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FLOW CHANNEL OF MONETARY POLICY

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# Consumption responses to rising mortgage rates: Unpacking the cash-flow channel of monetary policy\*

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## Abstract

We study the transmission of rising interest rates to consumption using granular customer data from a major bank in Denmark. We show that households with adjustable-rate mortgages gradually reduced spending and increased deposits as market rates soared in 2022 but made no further spending cuts when their mortgage rates eventually reset to a higher level in 2023-2024. These patterns are consistent with forward-looking households who respond to new information about future mortgage costs and use liquid buffers to smooth consumption. The cash-flow channel of monetary policy may therefore operate almost instantaneously even when mortgage rates reset with a significant lag.

**JEL-Codes:** D12, D14, E21, E43, E52.

**Keywords:** Consumption, Saving, Cash-flow effect, Monetary policy, Mortgage

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# 1 Introduction

A key channel of monetary policy transmission is the cash-flow channel: the pass-through of policy rates to the market interest rates that determine the financing costs of firms and households. In many countries, it is common for households to have mortgage rates that reset to market rates at regular intervals—e.g. every one, three or five years—implying that monetary policy affects mortgage costs with a relatively long time lag. Nonetheless, it is possible that monetary policy shocks influence household behavior almost immediately by shifting expectations about future mortgage costs. In other words, the timing of monetary policy transmission through the cash-flow channel is shaped by two margins of household behavior: responses to *current cash-flows*—what they pay on their mortgage today—and responses to *expected future cash-flows*—what they expect to pay after the next reset.

Theories of household consumption and saving provide some guidance on this question. The permanent income hypothesis suggests that households should adjust consumption in response to shocks that change expectations about future cash-flows and smooth consumption through fully anticipated changes in current cash-flows (Friedman 1957; Ando and Modigliani 1963; Hall 1978). Other canonical work highlights frictions: households whose consumption choices are constrained by a low level of liquidity may respond strongly to changes in current cash-flows and perhaps not at all to changes in expectations (Zeldes, 1989; Deaton, 1991; Carroll, 1997). Finally, more recent work discusses whether behavioral models such as rational inattention and mental accounting can explain the observed over-sensitivity to current cash-flows and under-sensitivity to expected future cash-flows (Kueng, 2018).

In this paper, we provide empirical evidence on household responses to rising interest rates and pass-through to mortgage rates. Our laboratory is Denmark where the market interest rate on mortgage loans with a 5-year interest fixation period soared from around 0% to around 3% during 2022. This dramatic increase implied that the mortgage payments of large groups of households almost doubled when their rates were reset in 2023-2024. Our analysis uses granular customer data from a large retail bank in Denmark, which allows us to track mortgage payments, spending, income, and saving across households with varying exposure to the interest rate shock.

In this setting, we are able to unpack the cash-flow effect of monetary policy by estimating, with distinct quasi-experimental designs, the response to anticipated changes in current mortgage payments, holding constant expectations about future cash-flows, and the response to changes in expected future mortgage payments, holding constant current cash-flows. In both cases, the design shuts down other channels of monetary policy, such as wealth effects and labor

market effects.

The first quasi-experiment identifies household responses to an anticipated increase in current mortgage payments. It compares two groups of households who had mortgages with a 5-year interest fixation period when they entered the period with surging market interest rates. While the two groups are almost identical on observable characteristics, differences in the timing of past home purchases creates variation in the timing of mortgage rate resets. Specifically, we compare a treatment group with reset during the estimation period, in April 2023, and a control group with reset immediately after the estimation period, in April 2024. The key identifying assumption is that the two groups are similarly exposed to other channels of monetary policy, including the effect on mortgage costs after future resets.

The results suggest that the increase in current mortgage payments had little or no effect on household spending. For every dollar increase in the treatment group’s monthly mortgage payments at reset, they reduced monthly spending by only 1 cent relative to the control group, a small and precisely estimated marginal propensity to consume of around 0.01. To sustain spending through the substantial increase in mortgage payments, they drew down balances on deposit and current accounts (around 75 cents on the dollar). We find no significant effects on other behavioral margins such as stock market investment and non-mortgage loans.

The second quasi-experiment identifies household responses to an increase in expected future mortgage payments. It compares two groups of households before any of them are affected by changes in mortgage payments. While they are similar on observable characteristics, they have different exposure to the looming pass-through of rising market rates to mortgage payments because of past financing choices. Specifically, we compare a treatment group with adjustable-rate mortgages due to reset in April 2023 or April 2024—the same households that we studied in the first quasi-experiment—and a control group with fixed-rate mortgages originating in the same period.

The results suggest that this shock to expected future mortgage payments had a significant negative effect on household spending. To express the estimate as a marginal propensity to consume, we use market forecasts of future mortgage rates to construct, for each household and for each month prior to reset, a time-varying measure of the expected increase in mortgage payments at reset. The results imply that for every dollar the treatment group’s monthly mortgage payments were expected to increase at reset, they reduced monthly spending by around 16 cents in the period prior to reset. By reducing spending, but also by reducing financial investments, the treatment group significantly increased balances on deposit and current accounts (around

60 cents on the dollar of expected future increases) in anticipation of the mortgage rate reset.

We show that the results are robust to changing the set of non-parametric controls and to excluding households that extract equity or make changes to the mortgage features—e.g. change the interest rate fixation period or move to interest-only—at the time of reset. Moreover, the results from the second quasi-experiment carry over to an alternative design that identifies spending effects from variation in ex ante loan size *within* the sample of households with adjustable-rate mortgages. This addresses a potential concern about our main design, namely that selection into adjustable vs fixed-rate mortgages correlates with unobservable and potentially confounding characteristics (e.g. risk preferences). Remarkably, the alternative design, although it exploits an entirely different source of variation, delivers the same estimate of the propensity to reduce current spending in response to higher expectations about future mortgage payments (16 cents on the dollar).

Overall, the results align well with standard theory for unconstrained and forward-looking households. The households in our sample reduce spending significantly and increase their buffer of liquid assets when a shock to market interest rates raises expectations about future mortgage payments. However, they make no further spending adjustments but draw on liquid buffers when the shock eventually passes through to current mortgage payments. Presumably, this reflects that Danish households with adjustable-rate mortgages are relatively liquid: average deposit balances in our sample equal almost one year of spending or more than three years of mortgage payments after reset. Focusing on the least liquid subsample, we find a larger spending cut in response to rising expectations about future mortgage payments (25 cents on the dollar of expected future increases), but still no response to the increase in current mortgage payments at reset.

Our paper contributes to the literature that uses granular microdata to study monetary policy transmission through the cash-flow channel. Closely related to our analysis of current cash-flows, Di Maggio et al. (2017) find that households increase spending when mortgage rates reset to a lower level. Cloyne et al., (2020), Floden et al. (2021), and Galaasen et al. (2024) find significant consumption responses to monetary policy shocks without distinguishing responses to current vs expected future cash-flows. At least three features set our paper apart from this existing work. First, we study rising—not falling—interest rates. Households need not respond symmetrically to positive and negative changes and, indeed, recent evidence from tax refunds suggest that households are more likely to smooth negative than positive cash-flows (Baugh et al., 2021). This asymmetry resolves the tension between the earlier finding that spending adjusts

at reset when rates are falling (Di Maggio et al., 2017) with our finding that spending adjusts in anticipation of reset when rates are rising. Second, we identify the consumption effects of shocks to expectations about future cash-flows, in addition to and separately from the effects of anticipated changes in current cash-flows.<sup>1</sup> This distinction is critical for the dynamics of monetary policy transmission. By highlighting that expectations play a key role, our results suggest that monetary policy shocks may affect household spending almost immediately even when mortgages have significant interest fixation periods. Third, our measures of spending, deposits, and investment are near-comprehensive. This enables us to estimate the marginal propensity to consume directly and to recover the full array of household responses with estimates that, at least approximately, respect the adding-up properties coming from the intertemporal budget constraint.

We also contribute to the broader empirical household finance literature on how spending and saving decisions are shaped by changes in the economic environment. A central question concerns the effect of anticipated cash-flows, positive or negative, on household consumption. The findings are mixed with some papers documenting a high sensitivity to anticipated cash-flows (Parker, 1999; Souleles, 1999; Kueng, 2018) and others finding no such sensitivity (Browning and Collado, 2002; Hsieh, 2003). Our small and precise estimate of the marginal propensity to consume out of current mortgage payments places our paper in the latter camp. Our finding is consistent with earlier work showing that households are more likely to smooth negative shocks to cash-flows (Baugh et al, 2021).

The paper proceeds as follows. Section 2 provides background. Section 3 describes the data. Section 4 and 5 analyze spending responses to current and expected future mortgage payments respectively. Section 6 analyzes heterogeneity. Section 7 probes the robustness of the main results. Section 8 concludes.

## 2 Background

**The mortgage market.** Most households in Denmark finance home purchases with long-term mortgages from specialized mortgage banks. The mortgage banks raise funds by issuing bonds with the same payment profile as the mortgages so that the interest rate paid by the borrower mirrors the yield on the bonds. Interest rates are therefore determined solely by market conditions and do not vary with borrower characteristics such as credit scores. Mortgages

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<sup>1</sup>Relatedly, Fuster et al. (2026) show that households prepare for future changes in mortgage rates through refinancing decisions and Druedahl et al. (2022) study household responses to advance notices from banks about reset rates.

generally come with an option of interest-only payments for a limited period.

