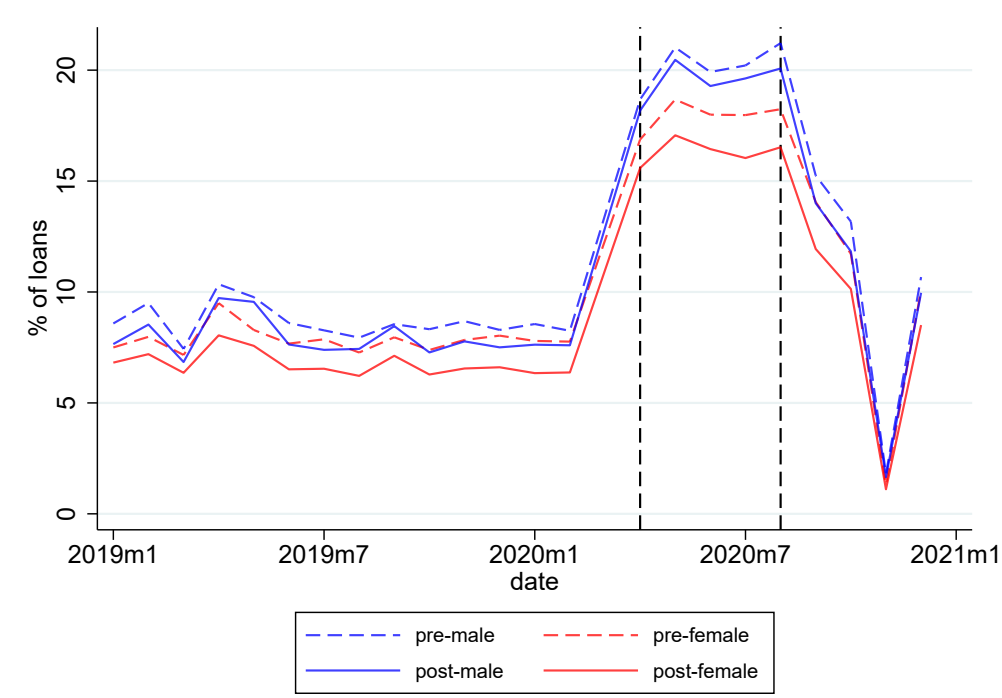
(a) Prepayment as % of Loan Amount



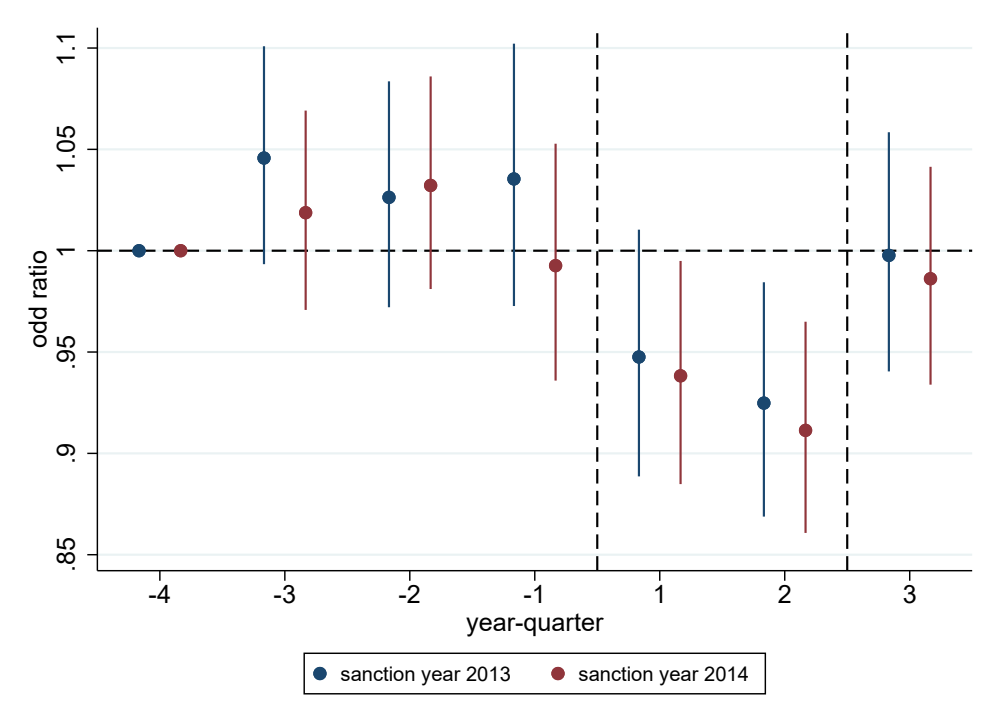
(b) Change in Gender Difference in Prepayment

Figure 6: Prepayment and Primary Borrower Gender

Figure (a) reports the average prepayment amount to initial total loan amount ratio from January 2019 till March 2023. The results are derived from the matched sample. The vertical dotted lines indicate the moratorium period starting from March 2020 to August 2020. Figure(b) shows the estimated coefficients and their 95% confidence interval from regression equation 5. The dependent variable is the amount of prepayment as a percentage of initial loan outstanding.

