# Financial Inclusion and Monetary Policy Transmission: Evidence from Indian Households*

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**Abstract**

How does financial inclusion shape the transmission of monetary policy in developing countries? We examine this question using a novel, nationally representative monthly panel of Indian households that tracks income and consumption expenditures, combined with administrative data on formal financial access and high-frequency, well-identified estimates of monetary policy surprises. We document strong, statistically significant, and persistent effects of monetary policy shocks on household outcomes at the sub-national level. Regions with greater formal financial inclusion exhibit weaker transmission of monetary policy to household income and consumption in the months immediately following a policy surprise. These results point to an important role for general equilibrium effects in determining the role of formal financial inclusion on monetary policy transmission in developing countries.

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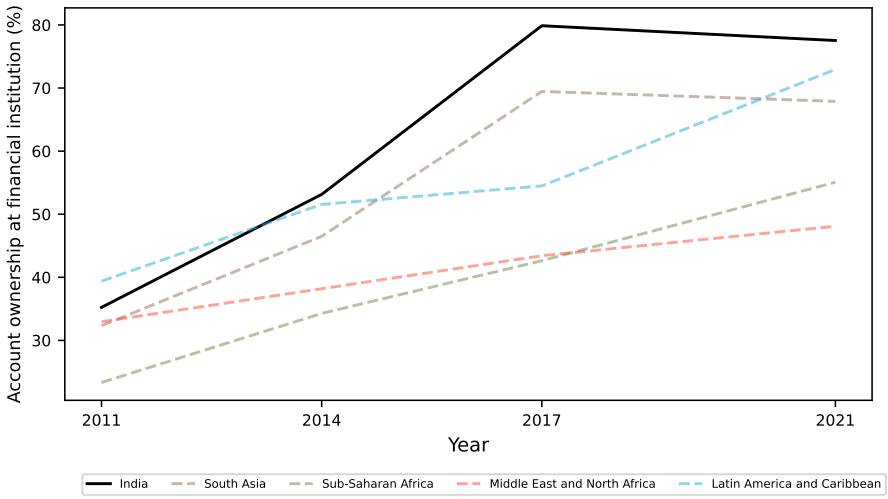



**Figure 1**
Account ownership at a formal financial institution

This figure plots the time-series of the evolution of formal financial access, measured specifically here as the proportion of individuals with access to an account at a formal financial institution, in major developing regions of the world between 2011 and 2021. Source: World Bank Findex Database

# 1 Introduction

The past decade has witnessed a rapid rise in formal financial inclusion across the developing world (Figure 1). Every major developing region has seen substantial growth in the share of adults with access to formal financial services. This expansion has been driven both by government-led efforts to expand financial access to previously excluded populations and by digital technologies that have significantly reduced the cost of delivering financial services. While the effects of financial inclusion on economic growth and development are well documented (Burgess and Pande, 2005; Cramer, 2024; Chander et al., 2024; Fonseca and Matray, 2024; Ji et al., 2023; Agarwal et al., 2023), its implications for macroeconomic policy—particularly monetary policy—remain less well understood. How does financial inclusion shape the transmission of monetary policy? Should central banks in developing countries adjust interest rates more or less aggressively to achieve their stabilization objectives in more financially included environments? We explore these questions in the context of the most rapid expansion of financial inclusion in the world: India.

India is uniquely positioned to shed light on the relationship between financial inclusion and monetary policy transmission. First, it has experienced the most rapid expansion in

formal financial access of any major developing country over the past decade (Figure 1). Between 2011 and 2021, the share of adults with access to a formal financial account rose from 35% to 78%. This expansion was driven largely by a government-led financial inclusion program launched in 2014, which brought nearly 280 million individuals into the formal financial system for the first time (Agarwal et al., 2023). The rollout of India's digital payments infrastructure has further reduced access costs, particularly in underserved regions.

Second, India offers an unusually rich data environment. The Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS) provides high-frequency, nationally representative panel data on monthly household income and consumption. When combined with administrative data on regional financial access, this enables a disaggregated analysis of monetary policy transmission comparable in structure to studies using aggregate macroeconomic data.

Finally, we exploit plausibly exogenous variation in the Reserve Bank of India's (RBI) monetary policy, identified through high-frequency changes in interest rate swap contracts around policy announcements. This identification strategy allows us to measure the effects of monetary policy in regions with different levels of financial inclusion, while addressing concerns of endogeneity and reverse causality.

Combining all these data sources, we first document economically meaningful, persistent and statistically significant effects of monetary policy on household income and consumption at the homogenous region level in India.[1] These effects begin almost immediately after a monetary policy surprise and last for around 12 months. Following a 10 basis points surprise increase in interest rates, the maximum effects on both household income and consumption occur between 4-8 months, leading to peak reductions of 3.3% in consumption and 4.8% in income. The effects of monetary policy at the homogenous region level are substantially stronger than the estimated effects of monetary policy at the aggregate level. While Buda et al. (2025) highlight the value of temporal disaggregation in understanding monetary policy transmission mechanism, we show that spatial disaggregation can also be extremely useful in refining our understanding of monetary policy transmission.

We then show that monetary policy transmission is weaker in regions with more financial inclusion, using a number of different measures of financial inclusion constructed from both the RBI's administrative data as well as from the CPHS data. In particular,

[1]The sub-national units studied in this paper are referred to as homogenous regions. These are groups of contiguous Indian executive or administrative districts that are pooled together by CMIE for purposes of representative sampling based on agro-climatic conditions, urbanization levels, and female literacy rates.

we document that regions with above median levels of financial inclusion observe weaker transmission to household income and consumption expenditure between 1–2% for income and 0.5–1.2% for consumption in response to a 10 basis points surprise interest rate increase respectively. This generally corresponds to between 25-45% percent weaker effects than in regions with below median levels of financial inclusion and are most pronounced in the first few months immediately following a monetary policy surprise. These effects have important implications for the conduct of monetary policy in developing countries witnessing rapid improvements in financial inclusion.

A useful way to interpret these results about the role of financial inclusion for monetary policy transmission is the Two Agent New Keynesian (TANK) model in Bilbiie (2020). In this model, an interest rate increase affects aggregate demand through two distinct channels: (i) an inter-temporal substitution effect which causes financially included, interest-rate sensitive households to cut back on current consumption in response to an interest rate increase and (ii) general equilibrium effects that lead to declines in consumption for both financially included and excluded households due to the initial declines in income driven by the inter-temporal substitution effect.

As the proportion of financially included households in the economy rises, interest rate increases will have stronger inter-temporal substitution effects but weaker general equilibrium effects. Financially included households become more interest-rate sensitive, but at the same time, they also become better positioned to smooth their consumption in response to subsequent declines in their income brought about by the general equilibrium propagation of the monetary policy increase through the economy.

Our empirical results suggest that the general equilibrium effects of an increase in financial inclusion are relatively more important as a determinant of the effects of financial inclusion on monetary policy transmission than the inter-temporal substitution effects. This is also consistent with the findings in the quantitative Heterogenous Agent New Keynesian (HANK) literature (for example, see Kaplan et al. (2018)) that points to the importance of general equilibrium effects relative to inter-temporal substitution effects in accounting for empirical patterns observed in the data.

## 1.1 Contribution to the literature

This paper contributes to three strands of the literature on monetary economics and finance. First, we contribute to the extensive literature studying the effects of financial access on economic outcomes at both the firm and household level, as well as its contributions to aggregate economic growth. These include the pioneering work of Burgess

and Pande (2005) and more recent contributions from Barboni et al. (2021) and Cramer (2024) examining household-level effects, Chander et al. (2024) and Fonseca and Matray (2024) examining firm-level effects and Ji et al. (2023) considering economy-wide general equilibrium effects of expanding financial access. We show that financial access matters not just for economic growth and development, but also for the business cycle. Adding to the evidence from Agarwal et al. (2023) that financial access helps smooth household responses to rainfall shocks, we find that households are also better positioned to smooth the effects of monetary policy shocks with improved financial access. This has important implications for the effectiveness of monetary policy with increasing financial access in developing countries.

Second, we contribute to the literature in macroeconomics quantitatively studying the role of household heterogeneity for monetary policy transmission. These are the Two Agent New Keynesian (TANK) models of Bilbiie (2020) and Bilbiie et al. (2025) as well as more general Heterogeneous Agent New Keynesian (HANK) models as in Kaplan et al. (2018). These papers suggest that the presence of 'hand-to-mouth' or 'wealthy hand-to-mouth' households, a term coined by Kaplan et al. (2014), can be an important source of amplification of monetary policy in macroeconomic models and are essential to quantitatively match the estimated impulse responses of monetary policy in the data. We contribute empirical evidence to this literature, using novel high-frequency panel data, to document that regions which are financially included, which likely have fewer 'hand-to-mouth' households, respond more weakly to monetary policy than less financially included regions.

Finally, this paper also makes a contribution to the literature on monetary policy transmission in developing countries. This literature suggests that the empirical estimates of monetary policy effectiveness in developing countries are quite weak, as discussed in Witheridge (2024) and Mishra and Montiel (2013). Commonly cited reasons for this include poor measurement of macroeconomic and financial conditions in developing countries as suggested by Adam et al. (2016), low statistical power in identified monetary policy shocks used to estimate the causal effects of monetary policy as discussed by Nakamura and Steinsson (2018) and fiscal dominance of monetary policy as pointed out by Witheridge (2024). In this paper, using measures of household income and consumption from survey data, we document effects of monetary policy that are strong and statistically significant in India, particularly when studying monetary policy transmission at the sub-national level. These results suggest that even in settings where statistical power to detect the effects of monetary policy are low, the use of more granular data on outcome variables can still allow us to detect strong, statistically significant effects of monetary

policy. Buda et al. (2025) suggest that temporal disaggregation of macroeconomic data can allow us to detect much stronger effects of monetary policy than previously documented in the literature using lower frequency aggregate macroeconomic data. We show that spatial disaggregation can also serve a similar purpose, particularly in low-powered settings like developing countries.

The rest of the paper is structured as follows. Section 2 documents the data used in this paper, section 3 documents the empirical estimates of monetary policy transmission at the regional level in India and provides a comparison of these estimates against more conventional aggregate time-series estimates of monetary policy transmission in India, section 4 documents the heterogeneity in the transmission of monetary policy surprises to regions with different levels of financial inclusion and interprets our empirical findings. Section 5 provides a brief conclusion and our plans for subsequent work in this paper.

# 2 Data

In this paper, we combine the following three datasets: (i) high-frequency survey data on monthly household consumption and income of a representative sample of Indian households, (ii) administrative data on banking activity from the RBI and (iii) monetary policy surprises of the RBI identified from high-frequency financial market data. The following sections describe each of these datasets in detail, outlining their scope and usefulness to understand our main research question of interest.

## 2.1 CPHS household survey data

In order to understand the transmission of monetary policy to household incomes and consumption at a high frequency, we use the Consumer Pyramids Household Survey (CPHS) conducted by the Centre for Monitoring the Indian Economy (CMIE). The CPHS collects dynamic panel data on household consumption, income, assets and liabilities from a nationally representative sample of households. Households are surveyed every four months and are asked about their income and expenses over the preceding four months as well as their assets and liabilities at the time of the survey. Hence, the survey provides us with information on household income and expenditure at a monthly frequency and information on household balance sheets every four months. There were 174,405 households in the January - April 2020 wave of the survey.

While the survey collects precise quantitative information on the components of household expenditure and sources of household income, it collects minimal information about

**(a)** Consumption

| **Consumption** | **N** | **Mean** | **Std.Dev** | **min** | **25%** | **50%** | **75%** | **max** |
|---|---|---|---|---|---|---|---|---|
| April 2014 | 140692 | 8200.73 | 4941.29 | 526.00 | 5121.00 | 7132.00 | 9780.00 | 397988.00 |
| October 2019 | 147739 | 13407.12 | 7082.03 | 180.00 | 9186.00 | 11940.00 | 15772.00 | 513672.00 |

**(b)** Income

| **Income** | **N** | **Mean** | **Std.Dev** | **min** | **25%** | **50%** | **75%** | **max** |
|---|---|---|---|---|---|---|---|---|
| April 2014 | 139412 | 15444.00 | 26942.21 | 200.00 | 6000.00 | 9100.00 | 16000.00 | 1956000.00 |
| October 2019 | 146621 | 23083.89 | 28688.22 | 50.00 | 10500.00 | 16000.00 | 26000.00 | 865220.00 |

**Table 1**

Summary statistics on consumption and income in the CPHS (April 2014 and October 2019)

the household balance sheet. We only observe extensive margins on sources and uses of borrowing, ownership of specific assets as well intentions about acquiring them in the next four months. There is no information available about the value of household assets and liabilities in this survey, and therefore no intensive margin estimates of financial inclusion is feasible.

The survey commenced data collection in January 2014. We utilize data up to the period before the start of the COVID-19 pandemic and associated lockdowns in March 2020 in our analysis. This provides us with 19 waves of CPHS data, with information on monthly household income and expenditure available for all households for the period between April 2014 and October 2019.[2]

Table 1 presents the summary statistics on consumption expenditure and income in April 2014 and October 2019 which correspond to the start and end periods of the data being used in the analysis. In each of these periods, we observe data for about 140,000 household respondents in this survey. Average monthly household consumption expenditure was ₹8,200 in April 2014, against an average income of ₹15,444. This increased to ₹13,407 and ₹23,083 respectively in October 2019. The consumption share of monthly income is relatively stable at 53.09% in April 2014 – and 58.08% in October 2019 – similar to the Private Final Consumption Expenditure (PFCE) shares of Gross Domestic Product (GDP) of 59.7% in 2013-14 and 60.5% 2019-20 respectively (Ministry of Statistics and Programme Implementation, 2015, 2021).[3]

[2]While information on consumption and income are also available for all households between January and March 2014, we lose this information for many households in the regression analysis that follows, when this data is combined with information on borrowing status in previous waves which does not exist for information pertaining to these months.

[3]It is also possible to calculate per capita consumption expenditure from the CPHS by multiplying the household survey weights [**HH_WGT_MS**] by their respective populations [**SIZE_GROUP**].

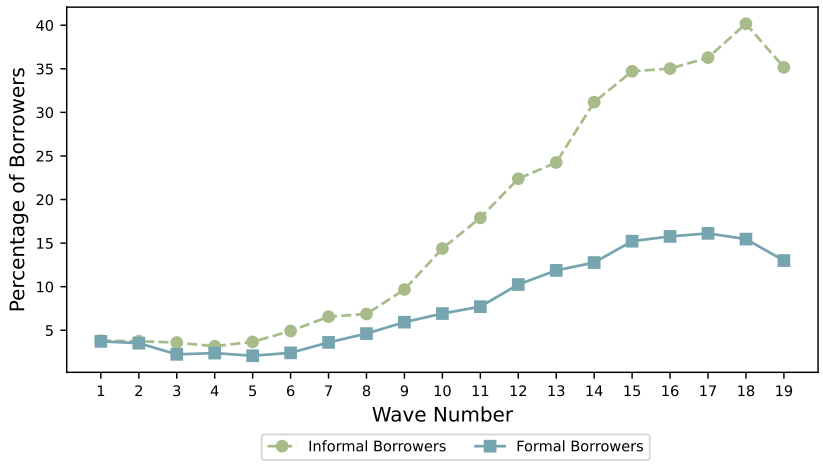
The coefficient of variation of household consumption expenditure was 0.60 in April 2014 and 0.52 in October 2019. In contrast, the coefficient of variation of household income was 1.74 in April 2014 and 1.24 in October 2019. This is consistent with both a more precise measurement of consumption expenditure relative to income in the CPHS as well as a smoother cross-sectional profile of consumption than of income among Indian households. Aggregate household consumption expenditure in the CPHS is computed as the sum of survey responses of consumption expenditure within granular consumption buckets, while aggregate household income is computed as the sum of survey responses of household income from a few broadly defined sources. This is documented in more detail in Vyas (2020c).

The CPHS is designed to ensure a nationally representative sample of households through a multi-stage stratified sampling frame. At the broadest level of stratification, India's 640 districts in the 2011 census are grouped into 102 Homogeneous Regions (HRs). HRs consist of a set of contiguous districts within a state that share similar agro-climatic conditions, urbanization levels, female literacy and size of households. Each HR is further divided into rural and urban sub-strata. The urban region of a HR was further stratified into four strata based on their population of households, because of the high variation in characteristics of towns based on their size. A total of 379 strata were surveyed during the period under study, accounting for 98.5% of the total population of India.[4]

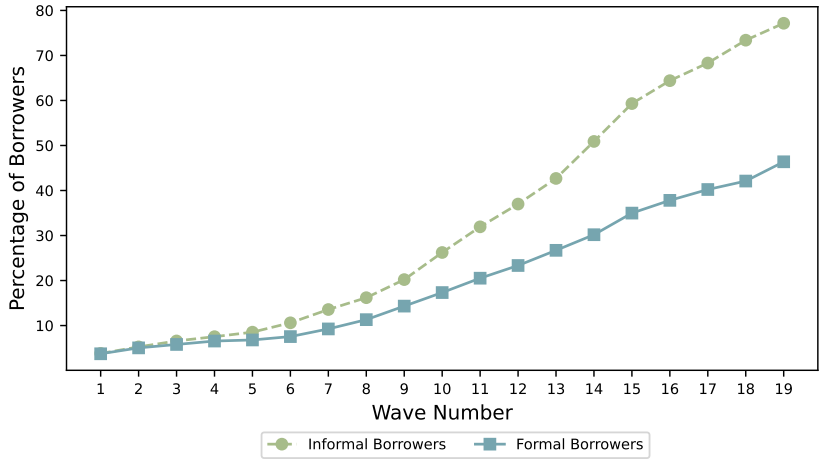
Within each rural stratum of a HR, 25-30 villages were chosen by simple random sampling for the purpose of conducting the survey. In the case of the urban strata, one town was generally selected at random from each size-based urban stratum within the HR and 21 Census Enumeration Blocks (CEBs) were selected through simple random sampling for the purpose of conducting the survey. In each village or CEB, 16 households were selected for the survey. Household selection proceeded by first selecting a random number n between 5 and 15 and selecting every $n^{th}$ household from a village/CEB street for the survey. Household selection always began from the main street of each village/CEB

Assigning a size of 9 members to the '8-10 Members' size group, 13 to the '11-15 Members' size group and 16 to the '> 15 Members' size group yields an annual estimate of per capita household expenditure of ₹22,449 in April 2014 and ₹40,718 in October 2019. These estimates are much lower than the estimated per capita PFCE estimates of ₹54,133 for 2013-14 and ₹91,790 for 2019-20 despite the evidence discussed later in this section which suggests a bias towards wealthier households in the CPHS. A potential explanation for this is the presence of imputed expenditures towards owner-occupied housing and in-kind transfers received from the government and non-profit sectors in the PFCE measures while they are not captured in the CPHS measures of consumption expenditure. An additional explanation is that the CPHS, unlike the national accounts data, fails to capture the far-right tail of the income distribution which lowers the per capita estimates of consumption from the CPHS (Dhingra and Ghatak, 2021).

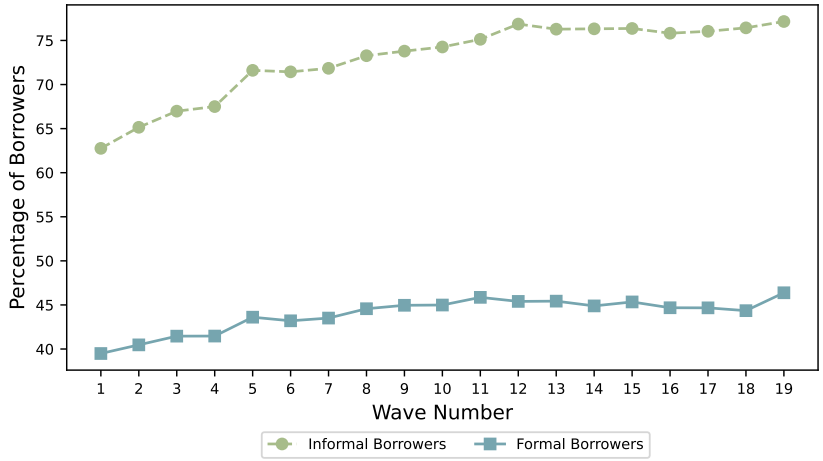
[4]The survey was not conducted in some of the smaller Indian states and union territories considered remote and inaccessible by CMIE.




**(a)** Borrowing in wave




**(b)** Borrowing in the past




**(c)** Borrowing at any point

**Figure 2**
Formal and informal borrowing in the CPHS (January 2014 to April 2020)

and only proceeded to the inner streets if 16 households could not be chosen in the main street. Additional details about the survey design and sample can be found in Vyas (2020b).