Households can choose between fixed-rate mortgages (FRM), for which the interest rate is determined at origination and stays constant during the term of the loan, and adjustable-rate mortgages (ARM), for which the interest rate is adjusted at regular, predefined intervals of 1, 3 or 5 years. As shown in Appendix Table A.1, around half of the households with a mortgage in 2021 had adjustable rates, and around half of those had opted for five-year intervals between rate adjustments (ARM5).

Around 3 months before the reset date, adjustable-rate borrowers receive a letter from their bank that informs them about the expected interest rate after reset and asks them if they want to keep the type of loan or make changes, e.g. shorten interest fixation periods or move to interest-only payments. Around 2 months before the reset date, banks issue new bonds to refinance the loans, and the new interest rate is calculated as the yield on the new bonds.

**The interest rate shock.** Figure 1 shows the evolution in interest rates on new ARM5 loans issued by mortgage banks in Denmark. The rates were close to zero throughout 2021 but then rose sharply by more than 3 percentage points in the first three quarters of 2022, as central banks raised policy rates to combat mounting inflationary pressures. The figure also shows Danske Bank’s forecast, made 12 months earlier, for the ARM5 interest rate in each month. The forecast series illustrates two important points: First, the forecasts for 2022 are only slightly increasing and far below actual realized rates, demonstrating that the steep increase came as a surprise to professional analysts. Second, the forecasts closely track current rates with a one-year lag, indicating that at any point during this period, forecasters expected the interest rate 12 months in the future to remain close to its current level. Specifically, the forecast in early 2023 was that interest rates would remain at roughly the same elevated level over the next year—an expectation that ultimately proved accurate.

### 3 Data

**Data sources.** The analysis uses customer data from Danske Bank, the largest retail bank in Denmark, and their mortgage bank subsidiary. The data includes loan-level data on mortgages with detailed information about loan characteristics and payments of interest and fees. It also includes transaction-level data on consumer expenditures made through card payments and bill payments, as well as on cash withdrawals.

**Sample.** We conduct the analysis at the household level. As the ARM5 loans in our dataset generally reset in April, we define four samples. The first two samples comprise households with an ARM5 mortgage resetting either in April 2023 (hereafter “ARM23”) or in April 2024 (hereafter “ARM24”). These loans generally originate 5 or 10 years before the resets we consider here.<sup>2</sup> The last two samples comprise households with a fixed-rate mortgage: One where the loans originate in the same period as in the ARM23 sample (hereafter “FRM23”), and one where they originate in the same period as in the ARM24 sample (hereafter “FRM24”).

We impose two additional sample restrictions to address concerns about incomplete spending measures in cases where households use multiple banks (Baker, 2018). To limit the sample to households who primarily use Danske Bank accounts for their spending, we require that households have at least five spending transactions through Danske Bank per month throughout the analysis period, and that the unique bank account designated for transactions with the public sector is held at Danske Bank. We also exclude business customers because their personal balance sheets are difficult to disentangle from those of their businesses.

**Period and frequency.** Our analysis covers the 48-month period from April 2020 to March 2024. This period covers the surge in market expectations about future mortgage rates in 2022, which is relevant for both adjustable-rate samples, as well as the reset for one of them in April 2023. The analysis period includes some of the Covid-19 pandemic, which had a significant effect on spending patterns (Andersen et al, 2022). While we measure all outcomes at the monthly level, we conduct the analysis at the quarterly level using the monthly average within the quarter as the outcome. This procedure reduces noise relative to estimations at the monthly frequency and retains the interpretation of the estimates as changes in monthly flows.

**Exogenous variation in current cash-flows.** Households occasionally change the size and the features of their mortgage loan at the time of reset and we treat such changes as potentially endogenous responses. Hence, we isolate the *exogenous* part of the variation in current mortgage payments at reset, which is the part that reflects movements in market interest rates holding constant the mortgage loan. Specifically, for each ARM5 loan that households hold in December 2021, our measure captures the change in payments at reset given the actual realization of the ARM5 interest rate and assuming that all mortgage features remain unchanged. For households

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<sup>2</sup>Specifically, the ARM23-sample financed their home with an ARM5 in the period March 2013 - February 2014 or in the period March 2018 - February 2019 while the ARM24-sample did the same in the period March 2014 - February 2015 or in the period March 2019 - February 2020.

who do not alter their loans between December 2021 and reset, this coincides with the actual change in mortgage payments at reset.

**Exogenous variation in expected future cash-flows.** Absent information about households' subjective expectations, we construct a time-varying measure of expected future mortgage payments based on the expert forecasts (see Figure 1). Specifically, for each ARM5 loan that households hold in December 2021, we apply the bank's forecasts about the change in the ARM5 interest rate at reset. For each loan and each month prior to reset, our measure captures the expected change in payments at reset given market expectations about the realization of the ARM5 interest rate and assuming that all mortgage features remain unchanged.

**Outcomes.** We use the data from Danske Bank to construct a number of household-level outcomes. First, we measure monthly *mortgage payments*, which include mortgage interest payments, principal repayments, and loan-related fees. Second, we measure monthly *spending* by summing payments made with cards and bills as well as cash withdrawals, while excluding transaction categories such as tax payments and debt service. Our approach follows existing papers that construct spending measures from bank transaction data (e.g., Ganong and Noel, 2019; Andersen et al., 2023, 2024).<sup>3</sup> Third, we measure *net saving in deposits* as the change in balances on all current accounts and deposit accounts from the beginning to the end of the month. Fourth, we measure *net investment in securities* as net flows into securities investment accounts from current and deposits accounts. Our measure includes flows to and from investment accounts at Danske Bank as well as the two main online investment platforms in Denmark. Fifth, we measure the change in *other loan balances* as the change in balances on all loan accounts other than mortgage loans from the beginning to the end of the month. Sixth, we measure *after-tax income* by summing over inflows categorized as income by the banks' classifier.

**Summary statistics.** Table 1 shows summary statistics for each of the four samples. The two adjustable-rate samples are highly comparable in terms of age, balance sheet structure, income and spending, geographical location and family structure. This is intuitive given that they have selected the same type of mortgage loan at almost the same point in time. By comparison, the fixed-rate samples are younger, have smaller balance sheets and higher income, are less likely to

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<sup>3</sup>Appendix Table A.2 compares our transaction-based measure of spending with the survey-based measure of consumption constructed by Statistics Denmark. Average transaction-based spending in our sample is somewhat higher than average survey-based consumption in the population with a roughly similar composition across categories.

live in the Copenhagen region and are more likely to have children under 18 years. We absorb the observable differences with a battery of control variables in the regressions below.

## 4 Current cash-flows

The goal of our first analysis is to estimate responses to the increase in current mortgage payments occurring at the time of the mortgage rate reset. While theory suggests that households with no liquidity constraints should smooth spending in response to fully anticipated changes in payments, many empirical studies show that household spending is sensitive to cash-flows, even when they are fully anticipated (e.g. Di Maggio et al., 2017).

**Empirical design.** Our design relies on quasi-random differences in the timing of mortgage rate reset after the shock to market interest rates in 2022. We compare a *treatment group* with adjustable-rate loans resetting in April 2023 (“ARM23”) to a *control group* with adjustable-rate loans resetting in April 2024 (“ARM24”). The difference in the timing of reset reflects minor differences in the timing of loan origination 5-10 years earlier. Given their similarity in terms of observable characteristics such as age, income and balance sheets, the two groups are similarly exposed to other effects of higher interest rates and related changes in the macroeconomic environment (see Table 1). It seems plausible that they would have remained on similar behavioral trajectories absent the difference in reset dates, which implies that we can interpret any divergence around April 2023 as the effect of the differential change in current mortgage payments.

Importantly, assuming that the two groups generally reset at similar rates, the differential effect of the surge in interest rates on loan net present value is small, suggesting that our estimates are not confounded by wealth effects. Intuitively, if the control group faces the same changes in mortgage payments as the treatment group, only with a 12-month delay, the differential wealth effect only reflects the time value of money applied to the change in mortgage payments. For the resets in 2023-2024, the assumption of similar reset rates holds in expectation as well as in realizations: when the treatment group was reset at around 3.5% in April 2023, the control group was expected to reset at a similar rate in April 2024 (see Figure 1) and this turned out to be accurate. For future resets in 2028-2029 and beyond, it seems likely that the two groups hold similar expectations about reset rates.

**Descriptive evidence.** Figure 2a illustrates the treatment by showing mean monthly mortgage payments for households in the treatment group (red line) and the control group (gray line). Before April 2023, the treatment group paid around DKK 4,000 per month, slightly more than the control group, with very little variation across months. In April 2023, the mortgage rate of the treatment group was reset and their monthly payments jumped to more than DKK 7,000 while nothing changed for the control group.

