What Makes Depositors Tick?

Fernando Cirelli Arna Olafsson*

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Abstract

This paper provides a comprehensive analysis of depositor behavior using a unique panel of high-frequency individual bank account holdings and transactions, combined with survey data from bank customers. We examine who moves deposits, what triggers these movements, and where funds are allocated. Our findings reveal persistent heterogeneity in portfolio allocations and returns, with financial literacy, education, and wealth influencing these differences. Using both expected and unexpected income and expense shocks, we show that fluctuations in individual wealth shape portfolio adjustments. Finally, we demonstrate that wealthier individuals are more likely to reallocate funds toward higher-return assets during periods of policy tightening.

Keywords: Bank Deposit Stickiness, Household Finance, Monetary Policy Transmission

JEL Classification Codes:

*Cirelli (f.cirelli@columbia.edu): School of International and Public Affairs, Columbia University. Address: 420 W 118th Street, New York, NY 10027; Olafsson (ao.fi@cbs.dk): Copenhagen Business school, Danish Finance Institute, CEPR; We thank the Bank providing the data for their collaboration and Ines Kishkill for her outstanding research assistance.

1 Introduction

What drives retail bank deposits is a central question in macroeconomics and finance. Retail bank deposits are a dominant, cost-effective and secure source of funding for banks, making it essential to understand their drivers to assess the stability of bank funding as well as the transmission of monetary policy (see, e.g., Hanson et al., 2015; Drechsler et al., 2017). Deposits also play two fundamental roles in the financial lives of households: as medium of exchange—as electronic payments take over cash and checks—and as a store of value—even the sole store of value for many—and their allocation can have profound implications for welfare Campbell (2006); Badarinza et al. (2016).

There is, however, little knowledge about what drives households' allocations to bank deposits. Existing studies have shown that aggregate deposit stickiness—which allows banks to manage liquidity risks arising from maturity mismatch—is partly explained by deposit insurance Hanson et al. (2015), superior liquidity services d'Avernas et al. (2023), and market power Drechsler et al. (2021). However, we still know little about individual-level behavior of depositors. More specifically, who moves deposits, why, and where does the money go? This is the aim of this paper.

In this paper, we undertake a comprehensive investigation of individuals' bank deposit behavior using a unique data set, sourced from one of the largest banks in Iceland, servicing about one third of the population, providing detailed, high-frequency, transactional-level bank information on the financial choices of depositors. We complement the bank data with four surveys conducted with bank customers, providing valuable insights into individuals' financial knowledge, preferences, education, and other relevant characteristics.

Studying the deposit allocations of depositors in an Icelandic setting is ideal for the purpose of this paper for various reasons. First, all bank accounts in Iceland are individual and therefore there are no "joint" accounts, which implies that all transactions we observe are related to the individual under investigation and not her spouse. Moreover, as we can link all

accounts within a household, we can study both the deposits of individuals and households and avoid the confusion that arises in settings where joint accounts exist. Second, in Iceland all transfers, both within banks and between different banks, are cleared instantly. This implies that bank-to-bank transfer delays, which have been hypothesized to be among the driving factors behind deposit stickiness (see, e.g., Lu et al., 2024) cannot be relevant in our setting. Third, because there are very few deposit providers in Iceland, search costs, which have also been hypothesized to be a driving force behind deposit stickiness (see, e.g., Yankov, 2024), are much lower than in most other settings and are thus unlikely to be a leading factor in explaining deposit stickiness.

The unique data used in this paper allow us to investigate alternative explanations for deposit stickiness than those offered in the existing literature. More specifically, our data allow us to track the funds after a portfolio adjustment, enabling us to investigate who moves them, in relation to the types of events that trigger the movement, and where the money comes from or goes as depositors either increase or withdraw their deposits. Furthermore, the bank surveys allow us to investigate the underlying mechanisms behind deposit stickiness to an extent that has not been feasible thus far.

We begin by providing a descriptive analysis of safe liquid asset holdings. We show significant differences in individuals' portfolio allocations, despite assets in this class offering nearly identical non-pecuniary benefits but differing in their rates of return. Specifically, we show that portfolio returns within this asset class increase with individual wealth: individuals in the highest wealth decile achieve returns that are, on average, 4 percentage points higher. This difference arises from wealthier individuals allocating a larger share of their portfolios to higher-return assets. However, despite achieving higher returns, wealthier households forego a larger share of consumption, effectively bearing a higher cost of liquidity of around 2 percentage points of annual consumption. We use survey data to investigate the characteristics of depositors who, on average, hold lower-return portfolios. We find that financial literacy, knowledge of inflation's effects, and attention to bank balances stand out as significant factors

explaining persistent differences in returns.