We can also construct measures of formal financial inclusion from the CPHS. The Aspirational India module of the CPHS records the source and purpose of outstanding household debt at the time of each survey wave. In particular, we construct measures of the proportion of households in each HR borrowing from formal credit sources. Formal credit sources, in this context, are defined to include: (i) banks, (ii) non-bank financial companies, (iii) self-help groups and microfinance institutions as well as (iv) credit cards. We focus especially on three measures of financial inclusion at the HR-Wave level: (i) proportion of households borrowing from formal sources in each survey wave, (ii) proportion of households who have borrowed from formal sources in the current or any previous survey wave and (iii) proportion of households who have borrowed from formal and informal sources at any point during the time sample under study. It is also possible to derive similar measures of informal borrowing from the CPHS survey data. These include (i) moneylenders, (ii) employers, (iii) relatives and friends, (iv) shops and (v) chitfunds.

Figure 2 plots these measures of financial inclusion at the national level over successive CPHS survey waves for the time period under study. This points to the fact that both formal and informal borrowing has increased in prevalence over time amongst the survey respondents, with informal borrowing remaining more prevalent than formal borrowing despite the large strides in formal financial inclusion visible in the CPHS dataset. Appendix B provides a further break up of the wave-level borrowing estimates from formal and informal sources into their component parts.

How representative is the CPHS dataset? There is an extensive literature examining the representativeness of the CPHS as compared to official sample surveys and census data. It has been suggested that the CPHS tends to under-represent more populous regions and over-represent wealthier main streets due to its sampling design, which selects villages and towns at random without giving more populous areas a higher probability of selection into the sample and tends to begin sample selection within the village or town from the main street. Furthermore, the CPHS has been found to over-represent well educated households, under-represent women and completely exclude households at the tails of the income distribution who are either extremely poor or extremely affluent (Somanchi, 2021; Dhingra and Ghatak, 2021).

However, the occupational structure of households in the CPHS appears to be broadly representative compared to estimates from official sample surveys conducted by the Government of India (Pais and Rawal, 2021). Figure 3 presents the occupational distribution

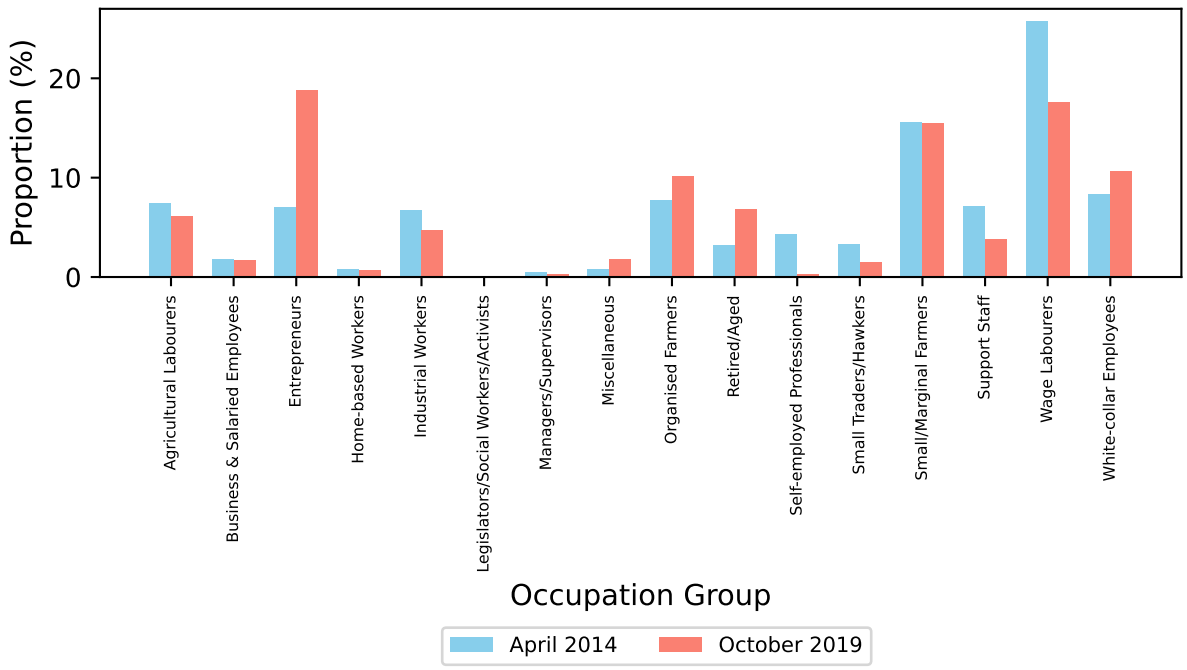



**Figure 3**
Occupational distribution of households in the CPHS (April 2014 and October 2019)

of households in the CPHS in April 2014 and October 2019. Wage labourers, small and marginal farmers and entrepreneurs constitute the largest occupational groups of households in this survey. An important trend in the occupational structure of the surveyed sample is the increase in the relative proportions of wealthier occupational groups at the expense poorer occupational groups. There is a marked increase in the proportion of surveyed entrepreneurs, organised farmers and white-collar employees and fewer wage labourers, agricultural labourers and industrial workers. Selective attrition of poorer households from the CPHS sample has been pointed out as a reason for these trends, by comparing estimates from the CPHS sample with lower frequency survey data collected in official surveys (Somanchi, 2021). One potential reason for selective attrition in the survey is due to CMIE's policy of only choosing to replace entire villages or CEBs due to low rates of response rather than to replace non-responding households within the same village or CEB as outlined in Vyas (2020a). Additional information about rates of attrition and response rates in the CPHS can be found in Appendix A.

Despite the biases towards richer households in the CPHS noted above, it has the advantage of being nationally representative and has the unique feature of providing information on household consumption expenditure and income at a monthly frequency. This ensures that there is sufficiently representative variation in consumption and income

between HRs with different levels of financial access to enable the study of the effects of financial inclusion on monetary policy transmission. The high-frequency nature of the CPHS dataset has meant that it has been utilized extensively in studies of high frequency changes in output, employment and inflation in India. Notable examples of the use of CPHS data include the study of the Indian demonetization episode by Chodorow-Reich et al. (2020) and the study of the pass-through of global price shocks to Indian consumers by Bhattarai et al. (2025).

## 2.2 Banking data

We combine the high-frequency household survey data from the CPHS outlined above with administrative data on banking activity at the district level, available at a quarterly frequency from the Reserve Bank of India (RBI). The RBI's publication, *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*, provides quarterly data on commercial bank branches, deposits and credit at the district-level, covering the universe of banking activity in India.[5]

We merge this quarterly banking dataset at the district level to 2011 Census district boundaries to ensure consistency and comparability with the groupings of districts into HRs used by the CPHS. Next, to ensure compatibility with the CPHS dataset, we aggregate the district-level banking dataset to the HR-level, using the HR-District mappings available in Vyas (2020b). There were a few instances where new districts were formed post-2011 from parent districts belonging to different HRs. In these instances, we aggregated these HRs themselves to form a single, larger HR for use in the empirical analysis.[6] We also merged district-level population data, aggregated to the HR-level, from the 2011 Census with the banking dataset in order to construct per capita measures of formal banking activity at the HR-level.[7]

We construct the following measures of financial inclusion at the HR-Quarter level

[5]Statement No. 4 and Statement No. 4A from the *Quarterly Statistics* contain the district-level data on banking activity. This data was downloaded from the RBI's Database on the Indian Economy (DBIE) which can be accessed online at https://data.rbi.org.in/ and was accessed in October 2022. The *Quarterly Statistics* publication was replaced in 2023 with the publication titled *Spatial Distribution of Deposits and Credit (Quarterly)*. With a subsequent update to the structure of the website, the *Quarterly Statistics* data tables for the period before 2017 is no longer accessible on the DBIE portal. We are happy to share the historical time series of *Quarterly Statistics* going back to 2004 on request.

[6]More specifically, HR 67, HR 68 and HR 69 in Telangana (erstwhile Andhra Pradesh) were combined into a single HR 201, HR 34, HR 35 and HR 37 in Gujarat were combined into a single HR 202 and HR 18 and HR 32 in Uttar Pradesh were combined into a single HR 203. This leaves a total of 97 unique HRs in the CPHS dataset.

[7]Data on district-level population for Indian districts was obtained from the 2011 Census, available for download here: https://censusindia.gov.in/census.website/data/population-finder.

using this dataset:

$$\overline{\text{APPBO}}_{i,t} = \frac{\text{Population in 2011 Census}}{\text{Number of Bank Branches}_{i,t}}$$

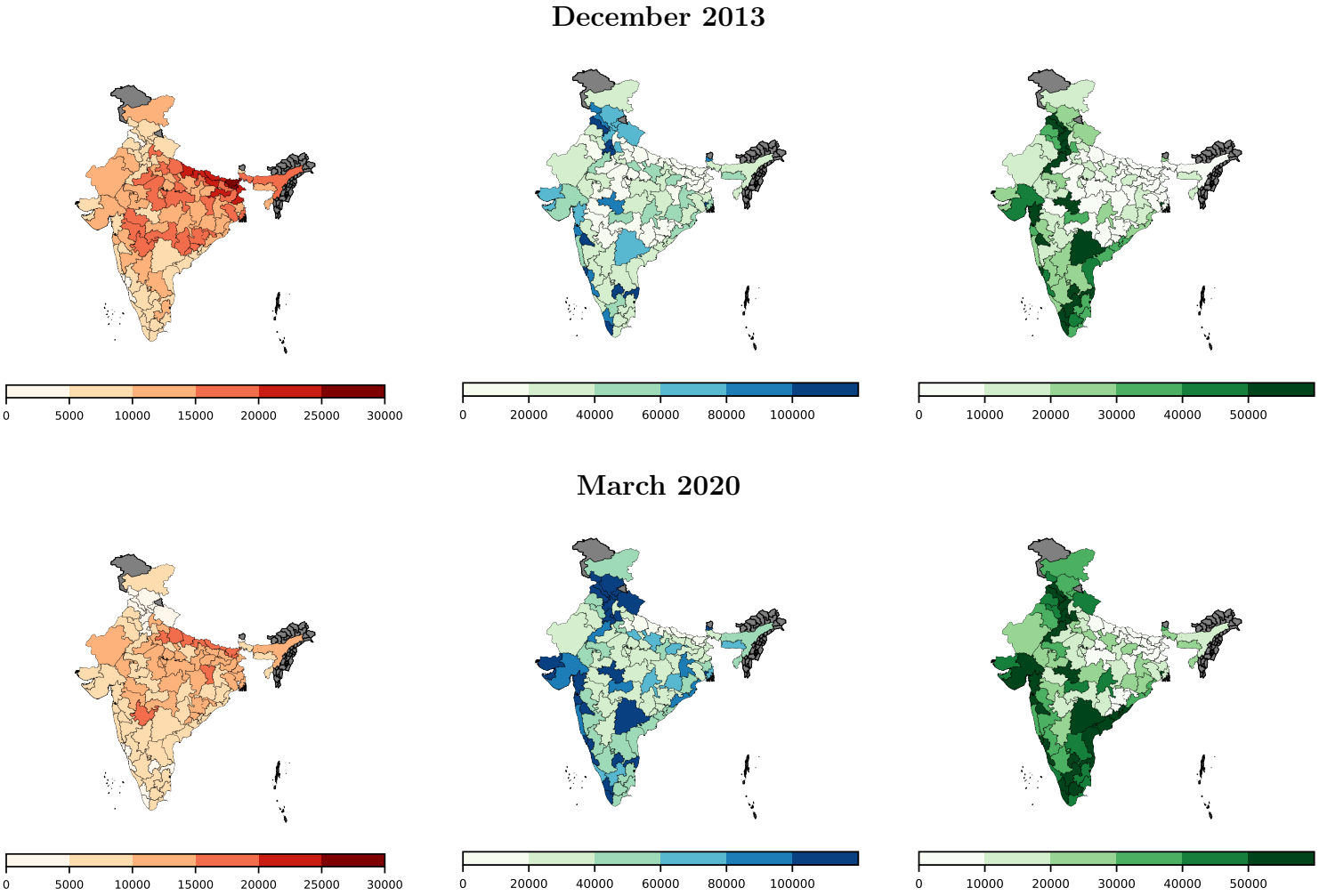
$$\overline{\text{Deposits}}_{i,t} = \frac{\text{Total Deposits Outstanding}_{i,t}}{\text{Population in 2011 Census}}$$

$$\overline{\text{Credit}}_{i,t} = \frac{\text{Total Credit Outstanding}_{i,t}}{\text{Population in 2011 Census}}$$

where $\overline{\text{APPBO}}_{i,t}$, $\overline{\text{Deposits}}_{i,t}$ and $\overline{\text{Credit}}_{i,t}$ refer to Average Population Per Branch Office (APPBO), Deposits Per Capita and Credit Per Capita in HR $i$ during quarter $t$ respectively.

Figure 4 maps these measures of formal financial inclusion in different CPHS HRs in December 2013 and March 2020, corresponding roughly to the start and end of the monthly time series of consumption and income being used in the analysis. There are two striking patterns in the geographic distribution of financial access and its evolution over time.

Firstly, there has been a visible improvement in measures of financial inclusion throughout the country in the period between December 2013 and March 2020. This has been aided by both government policy aimed at improving financial access as well as due to the emergence of digital technologies which have lowered the costs of financial access. A large-scale, financial inclusion program launched by the Government of India in 2014, resulted in almost 280 million individuals, who previously did not have a bank account, obtaining access to a savings bank account through a debit card and mobile banking services. A detailed description of this program and its roll out can be found in Agarwal et al. (2023). The development of a Digital Payments Infrastructure (DPI) in India, beginning in 2016, built on top of this increase in bank account access, helped to further lower the costs of regularly accessing financial services, particularly in regions where physical bank branches were difficult to access. The demonetization of large denomination currency notes in 2016, as shown in Chodorow-Reich et al. (2020), also helped to speed up the process of digital adoption of financial services. As Agarwal et al. (2023) note, these improvements in financial access allowed a larger number of households than ever before to use financial services to smooth their consumption in response to seasonal and aggregate shocks to their income.



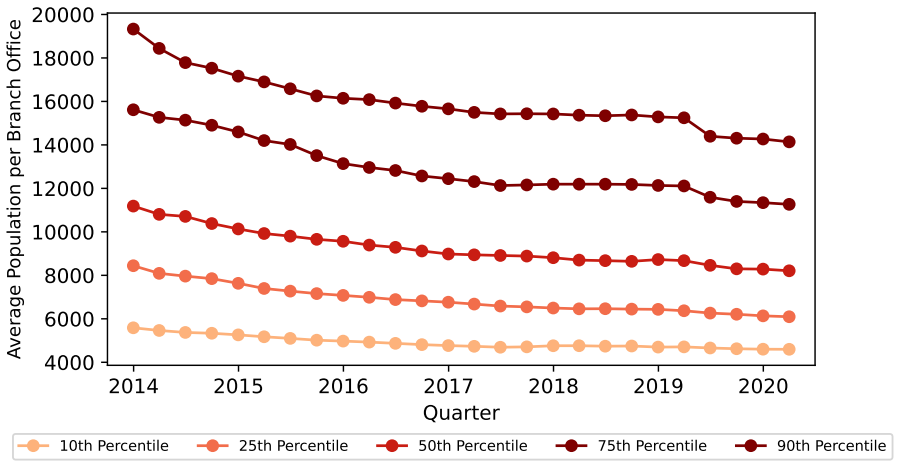

**(a) APPBO** **(b) Deposits per capita** **(c) Credit per capita**

**Figure 4**
Measures of formal financial inclusion in India (December 2013 and March 2020)

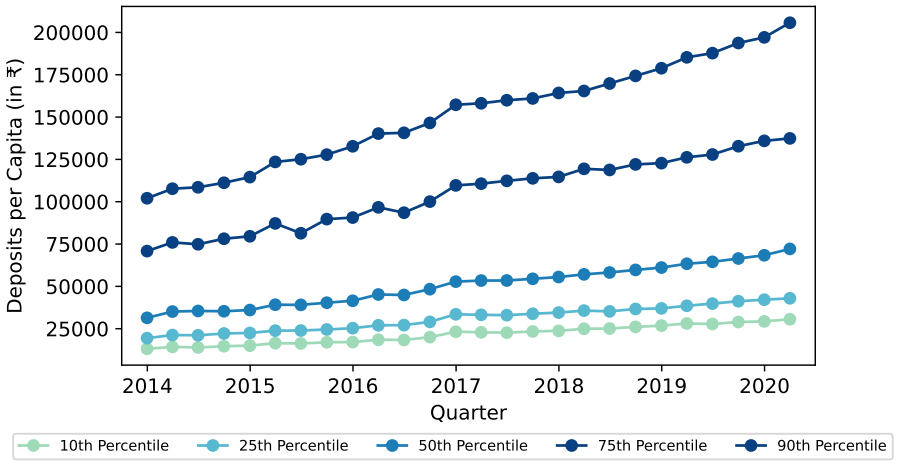
Despite these improvements in financial access in India, important geographic differences in financial access continue to persist. In particular, southern and western peninsular India continues to enjoy significantly greater financial access than the landlocked northern and eastern regions of the country. This geographic distribution of financial access has also been quite persistent, with similar patterns of financial access observable also at the start of an earlier push towards financial inclusion undertaken by the RBI in 2005, as documented in Cramer (2024). This is evident in Figure 5 where we plot the time series of different percentiles of the formal financial inclusion distribution in CPHS Homogeneous Regions. Average population per branch office for the median HR has steadily declined during the time period under study, accompanied by a steady increase in deposits and credit per capita in the median HR. These improvements in financial access are also visible throughout the formal financial inclusion distribution. However, there has been no sign of convergence in terms of financial access metrics across different CPHS Homogeneous Regions, with large gaps in financial access still persisting at the end of our sample period.

The patterns of financial access in the RBI data are also visible in the CPHS survey data. Figure 6 compares APPBO with the proportion of households borrowing from formal and informal credit sources at the HR-Quarter level in panels (a) and (b) respectively. The proportion of households in the CPHS borrowing from formal credit sources is significantly higher in HRs with more formal banking access, as proxied by a lower APPBO, than in HRs with less formal banking access. This serves as a useful validation of both the CPHS and RBI administrative datasets since they provide a fairly consistent picture of formal financial access in India.

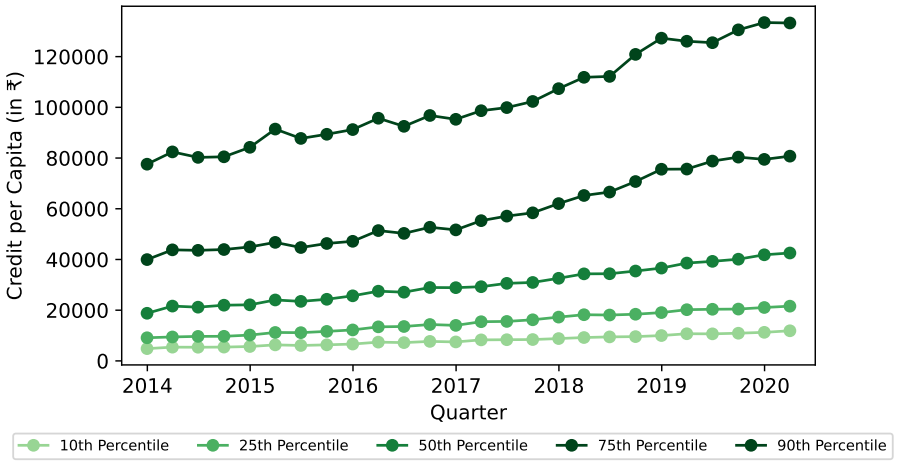
Figure 6 also shows that the proportion of households borrowing from informal credit sources are also greater in HRs with more formal financial access. This suggests that informal sources of credit appear to be *complements* rather than *substitutes* for formal access to credit. These results are consistent with micro-econometric evidence from Surendra (2025), which also documents the complementarities between formal and informal credit sources, with informal credit supply increasing in regions with increasing bank credit supply. Furthermore, these results also shed light on the effects of formal financial development on informal credit markets, an issue discussed at length in the context of Thailand by Sripakdeevong and Townsend (2022). In line with the findings in Thailand, in India too, access to formal credit sources complement access to informal sources of credit. However, we do not have the granularity in the data to verify or address the point raised by Sripakdeevong and Townsend (2022) and Ru and Townsend (2022), that while formal financial access may complement informal credit sources for well networked individuals, they may exacerbate financial exclusion for poorly networked households.