Figure 2b illustrates the treatment effect by showing mean monthly spending for the two groups. Spending is almost perfectly aligned across the treatment and control group throughout the analysis period. While there is significant variation across months—e.g. due to differences in the number of days, the number of weekends and public holidays, or Covid-related restrictions—it is remarkably similar across the two groups. Strikingly and most importantly for our purposes, there are no visible signs that the spending of the treatment group changes differentially in April 2023 when their mortgage payments almost double.

**Dynamic DiD estimates.** We conduct a formal investigation of the dynamic spending responses to the mortgage rate reset by estimating the following model for the period from 2020q2 to 2024q1:

$$y_{i,t} = \alpha_i + \gamma_t + \sum_{q \neq 2023q1} ((\beta_q ARM23_i + \mathbf{X}_i \boldsymbol{\delta}_q) \cdot \mathbb{1}(t = q)) + \epsilon_{i,t} \quad (1)$$

where  $y_{i,t}$  is average monthly spending for household  $i$  in quarter  $t$ ,  $\alpha_i$  represents household fixed effects,  $\gamma_t$  represents time fixed effects,  $ARM23_i$  is a dummy for belonging to the treatment group,  $\mathbb{1}(t = q)$  is an indicator for quarter  $t$ , and  $\mathbf{X}_i$  is a vector of controls evaluated in December 2021. The controls are categorical variables indicating birth year (5-year interval), income (quintile group), total debt (quintile group), total bank deposits (quintile group), and area of residence (11 regions). The  $\beta$  coefficients are dynamic difference-in-difference estimates capturing differential changes in the outcome since the last pre-reset quarter for treated households relative to control households with similar characteristics.

Figure 2c illustrates the dynamic difference-in-difference estimates. The two groups are on parallel spending trajectories both before and after the mortgage rate reset for the treatment group in April 2023, suggesting that the treatment group made no adjustments to spending in response to the sharp increase in current mortgage payments.

**Other response margins.** To explore how households sustained spending through the surge in mortgage payments, we provide static difference-in-difference estimates for a broader set of

response margins in Column (1) of Table 2. The results indicate that the monthly mortgage payments of the treatment group increased differentially by around DKK 3,300 from pre-reset to post-reset quarters while their spending decreased differentially by only around DKK 40. We also find small and statistically insignificant estimates for net investment, after-tax income and other loans. The only other significant response margin is deposit balances where we estimate a monthly differential decrease of around DKK 2,600. Jointly, the estimates are not far from respecting the adding-up properties implicit in the intertemporal budget constraint, suggesting that we are not missing any important response margins.

**Marginal effects.** Finally, we express the estimates as marginal effects, i.e., the change in the outcome variable per 1 DKK exogenous increase in current mortgage payments, by estimating the following instrumental variables framework:

$$y_{i,t} = \alpha_i + \gamma_t + \lambda \cdot \Delta pay_i \cdot post_t + \sum_{q \neq 2023q1} ((\mathbf{X}_i \boldsymbol{\delta}_q) \cdot \mathbb{1}(t = q)) + \epsilon_{i,t} \quad (2)$$

where  $post_t$  is an indicator for quarters after the mortgage rate reset for the treatment group. The key explanatory variable is  $\Delta pay$ , which measures the exogenous—i.e. absent refinancing— increase in monthly mortgage payments occurring at the mortgage rate reset for the treatment group. This variable takes the value zero for the control group by construction. To isolate the variation in  $\Delta pay$  created by the quasi-random differences in reset timing, we instrument it with the indicator for belonging to the treatment group. Any variation in  $\Delta pay$  created by potentially endogenous differences in loan amounts does not contribute to identification. The  $\lambda$  coefficient measures the marginal effect.

We report the estimated marginal effects in Column (2) of Table 2. Using actual current mortgage payments as the outcome, we obtain a coefficient of 0.98. This suggests that refinancing played a limited role in mitigating the surge in mortgage rates: households offset the exogenous increase in mortgage payments by only 2 cents on the dollar through switches to other mortgage products.<sup>4</sup> For spending, we estimate an insignificant coefficient, which implies a marginal propensity to consume out of anticipated changes in mortgage payments of 0.01. For net investment, after-tax income and other loans, the estimated coefficients are also relatively small and statistically insignificant. For deposits, however, we estimate a coefficient of 0.76,

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<sup>4</sup>Incidentally, the yield curve was approximately flat in early 2023 so switches from ARM5 to ARM1 had almost no impact on mortgage payments.

implying that liquid buffers absorbed more than three quarters of the increase in mortgage payments.

## 5 Expected future cash-flows

The goal of this analysis is to estimate household responses to shocks to expected future mortgage payments. Such shocks occur for ARM borrowers when market interest rates surge before the reset of the rate on their own loans. While theory suggests that households should make behavioral adjustments when expectations change, empirical evidence of such behavior remains scarce.

**Empirical design.** Our main empirical design exploits that the sharp increase in current market interest rates in 2022 was associated with a differential shock to expected future mortgage payments: adjustable-rate borrowers were suddenly facing a much higher rate after the next reset while fixed-rate borrowers were effectively insured against such an increase. We compare a *treatment group* of households with ARM5 loans resetting in April 2023 or April 2024 (“ARM23” and “ARM24”) to a *control group* of households with fixed-rate mortgages originating in the same period as the treatment group (“FRM23” and “FRM24”). To isolate the effect of expected future mortgage payments, we focus on the period *before reset* where current mortgage payments were fixed for both groups.

The key identification concern is selection into adjustable vs fixed rate loans on unobservable characteristics such as risk preferences that could have their own separate impact on household behavior and could potentially invalidate our difference-in-difference estimates. We address that concern with an alternative design that relies on variation in mortgage loan size *within* the sample of households with adjustable-rate mortgages for identification (see Section 7).

**Descriptive evidence.** Figure 3 first illustrates the treatment effect by showing mean monthly spending for the two treated groups with adjustable-rate loans and the corresponding control groups with fixed-rate loans. In Panel (a) where reset is in April 2023, the treatment group initially has slightly higher average spending than the control group, but the gap between the two groups is largely eliminated during 2022. In Panel (b) where reset in April 2024, the treatment group enters the analysis period with lower average spending than the control group and the gap between the two groups widens during 2022. Hence, in both cases, the spending of the treatment group decreases differentially around the surge in interest rate expectations. Recall

that the figure only considers the pre-reset period where current mortgage payments are fixed for both treatment and control groups (Appendix Figure A.1), suggesting that the divergence is driven by the differential shock to expected future mortgage payments.

**Dynamic DiD estimates.** We investigate the dynamic spending responses to expectation shocks more formally in a difference-in-differences framework including both treated groups and both control groups. The sample period is 2020q2-2024q1, but treated households with reset in April 2023 and the corresponding control group are only included in the period 2020q2-2023q1 to prevent the reset to contaminate the estimates. We estimate the following model:

$$y_{i,t} = \alpha_i + \gamma_t + \sum_{q \neq 2021q4} ((\beta_q ARM_i + \mathbf{X}_i \boldsymbol{\delta}_q) \cdot \mathbb{1}(t = q)) + \epsilon_{i,t} \quad (3)$$

where  $ARM_i$  is an indicator for belonging to a treatment group. The controls are the same as in Equation 1.

Figure 3c illustrates the dynamic difference-in-difference estimates. The two groups are generally on parallel spending trajectories before expected future mortgage rates start rising. Coinciding with the expectation shock in 2022, a wedge opens up with the treatment group gradually reducing their spending relative to the control group. This pattern suggests that the treatment group cut down on spending and started building a liquid buffer in anticipation of the expected future increase in mortgage payments.

**Other response margins.** We provide static DiD estimates for a broader set of response margins in Column (3) of Table 2. We find no differential change in the mortgage payments of the treatment group coinciding with the surge in expected future mortgage rates.<sup>5</sup> Nonetheless, the treatment group differentially reduce their monthly spending by around DKK 540 and their investments by around DKK 1,040. After-tax income also increases differentially by around DKK 260, which is likely to reflect the tax-deductibility of interest payments rather than labor supply responses.<sup>6</sup> As a result, the deposit balances of the treatment group increase by almost DKK 2,000 per month relative to the control group. Again, the estimates are not far from respecting the adding-up properties coming from the intertemporal budget constraint, suggesting

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<sup>5</sup>While the sample period is designed to exclude contractually scheduled mortgage rate resets, changes in mortgage payments can, in principle, occur for both ARM and FRM borrowers at any time if they choose to refinance their loans.

<sup>6</sup>Appendix Figure A.2 shows that the differential increase in after-tax income happens in 2023q1 for “ARM23” and 2024q1 for “ARM24”. This suggests that some households actively adjusted the expected annual interest expenses in their tax records prior to the actual reset on 1 April, triggering a reduced tax withholding by employers, and thus an increase in after-tax income, in January, February, and March.

that we capture all important response margins.