We then examine the events that trigger portfolio reallocations and track where funds are moved. Portfolio allocations are shown to respond to changes in individuals' wealth. Specifically, the share of high-return safe liquid assets, particularly savings deposits, increases as individuals become wealthier. The magnitude of this effect is substantial: during periods when individuals reach their peak wealth within the sample, the share of low-return deposits is, on average, 20 percentage points lower. Using event studies of expected and unexpected income shocks, we further demonstrate that income increases trigger almost immediate portfolio reallocations into high-return deposits, typically within a few days. Conversely, reallocations from high- to low-return deposits occur precisely on the day individuals incur expenses requiring additional funds, suggesting that consumption drives the decrease in high-return liquid assets within the portfolio.

Finally, we examine how changes in interest rate spreads influence portfolio allocation. During periods of policy tightening, the spreads between low- and high-return deposits widen, increasing the relative cost of holding low-return deposits. In response to these changes, the evidence points to wealthy individuals as the ones most likely to reallocate funds from low-return deposits to higher-return alternatives.

We contribute to the literature on the ability of banks to maintain a considerable and stable markup in deposit pricing (see, e.g., Hanson et al., 2015; Drechsler et al., 2021; Egan et al., 2021; d'Avernas et al., 2023; Li et al., 2023; DeMarzo et al., 2024; Kundu et al., 2024). Our paper contributes by providing a micro-founded behavioral perspective on the market power of banks in the deposit market and for the divergence of deposits to high- and low-rate deposit accounts: the depositors that hold substantial liquidity in low-interest checking accounts tend to have lower financial literacy and numeracy, a weaker understanding of inflation's effects, poorer decision-making abilities, and are typically older and less educated. Our findings also contribute to the literature on the importance of stable deposits for bank funding and the overall stability of the banking sector (see, e.g., Diamond and Dybvig, 1983;

Hanson et al., 2024), as well as on how recent changes in financial technology may impact this (see, e.g., Erel et al., 2023; Jiang et al., 2023; Koont, 2023; Koont et al., 2024).

The rest of the paper is organized as follows. Section 2 describes the data and the construction of key variables. Section 3 provides a descriptive analysis of holdings of safe liquid assets. Section 4 study events that trigger a portfolio reallocation. Section 5 presents a standard model whose predictions can be compared to our findings. Section 6 concludes.

2 Data

The data we use are provided by one of the largest banks in Iceland that provides us with access to comprehensive, detailed, and highly disaggregated panel of bank data, providing a close to 360-degree view of the personal finances of about 1/3 of the adult Icelandic population. More specifically, the data contain individual and family identifiers, detailed information on demographics, bank account transactions (time, location, merchant, product category, and transaction amount)—providing us with a detailed measure of individuals' consumption by category—all bank account balances, bank account overdraft limits and use, credit card transactions and limits, all loans (including, e.g., mortgages, car loans and leases, and consumer loans), and financial portfolios (including, e.g., daily information on portfolio composition and all sales and purchases of stocks, bonds, and funds). Furthermore, we can infer real estate owners and the value of real estate from real estate taxes that we observe in the transaction data.

In addition to the bank data, we also have data from four online surveys conducted with bank customers. These surveys provide valuable information of individuals' financial knowledge, understanding of inflation's effects, discounting and risk preferences, decision-making abilities, education levels, and other relevant characteristics.

2.1 Using Bank Data to document Financial Behavior

Detailed and accurate high-frequency panel data on consumption and financial choices of individuals are notoriously hard to come by (see, e.g., Gelman et al., 2014; Kolsrud et al., 2018). Questions regarding consumption and many financial decisions, e.g., use of consumer credit and investments in risky asset markets, are normally analyzed empirically using self-reported survey data. As discussed by, e.g., Kolsrud et al. (2018), such survey measures may be very problematic.