**(a)** APPBO

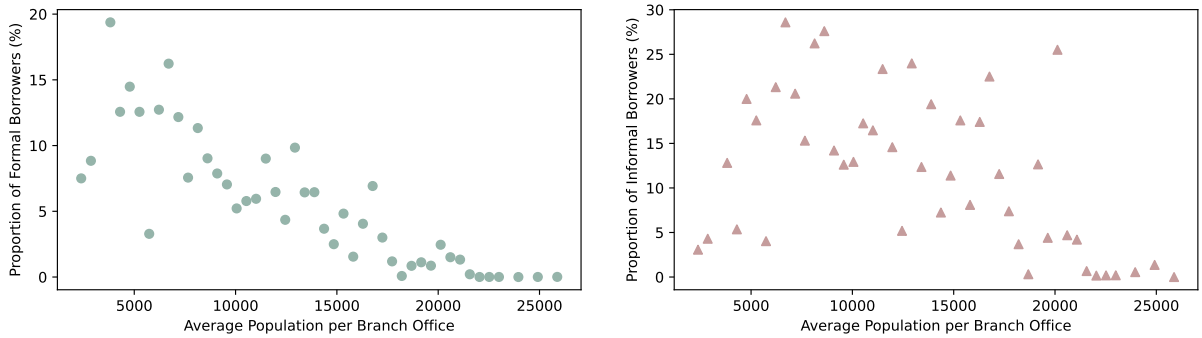



**(b)** Deposits per capita




**(c)** Credit per capita

**Figure 5**
Time series of measures of formal financial inclusion in India (December 2013 to March 2020)




**(a)** Borrowing from formal sources **(b)** Borrowing from informal sources

**Figure 6**
Comparison of financial inclusion measures from RBI and CPHS (January 2014 to April 2020)

These results stand in contrast to the findings in Agarwal et al. (2023), which document that regions that witnessed greater formal financial inclusion following the Indian government's 2014 financial inclusion policy, actually see a larger decline in informal borrowing by households in the CPHS. The principal reason for this discrepancy is likely due to our differing definitions of what counts as an informal source of credit. As shown in Appendix B, credit offered by shops is an important and growing source of informal credit for Indian households. However, this is not explicitly counted as an informal source of lending by Agarwal et al. (2023).

## 2.3 Estimating monetary policy surprises for India

A key challenge in identifying the causal effects of monetary policy on economic activity lies in the endogeneity of changes in monetary policy to macroeconomic conditions. An extensive literature, summarized in Ramey (2016), examines the various approaches utilized by macroeconomists to identify plausibly exogenous variation in monetary policy which can be used to assess the causal effects of monetary policy actions undertaken by the central bank.

A leading approach to identifying plausibly exogenous variation in monetary policy, pioneered by Kuttner (2001) with further development by Gürkaynak et al. (2005) and Nakamura and Steinsson (2018), uses high-frequency changes in forward-looking derivatives contracts linked to the central bank policy interest rate in narrow time windows around key monetary policy announcements of the central bank to identify changes in monetary policy that were unanticipated by financial market participants, and hence not priced in to these derivatives contracts. These monetary policy surprises are then used to identify the causal effects of monetary policy, under a set of identifying assumptions.

| MIBOR-OIS Contract | **N** | **Mean** | **Std.Dev** | **min** | **25%** | **50%** | **75%** | **max** |
|---|---|---|---|---|---|---|---|---|
| 1-month | 41 | 0.081 | 0.115 | -0.310 | -0.035 | 0.005 | 0.075 | 0.280 |
| 3-month | 41 | 0.084 | 0.119 | -0.300 | -0.060 | 0.000 | 0.080 | 0.275 |
| 1-year | 41 | 0.097 | 0.123 | -0.267 | -0.060 | 0.025 | 0.080 | 0.235 |

**Table 2**

Summary statistics of MIBOR-OIS monetary policy surprises, April 2013 to October 2019

In the Indian context, the use of the high-frequency identification approach to identify monetary policy surprises was initially constructed by Lakdawala and Sengupta (2025) and was further refined by Narayan (2025). The derivative contract that is typically used to identify monetary policy surprises in India is the Overnight Indexed Swap (OIS) contract linked to the Mumbai Interbank Outright Rate (MIBOR) of various different maturities. MIBOR-OIS contacts have a market determined fixed leg and a floating leg tied to MIBOR, which is the Reserve Bank of India (RBI)'s operating target for its monetary policy. These swap contracts are typically utilised by banks and other financial institutions to hedge against their interest rate risks by swapping their fluctuating interest rate income streams for a fixed interest rate income stream. Additional details about the MIBOR-OIS contracts and the identification assumptions required to obtain monetary policy surprises from changes in the fixed rate of MIBOR-OIS contracts can be found in Narayan (2025).

We use MIBOR-OIS based monetary policy surprises based on contracts of 1-month, 3-month and 12-month maturity in the analysis, with a focus on the monetary policy surprises based on the 3-month rate since that captures the average time period between two monetary policy announcements during the time period under consideration. Monetary policy surprises are computed as the two-day change (change from the closing price on the day before the monetary policy announcement to the closing price on the day after the announcement) in the fixed rate of the MIBOR-OIS contracts on scheduled monetary policy announcement dates of the RBI. The necessity to use two-day windows and to restrict focus to scheduled announcement dates for the proper identification of monetary policy surprises in India is discussed in further detail in Narayan (2025).

Between April 2013 and October 2019, there are 41 scheduled announcements of the RBI. The remaining four in the same period were unscheduled announcements by the RBI. The RBI typically had scheduled reviews of monetary policy twice every quarter, once in the middle and once at the end of each quarter between 2011 and 2013. Beginning in 2014 the RBI moved to a bi-monthly schedule of meetings of the Monetary Policy Committee

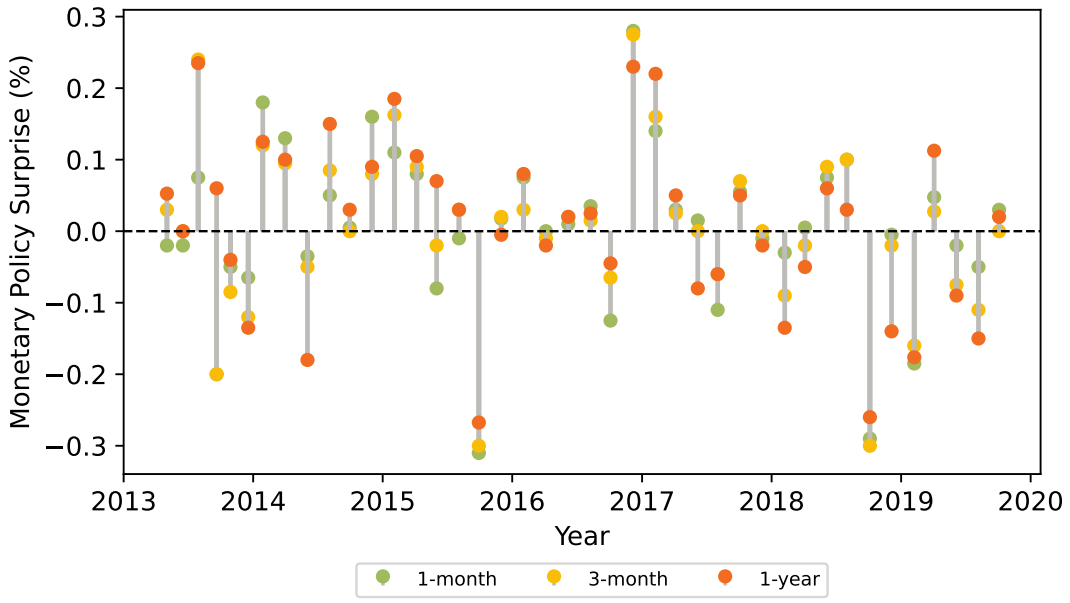



**Figure 7**
Monetary policy surprises from MIBOR-OIS contracts (April 2013 to October 2019)

(MPC) to review and determine the monetary policy stance on the basis of a majority vote. The changes in the fixed leg of the MIBOR-OIS contracts of different maturities on monetary policy announcement dates, shown in Figure 7, captures the unanticipated component of changes in the entire time path of monetary policy up to one-year ahead under the standard identification assumptions laid out in Narayan (2025).

Table 2 presents summary statistics on these monetary policy surprises. The mean absolute change of the monetary policy surprises across different maturities, is around 10 basis points, with a standard deviation of around 12 basis points. The largest individual surprise changes in monetary policy in the sample range from a 31 basis points surprise cut in interest rates to a 28 basis points surprise increase in interest rates. In the analyses that follow, we use these monetary policy surprises as the main source of variation to identify the effects of monetary policy on household-level consumption and income. In order to ensure interpretability of the results and to ensure robustness to non-linearities in estimating the effects of monetary policy, we focus on the effects of a 10 basis points change in monetary policy (approximately a 1 standard deviation change) on outcomes of interest in the survey data. Appendix C provides similar summary statistics on monetary policy surprises during unscheduled announcement dates of the RBI.

# 3 Monetary policy transmission at the aggregate level

## 3.1 Empirical strategy

Before proceeding to examine the role of financial inclusion for monetary policy transmission, we first begin with an examination of monetary policy transmission to household consumption and income in the CPHS data. This serves as a useful initial validation for our CPHS data, banking and monetary policy surprises data, and also allows us to compare and understand transmission to sub-national level aggregates. We first aggregate the household-level CPHS data to the HR level and work with a HR-Month panel dataset. We then merge this dataset with HR-level information on bank branches, deposits and credit outstanding from the RBI. Finally, we merge the monetary policy surprises data from Narayan (2025) with this HR-Month panel dataset in order to study the effects of monetary policy on household consumption and income at the HR level.

In order to understand the dynamic responses of household consumption and income to monetary policy surprises, we estimate a Local Projections (LP) specification, following Jordà (2005), as follows:

$$y_{i,t+h} = \alpha_{i,h} + \beta_h \text{MonSurprise}_t + \Gamma_h' \mathbf{X}_{i,t} + \varepsilon_{i,t+h} \tag{1}$$

for $h = 0, 1, 2, ...., 18$, where $y_{i,t}$ is the outcome variable of interest in HR $i$ in month $t$, $\text{MonSurprise}_t$ is the scheduled monetary policy surprise in month $t$ and $\mathbf{X}_{i,t}$ are a set of control variables added to the specification to improve the precision of the estimated impulse response functions.[8] $\alpha_i$ are HR-level fixed effects. $\{\beta_h\}_{h=0}^{18}$ are the coefficients of interest and trace out an impulse response function of the dynamic causal effects of outcomes of interest to a surprise change in monetary policy.

We control for the following variables in the analysis to improve the precision with which we estimate our impulse response functions of interest: (i) first lag of the dependent variable ($y_{i,t-1}$), (ii) month of the year dummies, (iii) 12 lags of the monetary policy surprises on scheduled announcement dates, (iv) monetary policy surprises on unscheduled announcement dates, (v) 12 lags of the monetary policy surprises on unscheduled announcement dates and (vi) a dummy for the demonetization period (Q4 2016 and Q1 2017).[9] Following Ramey (2016), we estimate the specifications for household income and

[8]Following the standard practice in the literature, monetary policy surprises in month $t$ are calculated as the sum of all monetary policy surprises during that month, if there are multiple monetary policy announcements during any given month, and are set to 0 in months where there was no monetary policy announcement.

[9]The choice of specifying Q4 2016 and Q1 2017 as being the demonetization period is motivated by

consumption in log-levels. We also winsorize the dependent variable at the 5% and 95% levels in the main specification. Furthermore, monetary policy surprises based on the 3-month MIBOR-OIS contract forms the main focus of our analysis in this section. We cluster the standard errors by HR and Month to construct confidence intervals for the impulse response functions. We will focus throughout on the impulse responses to a 10 basis points surprise increase in the fixed rate of the 3-month MIBOR-OIS contract, as this corresponds approximately to a 1 standard deviation monetary policy surprise during this period, as shown in Table 2.

Finally, in order to compare the estimates of the effects of monetary policy surprises at the HR-Month level with more conventional estimates of the effects of monetary policy at the national level using time series data on country-level macroeconomic variables, we also estimate a time series version of Equation 1, to understand monetary policy transmission to country-level monthly income and consumption from the CPHS as well as monthly estimates of industrial production compiled by the government.

## 3.2 Responses of household consumption and income

Figure 8 documents the impulse responses of household income and consumption, at the HR-Month level, to a 10 basis points surprise increase in the 3-month MIBOR-OIS fixed rate. The dynamic responses of both household income and consumption to monetary policy surprises suggest that monetary policy surprises have strong, persistent and almost immediate effects on aggregate demand. The effects on household income and consumption are particularly strong and statistically significant for the first 12 months immediately following a monetary policy surprise.

Following a 10 basis points surprise increase in the 3-month MIBOR-OIS fixed rate, household income and consumption both fall on impact between 1.5-2%. The effects continue to increase in magnitude in the months immediately following the monetary policy surprise, with the maximum effects occurring between 4 and 8 months following the monetary policy surprise. Household consumption falls by a maximum of 3.3% during this period, while household income falls by a larger 4.8%, suggesting that the effects of monetary policy surprises on consumption are likely attenuated relative to the effects on income due to consumption smoothing by households. The effects on both household consumption and income begin to decline between 9 to 12 months following the monetary policy surprise, with no statistically significant effect on either household consumption or

the results in Chodorow-Reich et al. (2020), which shows that the economic effects of demonetization were short-lived and restricted to this time period.

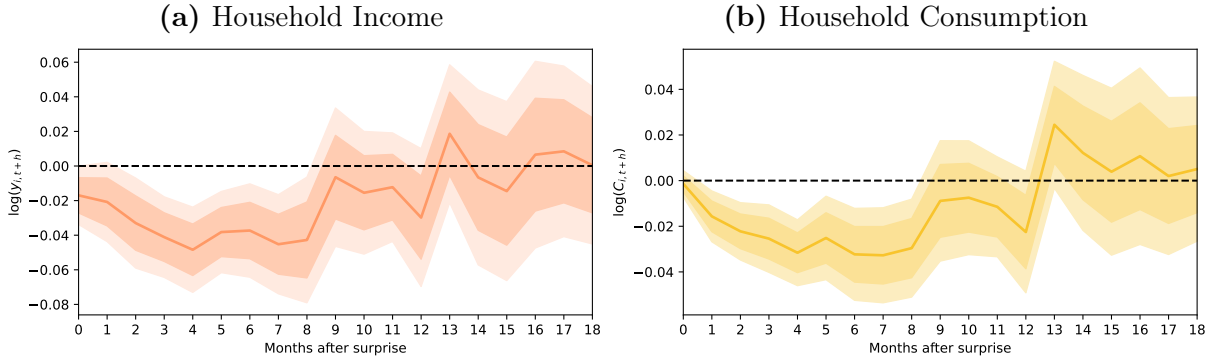



**Figure 8**

Impulse response functions of household income and consumption to monetary surprises

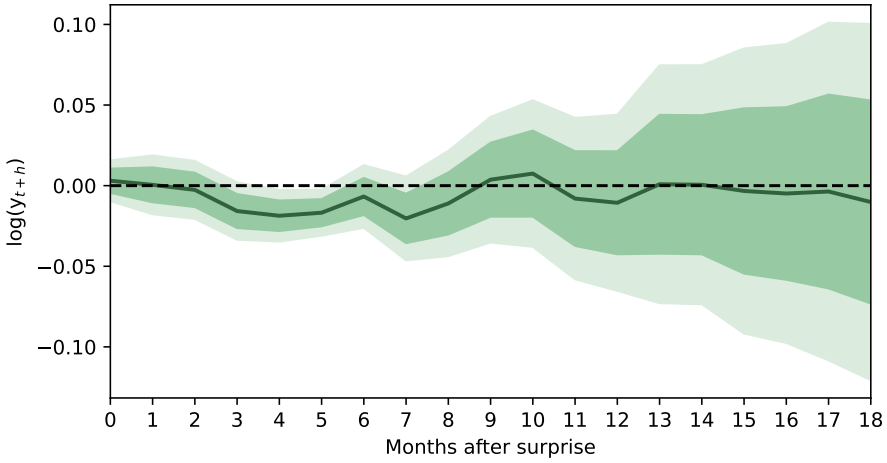
income after 12 months.[10]

The evidence presented here adds to the recent work on monetary policy transmission, particularly by Buda et al. (2025) and Miranda-Agrippino and Ricco (2021), which suggests that the effects of monetary policy are evident almost immediately after a change in interest rates by the central banks, standing in contrast to the standard view that the effects of monetary policy occur with 'long and variable lags' as suggested by Friedman (1961). Monetary policy, even in developing countries, appears to have strong and almost immediate effects on aggregate demand conditions.

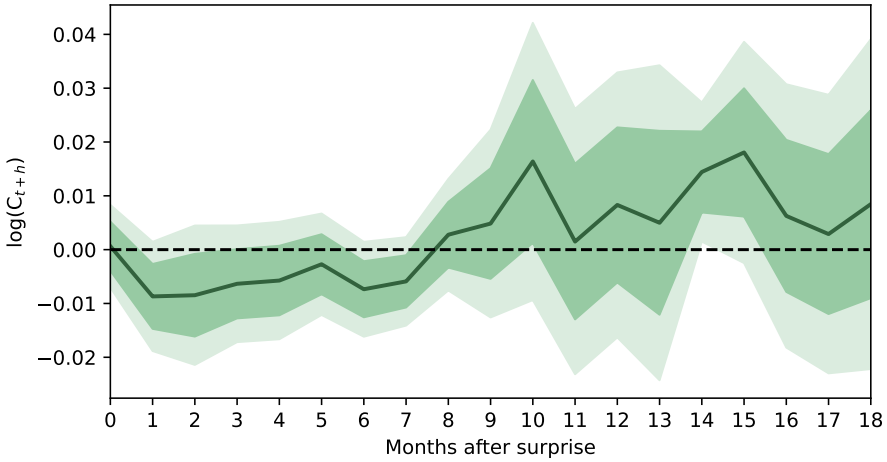
These results are broadly robust to not winsorizing the dependent variables, as shown in Figure E.3, as well as to adjusting the dependent variables for non-response on the part of survey participants, as shown in Figure E.4. These results are also robust to an alternative definition of household consumption expenditure, as shown in Figure E.5, as well as to the use of 1-month or 1-year MIBOR-OIS monetary policy surprises, as documented in Figures E.1 and E.2, with effects being stronger and more persistent with 1-year MIBOR-OIS monetary policy surprises.

Figure 9 considers the responses of aggregate household income and consumption at the national level as well as the response of national industrial production to a 10 basis points surprise increase in the 3-month MIBOR-OIS fixed rate. These results suggest much weaker estimated effects of monetary policy at the aggregate level than the average of the estimated effects of monetary policy at the level of CPHS Homogeneous Regions. While household income and consumption continue to see a decline in response to a surprise monetary policy tightening even at the aggregate level, there are no statis-

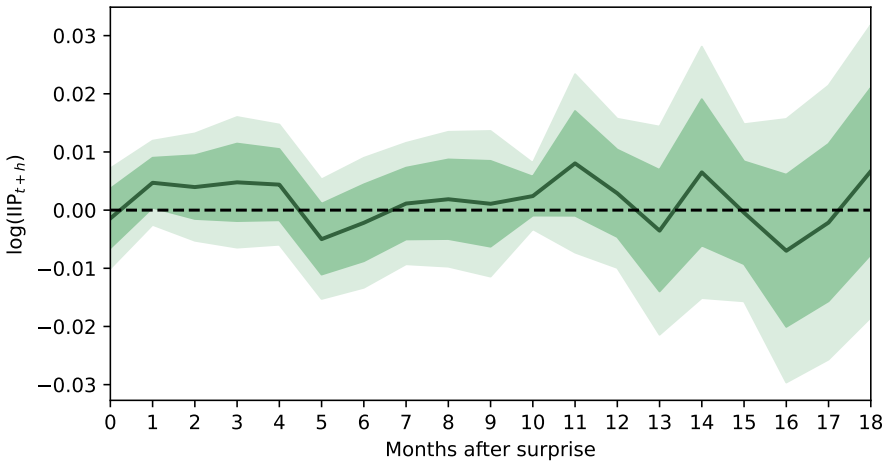
[10]These dynamic effects are in response to monetary policy surprises which tend to persist on average for around 24 months, as shown in Appendix D, suggesting that the effects of monetary policy on financial conditions last longer than their effects on aggregate demand in India.




**(a)** Household Income




**(b)** Household Consumption




**(c)** Industrial Production

**Figure 9**
Impulse response functions of aggregate economic outcomes to monetary surprises

tically significant responses of industrial production at the national level. The response of household income and consumption too are much less than what is observed in Figure 8, with a maximum decline of 1.9%-2% being observed between months 4-7 following the monetary policy surprise and a maximum decline of around 0.9% being observed 1 month following the monetary policy surprise respectively. These results too are broadly robust to not winsorizing the dependent variable (Figure E.8), adjusting the dependent variable for non-response (Figure E.9), alternative definition of household consumption expenditure (Figure E.10), the use of 1-month MIBOR-OIS monetary policy surprises (Figure E.6) and the use of 1-year MIBOR-OIS monetary policy surprises (Figure E.7).