**Marginal effects.** Finally, we express the estimates as marginal effects, i.e., the change in the outcome variable per 1 DKK exogenous increase in expected future mortgage payments, by estimating the following instrumental variables framework:

$$y_{i,t} = \alpha_i + \gamma_t + \lambda \cdot E_t[\Delta pay_i] + \sum_{q \neq 2021q4} ((\mathbf{X}_i \boldsymbol{\delta}_q) \cdot \mathbb{1}(t = q)) + \epsilon_{i,t} \quad (4)$$

where  $E_t[\Delta pay]$  measures the market expectation in quarter  $t$  of the increase in mortgage payments at reset absent refinancing, which is zero for the control group by construction. We instrument this variable with  $ARM_i \cdot E_t[\Delta r_{reset}]$  where  $E_t[\Delta r_{reset}]$  denotes the forecasted change in the mortgage rate at reset. The instrumentation implies that identification comes exclusively from comparing average adjustable-rate and fixed-rate borrowers before and after the expectation shock in the spirit of the difference-in-differences estimator. Variation in  $E_t[\Delta pay]$  stemming from variation in mortgage size within the treatment group does not contribute to the identification of  $\lambda$ .

We provide estimates of the marginal effects in Column (4) of Table 2. The estimates suggest that adjustable-rate borrowers reduced monthly spending by around 0.16 per DKK 1 expected increase in future monthly mortgage payments and monthly investments by 0.27. The resulting increase in deposit balances is around 0.58 per DKK 1 expected increase in future monthly mortgage payments.

## 6 Heterogeneity

Theory highlights that household responses to changes in cash-flows may vary systematically with household characteristics. Most notably, households with little liquidity may reduce consumption more strongly in response to an adverse change in cash-flows because they lack liquid reserves to smooth consumption. However, other characteristics may matter too. For instance, highly levered households may respond more strongly because the change in cash-flows is more salient; households with a high share of spending on food may respond less strongly because food is a necessity item; and older households may respond more strongly because a given shock must be smoothed over a smaller number of years.

**Dimensions.** To understand the mechanisms underlying the mean spending responses reported above, we provide MPC estimates for ten subsamples. Specifically, we split the full

sample by (i) *liquidity* - deposit balances above and below DKK 75,000; (ii) *debt-to-income* - housing debt above and below two times annual income; (iii) *loan-to-value* - housing debt above and below 0.6 times the property value; (iv) *grocery share* - more and less than 20% of total expenditures in grocery stores; (v) *age* - above and below 60 years.

**Results.** The marginal propensity to consume out of current mortgage payments does not exceed 0.05 in any of the subsamples and none of the estimates are statistically significant (Figure 2d). Perhaps most surprisingly, the point estimate for the low-liquid group is almost exactly zero; however, this estimate is imprecise and we cannot reject MPCs up to 0.14. The marginal propensity to consume out of expected future mortgage payments is sizeable and statistically significant across all the subsamples (Figure 3d). We find the largest point estimate of around 0.25 for the low-liquidity group, suggesting that households with less ex ante liquidity make deeper cuts in spending to expand liquidity buffers in anticipation of future increases in mortgage payments.

## 7 Robustness

**Robustness to controls.** Appendix Figure A.3 shows how the estimated responses vary with the set of controls. Starting from a parsimonious specification that only includes household and time fixed effects, we sequentially add non-parametric controls for ex ante income and balance sheet components, and demographics. Finally, we increase the granularity of the controls replacing quintiles with deciles. For current cash-flows, the estimated responses are remarkably robust to the set of controls (Panel a). For expected future cash-flows, it is more important to absorb ex ante differences in household characteristics (Panel b).

**Robustness to sample restrictions.** Appendix Figure A.4 illustrates how the estimates change when we impose more stringent sample restrictions. Spending and investment responses to changes in current cash-flows are consistent across all samples, but the change in deposits becomes smaller when we drop households that extracted equity or refinanced their mortgage around the reset (Panel a). The estimated responses to changes in expected future cash-flows are generally highly robust to harsher sample restrictions (Panel b). This is intuitive because households typically extract equity and refinance in the context of mortgage rate resets, which do not occur within this analysis period by design.

**Robustness to alternative design.** Appendix Figure A.5 shows the results from our alternative design for estimating spending responses to shocks to expected future mortgage payments. It addresses the potential identification problem in the main design that ARM and FRM borrowers may differ on important unobservables by exploiting variation *within* the sample of ARM borrowers for identification. Intuitively, a given shock to expected future mortgage rates generates a larger change in expected future mortgage payments for households with larger loans. We harness this variation by estimating equation (3) for the sample of adjustable-rate borrowers while replacing  $ARM_i$  with an indicator for ARM loan balances above the sample median. Consistent with the baseline results, the two groups are on parallel spending trajectories before expectations about future mortgage rates increase and then diverge with large-loan households gradually reducing spending relative to small-loan households. The implied marginal propensity to consume out of expected future mortgage payments is almost identical, 0.162 vs 0.160, across the two designs.

## 8 Concluding remarks

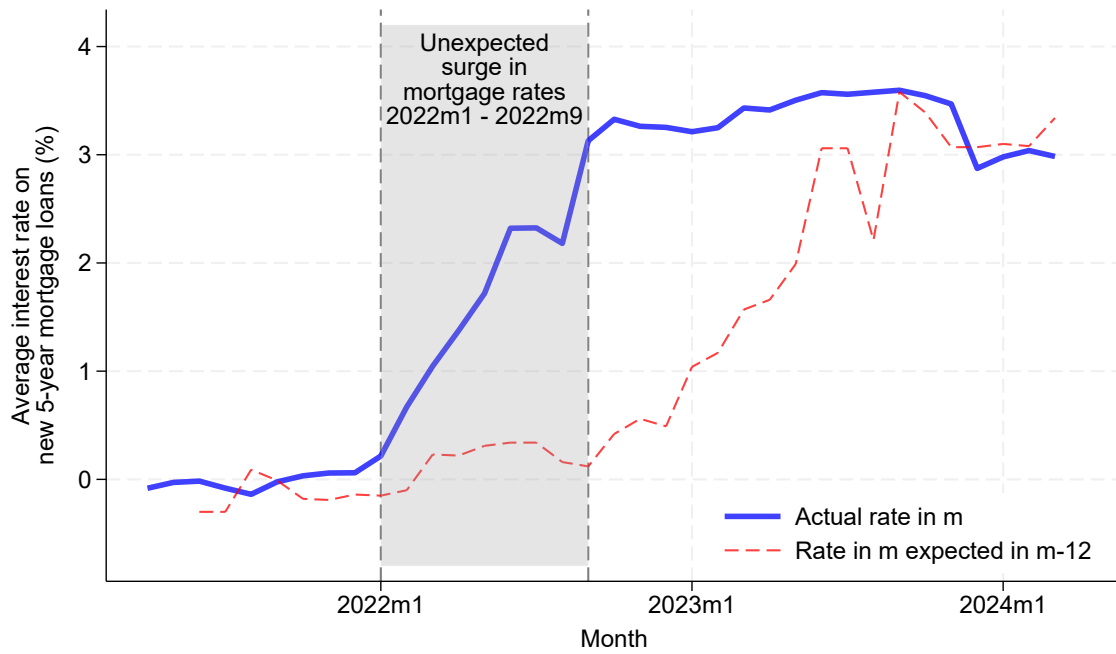
This paper unpacks the cash-flow channel of monetary policy by studying how and when households with adjustable-rate mortgages respond to rising market interest rates. Our results suggest that households reduce spending in response to shocks to expected future mortgage payments but make no further spending adjustments when current mortgage payments increase at mortgage rate reset. This behavior is consistent with standard theories of forward-looking and unconstrained households who use liquid buffers to smooth consumption across periods with fluctuating disposable income.

# References

- [1] Andersen, A. L., Hansen, E. T., Johannesen, N., and Sheridan, A. (2022). Consumer responses to the COVID-19 crisis: Evidence from bank account transaction data. *Scandinavian Journal of Economics*, 124(4), 905-929.
- [2] Andersen, A. L., Jensen, A. S., Johannesen, N., Kreiner, C. T., Leth-Petersen, S., and Sheridan, A. (2023). How do households respond to job loss? Lessons from multiple high-frequency datasets. *American Economic Journal: Applied Economics*, 15(4), 1-29.
- [3] Andersen, A. L., Johannesen, N., and Sheridan, A. (2024). Dynamic Spending Responses to Wealth Shocks: Evidence from Quasi Lotteries on the Stock Market. *American Economic Review: Insights*, 6(3), 434-452.
- [4] Ando, A., and Modigliani, F. (1963). The "life cycle" hypothesis of saving: Aggregate implications and tests. *American Economic Review*, 53(1), 55-84.
- [5] Baker, S. R. (2018). Debt and the response to household income shocks: Validation and application of linked financial account data. *Journal of Political Economy*, 126(4), 1504-1557.
- [6] Baugh, B., Ben-David, I., Park, H., and Parker, J. A. (2021). Asymmetric consumption smoothing. *American Economic Review*, 111(1), 192-230.
- [7] Browning, M., and Collado, M. D. (2001). The response of expenditures to anticipated income changes: panel data estimates. *American Economic Review*, 91(3), 681-692.
- [8] Carroll, C. D. (1997). Buffer-stock saving and the life cycle/permanent income hypothesis. *Quarterly Journal of Economics*, 112(1), 1-55.
- [9] Cloyne, J., Ferreira, C., and Surico, P. (2020). Monetary Policy when Households have Debt: New Evidence on the Transmission Mechanism. *Review of Economic Studies*, 87(1), 102-129.
- [10] Deaton, A. (1991). Saving and liquidity constraints. *Econometrica*, 59(5), 1221-1248.
- [11] Di Maggio, M., Kermani, A., Keys, B. J., Piskorski, T., Ramcharan, R., Seru, A., and Yao, V. (2017). Interest rate pass-through: Mortgage rates, household consumption, and voluntary deleveraging. *American Economic Review*, 107(11), 3550-3588.
- [12] Di Maggio, M., Kermani, A., and Palmer, C. J. (2020). How quantitative easing works: Evidence on the refinancing channel. *Review of Economic Studies*, 87(3), 1498-1528.
- [13] Druedahl, J., Jensen, E. B., and Leth-Petersen, S. (2022). The intertemporal marginal propensity to consume out of future persistent cash-flows: Evidence from transaction data (No. 13/22). CEBI Working Paper Series.