Survey responses rely on participants' recall of bank account balances at the interview day or their estimate of average balances while consumption measures are based on stylized questions regarding spending by broad categories over a certain period or an expenditure diary (e.g., the diary surveys of the Consumer Expenditure Survey, CEX, in the US and Living Costs and Food Survey, LCF, in the UK). Such survey based measures of consumption and financial decision making may suffer from measurement error (Zinman, 2009). Specifically, respondents may, e.g., have little incentive to answer the questions accurately, may not understand the wording of the questions, they may simply forget some of their past actions. Moreover, this type of measurement error or noise in survey-generated data can increase with the length of the recall period (de Nicola and Giné, 2014) Furthermore, survey can generate systematically biased data if respondents, e.g., suffer from either agreement or justification bias and report how they believe they should behave rather than how they behave in practice, concerns about surveyors sharing the information, or stigma about their consumption habits (Karlan and Zinman, 2008).

A sizable literature now avoids the problems associated with survey data by exploiting the recent availability of highly accurate register data to capture financial behavior, consumption, and wealth. These data are the most comprehensive in the Nordic countries and include, e.g., asset holdings by year-end and annual income. These annual snapshots are then used to infer financial behavior, e.g., stock market participation, portfolio diversification, etc. (see,

e.g., Calvet et al., 2009; Olafsson and Pagel, 2018a) and to impute consumption and wealth returns (see, e.g., Koijen et al., 2014; Browning and Leth-Petersen, 2003; Sodini et al., 2016; Fagereng and Halvorsen, 2017; Fagereng et al., 2017, 2020; Bach et al., 2020; Fagereng et al., 2021). As discussed by Koijen et al. (2014), there are considerable discrepancies between the registry-based and survey-based measures.

However, although the use of register data to capture certain financial behaviors overcomes the problems associated with survey data, both types of data suffer from long reporting intervals. This low frequency of survey and register data challenges the analyses of various questions regarding aspects of personal finances that change frequently, e.g., the allocation of liquid wealth. For instance, yearly snapshots of an individual's bank account balances do not capture if individuals respond sluggishly to interest rate changes.

This study overcomes the problems associated with the use of surveys and register-based measures of financial behavior by using transaction-level administrative data from a retail bank and enriches it with experimental measures that can be used to explore the underlying mechanism for the patterns of behavior we document in the bank data.

2.2 Setting

Using data from Iceland has three main advantages when studying the allocation of liquid wealth. First, bank accounts in Iceland are personal and cannot be shared, even within households. The fact that there are no "joint" accounts in Iceland means that all transactions we observe are related to the individual under investigation and not her spouse, and we can identify all transfers between the individual and her spouse. Second, the administrative bank data are more representative of the underlying population than bank data obtained from banks in other settings. This is because: i) there are not that many banks in Iceland and each of them services a large share of the population, ii) all adult individuals in Iceland need to have a bank account.[1] This is also reflected in that Iceland has the highest share of

[1]There are many reasons for this. For instance, checks are not used in Iceland and if individuals want to receive salary payments or state benefits, they need a bank account.

internet banking usage in Europe.[2] Olafsson and Pagel (2018b), Carvalho et al. (2024), and Gathergood and Olafsson (2024) discuss in more detail the representativeness of bank data in Iceland. Third, Icelandic consumers use electronic means of payments almost exclusively,[3] which implies that the data capture the financial lives of the users better than transaction-level bank data in other settings would.

2.3 Accounts Classification and Descriptive Statistics

We analyze the balance holdings of individuals within the bank and in their associated brokerage accounts, if such an account is open. The bank offers a wide variety of account types, whose names and characteristics change in some cases during the sample period. Using information provided by the bank, its public website, and the Internet archives, we classify these accounts into categories that are straightforward to interpret and comparable to other countries. Figure 1 presents a summary of this classification along with examples.