A key challenge in empirically estimating the effects of monetary policy lies in getting sufficiently large, plausibly exogenous variation in monetary policy over a sufficiently long time period. This has been referred to in the literature as the 'power problem' in identifying the causal effects of monetary policy , as discussed by Nakamura and Steinsson (2018). Monetary policy surprises tend to be relatively small, as central banks strive to conduct and communicate monetary policy in a very systematic and predictable fashion. For instance, in our sample of monetary policy surprises, the largest individual monetary policy surprise is no greater than 31 basis points, as documented in Table 2. Furthermore, the lack of statistical power is exacerbated by the short length of monetary policy surprise series due to limited availability of high-frequency financial market and macroeconomic data. These issues are particularly relevant in developing countries and is a potentially important cause of the weak estimated effects of monetary policy in many developing countries, as shown by Adam et al. (2016) and Mishra and Montiel (2013).

The results we have presented in this section using more granular data on income and consumption, however, suggest that it is possible to identify strong average effects of monetary policy on sub-national regions even in the absence of statistical power to precisely identify the aggregate effects of monetary policy in developing countries. Just as how Buda et al. (2025) show that temporal disaggregation can improve our understanding of monetary policy transmission, we document that spatial disaggregation can improve our understanding of the causal effects of monetary policy. Therefore, even while we search for more statistical power to detect the effects of monetary policy at the aggregate level, monetary policy surprises in developing countries can still be very useful to answer novel questions about differences in monetary policy transmission across different sub-national regions, when combined with the appropriate datasets. In the next section, we ask one such question: How do differences in formal financial inclusion affect monetary policy transmission across different CPHS Homogeneous Regions in India?

# 4 Financial inclusion and monetary policy transmission

## 4.1 Empirical strategy

In order to understand the role of formal financial inclusion on monetary policy transmission, we estimate the following panel Local Projections specification:

$$\begin{aligned} y_{i,t+h} = \alpha_{i,h} + \beta_h \, \text{MonSurprise}_t + \delta_h \mathbb{1}\left\{\overline{\text{FinInc}}_{i,t-1} > \overline{\text{FinInc}}_{\text{m},t-1}\right\} \\ + \gamma_h \left[\text{MonSurprise}_t \cdot \mathbb{1}\left\{\overline{\text{FinInc}}_{i,t-1} > \overline{\text{FinInc}}_{\text{m},t-1}\right\}\right] + \Gamma_h' \mathbf{X}_{i,t} + \varepsilon_{i,t+h} \end{aligned} \tag{2}$$

for $h = 0, 1, 2, ...., 12$, where $y_{i,t}$ is the outcome variable of interest in HR $i$ in month $t$, $\text{MonSurprise}_t$ is the scheduled monetary policy surprise in month $t$ and $\mathbf{X}_{i,t}$ are a set of control variables added to the specification to improve the precision of the estimated impulse response functions. Given the short length of our time sample and as we are now augmenting Equation 1 with additional variables, we restrict our focus to the first 12 months following a monetary policy surprise. $\alpha_i$ are HR-level fixed effects. $\mathbb{1}\left\{\overline{\text{FinInc}}_{i,t-1} > \overline{\text{FinInc}}_{\text{m},t-1}\right\}$ is an indicator variable which takes the value of 1 for HRs with above median levels of the financial inclusion indicator at time $t-1$. $\{\gamma_h\}_{h=0}^{12}$ are the coefficients of interest and capture the dynamic effects of monetary policy in regions with above median levels of the financial inclusion variable relative to regions with below median levels of that variable.

We will estimate this specification using both measures of financial inclusion derived from the RBI dataset, namely APPBO, Deposits per capita and Credit per capita, whose construction is discussed in more detail in Section 2.2 as well as measures of financial inclusion derived from the CPHS dataset, namely proportion of people borrowing from formal credit sources during the wave, in the present or any previous wave and at any point in time as discussed in more detail in Section 2.1. Since we do not have data from the RBI or details about borrowing from the CPHS at a monthly frequency, $t-1$ refers to the quarter immediately preceding the quarter to which month $t$ belongs for the RBI dataset and to the survey wave immediately preceding the present survey wave during which data on month $t$ is collected in the CPHS.

As before, we control for the following variables in the analysis to improve the precision with which we estimate our impulse response functions of interest: (i) first lag of the dependent variable ($y_{i,t-1}$), (ii) month of the year dummies, (iii) 12 lags of the monetary policy surprises on scheduled announcement dates, (iv) monetary policy surprises

on unscheduled announcement dates, (v) 12 lags of the monetary policy surprises on unscheduled announcement dates and (vi) a dummy for the demonetization period (Q4 2016 and Q1 2017). Following Ramey (2016), we estimate the specifications for household income and consumption in log-levels. We also winsorize the dependent variable at the 5% and 95% levels in the main specification. Furthermore, monetary policy surprises based on the 3-month MIBOR-OIS contract forms the main focus of our analysis in this section. We cluster the standard errors by HR and Month to construct confidence intervals for the impulse response functions. We will focus throughout on the impulse responses to a 10 basis points surprise increase in the fixed rate of the 3-month MIBOR-OIS contract, as this corresponds approximately to a 1 standard deviation monetary policy surprise during this period, as shown in Table 2.

## 4.2 Responses of household consumption and income

Figure 10 plots the impulse response functions of the interaction term in Equation 2, where the monetary policy surprises are interacted with measures of financial inclusion from the RBI dataset. Regions with above median APPBO witness much stronger transmission of monetary policy surprises to household income than regions with below median APPBO. The effects are particularly strong and statistically significant in the months immediately following a monetary policy surprise, with a maximum effect of 2% occurring two months after the monetary policy surprise. The effects on household consumption are very similar but quantitatively smaller with a maximum effect of 0.7% occurring two months after the monetary policy surprise.

We find economically similar effects in specifications which use deposits or credit per capita instead of APPBO. Regions with above median deposits or credit per capita witness much weaker transmission of monetary policy surprises. Following a 10 basis points surprise monetary policy tightening, regions with above median deposits per capita witness relatively weaker transmission of monetary policy to household income in the months immediately following the monetary policy surprise, with a maximum effect of 1.6% occurring two months following the monetary policy surprise. The responses of household consumption are very similar, with a maximum effect of 1% occurring two months after the monetary policy surprise. The patterns with credit per capita have very similar dynamics but are quantitatively smaller especially for household consumption with the maximum effects for household income being 1.6% while for household consumption it is 0.5%.

The results discussed above are broadly robust to not winsorizing the dependent vari-

able (Figure F.5), adjusting the dependent variable for non-response (Figure F.6), alternative definition of household consumption expenditure (Figure F.1) as well as the use of 1-month (Figure F.3) and 1-year (Figure F.4) MIBOR-OIS monetary policy surprises.

These results suggest that monetary policy transmission in India is much weaker to household income and consumption in regions with more financial inclusion. The dynamic responses of household income and consumption in regions with higher financial inclusion relative to regions with lower financial inclusion are not statistically significant under any of these specifications beyond 5-6 months following the monetary policy surprise, suggesting that the effects of financial inclusion on monetary policy transmission are particularly significant in the months immediately following a monetary policy surprise.

Figure 11 plots the impulse response functions of the interaction term in Equation 2, where the monetary policy surprises are interacted with measures of financial inclusion from the CPHS dataset. Under these alternative definitions of financial inclusion, the dynamic responses of household consumption in regions with above median levels of financial inclusion are very similar to the responses in Figure 10 above, with weaker effects of monetary policy being observed in the months immediately following a monetary policy surprise with maximum effects occurring around 2 months after the monetary policy surprise. The effects on household consumption are quantitatively greater under this specification with maximum effects of between 0.8-1.2%. The dynamic responses of household income in above median financial inclusion regions are slightly different for household income under this alternative specification, with statistically significant weaker effects on financial inclusion lasting 7-8 months with maximum effects of between 0.9%-1.6% occurring with a slightly longer delay after the initial impulse.

These results too are broadly robust to not winsorizing the dependent variable (Figure F.9), adjusting the dependent variable for non-response (Figure F.10), alternative definition of household consumption expenditure (Figure F.2) as well as the use of 1-month (Figure F.7) and 1-year (Figure F.8) MIBOR-OIS monetary policy surprises. We also find broadly similar dynamic responses when measuring financial inclusion using the proportion of people borrowing from informal credit sources, as documented in Figure F.11.

A common feature across the set of six specifications considered above is that regions with more financial inclusion are estimated to have weaker transmission to household income and consumption, particularly in the months immediately following a change in monetary policy by the central bank. How do we contextualize these findings on the role of financial inclusion in monetary policy transmission?

A useful starting point to think about this question more formally is the class of Two

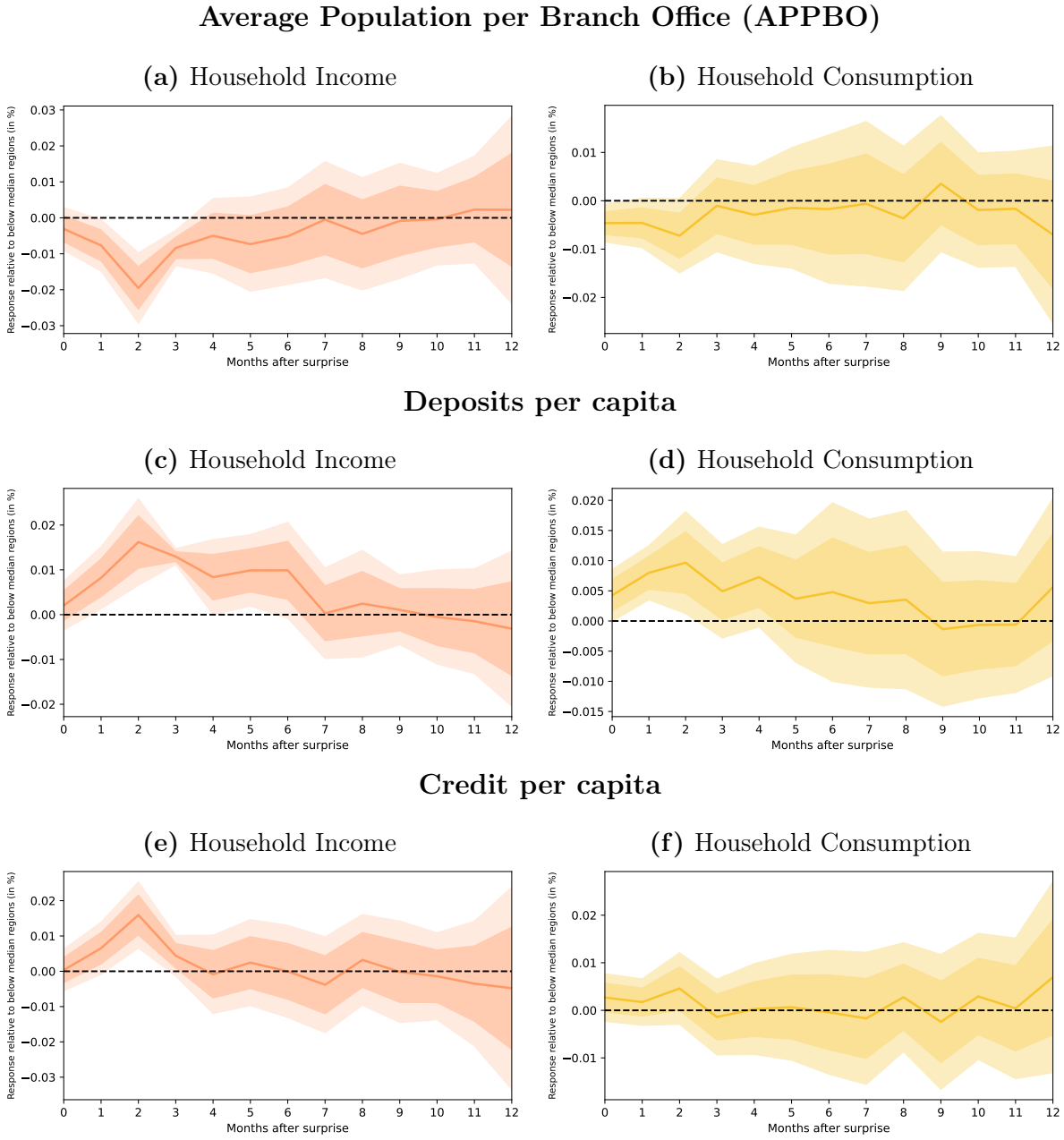



**Figure 10**
Financial inclusion and monetary policy transmission to income and consumption (RBI measures)

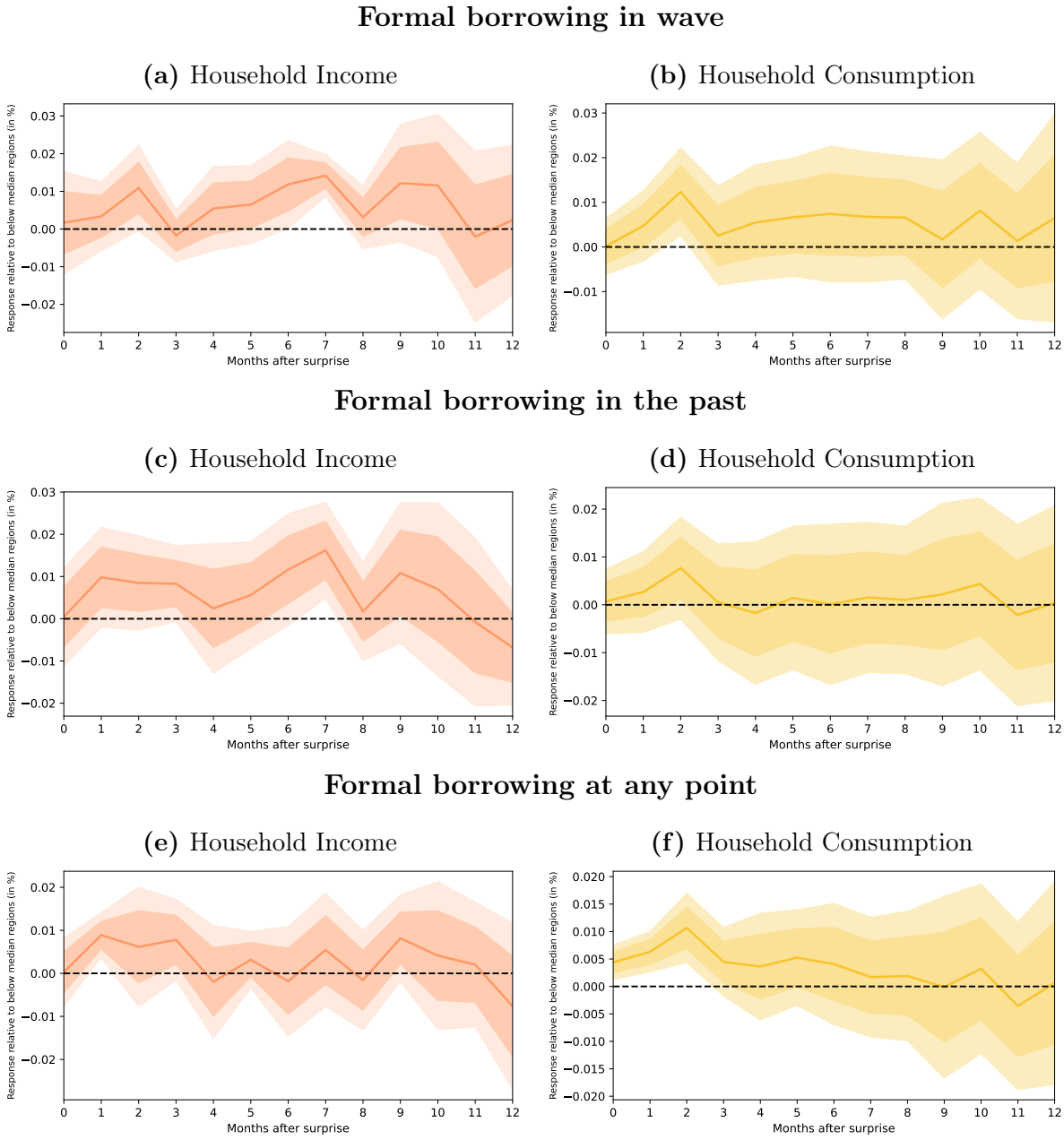



**Figure 11**
Financial inclusion and monetary policy transmission to income and consumption (CPHS measures)

Agent New Keynesian (TANK) models, as discussed in Bilbiie (2020). In these models, there are usually two kinds of economic agents, whom we can label as Ricardian and Keynesian. These agents have identical preferences but differ in terms of their access to financial markets. Ricardian agents have complete access to financial markets, which they can use to smooth their consumption over time. Keynesian agents, on the other hand, are completely shut out from financial markets, preventing them from being able to save or borrow. An implication of this is that Keynesian agents have higher Marginal Propensities to Consume (MPC) out of current income than Ricardian agents, as Keynesian agents are forced to shift their consumption one-for-one in response to shifts in their current income.

In TANK models, a monetary policy tightening has two distinct kinds of effects. When the central bank raises interest rates, the rate of return to saving rises for the Ricardian agents, who cut their consumption today in order to save more to consume in the future. This is the direct or inter-temporal substitution effect. This initial fall in consumption is going to lead to a fall in income for both Ricardian and Keynesian agents. This in turn leads to further declines in income and consumption, this time for both Ricardian and Keynesian agents. These are the indirect or general equilibrium effects of the monetary policy tightening in this class of models.

At a conceptual level, it is possible to think of the process of financial inclusion in an economy as corresponding to an increase in the relative proportion of Ricardian agents in the TANK economy. As Bilbiie (2020) points out, the increase in the proportion of Ricardian agents in the TANK economy strengthens the direct effects while weakening the indirect effects associated with a change in monetary policy.

When there are more Ricardian agents in the economy, a larger share of economic agents inter-temporally substitute consumption in response to interest rate increases, leading to stronger direct effects. However, the general equilibrium effects of the interest rate increase will become relatively weaker as the proportion of Ricardian agents increase. Ricardian agents are better placed to smooth the effects of the initial declines in current income brought about by inter-temporal substitution than Keynesian agents. Hence, the second-round declines in income and consumption will be proportionally smaller in more financially included economies.

The empirical results presented in this section, which suggest weaker monetary policy transmission to aggregate demand in regions with more financial inclusion, are broadly in line with stronger general equilibrium effects than inter-temporal substitution effects with rising financial inclusion in the economy. Bilbiie (2020) suggests that indirect effects are stronger with a rising share of Ricardian households in the TANK economy when the elasticity of income of Keynesian households to aggregate income is greater than 1.

The presence of countercyclical inequality, which is implied by this parameter restriction, seems quite plausible in the Indian context, given the lack of sufficient fiscal redistribution towards poorer households, constrained by a low tax base, and pervasive labour market informality. These results are also consistent with the predictions of more quantitative Hetereogenous Agent New Keynesian (HANK) models which suggest that general equilibrium effects are amplify the effects of monetary policy in the presence of 'hand-to-mouth' and 'wealthy hand-to-mouth' households.

# 5 Conclusion

Combining high-frequency panel data on household income and consumption with administrative data on financial access from the RBI and high-frequency identified monetary policy surprises, we have documented strong and statistically significant effects of monetary policy on household income and consumption at the sub-national level in India. Monetary policy has statistically significant, economically meaningful and persistent effects on household consumption and income at the level of CPHS Homogeneous Regions (groups of contiguous Indian districts).

We then documented that the effects of monetary policy at the Homogeneous Region level are substantially stronger than the estimated effects of monetary policy at the aggregate level. These results suggest that the use of granular sub-national level data can help us detect strong effects of monetary policy at the regional level even if the estimated aggregate effects of monetary policy are much weaker.

Finally, we have shown that monetary policy transmission is weaker in regions with more financial inclusion, using a number of different measures of financial inclusion constructed from both the RBI's administrative data as well as from the CPHS data. These effects are particularly important in the first few months immediately following a monetary policy surprise and have important implications for monetary policy in developing countries witnessing rapid improvements in financial inclusion.

At this stage, it is useful to note that an important limitation of the present analysis is that it does not utilize any exogenous variation in financial inclusion across different Indian regions while pointing to heterogeneity in the strength of monetary policy transmission in these regions. In ongoing work, we are also attempting to find a potential source of exogenous variation across different Indian regions to examine the robustness of our findings to utilizing this variation. Furthermore, we are working to quantify the direct and indirect effects of financial inclusion on monetary policy transmission with a quantitative version of the TANK economy sketched out above.