- [14] Flodén, M., Kilström, M., Sigurdsson, J., and Vestman, R. (2021). Household debt and monetary policy: Revealing the cash-flow channel. *Economic Journal*, 131(636), 1742-1771.
- [15] Friedman, M. (1957). The permanent income hypothesis. In *A theory of the consumption function* (pp. 20-37). Princeton University Press.
- [16] Fuster, A., Gianinazzi, V., Hackethal, A., Schnorpfeil, P., and Weber, M. (2026). The response of debtors to rate changes. NBER Working Paper No. 34752.
- [17] Galaasen, S., Maehlum, M., and Ahn, S. (2024). The Cash-Flow Channel of Monetary Policy-Evidence from Billions of Transactions. Available at SSRN 5089327.
- [18] Ganong, P., and Noel, P. (2019). Consumer Spending during Unemployment: Positive and Normative Implications. *American Economic Review*, 107(9), 2383–2424.
- [19] Hall, R. E. (1978). Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence. *Journal of Political Economy*, 86(6), 971-987.
- [20] Hsieh, C. T. (2003). Do consumers react to anticipated income changes? Evidence from the Alaska permanent fund. *American Economic Review*, 93(1), 397-405.
- [21] Kaplan, G., Moll, B., and Violante, G. L. (2018). Monetary policy according to HANK. *American Economic Review*, 108(3), 697-743.
- [22] Kueng, L. (2018). Excess sensitivity of high-income consumers. *Quarterly Journal of Economics*, 133(4), 1693-1751.
- [23] Parker, J. A. (1999). The reaction of household consumption to predictable changes in social security taxes. *American Economic Review*, 89(4), 959-973.
- [24] Souleles, N. S. (1999). The response of household consumption to income tax refunds. *American Economic Review*, 89(4), 947-958.
- [25] Zeldes, S. P. (1989). Consumption and liquidity constraints: an empirical investigation. *Journal of Political Economy*, 97(2), 305-346.

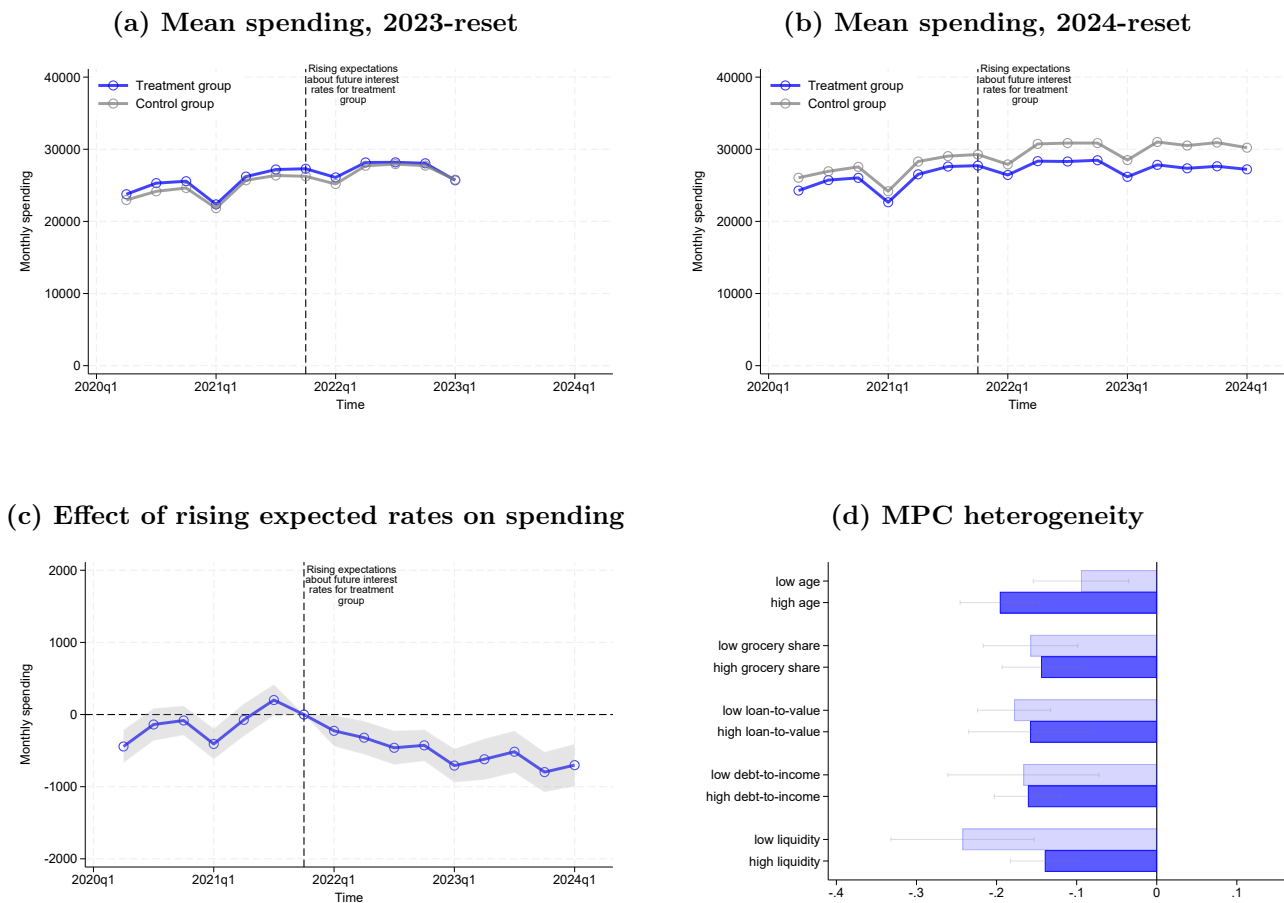
**Figure 1. Actual and forecasted mortgage rates.** The figure shows actual and forecasted interest rates on new adjustable-rate mortgage with a 5-year interest fixation period: the actual rate in month  $m$  (blue solid line) and the market forecast of the rate in month  $m$  made one year earlier in month  $m-12$  (red dotted line). Actual rates are from Danmarks Nationalbank and market forecasts are from Danske Bank.



**Figure 2 – Current cash-flows.** The figure shows the main results concerning the effect of current cash-flows. The treatment and control groups are households with a 5-year adjustable-rate mortgage that resets to a higher rate in April 2023 and April 2024, respectively. The sample period is 2020q2 – 2024q1. Panel (a) shows mean monthly mortgage payments for each of the two groups by quarter. Panel (b) shows mean monthly spending for each of the two groups by quarter. Panel (c) shows difference-in-difference estimates of the effect of mortgage rate reset on spending. Panel (d) shows estimates of the marginal propensity to consume out of an increase in current cash-flows for various subsamples defined relative to the following ex ante characteristics (i.e. measured in 2021): *age*: average household age above or below 60 years; *grocery share*: grocery spending accounts for more or less than 20% of total expenditure; *loan-to-value*: total housing debt is above or below 60% of the property value; *debt-to-income*: total housing debt is above or below 200% of the household income; *liquidity*: total deposit account balances is above or below DKK 75,000. All estimates in Panel (d) are based on estimation of equation 2 on the relevant subsample. Confidence bands in Panel (c)-(d) are at the 95% level based on standard errors clustered at the household level.



**Figure 3 – Expected future cash-flows.** The figure shows the main results concerning the effect of expected future cash-flows. The treatment groups are households with a 5-year adjustable-rate mortgage that resets to a higher rate in April 2023 or April 2024. The controls groups are households with a fixed-rate mortgage originating in the same years as the treatment groups. Panel (a) shows mean monthly spending for the treatment group with reset in April 2023 and the corresponding control group in the pre-reset period 2020q2–2023q1. Panel (b) shows mean monthly spending for the treatment group with reset in April 2024 and the corresponding control group in the pre-reset period 2020q2–2024q1. Panel (c) shows difference-in-difference estimates of the effect of surging expectations about future mortgage rate on spending using pre-reset observations from both treatment groups and their corresponding control groups. Panel (d) shows estimates of the marginal propensity to consume out of an increase in expected future cash-flows for various subsamples defined relative to the following ex ante characteristics (i.e. measured in 2021): *age*: average household age above or below 60 years; *grocery share*: grocery spending accounts for more or less than 20% of total expenditure; *loan-to-value*: total housing debt is above or below 60% of the property value; *debt-to-income*: total housing debt is above or below 200% of the household income; *liquidity*: total deposit account balances is above or below DKK 75,000. All estimates in Panel (d) are based on estimation of equation 4 on the relevant subsample. Confidence bands in Panel (c)-(d) are at the 95% level based on standard errors clustered at the household level.