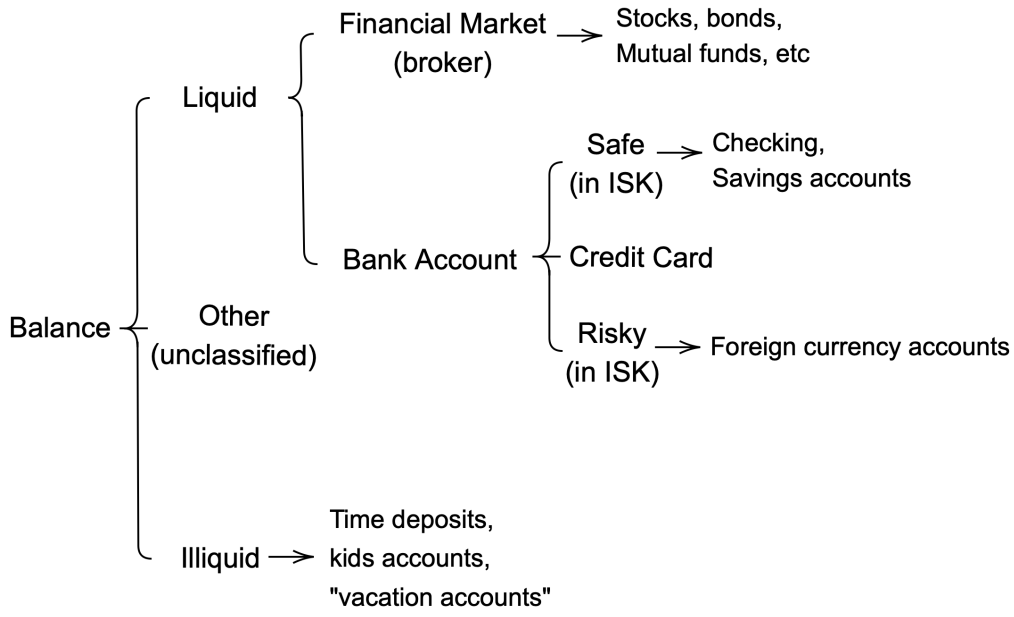
Individual balances can be *liquid*—meaning funds can be transferred to an account that can be used for payments at full value without time constraints—or *illiquid*, if they do not meet this criterion. Liquid accounts are further divided into funds held in bank accounts or in the brokerage account provided by the bank. We refer to balances held in the brokerage account as balances in the *financial market*. Bank accounts are further divided into those providing a secure return in Icelandic Krona (ISK) and those with uncertain returns, which we label as *risky*. We also observe daily credit card balances. Finally, there is a small share of accounts that we could not classify and which we labeled as *other*.

Bank balances can be positive or negative, as most checking accounts come with an overdraft facility, where account balances can be negative up to a limit based on credit history, income, and assets. Overdrafts dominate the unsecured consumer credit market in Iceland and are generally used extensively. Credit card balances can also be either positive (prepaid

[2]According to Eurostat, 96 percent of Icelanders used internet banking in 2020. Source: https://ec.europa.eu/eurostat/databrowser/view/tin00099/default/table?lang=en

[3]ATM withdrawals make up approximately one percent of spending transactions by amounts or transactions volume.

Figure 1: Accounts Classification



credit cards) or negative (outstanding balances). Credit cards in Iceland are issued by the banks and their balances are rarely rolled over on their due dates but rather paid in full, and if individuals lack funds to pay them, they rather take an overdraft to pay the bill. For these reasons, we include credit card accounts in our analyses.

Table 1 provides a summary of account balances from both the individuals' and banks' perspectives. Each figure represents the time series average across the sample, with values reported in 2024 Icelandic Kronas.[4] Checking and savings accounts are by far the most common financial assets, as nearly every individual in the sample holds a positive balance in these accounts. On average, these accounts constitute the largest shares of individual portfolios. In contrast, holdings in risky assets and financial market accounts are relatively uncommon and exhibit a higher concentration of funds. For the bank, the bulk of funds come in the form of savings deposits, which are also relatively stable, especially when compared to funds in checking accounts.

[4]For reference, the US/ISK exchange rate was \$129 ISK per US Dollar during the sample period.

Table 1: Balances Descriptive Statistics

	Checking	Savings	Risky	Illiquid	Financial Market
Individuals					
Share with Positive Holdings	0.87	0.85	0.17	0.39	0.14
Mean balance (if positive)	\$553	\$2194	\$935	\$1697	\$10800
Mean portfolio share	0.34	0.41	0.02	0.17	0.06
Gini index	0.783	0.835	0.988	0.921	0.979
Share held by (if positive):					
top 25% holders	0.843	0.894	0.988	0.889	0.929
top 10% holders	0.651	0.674	0.901	0.687	0.782
top 3% holders	0.403	0.395	0.675	0.406	0.537
Bank					
Mean share	0.15	0.55	0.05	0.20	-
Std. Dev.	0.023	0.018	0.009	0.018	-

Note: Nominal amounts are in thousands of 2024 ISK. Statistics represent sample averages. The share held by top holders of each asset is calculated for each period, with the reported value being the time-series average.