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# Financial Inclusion and Monetary Policy

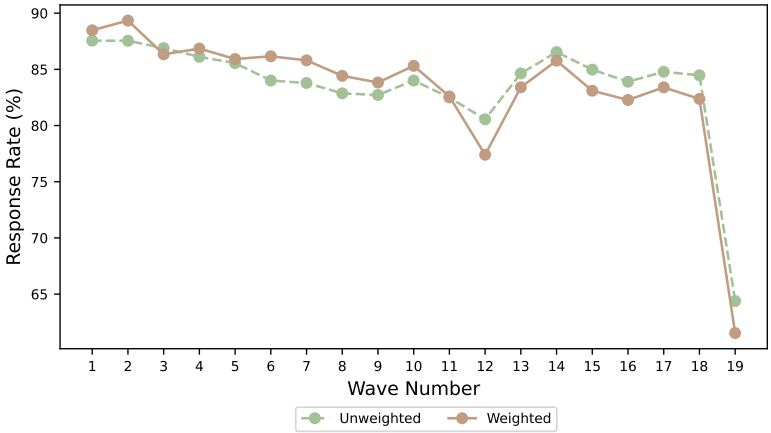
## Online Appendix

Vimal Balasubramaniam Karthik Narayan A.S.

June 25, 2025

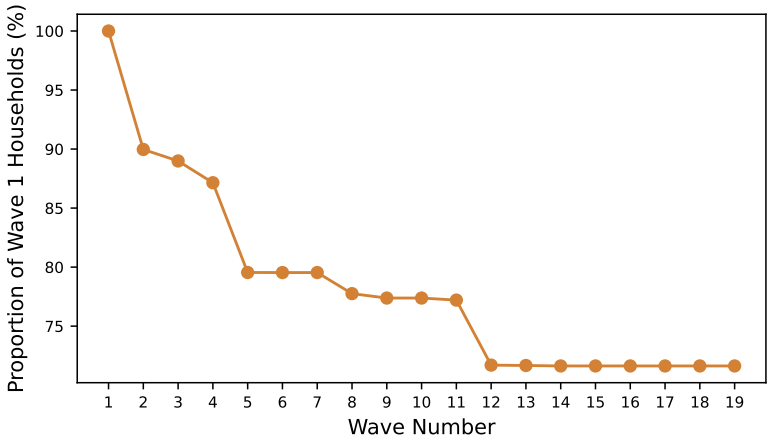
# A Response Rates and Attrition in CPHS

**Figure A.1**
Response Rates in the CPHS, January 2014 to April 2020




**Notes:** This figure plots the wave-level weighted and unweighted response rates amongst surveyed households in the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS) between January 2014 and April 2020, corresponding to the first 19 survey waves of the CPHS. Data from the Aspirational India module of the CPHS is used in this analysis. The unweighted response rate refers to the proportion of 'Accepted' survey responses [**RESPONSE_STATUS**] amongst all surveyed households in each wave [**WAVE_NO**] of the Aspirational India dataset. The weighted response rates are calculated by weighting both the accepted responses and total surveyed households by their respective wave-level survey weights [**HH_WGT_W**].

**Figure A.2**
Attrition of Wave 1 households in the CPHS, January 2014 to April 2020

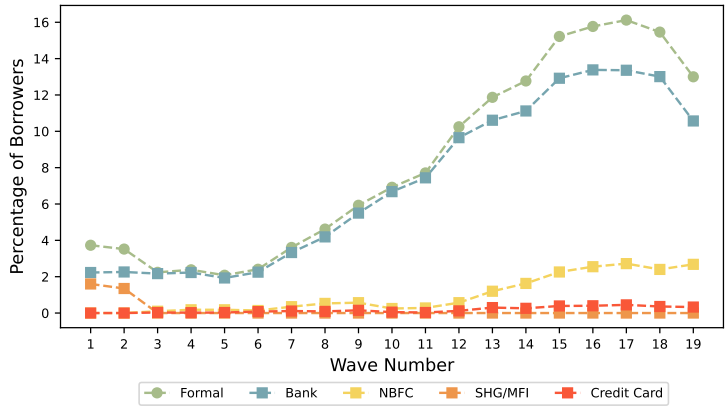



**Notes:** This figure plots the proportion of households [**HH_ID**] present in Wave 1 of the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS) who continue to be present in subsequent waves of the survey for the period between January 2014 and April 2020, corresponding to the first 19 survey waves of the CPHS. Data from the Aspirational India module of the CPHS is used in this analysis.

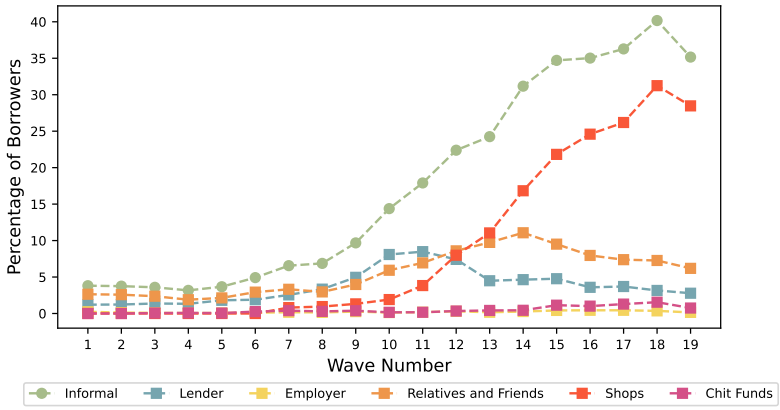
# B Time-series trends in financial inclusion in CPHS

**Figure B.1**
Components of Formal and Informal borrowing in the CPHS, January 2014 to April 2020

**(a)** Formal Borrowing



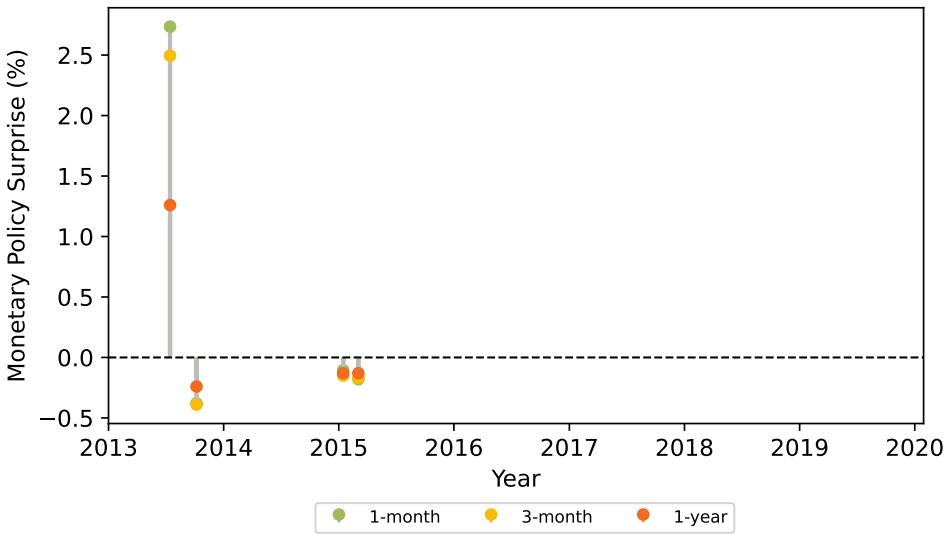

**(b)** Informal Borrowing




**Notes:** This figure shows the time series of the proportion of surveyed households in India who borrow from different formal and informal credit sources. The first panel shows the proportion of households who had borrowed from a formal credit source in that wave. The second panel shows the proportion of households who had borrowed from an informal credit source in that wave. Data from the first 19 waves of the Consumer Pyramids Household Survey (CPHS) of the Centre for Monitoring the Indian Economy (CMIE) are used in the analysis, corresponding to the period between January 2014 and April 2020. In particular, data from the Aspirational India module for households with accepted survey responses [**RESPONSE_STATUS**] are used to compute measures of formal and informal borrowing. Formal borrowers refers to households in each wave who borrow from either banks [**BORR_FRM_BANK**], non-bank financial companies [**BORR_FRM_NBFC**], self-help groups or micro-finance institutions [**BORR_FRM_SHG_MFI**] and credit cards [**BORR_FRM_CC**]. Informal borrowers refers to households in each wave who borrow from either moneylenders [**BORR_FRM_LENDER**], employers [**BORR_FRM_EMPLOYER**], relatives or friends [**BORR_FRM_REL_FRNDS**], shops [**BORR_FRM_SHOPS**] or chitfunds [**BORR_FRM_CHTFUND**]. In order to construct the proportion of households borrowing from formal and informal sources at the wave level, all households borrowing from any particular formal or informal sources are weighted by their wave-level survey weights [**HH_WGT_W**].

# C Monetary policy surprises on unscheduled announcement dates

**Figure C.1**
Monetary policy surprises on unscheduled announcement dates




**Notes:** This figure plots the monetary policy surprises for India computed from MIBOR-OIS contracts of different maturities between April 2013 and October 2019. The monetary policy surprises are calculated as the two-day change in the fixed leg of 1-month, 3-month and 1-year MIBOR-OIS contracts around unscheduled announcement dates of the RBI. Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy. Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy. Monetary policy announcement dates of the RBI are sourced from Narayan (2025).

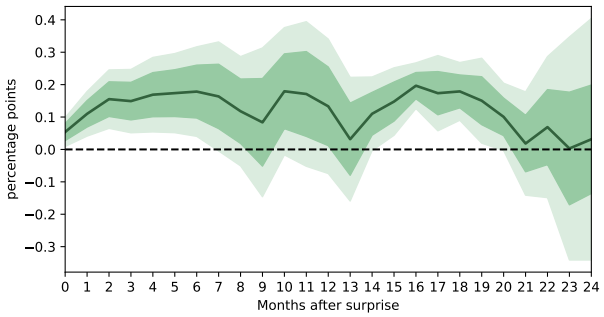
**Table C.1**
Summary statistics of monetary policy surprises on unscheduled announcement dates

| MIBOR-OIS Contract | **N** | **Mean** | **Std.Dev** | **min** | **25%** | **50%** | **75%** | **max** |
|---|---|---|---|---|---|---|---|---|
| 1-month | 4 | 0.850 | 1.483 | -0.380 | -0.230 | -0.143 | 0.605 | 2.735 |
| 3-month | 4 | 0.801 | 1.370 | -0.390 | -0.225 | -0.160 | 0.511 | 2.495 |
| 1-year | 4 | 0.440 | 0.715 | -0.240 | -0.158 | -0.130 | 0.218 | 1.260 |

**Notes:** This table documents the summary statistics for monetary policy surprises for India computed from MIBOR-OIS contracts of different maturities between April 2013 and October 2019. The monetary policy surprises are calculated as the two-day change in the fixed leg of 1-month, 3-month and 1-year MIBOR-OIS contracts around scheduled announcement dates of the RBI. Mean refers to mean of the absolute changes in the fixed leg of the relevant MIBOR-OIS contract on monetary policy announcement dates. Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy. Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy. Monetary policy announcement dates of the RBI are sourced from Narayan (2025).

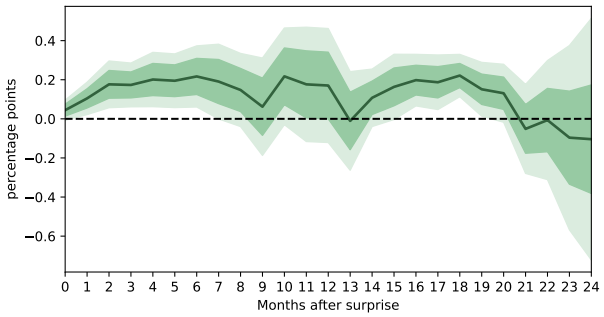
# D Persistence of monetary policy surprises

**Figure D.1**
Impulse Response Function of Overnight MIBOR to Monetary Surprises



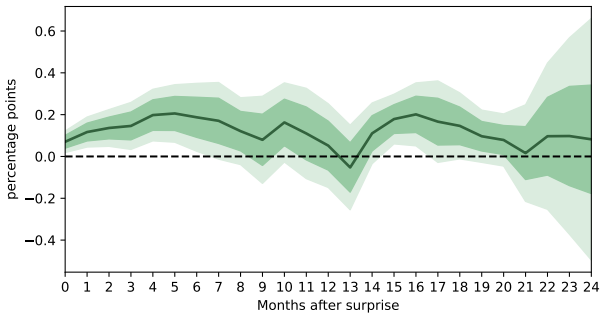

**Notes:** The above figure plots the impulse response function of the overnight Mumbai Interbank Outright Rate (MIBOR) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Overnight MIBOR is winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response function is estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Data on Overnight MIBOR is from Bloomberg Terminal with ticker: IN00O/N Index. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

**Figure D.2**
Impulse Response Function of Overnight MIBOR to Monetary Surprises (No Winsorization)



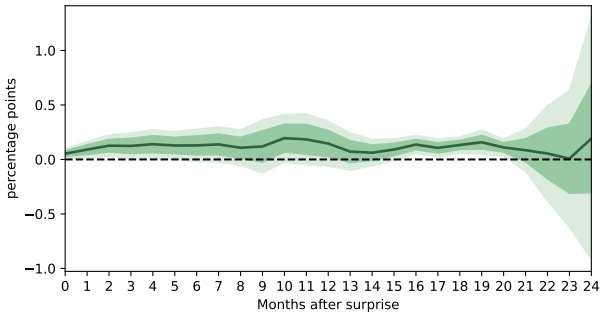

**Notes:** The above figure plots the impulse response function of the overnight Mumbai Interbank Outright Rate (MIBOR) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response function is estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Data on Overnight MIBOR is from Bloomberg Terminal with ticker: IN00O/N Index. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

## Figure D.3
Impulse Response Function of Overnight MIBOR to Monetary Surprises (1-month)




**Notes:** The above figure plots the impulse response function of the overnight Mumbai Interbank Outright Rate (MIBOR) to a 10 basis points change in the 1-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Overnight MIBOR is winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response function is estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Data on Overnight MIBOR is from Bloomberg Terminal with ticker: IN00O/N Index. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy.

## Figure D.4
Impulse Response Function of Overnight MIBOR to Monetary Surprises (1-year)



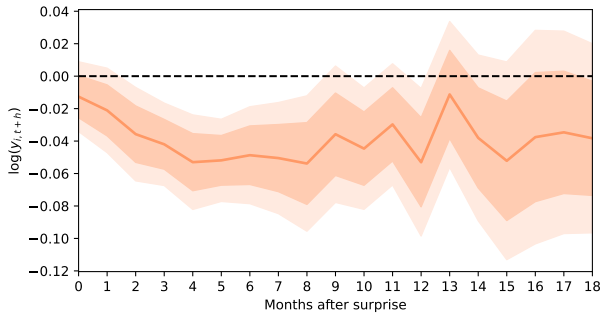

**Notes:** The above figure plots the impulse response function of the overnight Mumbai Interbank Outright Rate (MIBOR) to a 10 basis points change in the 1-year MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Overnight MIBOR is winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response function is estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Data on Overnight MIBOR is from Bloomberg Terminal with ticker: IN00O/N Index. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy.

# E Robustness for monetary policy transmission at the aggregate level

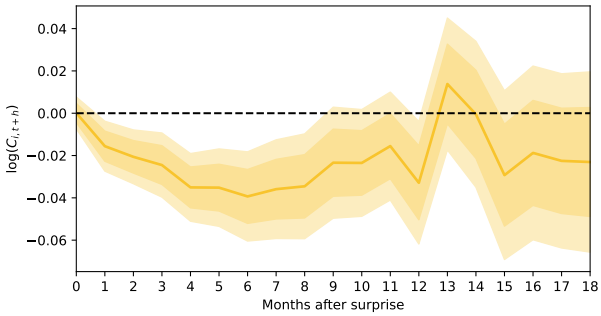
**Figure E.1**

Impulse Response Functions of Income and Consumption to Monetary Surprises (1-month)

**(a)** Household Income




**(b)** Household Consumption

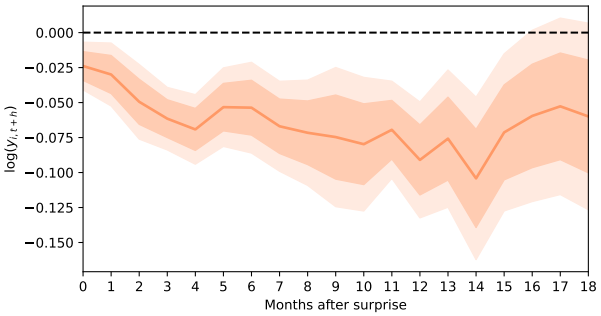



**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) to a 10 basis points change in the 1-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of the CPHS Homogeneous Region using appropriate monthly survey weights [**HH_WGT_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy.

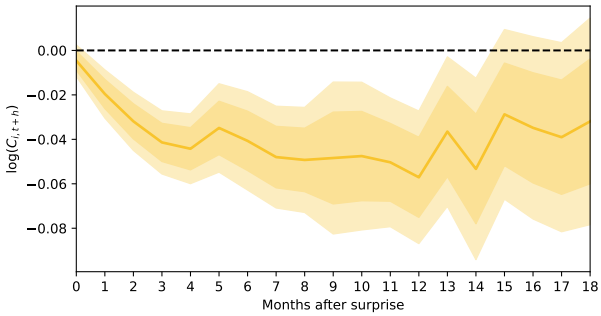
## Figure E.2

Impulse Response Functions of Income and Consumption to Monetary Surprises (1-year)

**(a)** Household Income




**(b)** Household Consumption

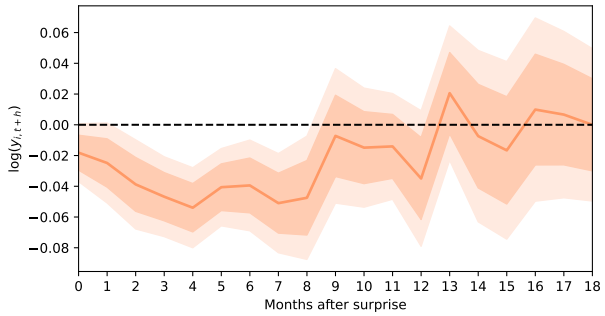



**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) to a 10 basis points change in the 1-year MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of the CPHS Homogeneous Region using appropriate monthly survey weights [**HH_WGT_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy.