**Table 1. Summary statistics.** The table shows mean values for a range of observable characteristics, for each of the four samples used in the analysis: households with an adjustable-rate mortgage with a 5-year interest fixation period originating in 2013 or 2018 and resetting in April 2023 (“ARM23” Column 1), households with an adjustable-rate mortgage with a 5-year interest fixation period originating in 2014 or 2019 and resetting in April 2024 (“ARM24” - Column 2), households with a fixed-rate mortgage originating in 2013 or 2018 (“FRM23”, Column 3), households with a fixed-rate mortgage originating in 2014 or 2019 (“FRM24”, Column 4).

	Households with adjustable-rate mortgage		Households with fixed-rate mortgage	
	(1) "ARM23"	(2) "ARM24"	(3) "FRM23"	(4) "FRM24"
	Loan origination: 2013 or 2018	Loan origination: 2014 or 2019	Loan origination: 2013 or 2018	Loan origination: 2014 or 2019
	Rate reset: 2023	Rate reset: 2024	Rate reset: none	Rate reset: none
Age	62.5	64.2	53.9	54.1
Household size	2.0	2.0	2.2	2.4
Annual after-tax income (DKK)	442,129	442,758	464,040	505,695
Annual spending (DKK)	311,664	316,194	302,038	334,854
Annual mortgage payment (DKK)	47,751	37,154	77,388	82,027
Annual net investment (DKK)	17,416	21,394	13,809	18,832
Deposits (DKK)	266,781	309,515	215,361	230,934
Property value (DKK)	3,866,100	4,011,550	2,922,442	3,600,115
Other loan debt (DKK)	14,453	12,848	16,266	18,864
Copenhagen region (%)	44	45	33	39
Number of households	5,764	4,512	4,461	20,194

**Table 2. Total effects and marginal effects.** The table shows household responses to changes in current mortgage payments (Columns 1-2) and changes in expected future mortgage payments (Columns 3-4) on a range of margins. It displays difference-in-difference estimates of total effects measured in DKK (Columns 1 and 3). These estimates are obtained from parsimonious versions of equations (1) and (3) in which the vector of quarterly indicators is replaced by a single indicator for post-treatment quarters. The table also displays IV estimates of marginal effects (Column 2 and 4). These estimates are obtained from equations (2) and (4). The effect of changes in current mortgage payments is identified from a comparison of a treatment group with ARM5 loans resetting in April 2023 (“ARM23”) vs. a control group with ARM5 loans resetting in April 2024 (“ARM24”). The effect of changes in expected future mortgage payments are identified from a pre-reset comparison of a treatment group with ARM5 loans resetting in April 2023 or April 2024 (“ARM23” and “ARM24”) and a control group with FRM loans originating in the same time period (“FRM23” and “FRM24”). Standard errors are clustered at the household level:  $*p \leq 0.1$ ,  $**p \leq 0.05$ ,  $***p \leq 0.01$ .

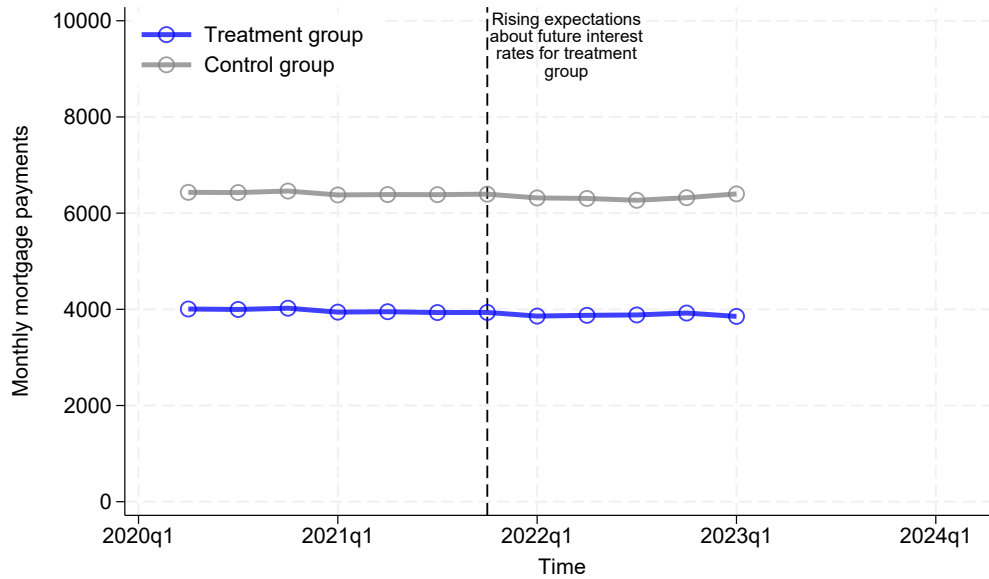
	Current cashflows		Expected future cashflows	
	(1) DiD estimates (Total effect)	(2) IV estimates (Marginal effect)	(3) DiD estimates (Total effect)	(4) IV estimates (Marginal effect)
Mortgage payments	3,348*** (41)	0.977*** (0.010)	15 (16)	-0.003 (0.006)
Spending	-39 (91)	-0.012 (0.028)	-543*** (68)	-0.162*** (0.020)
Net investment	173 (184)	0.048 (0.056)	-1,044*** (136)	-0.268*** (0.037)
After-tax income	203 (170)	0.072 (0.052)	262** (104)	0.051 (0.032)
Other loans	40 (46)	0.011 (0.014)	-9 (32)	-0.028*** (0.009)
Deposits	-2,638*** (303)	-0.763*** (0.092)	1,950*** (212)	0.579*** (0.059)

## ONLINE APPENDIX

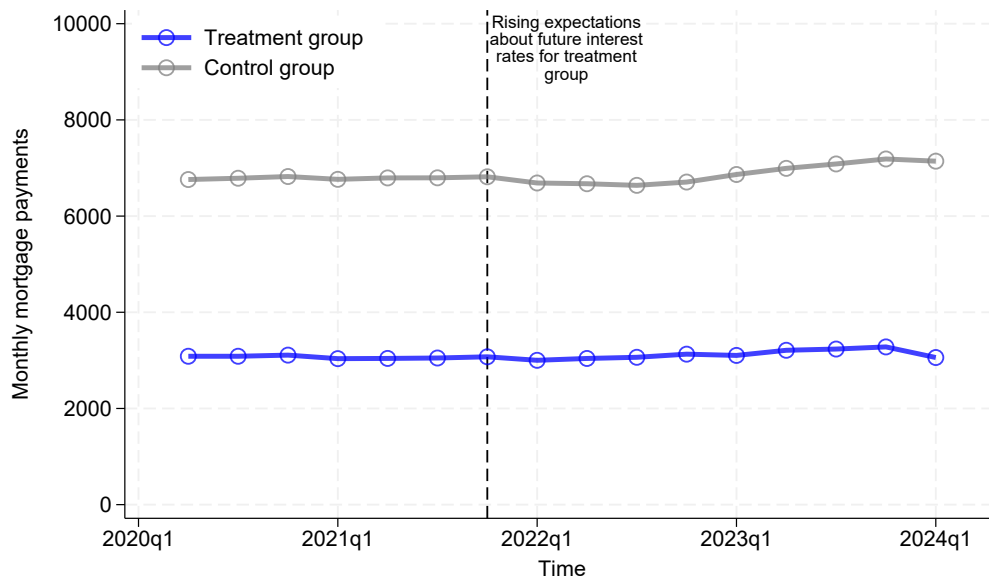
Consumption responses to rising mortgage rates: Unpacking the cash-flow channel of monetary policy

**Figure A.1 – Mortgage payments.** The figure shows mean mortgage payments in the pre-reset period for different samples: the treatment group of ARM5 borrowers with reset in April 2023 (ARM23-sample) and the corresponding control group (FRM23-sample) in Panel (a) and the treatment group of ARM5 borrowers with reset in April 2024 (ARM24-sample) and the corresponding control group (FRM24-sample) in Panel (b).