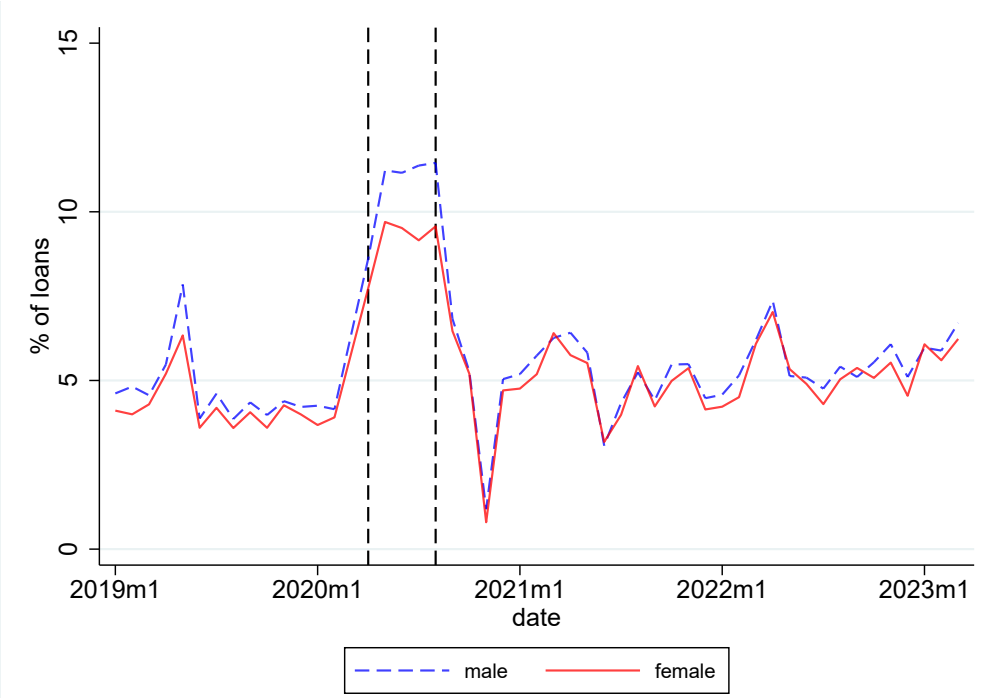


(a) Percentage of Loans with Missing Repayment

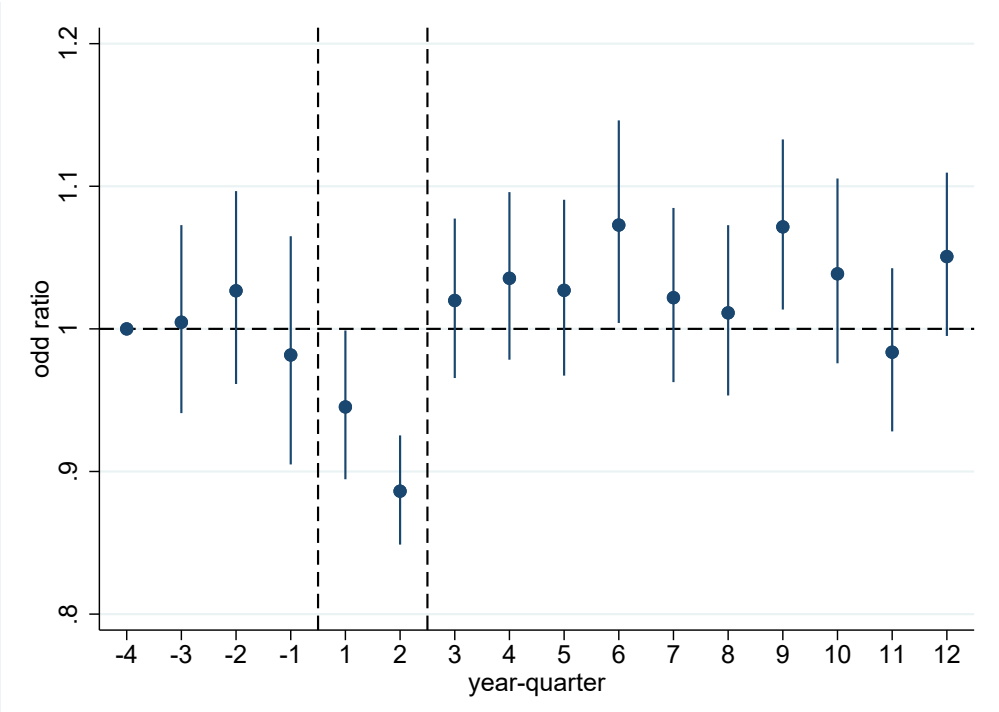


(b) Gender Difference in Missing Repayment by Loan Sanction Year

Figure 7: Missing Repayment during Moratorium Period and Loan Sanction Year
Figure (a) reports the % of loans with missing repayment from January 2019 to December 2020. The red lines represent the female loans. The blue lines represent the male loans. The dashed lines are for the loans sanctioned in the year of 2013. The solid lines are for the loans sanctioned in the year of 2014. The vertical dashed lines indicate the moratorium period. Figure (b) displays the results by estimating regression equation 4 separately for loans sanctioned in 2013 and 2014. The blue points report the estimation for loans sanctioned in 2013. The red points report the the estimation for loans sanctioned in 2014. The estimated coefficients and their corresponding 95% confidence interval are depicted in the figure.