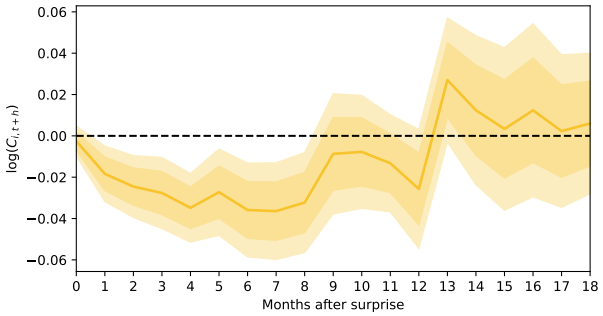
## Figure E.3

Impulse Response Functions of Income and Consumption to Monetary Surprises (No Winsorization)

**(a)** Household Income




**(b)** Household Consumption

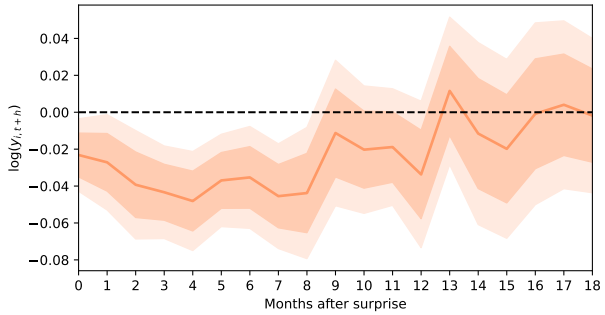



**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of the CPHS Homogeneous Region using appropriate monthly survey weights [**HH_WGT_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

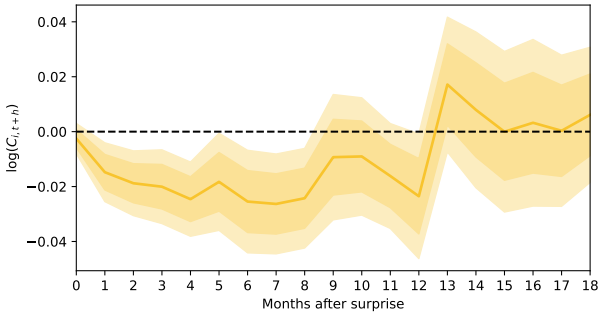
## Figure E.4

Impulse Response Functions of Income and Consumption to Monetary Surprises (Non-Response Adjustment)

**(a)** Household Income



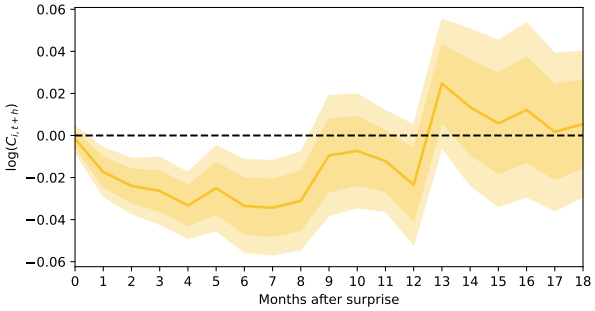

**(b)** Household Consumption




**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of the CPHS Homogeneous Region using appropriate monthly survey weights [**HH_WGT_MS**] adjusted for non-response using a non-response factor [**HH_NR_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

## Figure E.5

Impulse Response Functions of Consumption to Monetary Surprises (Total Expenditure)

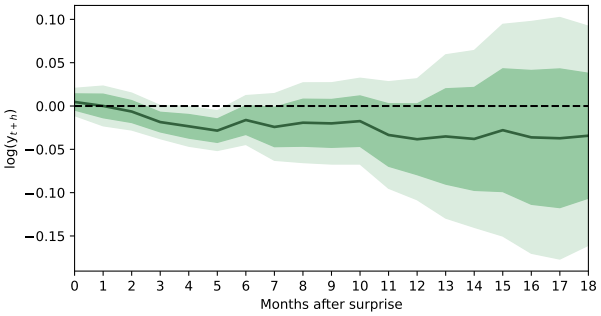



**Notes:** The above figures plot the impulse response functions of household consumption (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response function is estimated using Equation 1 outlined in the main text. Household consumption is obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**]. Data on household consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of consumption expenditure are aggregated to the level of the CPHS Homogeneous Region using appropriate monthly survey weights [**HH_WGT_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

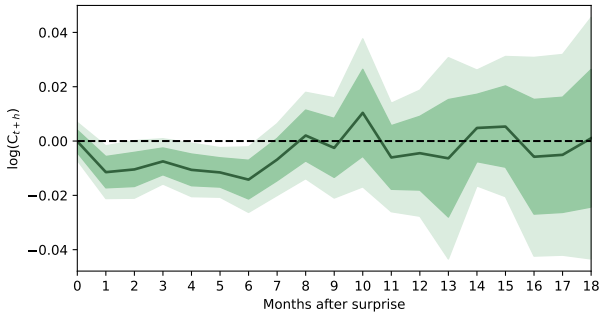
## Figure E.6

Impulse Response Functions of Aggregate Economic Outcomes to Monetary Surprises (1-month)

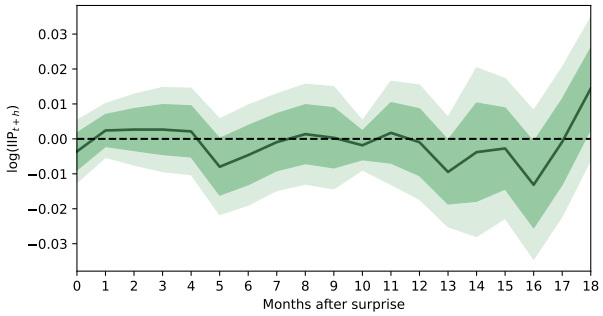
**(a)** Household Income




**(b)** Household Consumption




**(c)** Industrial Production

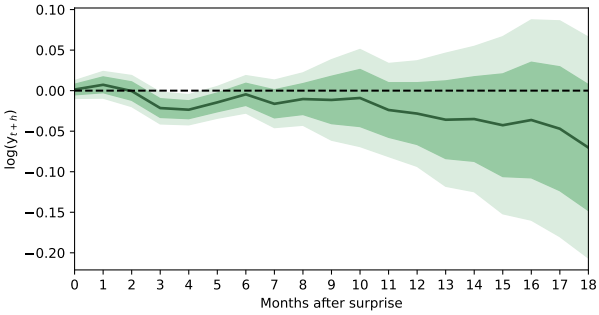



**Notes:** The above figures plot the impulse response functions of aggregate monthly household income, household consumption and industrial production (in logarithms) to a 10 basis points change in the 1-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income, household consumption and industrial production (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of India using appropriate monthly survey weights [**HH_WGT_MS**]. Data on Index of Industrial Production is from FRED with ticker: INDPROINDMISMEI (data accessed on 14th August, 2023). Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy.

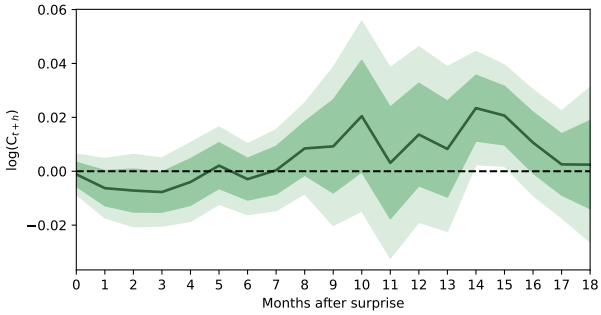
## Figure E.7

Impulse Response Functions of Aggregate Economic Outcomes to Monetary Surprises (1-year)

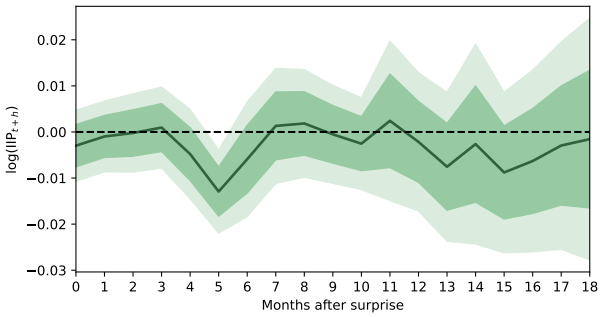
**(a)** Household Income




**(b)** Household Consumption




**(c)** Industrial Production

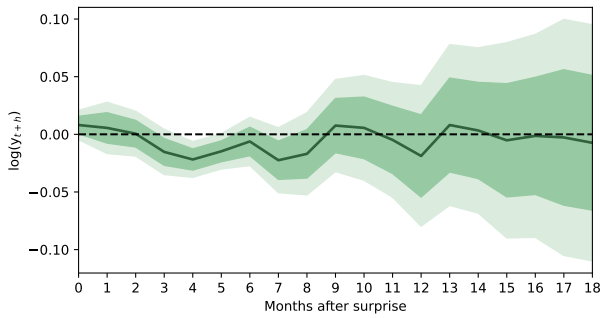



**Notes:** The above figures plot the impulse response functions of aggregate monthly household income, household consumption and industrial production (in logarithms) to a 10 basis points change in the 1-year MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income, household consumption and industrial production (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of India using appropriate monthly survey weights [**HH_WGT_MS**]. Data on Index of Industrial Production is from FRED with ticker: INDPROINDMISMEI (data accessed on 14th August, 2023). Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy.

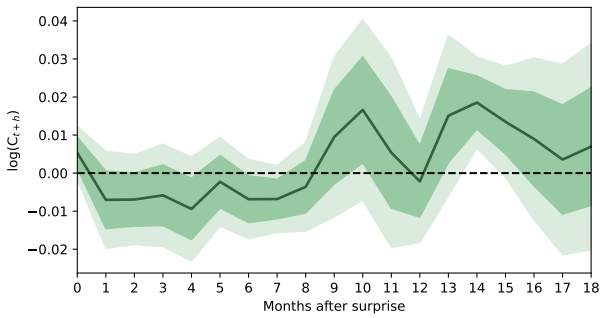
## Figure E.8

Impulse Response Functions of Aggregate Economic Outcomes to Monetary Surprises (No Winsorization)

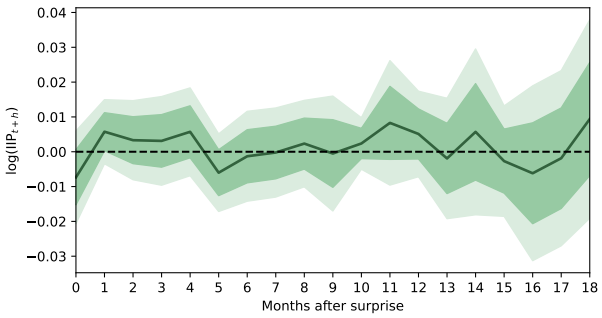
**(a)** Household Income




**(b)** Household Consumption




**(c)** Industrial Production

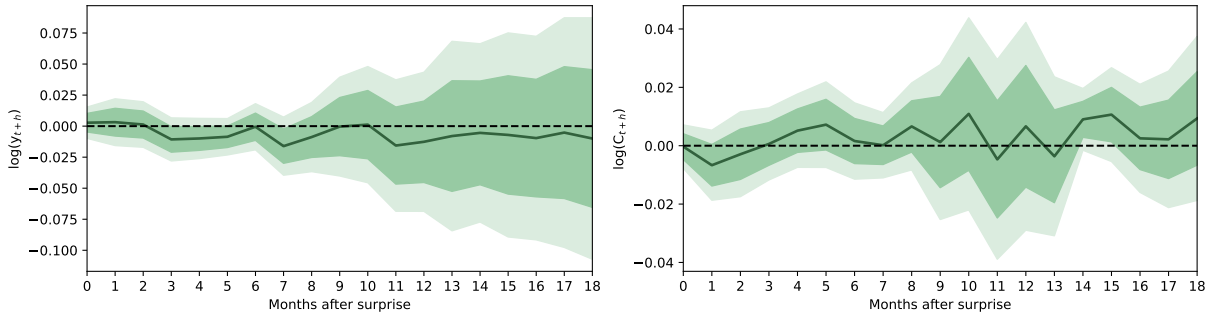



**Notes:** The above figures plot the impulse response functions of aggregate monthly household income, household consumption and industrial production (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of India using appropriate monthly survey weights [**HH_WGT_MS**]. Data on Index of Industrial Production is from FRED with ticker: INDPROINDMISMEI (data accessed on 14th August, 2023). Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

## Figure E.9

Impulse Response Functions of Aggregate Economic Outcomes to Monetary Surprises (Non-Response Adjustment)

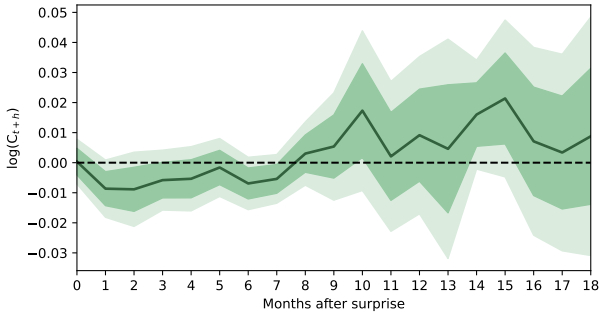
**(a)** Household Income **(b)** Household Consumption




**Notes:** The above figures plot the impulse response functions of aggregate monthly household income and household consumption (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and household consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of India using appropriate monthly survey weights [**HH_WGT_MS**] adjusted for non-response using a non-response factor [**HH_NR_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

## Figure E.10

Impulse Response Functions of Aggregate Consumption to Monetary Surprises (Total Expenditure)

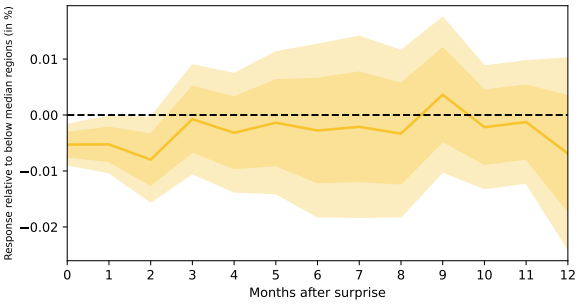



**Notes:** The above figures plot the impulse response functions of aggregate monthly household consumption (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household consumption (in logarithms) is winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response function is estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per month. Household consumption data is obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**]. Data on household consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of consumption expenditure are aggregated to the level of India using appropriate monthly survey weights [**HH_WGT_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

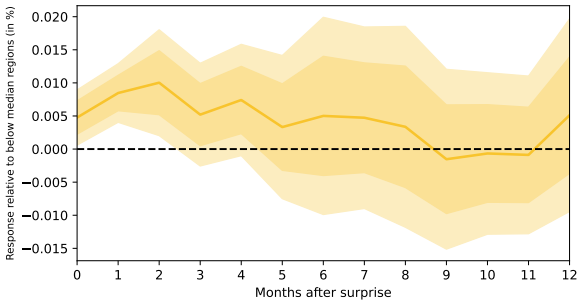
# F Robustness for financial inclusion and monetary policy transmission

**Figure F.1**
Financial Inclusion and Monetary Transmission (RBI Measures) [Total Expenditure]

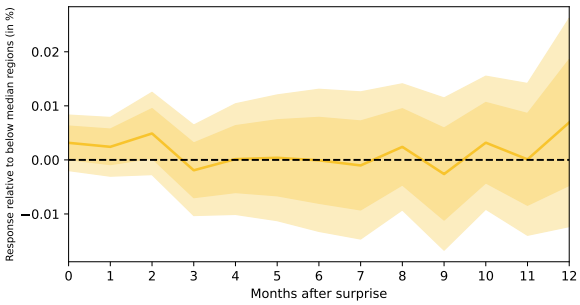
**(a)** Average Population per Branch Office (APPBO)




**(b)** Deposits per capita




**(c)** Credit per capita

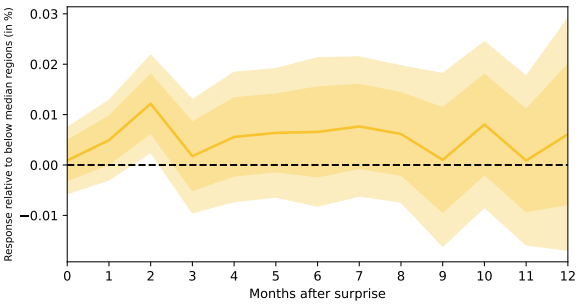



**Notes:** The above figures plot the impulse response function of household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household consumption (in logarithms) is winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of consumption at the HR-Month level can be found in the notes to Figure E.5. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. Additional details about the construction of these financial inclusion measures can be found in the notes to Figure 4 and in Section 2.2.

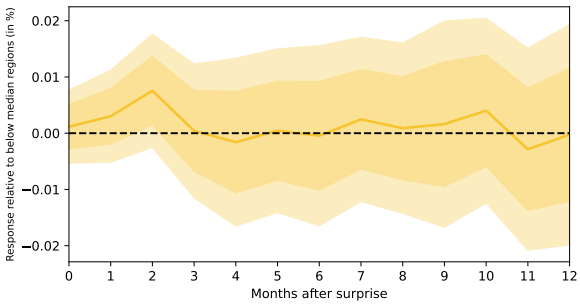
## Figure F.2

Financial Inclusion and Monetary Transmission (CPHS Measures) [Total Expenditure]

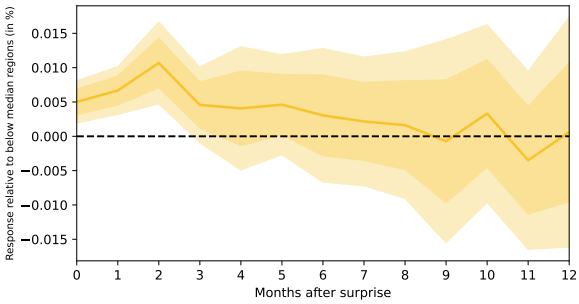
**(a)** Formal borrowing in wave




**(b)** Formal borrowing in the past




**(c)** Formal borrowing at any point



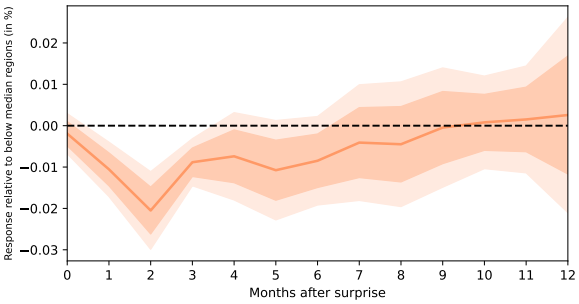

**Notes:** The above figures plot the impulse response function of household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household consumption data is obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figure E.5. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on formal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.

## Figure F.3

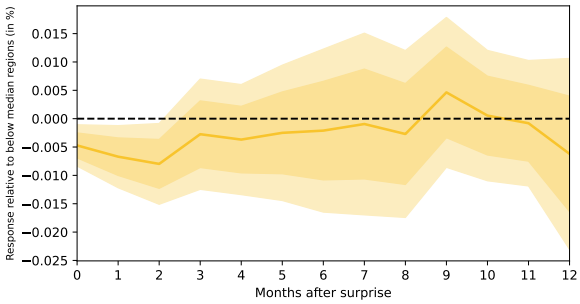
Financial Inclusion and Monetary Transmission (RBI Measures) [1-month]

### Average Population per Branch Office (APPBO)

**(a)** Household Income

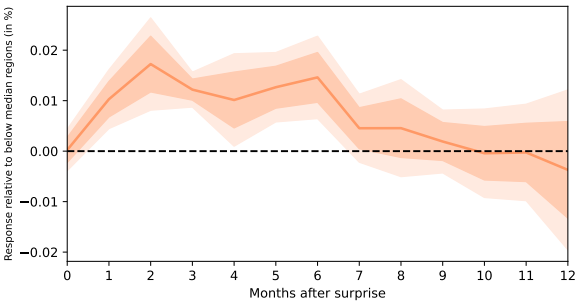



**(b)** Household Consumption

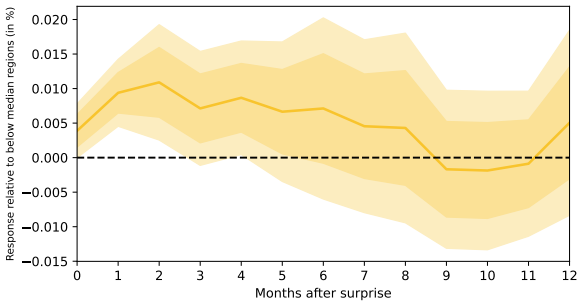



### Deposits per capita

**(c)** Household Income

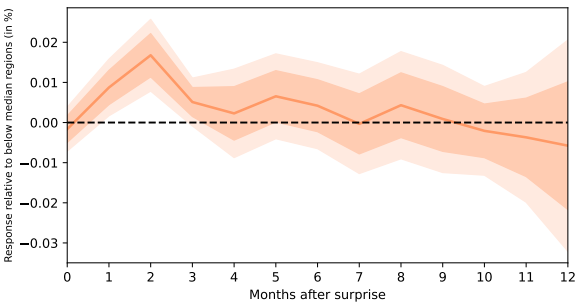



**(d)** Household Consumption

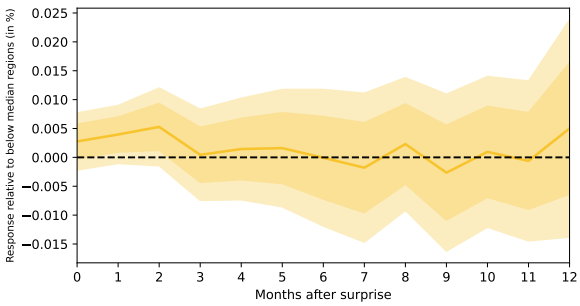



### Credit per capita

**(e)** Household Income




**(f)** Household Consumption



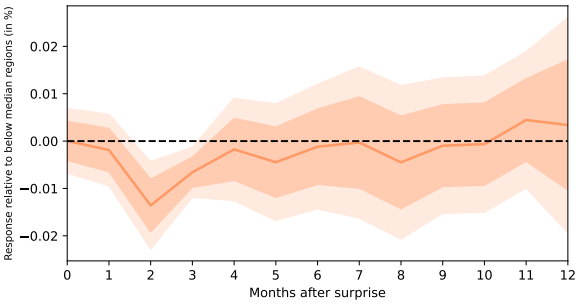

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 1-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. Additional details about the construction of these financial inclusion measures can be found in the notes to Figure 4 and Section 2.2.