(a) Mean mortgage payments, 2023-reset

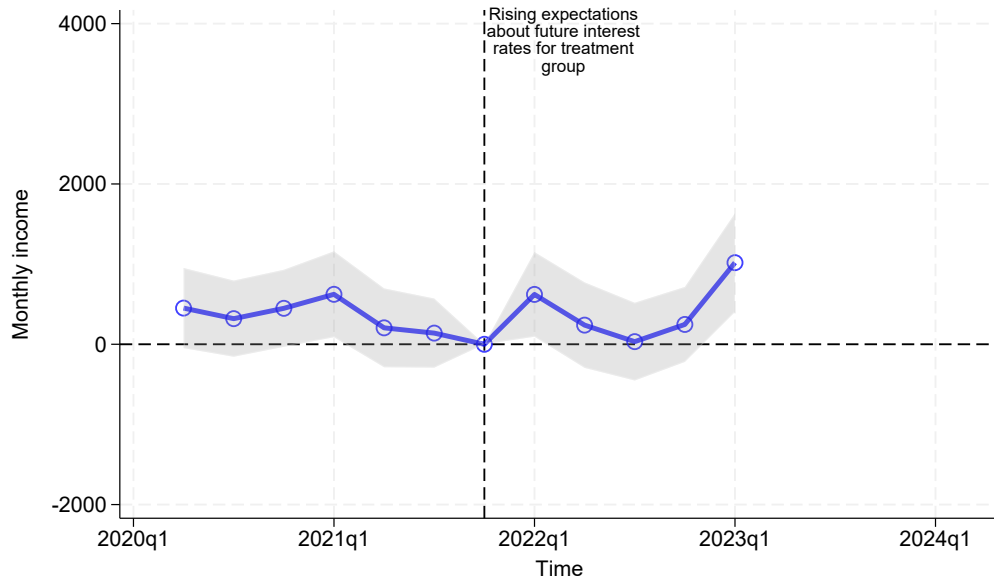


(b) Mean mortgage payments, 2024-reset

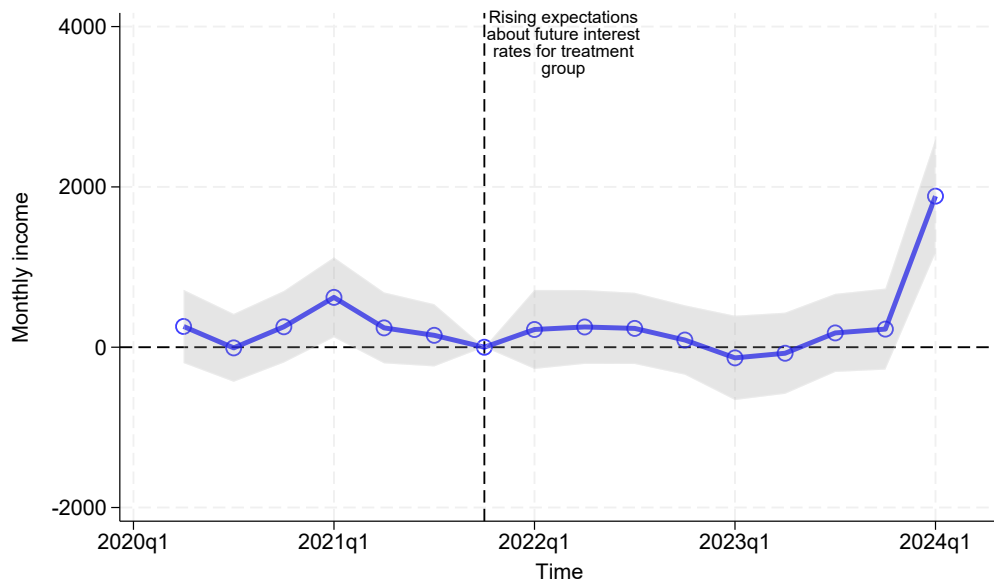


**Figure A.2 – After-tax income.** The figure shows dynamic difference-in-difference estimates of the effect of surging expectations about future mortgage rate on after-tax income. The regressions use pre-reset observations for the treatment group of ARM5 borrowers with reset in April 2023 (ARM23-sample) and the corresponding control group (FRM23-sample) in Panel (a) and for the treatment group of ARM5 borrowers with reset in April 2024 (ARM24-sample) and the corresponding control group (FRM24-sample) in Panel (b). Confidence bands are at the 95% level based on standard errors clustered at the household level.

**(a) Effect of rising expected rates on after-tax income, 2023-reset**

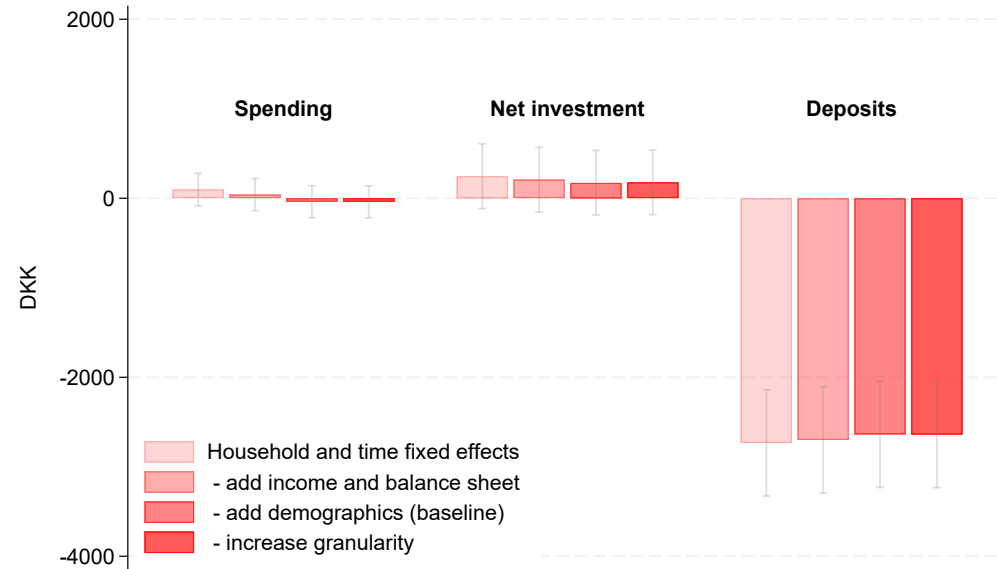


**(b) Effect of rising expected rates on after-tax income, 2024-reset**

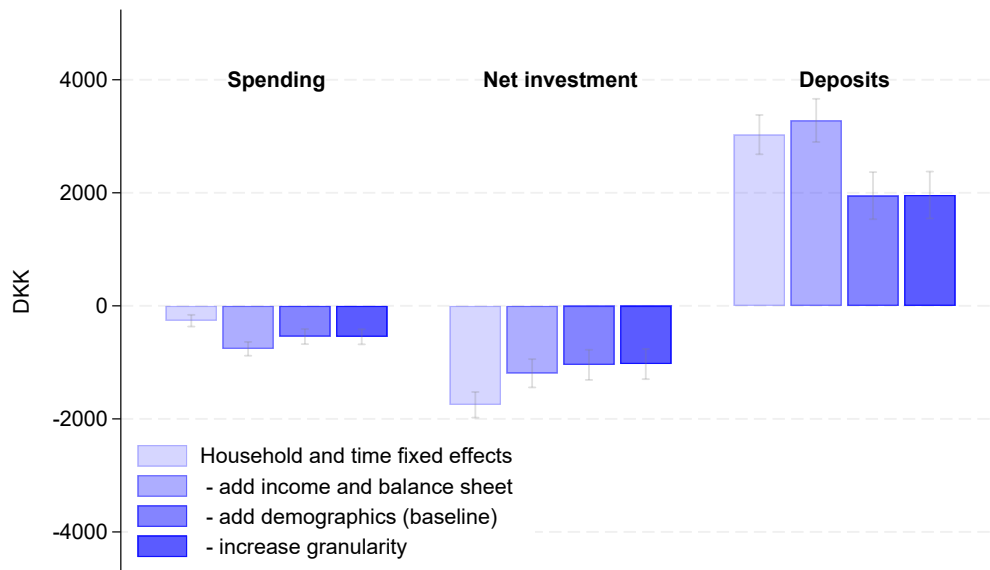


**Figure A.3 – Robustness (controls).** The figure illustrates the robustness of the baseline estimates to using different sets of control variables. Each of the reported DiD estimates corresponds to the  $\beta$  parameter in a parsimonious version of model 1 (Panel a) or model 3 (Panel b), in which the vector of quarterly indicators is replaced by a single indicator of post-treatment quarters. The first version only includes household and time fixed effects (lightest shading), the second version includes income and balance sheet controls (second-lightest shading), the third version includes demographic controls and corresponds to the baseline (second-darkest shading), and the fourth version increases the granularity of the controls by using deciles rather than quartiles of the continuous covariates (darkest shading). Confidence bands are at the 95% level based on standard errors clustered at the household level.