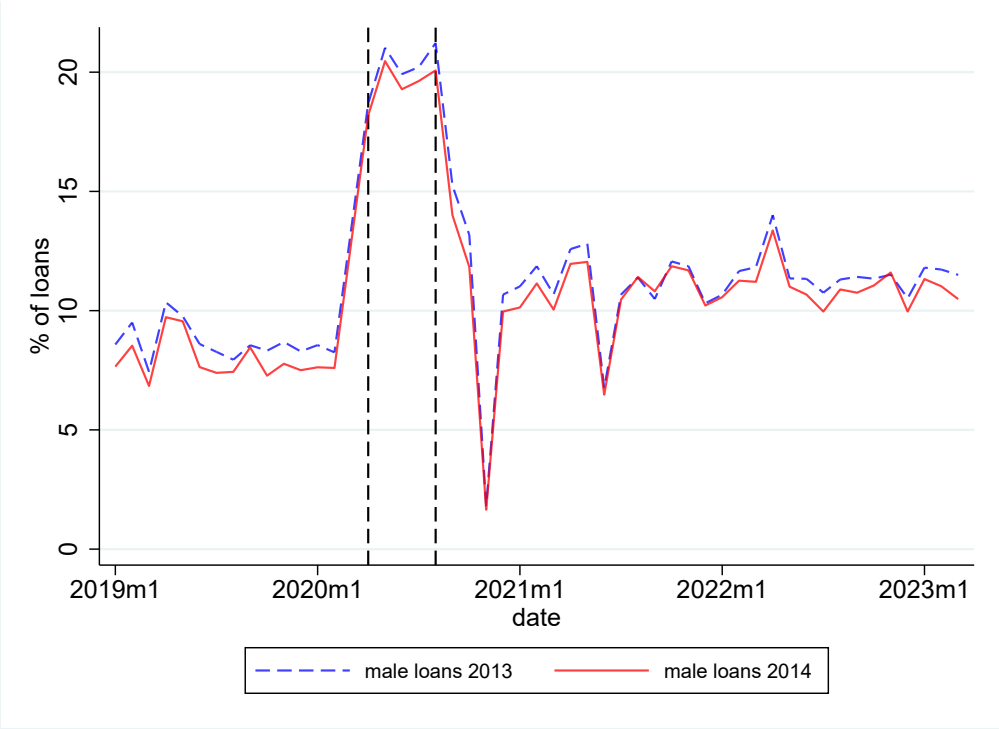


(a) Missing Repayment during Moratorium Period

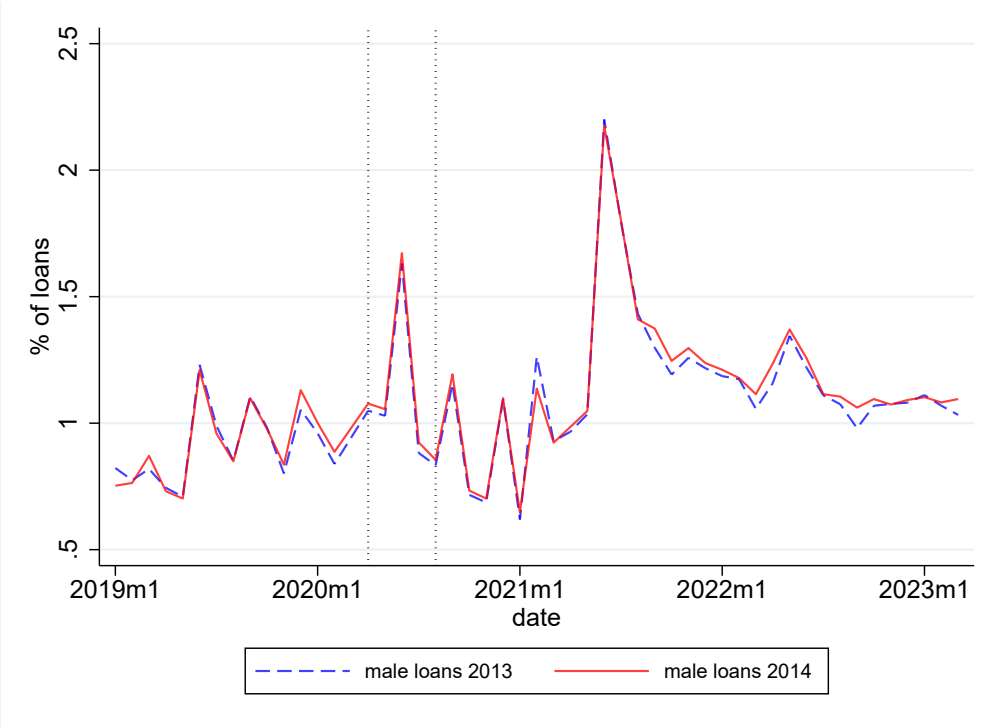


(b) Change in Gender Difference in Missing Repayment

Figure 8: Gender Difference in Missing Repayment among Government Employees
Figure (a) reports the % of loans with zero repayment from January 2019 to March 2023. The two vertical lines indicate the moratorium period starting from April 2020 to August 2020. The results presented are derived from the matched sample. The sample only retained individuals engaged in government-related