## Figure F.4

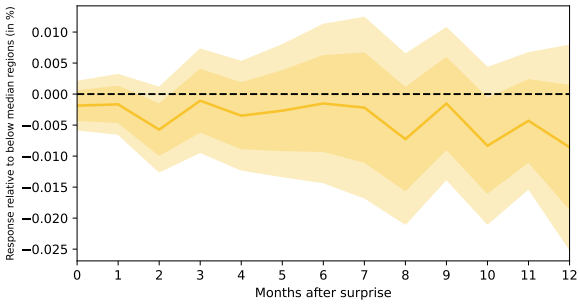
Financial Inclusion and Monetary Transmission (RBI Measures) [1-year]

### Average Population per Branch Office (APPBO)

**(a)** Household Income

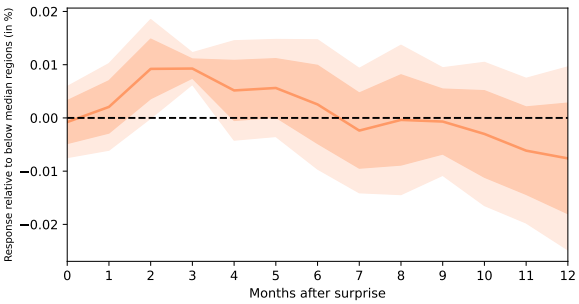



**(b)** Household Consumption

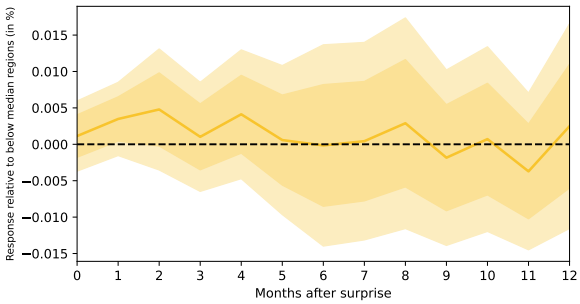



### Deposits per capita

**(c)** Household Income

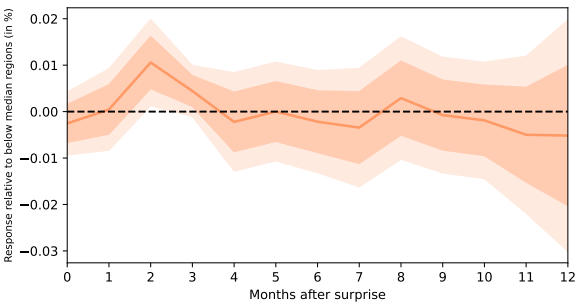



**(d)** Household Consumption

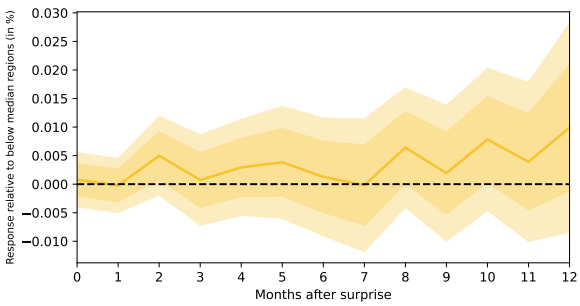



### Credit per capita

**(e)** Household Income




**(f)** Household Consumption



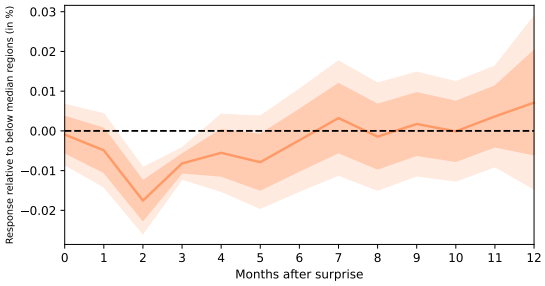

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 1-year MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. Additional details about the construction of these financial inclusion measures can be found in the notes to Figure 4 and Section 2.2.

## Figure F.5

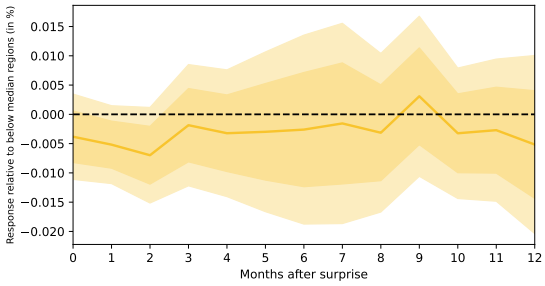
Financial Inclusion and Monetary Transmission (RBI Measures) [No Winsorization]

### Average Population per Branch Office (APPBO)

**(a)** Household Income

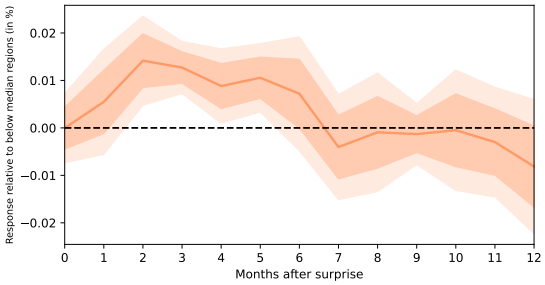



**(b)** Household Consumption

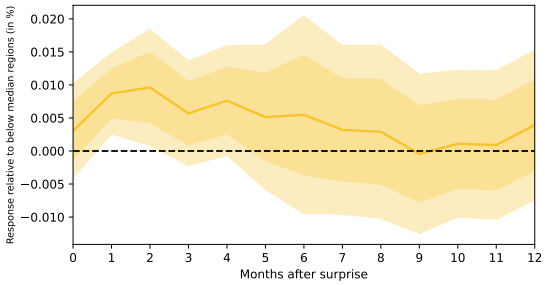



### Deposits per capita

**(c)** Household Income

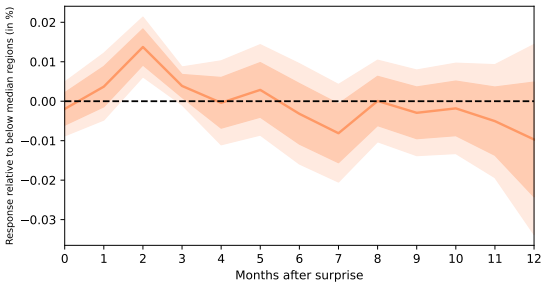



**(d)** Household Consumption

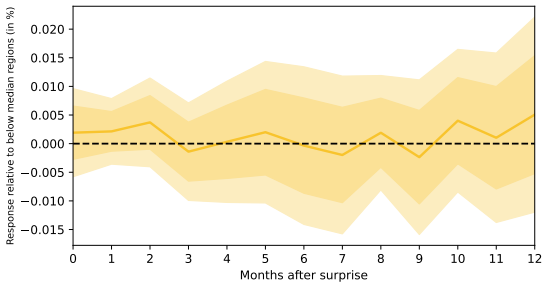



### Credit per capita

**(e)** Household Income




**(f)** Household Consumption



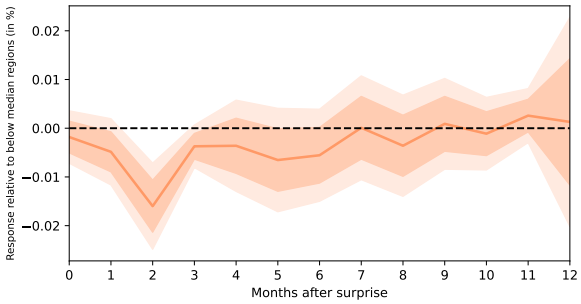

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. Additional details about the construction of these financial inclusion measures can be found in the notes to Figure 4 and in Section 2.2.

## Figure F.6

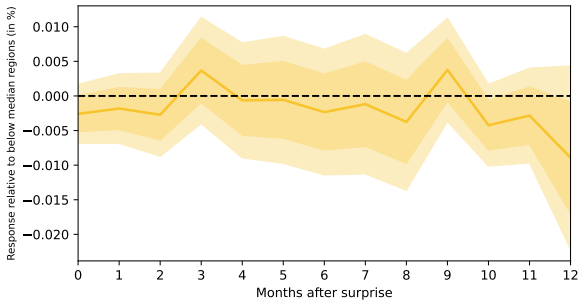
Financial Inclusion and Monetary Transmission (RBI Measures) [Non-Response Adjustment]

### Average Population per Branch Office (APPBO)

**(a)** Household Income

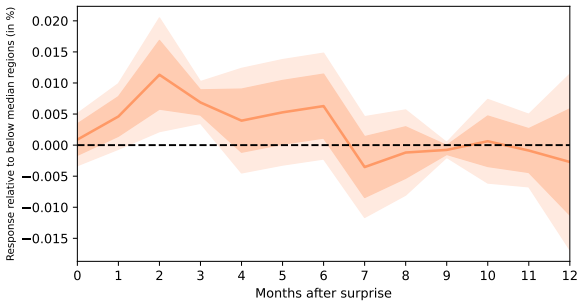



**(b)** Household Consumption

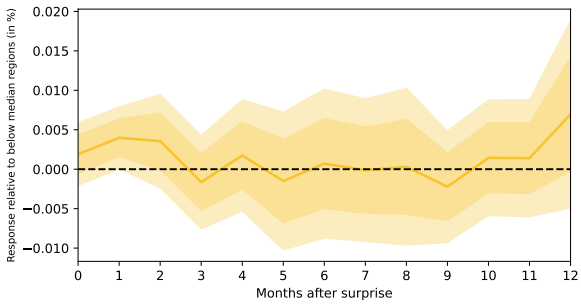



### Deposits per capita

**(c)** Household Income

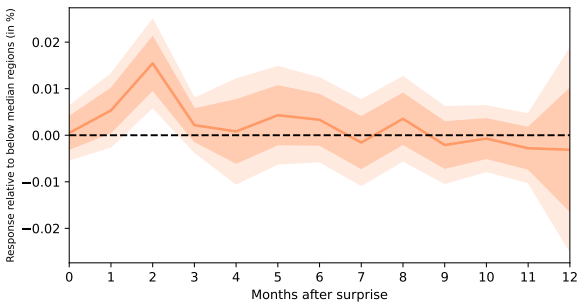



**(d)** Household Consumption

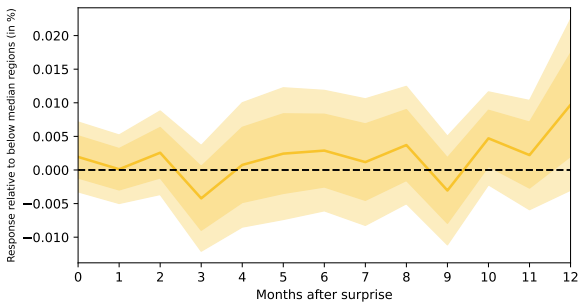



### Credit per capita

**(e)** Household Income




**(f)** Household Consumption



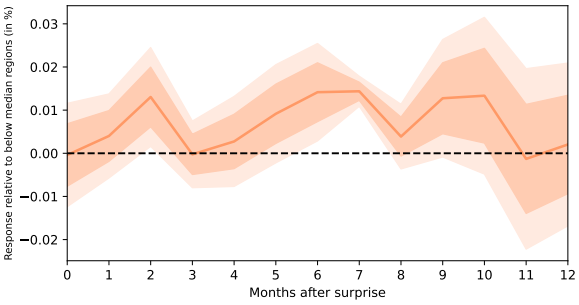

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figure E.4. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. Additional details about the construction of these financial inclusion measures can be found in the notes to Figure 4 and Section 2.2.

## Figure F.7

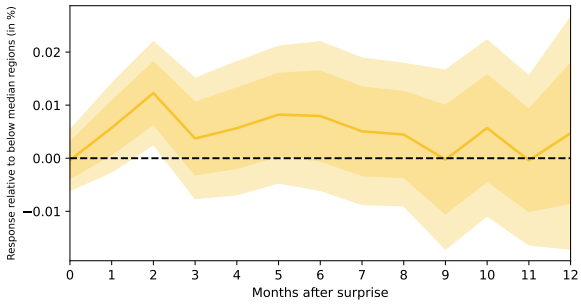
Financial Inclusion and Monetary Transmission (CPHS Measures) [1-month]

### Formal borrowing in wave

**(a)** Household Income

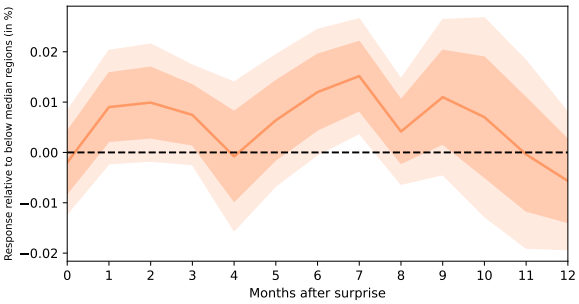



**(b)** Household Consumption

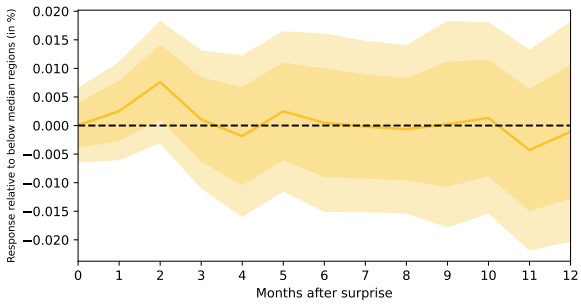



### Formal borrowing in the past

**(c)** Household Income

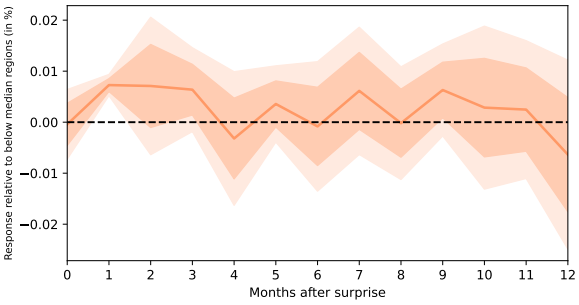



**(d)** Household Consumption

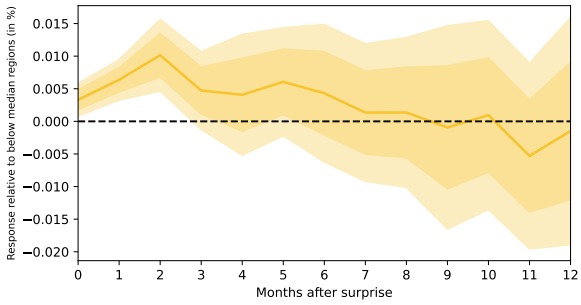



### Formal borrowing at any point

**(e)** Household Income




**(f)** Household Consumption



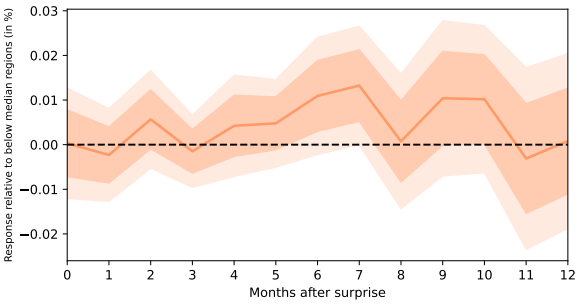

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 1-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy. Data on formal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.

## Figure F.8

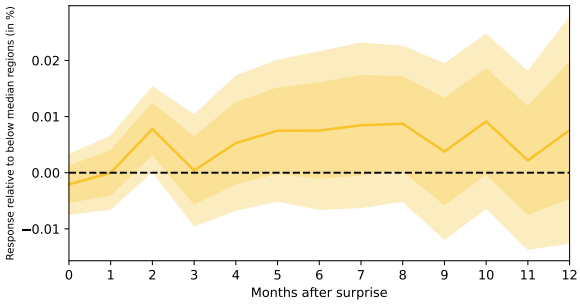
Financial Inclusion and Monetary Transmission (CPHS Measures) [1-year]

### Formal borrowing in wave

**(a)** Household Income

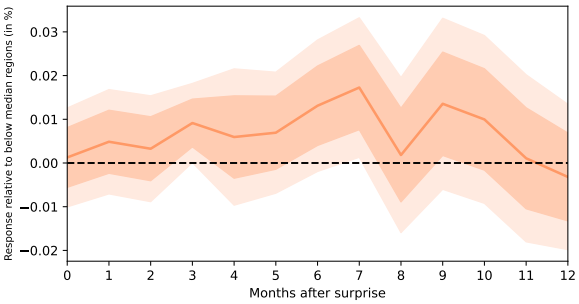



**(b)** Household Consumption

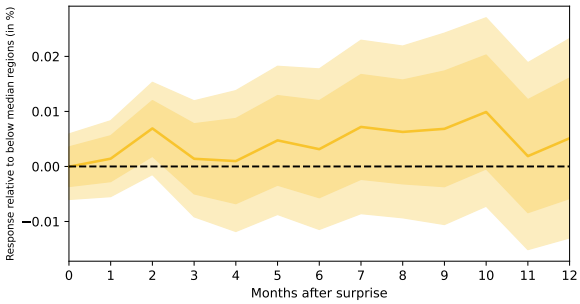



### Formal borrowing in the past

**(c)** Household Income

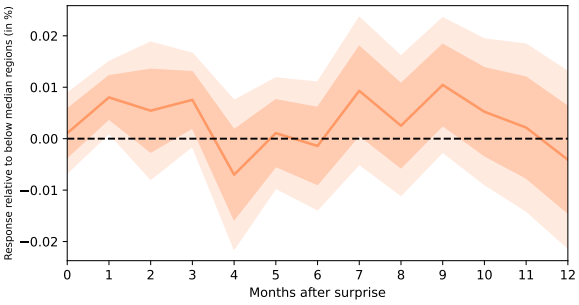



**(d)** Household Consumption

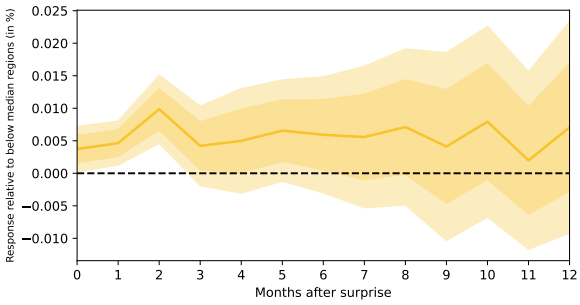



### Formal borrowing at any point

**(e)** Household Income




**(f)** Household Consumption



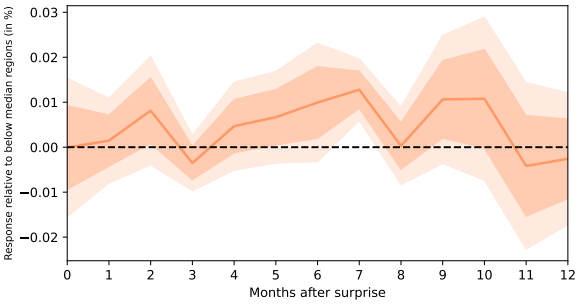

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 1-year MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy. Data on formal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.

## Figure F.9

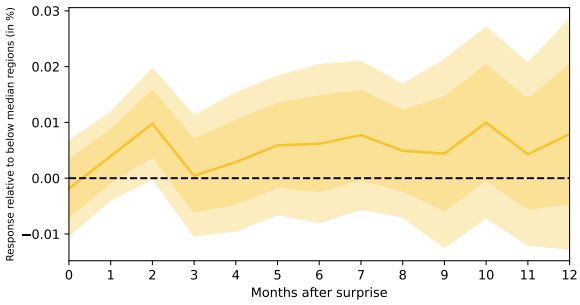
Financial Inclusion and Monetary Transmission (CPHS Measures) [No Winsorization]

### Formal borrowing in wave

**(a)** Household Income

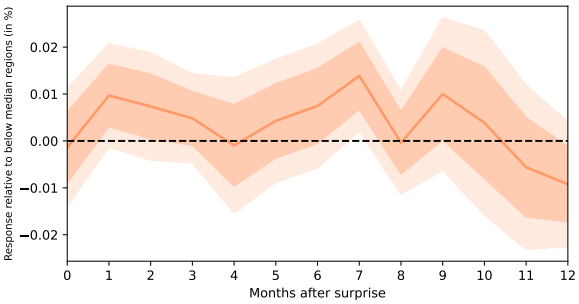



**(b)** Household Consumption

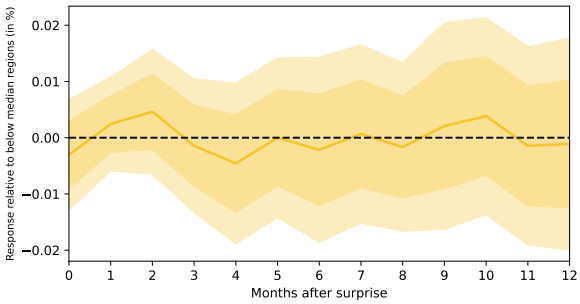



### Formal borrowing in the past

**(c)** Household Income

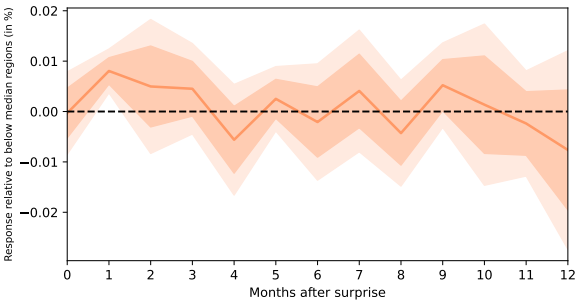



**(d)** Household Consumption

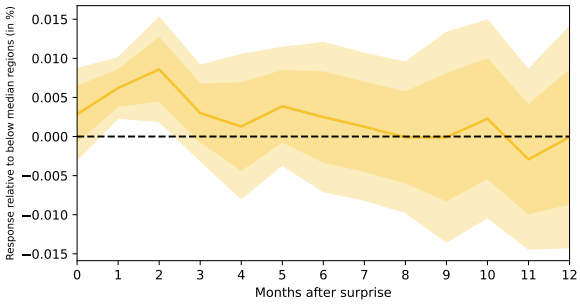



### Formal borrowing at any point

**(e)** Household Income




**(f)** Household Consumption



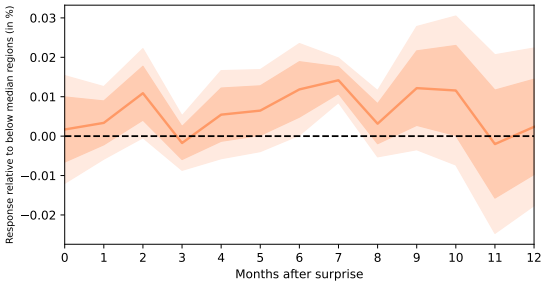

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on formal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.