(a) Current cash-flows

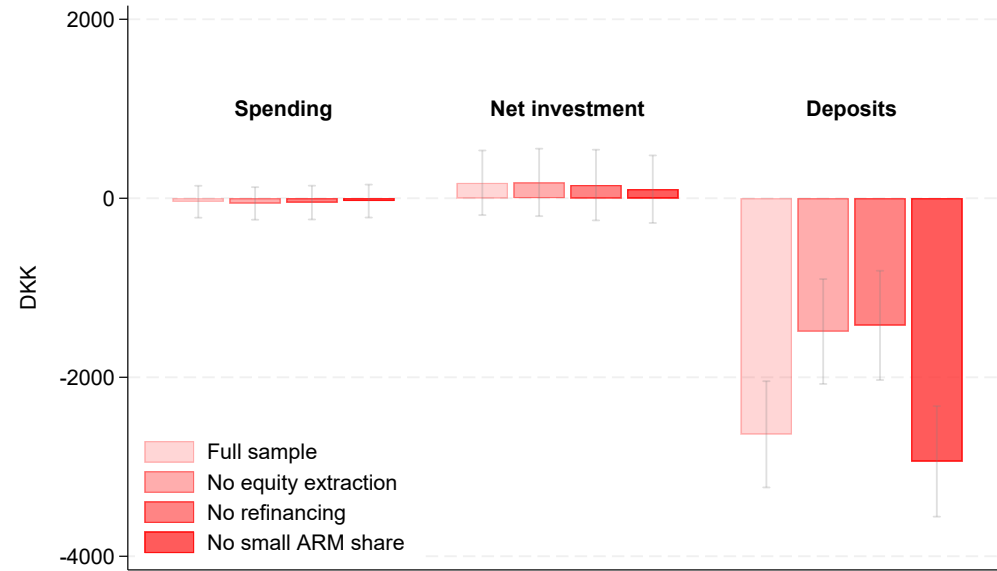


(b) Expected future cash-flows

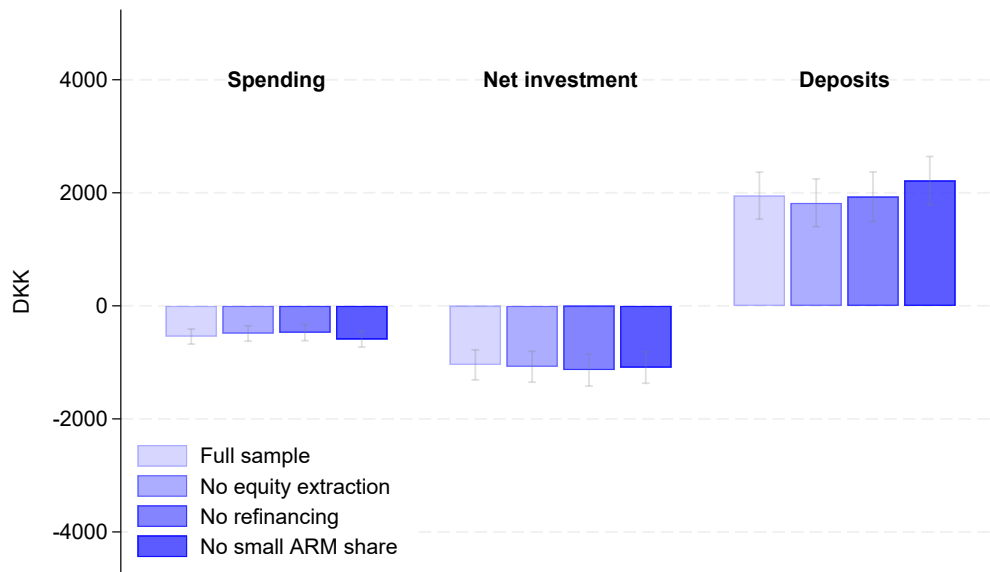


**Figure A.4 – Robustness (sample).** The figure illustrates the robustness of the baseline estimates to various sample restrictions. Each of the reported DiD estimates corresponds to the  $\beta$  parameter in a parsimonious version of model 1 (Panel a) or model 3 (Panel b), in which the vector of quarterly indicators is replaced by a single indicator of post-treatment quarters. The first version only includes the full sample (lightest shading), the second version excludes households that extract equity at the time of the reset (second-lightest shading), the third version excludes households that switch to another mortgage product at the time of reset (second-darkest shading), and the fourth version excludes households for which the ARM loan constitutes a small share of their total mortgage loans (darkest shading). Confidence bands are at the 95% level based on standard errors clustered at the household level.

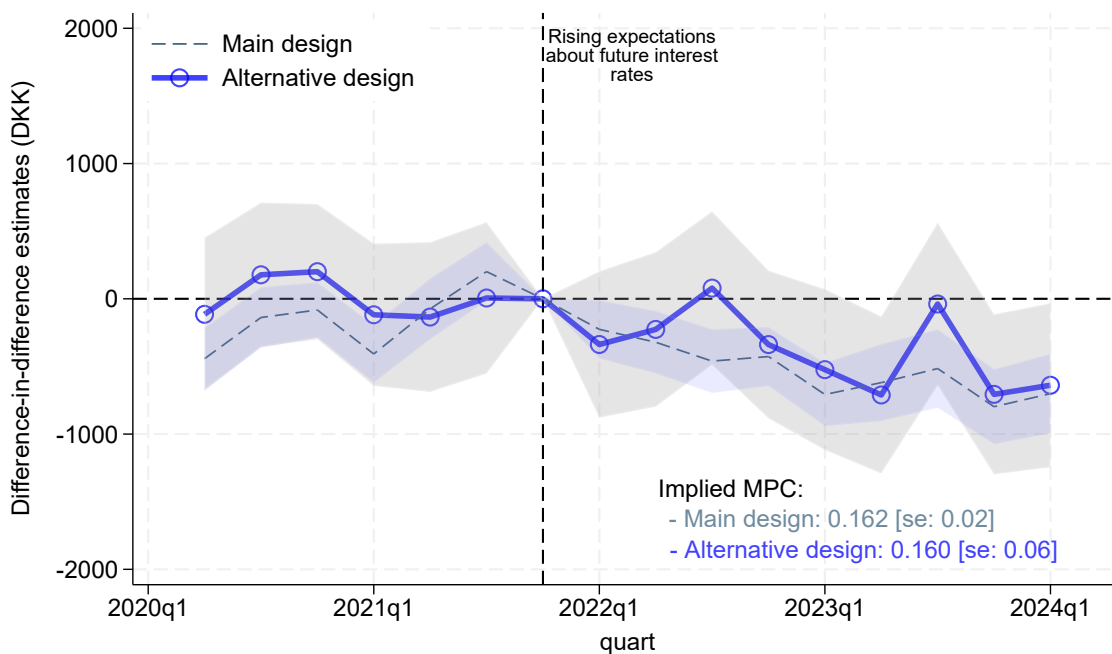
(a) Current cash-flows



(b) Expected future cash-flows



**Figure A.5. Robustness (design).** The figure illustrates the robustness of the estimated effect of a change in expected future mortgage payments to an alternative research design. The alternative design uses pre-reset observations for households with ARM5 loans resetting in April 2023 and April 2024 (ARM23-sample and ARM24-sample) and compares households with mortgage size above the median (“treatment group”) and below the median (“control group”). The figure shows dynamic difference-in-difference estimates obtained from the main design (dashed line) and the alternative design (full line). The figure also shows IV estimates of the implied marginal propensity to consume out of expected future mortgage payments obtained with each of the two designs. Confidence bands are at the 95% level based on standard errors clustered at the household level.



**Table A.1. Mortgage borrowers by type of loan** The table shows aggregate statistics for the universe of households with mortgages in Denmark as of December 2021: all households with a mortgage, regardless of type (Column 1), all households with an adjustable-rate mortgage (ARM) of any type (Column 2), households with an adjustable-rate mortgage with a five-year interest fixation period (ARM5) (Column 3). All statistics are own calculations based on matched individual-level data from administrative registers.

	(1)	(2)	(3)
	All households with mortgages	Households with adjustable-rate mortgages, any fixation period (ARM)	Households with adjustable-rate mortgages, 5-year fixation period (ARM5)
No. of households	1,123,985	520,427	262,297
Total debt, bn. DKK	2,134	1,151	639
Mortgage debt, bn. DKK	1,818	967	562
Total interest payments, bn. DKK	32.6	12.8	7.0
Mortgage interest payments, bn. DKK	23.6	8.5	5.0

**Table A.2 – Spending measures** The table compares a measure of consumption constructed by Statistics Denmark based on a household survey to our measure of spending based on transaction data. The differences in the level and composition of spending may reflect both differences in sample and methodology. We note that “Housing and utilities” excludes rents and imputed rents, “Transport” excludes the purchase of vehicles, and “Other” excludes financial services. Moreover, spending in the estimation sample includes cash withdrawals.

	Statistics Denmark		Estimation sample	
	Monthly (1,000 DKK)	Share (percent)	Monthly (1,000 DKK)	Share (percent)
(1) Food etc.	3.8	19.2	0.7	2.8
(2) Clothing	1.0	4.8	1.5	5.7
(3) Supermarkets and dept stores		-	6.0	23.5
(4) Subtotal (1)-(3)	4.8	24.0	8.2	32.0
(5) Housing and utilities	3.2	16.0	3.9	15.2
(6) Furniture and appliances	1.5		1.4	5.3
(7) Transport	1.9	9.6	0.4	1.5
(8) Information and comm	1.3	6.6	1.5	6.1
(9) Recreation and culture	2.3	11.7	2.4	9.6
(10) Restaurants	1.1	5.3	1.1	4.1
(11) Insurance	1.6	8.1	1.9	7.4
(12) Other	2.2	11.3	4.8	18.8
Total (4)-(12)	19.9		25.5	