work. Figure(b) shows the estimated coefficients and their 95% confidence interval from regression equation 4

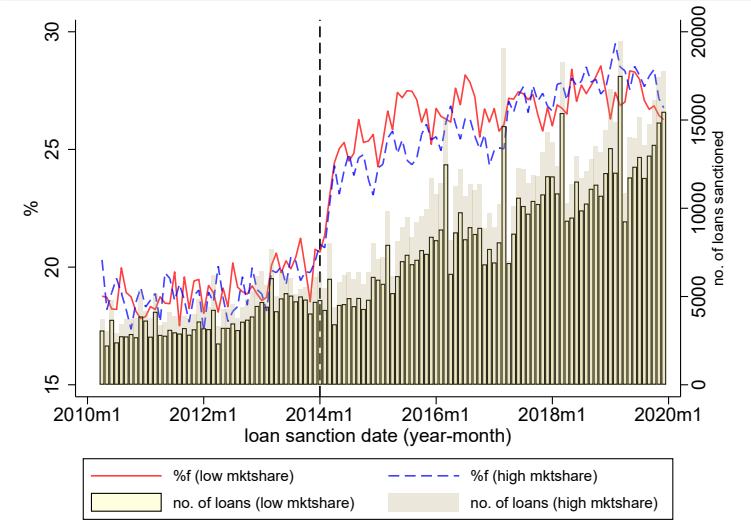


(a) % of Missing Repayment of Male Loans

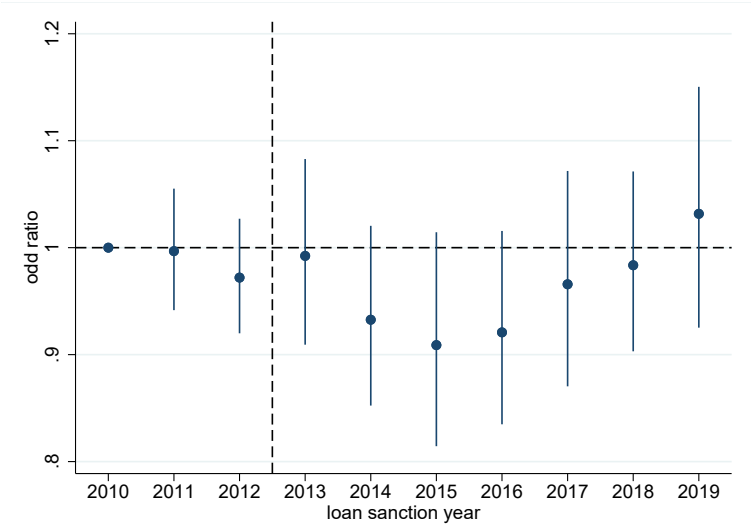


(b) Default Rate of Male Loans

Figure 9: Change in Composition of Male Loans
Figure (a) shows the monthly percentage of male loans with missed repayments from January 2019 to March 2023, for loans originated in 2013 and 2014, separately. Figure (b) shows the monthly loans default rate for male loans originated in 2013 and 2014 respectively.