## Figure F.10

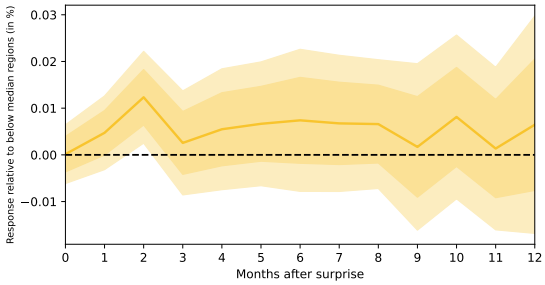
Financial Inclusion and Monetary Transmission (CPHS measures) [Non-Response Adjustment]

### Formal borrowing in wave

**(a)** Household Income

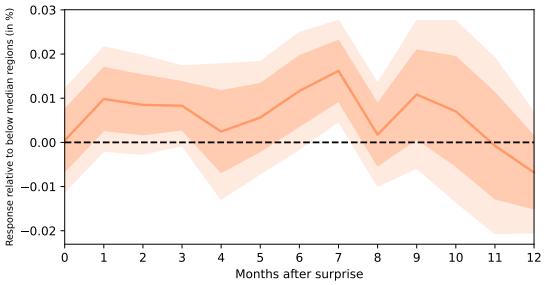



**(b)** Household Consumption

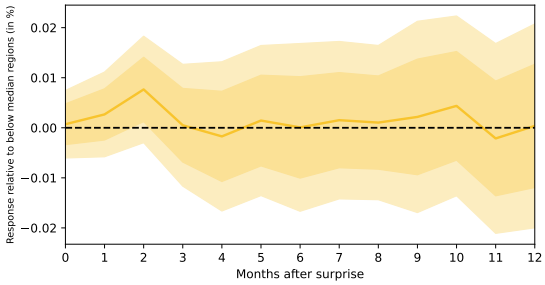



### Formal borrowing in the past

**(c)** Household Income

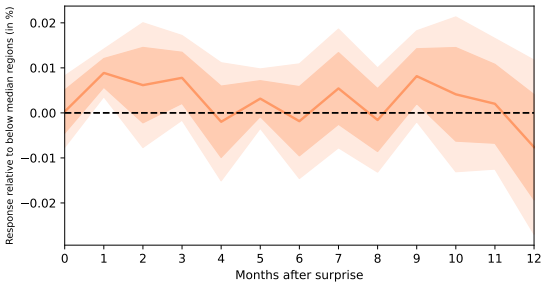



**(d)** Household Consumption

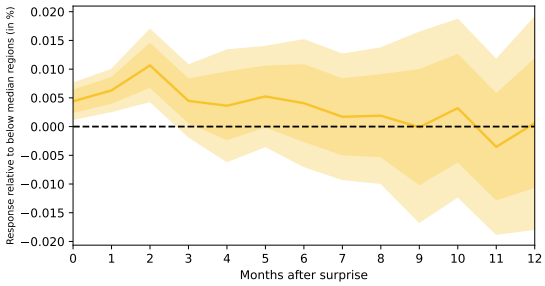



### Formal borrowing at any point

**(e)** Household Income




**(f)** Household Consumption



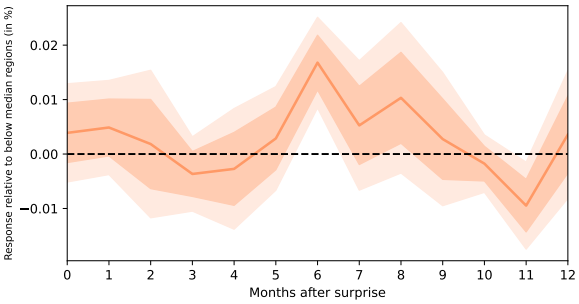

**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. For the specification for income when borrowing in wave, the demonetization dummies are not used in the specification to deal with near multicollinearity in estimation. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figure E.4. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on formal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.

## Figure F.11

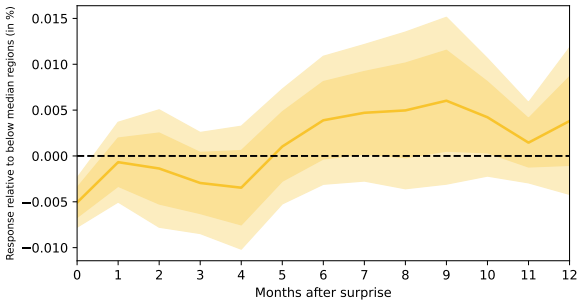
Financial Inclusion and Monetary Transmission (CPHS measures) [Informal Borrowing]

### Informal borrowing in wave

**(a)** Household Income

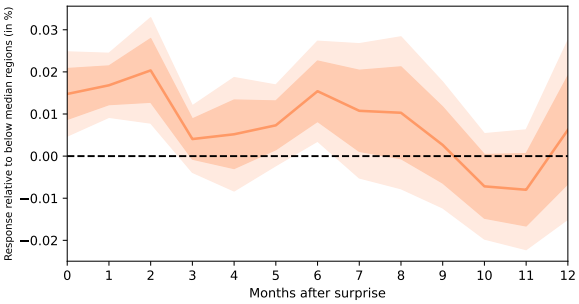



**(b)** Household Consumption

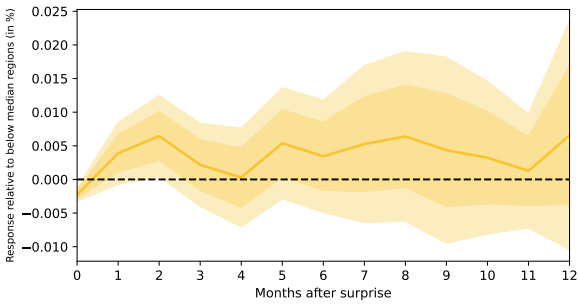



### Informal borrowing in the past

**(c)** Household Income

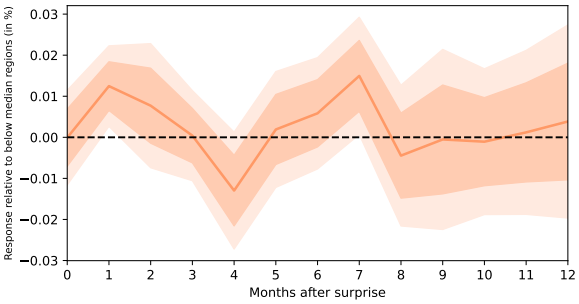



**(d)** Household Consumption

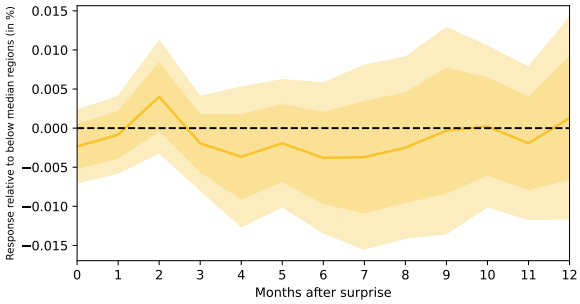



### Informal borrowing at any point

**(e)** Household Income




**(f)** Household Consumption




**Notes:** The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on informal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.

# G Notes to Tables and Figures

## G.1 Notes to Tables

- Table 1: This table documents summary statistics (in ₹) on monthly consumption expenditure and income for households surveyed in the Consumer Pyramids Households Survey (CPHS) conducted by the Centre for Monitoring the Indian Economy (CMIE). Monthly consumption expenditure for each household is defined as adjusted total expenditure [**ADJ_TOT_EXP**] net of all EMIs [**M_EXP_ALL_EMIS**], remittances [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Income refers to total income of the household from all sources [**TOT_INC**]. Data on consumption and income pertaining to April 2014 and October 2019 are shown in the above tables. Only accepted survey responses [**RESPONSE_STATUS**] with total [**TOT_EXP**] and adjusted total expenditure [**ADJ_TOT_EXP**] greater than 0 (in the case of consumption) and total income [**TOT_INC**] greater than 0 (in the case of income) are used in the analysis. The individual observations are weighted by their corresponding survey weights [**HH_WGT_MS**] in producing the descriptive statistics.

- Table 2: This table documents the summary statistics for monetary policy surprises for India computed from MIBOR-OIS contracts of different maturities. The monetary policy surprises are calculated as the two-day change in the fixed leg of 1-month, 3-month and 1-year MIBOR-OIS contracts around scheduled announcement dates of the RBI. Mean refers to mean of the absolute changes in the fixed leg of the relevant MIBOR-OIS contract on monetary policy announcement dates. Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy. Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy. Monetary policy announcement dates of the RBI are sourced from Narayan (2025).

## G.2 Notes to Figures

- Figure 1: This figure plots the evolution of the proportion of surveyed individuals in different regions of the world who are aged 15 and over and own an account (by themselves or together with someone else) at a bank or another type of financial institution or report personally using a mobile money service in the past year. The data comes from multiple rounds of the World Bank Global Findex survey between 2011 and 2021 and is available for download here: `https://www.worldbank.org/en/publication/globalfindex/Data`.

The country codes to access the series used above are: India [**IND**], South Asia [**SAS**], Sub-Saharan Africa [**SSA**], Middle East and North Africa [**MNA**] and Latin America and the Caribbean [**LAC**]. The data series plotted above can be accessed through the variable name [**Account (% age 15+)**].

- Figure 2: This figure shows the time series of the proportion of surveyed households in India who borrow from formal and informal sources. The first panel shows the proportion of households who had borrowed from a formal or informal credit source in that wave. The second panel shows the proportion of households who had borrowed from a formal or informal credit source in any wave up to the present wave. The third panel shows the proportion of households who had borrowed from a formal or informal credit source in any of the 19 waves of the survey considered in the analysis. Data from the first 19 waves of the Consumer Pyramids Household Survey (CPHS) of the Centre for Monitoring the Indian Economy (CMIE) are used in the analysis, corresponding to the period between January 2014 and April 2020. In particular, data from the Aspirational India module for households with accepted survey responses [**RESPONSE_STATUS**] are used to compute measures of formal and informal borrowing. Formal borrowers refers to households in each wave who borrow from either banks [**BORR_FRM_BANK**], non-bank financial companies [**BORR_FRM_NBFC**], self-help groups or micro-finance institutions [**BORR_FRM_SHG_MFI**] and credit cards [**BORR_FRM_CC**]. Informal borrowers refers to households in each wave who borrow from either moneylenders [**BORR_FRM_LENDER**], employers [**BORR_FRM_EMPLOYER**], relatives or friends [**BORR_FRM_REL_FRNDS**], shops [**BORR_FRM_SHOPS**] or chitfunds [**BORR_FRM_CHTFUND**]. In order to construct the proportion of households borrowing from formal and informal sources at the wave level, all households borrowing from either formal or informal sources are weighted by their wave-level survey weights [**HH_WGT_W**].

- Figure 3: This figure plots the proportion of households belonging to each occupational group in April 2014 and October 2019 Consumer Pyramids Household Survey (CPHS) conducted by the Centre for Monitoring the Indian Economy (CMIE). Data from the consumption pyramids module of the CPHS is used in this analysis. Occupation Group refers to an occupational classification of the household based on occupations of individual household members by CMIE [**OCCUPATION_GROUP**]. Only accepted survey responses [**RESPONSE_STATUS**] with total [**TOT_EXP**] and adjusted total expenditure [**ADJ_TOT_EXP**] greater than 0 are considered in this analysis. The definition of adjusted total expenditure is the same as in Table 1. For presentational convenience, 'White-collar Clerical employees', 'White-collar Professional employees' and 'Non-industrial Technical Employees' have been categorized as 'White-collar employees', 'Qual-

ified Self-employed Professionals' have been categorized as 'Self-employed Professionals' and 'Self-employed Entrepreneurs' have been categorized as 'Entrepreneurs'. The individual observations are weighted by their corresponding survey weights [**HH_WGT_MS**] in producing the proportions in each period.

- Figure 4: This figure plots measures of formal financial inclusion in different Consumer Pyramids Household Survey (CPHS) Homogeneous Regions (HRs) in India in December 2013 and March 2020. The first panel plots Average Population per Branch Office, the second panel plots Deposits per capita and the third panel plots Credit per capita in different HRs. APPBO is calculated as the ratio of the Census 2011 population in each HR to the number of bank branches operating in that HR in December 2013 and March 2020. Deposits per capita is calculated as the ratio of total deposits outstanding in each HR in December 2013 and March 2020 to the Census 2011 population in that HR. Credit per capita is calculated as the ratio of total credit outstanding in each HR in December 2013 and March 2020 to the Census 2011 population in that HR. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. The mapping from districts to CPHS HRs is from Vyas (2020b). HR 67, HR 68 and HR 69 in Telangana, HR 34, HR 35 and HR 37 in Gujarat and HR 18 and HR 32 in Uttar Pradesh have each been aggregated into a single HR within their respective states to deal with changes in district boundaries post-2011 that affect all these individual HRs. Deposits per capita and Credit per capita in March 2020 are deflated by the ratio of General CPI in March 2020 to General CPI in December 2013 to ensure a comparison across time in December 2013 prices. Data on the General CPI for India is from Annexure VI, Press Information Bureau (2025). The HR and district shape files used for plotting the above figures was obained from xKDR's Maps of India, available at `https://github.com/xKDR/india-maps`.

- Figure 5: This figure plots the time series of different percentiles of the formal financial inclusion distribution in different Consumer Pyramids Household Survey (CPHS) Homogeneous Regions (HRs) in India between December 2013 and March 2020. The first panel plots Average Population per Branch Office, the second panel plots Deposits per capita and the third panel plots Credit per capita in different HRs. APPBO is calculated as the ratio of the Census 2011 population in each HR to the number of bank branches operating in that HR in December 2013 and March 2020. Deposits per capita is calculated as the ratio of total deposits outstanding in each HR in December 2013 and March 2020 to the Census 2011 population in that HR. Credit per capita is calculated as the ratio of total credit outstanding in each HR in December 2013 and March 2020 to the Census 2011 population in that HR. Data on bank branches, deposits and credit outstanding are from the

RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. The mapping from districts to CPHS HRs is from Vyas (2020b). HR 67, HR 68 and HR 69 in Telangana, HR 34, HR 35 and HR 37 in Gujarat and HR 18 and HR 32 in Uttar Pradesh have each been aggregated into a single HR within their respective states to deal with changes in district boundaries post-2011 that affect all these individual HRs.

- Figure 6: This figure shows binned scatterplots (with 50 bins) of Average Population per Branch Office (APPBO) in each Homogeneous Region (HR)-Quarter against proportions of responding households in that HR-Quarter who had outstanding borrowing from formal and informal sources. Data from the first 19 waves of the Consumer Pyramids Household Survey (CPHS) of the Centre for Monitoring the Indian Economy (CMIE) are used in the analysis, corresponding to the period between January 2014 and April 2020. In particular, data from the Aspirational India module for households with accepted survey responses [**RESPONSE_STATUS**] are used to compute measures of formal and informal borrowing. The quarter for each HR-Wave [**WAVE_NO**] is assigned as the earliest quarter to which the month [**MONTH_SLOT**] in which households from that HR-Wave are surveyed belongs. Formal borrowers refers to households each HR-Quarter who borrow from either banks [**BORR_FRM_BANK**], non-bank financial companies [**BORR_FRM_NBFC**], self-help groups or micro-finance institutions [**BORR_FRM_SHG_MFI**] and credit cards [**BORR_FRM_CC**]. Informal borrowers refers to households in each HR-Quarter who borrow from either moneylenders [**BORR_FRM_LENDER**], employers [**BORR_FRM_EMPLOYER**], relatives or friends [**BORR_FRM_REL_FRNDS**], shops [**BORR_FRM_SHOPS**] or chitfunds [**BORR_FRM_CHTFUND**]. In order to construct the proportion of households borrowing from formal and informal sources at the HR-Quarter level, all households borrowing from either formal or informal sources are weighted by their wave-level survey weights [**HH_WGT_W**]. APPBO is calculated as the ratio of the Census 2011 population in each HR to the number of bank branches operating in that HR. Data on bank branches are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. The mapping from districts to CPHS HRs is from Vyas (2020b). HR 67, HR 68 and HR 69 in Telangana, HR 34, HR 35 and HR 37 in Gujarat and HR 18 and HR 32 in Uttar Pradesh have each been aggregated into a single HR within their respective states to deal with changes in district boundaries post-2011 that affect all these individual HRs. APPBO at the beginning of each HR-Quarter are used in the scatterplots.

- Figure 7: This figure plots the monetary policy surprises for India computed from MIBOR-OIS contracts of different maturities. The monetary policy surprises are calculated as the

two-day change in the fixed leg of 1-month, 3-month and 1-year MIBOR-OIS contracts around scheduled announcement dates of the RBI. Data on the 1-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOA BGN Curncy. Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on the 1-year MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWO1 BGN Curncy. Monetary policy announcement dates of the RBI are sourced from Narayan (2025).

- Figure 8: The above figures plot the impulse response functions of household income and household consumption (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and payments towards religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of the CPHS Homogeneous Region using appropriate monthly survey weights [**HH_WGT_MS**]. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

- Figure 9: The above figures plot the impulse response functions of aggregate monthly household income, household consumption and industrial production (in logarithms) to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income, household consumption and industrial production (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on heteroscedasticity-robust standard errors are displayed. The impulse response functions are estimated using Equation 1 outlined in the main text, but without an index for HR, as there is only a single observation per

month. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Household income refers to income of all household members from all sources [**TOT_INC**]. Household consumption refers to total household consumption expenditure [**ADJ_TOT_EXP**] net of EMIs [**M_EXP_ALL_EMIS**], remittances sent [**M_EXP_REMITTANCES_SENT**] and payments towards social [**M_EXP_SOCIAL_OBLIGATIONS**] and religious obligations [**M_EXP_RELIGIOUS_OBLIGATIONS**]. Data on household income and consumption expenditure for households with accepted survey responses [**RESPONSE_STATUS**] and positive values of income and consumption expenditure are aggregated to the level of India using appropriate monthly survey weights [**HH_WGT_MS**]. Data on Index of Industrial Production is from FRED with ticker: INDPROINDMISMEI (data accessed on 14th August, 2023). Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy.

- Figure 10: The above figures plot the impulse response functions of household income and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on bank branches, deposits and credit outstanding are from the RBI's *Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks*. Data on population in each HR is from the *Census of India, 2011*. Additional details about the construction of these financial inclusion measures can be found in the notes to Figure 4 and Section 2.2.

- Figure 11: The above figures plot the impulse response functions of household income

and household consumption (in logarithms) in HRs with above median levels of different measures of financial inclusion relative to below median HRs to a 10 basis points change in the 3-month MIBOR-OIS fixed rate on scheduled monetary policy announcement dates of the Reserve Bank of India. Household income and consumption (in logarithms) are winsorized at the 5% and 95% levels. 90% and 68% confidence intervals based on standard errors double clustered by HR and Month are displayed. The impulse response functions are estimated using Equation 2 outlined in the main text. Household income and household consumption are obtained from the Centre for Monitoring the Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS). The data on income is from the Income Pyramids module and on consumption expenditure is from the Consumption Pyramids module of the CPHS. Further details about the calculation of income and consumption at the HR-Month level can be found in the notes to Figures 8 and 9. Data on monetary policy announcement dates of the Reserve Bank of India are from Narayan (2025). Data on the 3-month MIBOR-OIS fixed rate is sourced from Bloomberg Terminal with ticker: IRSWOC BGN Curncy. Data on formal borrowing proportions in each HR is from the Aspirational India module of the CPHS. Additional details about the construction of these financial inclusion measures can be found in Section 2.1.