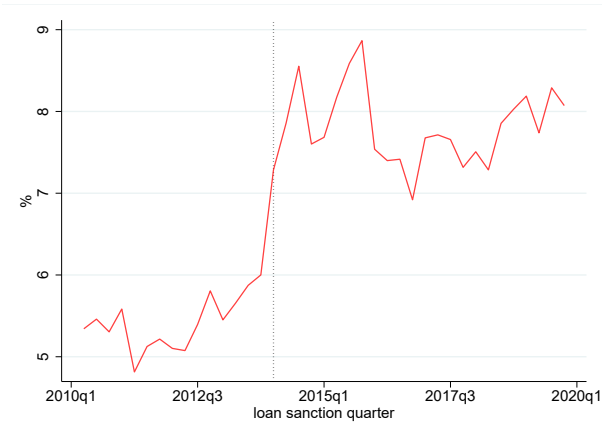
(a) % of female loans by SBI market share



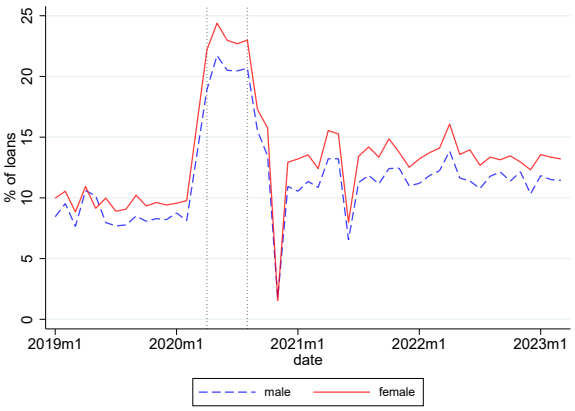
(b) change of % of female loans by SBI market share

Figure 10: SBI Market Share and Proportion of Female Loans

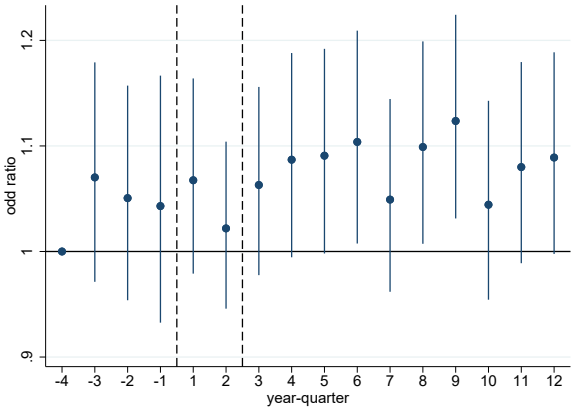
Figure (a) shows the percentage of female loans by the market share of the state bank of India. The red line represents the percentage of female loans in districts where the SBI has a low market share. The blue dotted line shows the percentage of female loans in districts with a high SBI market share. The empty bars depict the monthly number of loans sanctioned in districts with a low SBI market share, while the yellow shaded bars represent the monthly count of loans sanctioned in districts with a high SBI market share. Figure (b) reports the results by estimating regression equitation $Logit(Female_{i,t}) = \gamma_0 + \sum_{t=-3}^{t=6} \gamma_t \times SancYear_t \times MktShare_i + \gamma_7 \times MktShare_i + Controls_i + \epsilon_i t$. The graph reports the estimated coefficients γ_{-3} to γ_6 for the interaction term between loan sanction year dummy and district SBI market share dummy, along with their 95% confidence interval.



(a) % of housewives



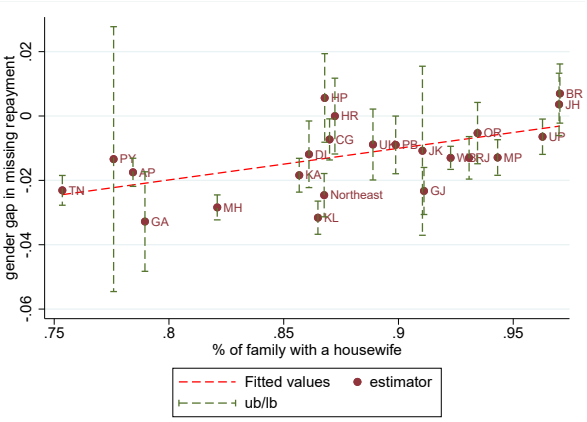
(b) Missing Repayment



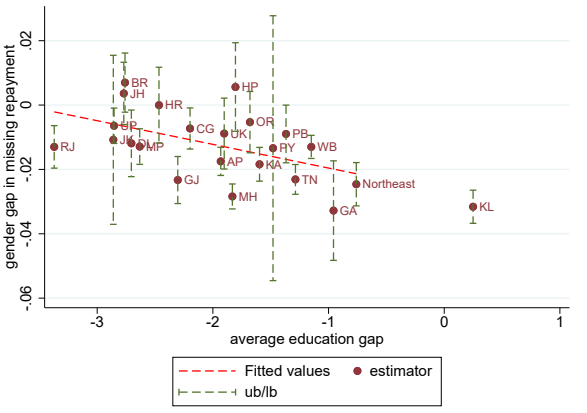
(c) Change in Missing Repayment

Figure 11: Housewives as the Primary Mortgage Borrowers

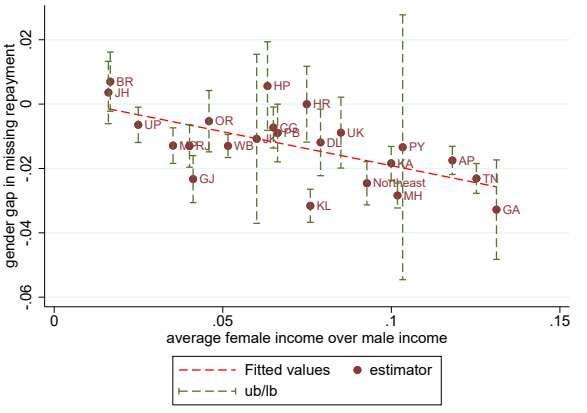
These figures present the results related to housewives as the primary mortgage borrowers. Figure (a) displays the proportion of housewives who are the primary borrowers of loans by quarters when the loans were sanctioned, provided that occupation data is available. Figure (b) shows the % of loans with missing repayment in a month from January 2019 till March 2023 for the housewife primary borrowers and their matched male primary borrowers. The sample includes 6687 male borrowers and 6687 housewife borrowers. The dotted vertical lines indicate the moratorium period. Figure (c) shows the results from estimating regression equation 4 among the housewife primary borrowers and their matched male borrower counterparts. The figure plots the estimated coefficients and their 95% confidence interval.



(a) labor market participation



(b) education gap



(c) income gap

Figure 12: Gender Inequality and Gender Difference in Repayment during Moratorium Period
These figures present the correlation between gender differences in repayment during moratorium period and the gender inequality status across states in India. Figure (a) measures the gender inequality by the percentage of families with a housewife. Figure (b) measures the gender inequality by the average education level difference between husbands and wives within a household. Figure (c) measures the gender inequality by the average wife and husband income ratio. The correlation regression equation also control for other state level demographics including population, GDP per capita, % of female, % of home owners.

Appendix

A.0.1. data cleaning process

Table A.1: Data Cleaning Summary
This table shows the data cleaning process.The first column describes what kind of loans were dropped out of the sample, the second column indicates how many such observations there are, and the third column shows the proportion of these observations.

	Num	**Percent**
Total number of loans	6,222,914	
drop if age is missing	17,109	0.3%
drop if age is more than 70 or age is below 18	27,236	0.4%
drop if gender is missing	9,012	0.1%
drop if loans sanctioned after 2019	595,993	9.6%
drop if interest rate is missing	75,359	1.2%
drop if interest rate is zero	1,518,118	24.4%
drop if interest rate is outliers (<5% or >15%)	660	0.0%
drop if loan tenure is missing	216,856	3.5%
drop if loan tenure is less than 6 months	2,924	0.0%
drop if loan amount is missing	77,031	1.2%
drop if loan amount is less than 1.5 lakh (This primarily pertains to a special loan provided by SBI to local government employees, with a loan amount cap of 1.5 lakh.)	1,139,350	18.3%
drop if loan amount are outliers (less than 1 lakh or more than 100 lakh)	15,066	0.2%
drop if collateral value is missing	288,528	4.6%
drop if collateral is zero	51,430	0.8%
drop if collateral value are outliers (less than 1 lakh or more than 1000 lakh)	900	0.0%
Total number of loans after data cleaning	2,187,342	35.1%

A.0.2. Variable Definition

Table A.2: Description of Variables used in this Study

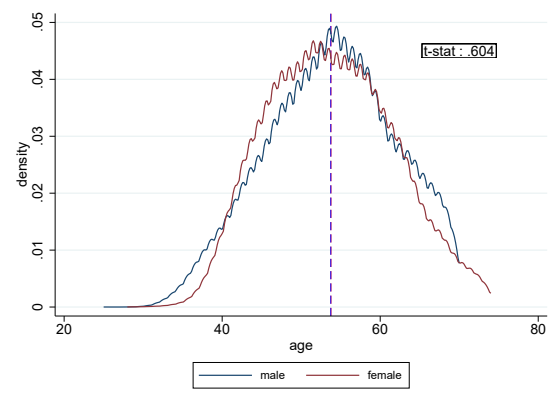
Variable name	Definition
Age	The primary borrower's age at the loan origination date.
Interest Rate	The mortgage loan interest rate at the time of loan origination.
Loan tenure	The mortgage loan tenure in months at the time of loan origination.
Loan amount	The mortgage loan amount at the time of loan origination.
Collateral value	The collateral value of the mortgage loan at the time of the loan origination.
EMI	Equated Monthly Installment (EMI) is computed based on the formula $EMI = \left[\frac{L \times R \times (1+R)^N}{(1+R)^N - 1}\right]$. L stands for the loan amount. R stands for the monthly interest rate which is the initial annual interest rate divided by 12. N stands for the loan tenure
Loan-to-Value ratio	Mortgage loan amount over collateral value at the time of the loan origination.
Delinquent indicator	A binary variable indicating if the loan has any overdue amount in a given month.
Delinquent amount	The cumulative loan amount overdue as of a given month.
Default indicator	A binary variable indicating if the loan has been in default status as of a given month
Default amount	The cumulative loan amount overdue after the loan becomes in default status as of a given month.
Repayment amount	The total amount repaid on the mortgage loan in a given month, including both principal and interest payments.

Table A.2 – continued from previous page

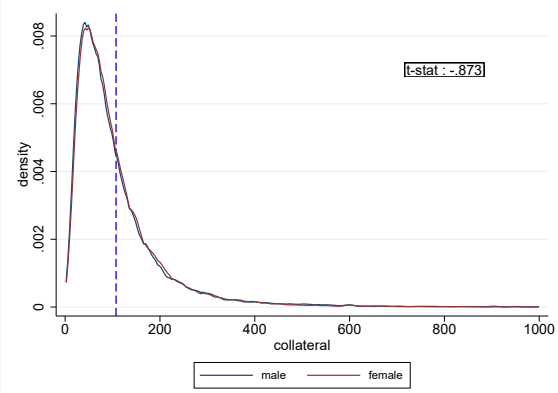
Variable name	Definition
Prepay indicator	A binary variable indicating if the mortgage loan cumulative repayment exceeds the scheduled amount in a given month.
Prepay amount	The cumulative total prepaid amount in a given month.
Prepayment to loan amount ratio	The ratio of prepayment amount to the initial loan amount in a given month.
% of housewife	Proportion of the households where the wife is a homemaker
gender gap in education	If the individual has no education, the education index is 0. The value of the education index is 1 for passing 1st standard. Similarly, the education index is 12 for passing 12th standard. The education index is 13 for completing a diploma or certificate course. The education index is 14 for graduating at the college level, and 15 for obtaining a PhD or MPhil. Within a household, the education gap is the difference between the wife's education index and the husband's education index
gender gap in income	Within a household, the income gap is defined as the wife's total income from all sources divided by the combined total income from all sources of both the husband and wife.
% of female	Percentage of female out of the total population
% of homeowner	Percentage of household owning a residential property.
% of secondary school	Percentage of people who have graduated from a secondary school.

A.0.3. Matching Outcome for the Loans with Repayment Data

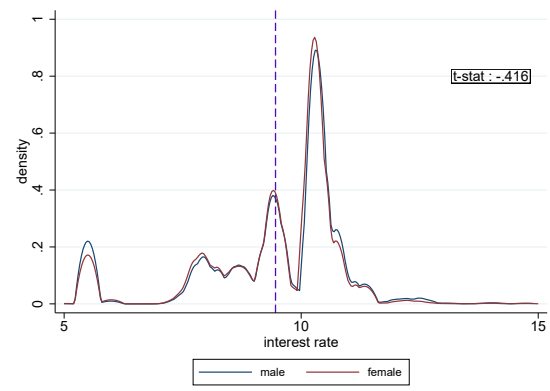
Here we present the outcomes following p-score matching. The matching was conducted among mortgage loans with available repayment data. For all mortgages originated between 2013 and 2014, we performed p-score matching within each quarter based on the borrower's age, loan collateral value, interest rate, loan amount, loan-to-value ratio, and loan tenure. The matching was based on the nearest neighbor method with replacement, ensuring the p-score differences were within 0.05. The matching outcome is presented in the Figure A.1 below. Each graph plots the kernel density distribution of the matched male and female loan sample.



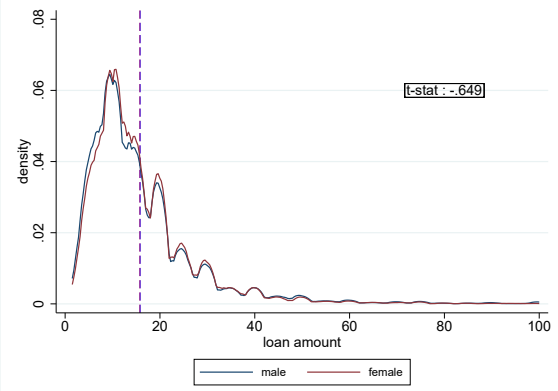
(a) Kdensity Distribution of Borrower's Age



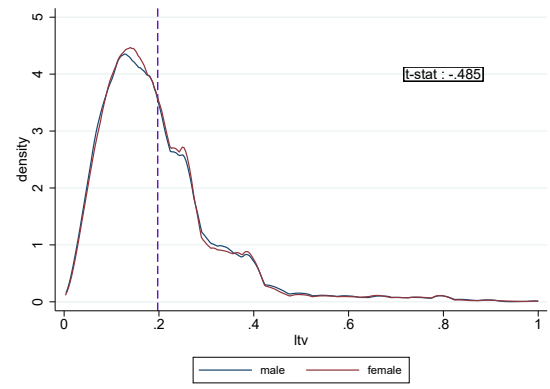
(b) Kdensity Distribution of Collateral Value (lakh)



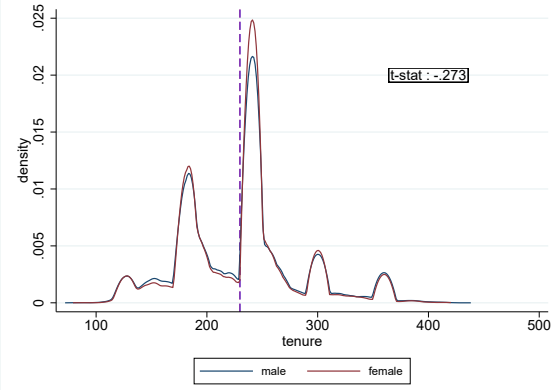
(c) Kdensity Distribution of Interest Rate



(d) Kdensity Distribution of Loan Amount (lakh)



(e) Kdensity Distribution of Loan-to-Value Ratio



(f) Kdensity Distribution of Loan Tenure (month)

Figure A.1: Kernal Density Distribution of Borrower and Loan Characteristics
The graphs plot the kernel density distribution for the borrower and loan characteristics for the matched male and female loans. The graphs compare female loan sample and the male loan sample after the propensity score matching. The dashed vertical lines indicate the mean value of each variable. The t-stats are reported in the box on the right upper corner.

A.0.4. State Name and Abbreviation

Table A.3: State Names and Abbreviations

State Name	State Name Abbreviation
JAMMU & KASHMIR	JK
PUDUCHERRY	PY
UTTARAKHAND	UK
WEST BENGAL	WB
ODISHA	OR
HIMACHAL PRADESH	HP
CHHATTISGARH	CG
RAJASTHAN	RJ
PUNJAB	PB
DELHI	DL
HARYANA	HR
BIHAR	BR
JHARKHAND	JH
TRIPURA	TR
TAMIL NADU	TN
MAHARASHTRA	MH
GUJARAT	GJ
KERALA	KL
ANDHRA PRADESH	AP
TELANGANA	TS
KARNATAKA	KA
UTTAR PRADESH	UP
ARUNACHAL PRADESH	Northeast
MEGALAYA	Northeast
MIZORAM	Northeast
NAGALAND	Northeast
ASSAM	Northeast
SIKKIM	Northeast
MANIPUR	Northeast
MADHYA PRADESH	MP
GOA	GA
DAMAN and DIU	GA