2.4 Survey Administration by the Bank

The bank providing the data for this paper has collaborated with Copenhagen Business School to administered four online surveys in the last couple of years. In October 2021, the bank sent out two short emails with invitations to participate two different surveys administered by Copenhagen Business School. The first one was only sent to married or cohabiting individuals where both spouses were active customers of the bank, based on certain activity filters we imposed, while the other survey was sent to all other active customers. In the survey for couples, 23,640 invitations were sent and of those 2,026 (8.6%) completed the survey while in the other survey 76,654 invitations were sent and 3,388 (4.4%) of these completed within a few days and the survey was thus closed as we lacked funding to pay more participants. Compared to the timing of responses and the time in the field in other surveys, we would have expected about twice as high response rate if the survey had stayed in the field as long in the field for a couple of weeks as is common. In June 2023, the bank sent again a short email to customers, this time to around 51,546 active customers, inviting them to participate in a survey on financial decision-making administered by Copenhagen Business School. Bank

customers then received 1-2 reminders about the survey, in June and September. In total, 5,736 customers completed the survey (11.1%). In October, the bank sent out another email to all individuals that completed the survey in 2023 and still passed the activity filters to invite them to participate in a follow up survey. This time 5,665 invitations were sent out and of those, 2,388 (42.2%) completed the survey. The response rates in these surveys are relatively high response (For instance, Schnorpfeil et al. (2024a) report 1.8% and Schnorpfeil et al. (2024b) report 6.8%).

In all surveys, participants were informed that the survey data would not be available to the employees of the bank and that the researchers working with their information would not have access to any personally identifiable data. An important aspect of this is the design of the survey and payment setup, allowing us to contact bank customers without getting any contact information and to pay incentives, that were transferred directly into their bank accounts, without collecting any payment details. The way this was done is that we provided the bank with a list of anonymized IDs of the individuals we wanted them to invite to participate in the survey and a unique survey link for each. The bank kept a bridge file that was used to obtain the email addresses of these individuals and used this to email survey invitations to the selected customers that contained the unique link we provided them with. Once an individual participates, we can link the responses using the unique link to his or her anonymized ID and thereby to the anonymized administrative bank data. Every day the bank then received a list of anonymized IDs and the bank then used the bridge file to transfer the incentives directly to the bank accounts of the individuals. This way, we never got hold of any contact information of the individuals (for example, email addresses) in our survey sample, and we did not have to collect any payment information to be able to pay them for their participation.

In all surveys, survey participants have similar characteristics to other bank customers as well as the population in general. The surveys were tailored to the specific research questions under investigation in the project associated with each survey. Some topics appear in several

surveys while others only in one of them. The number of observations for each measure obtained from the surveys thus varies. There are two main elements of this survey. Examples of the content of the surveys include a set of incentivized experiments involving choice under risk, consisting of a standard task of allocating an endowment across risky assets which enable us to obtain measures of risk preferences and decision-making ability (see, e.g., Carvalho et al., 2024), a qualitative assessments of time preferences, asking participants to evaluate their own willingness to postpone a benefit to receive a larger benefit in the future, as well as a qualitative decision-making ability assessment, asking participants to evaluate their own skills at avoiding financial mistakes, as well as tests of individuals' understanding of the link between inflation, the economy, and households financial and labor market outcomes. Other information we obtain from the survey data include, e.g., education level, fields of education, labor market status, inflation expectations, knowledge about past inflation, and assessment of ability to cope with unexpected expense shocks.

2.5 Data Representativeness and Quality Checks

One concern is whether individuals bank activities at one bank provide an accurate picture of their finances. In surveys to bank clients we found that 67% of bank customers say they bank exclusively with the collaborating bank and among the ones with multiple accounts, over 35% mention that they only have inactive accounts at other banks.

Additionally, the distribution of age, gender, and family size in our bank dataset closely aligns with the population distribution in Iceland, as shown in Table 3 in the appendix.

Our dataset includes deposits from all individuals with an account in the collaborating bank. Figure 11 in the appendix shows that these deposits account for an average of 30% of total household deposits reported by the Central Bank of Iceland, with this share remaining stable over time. We interpret this as evidence supporting the representativeness of our deposit data.

Even though the bank serves a large share of the population and the demographics

of the bank customers are similar to those of the nation in recent years a worry about representativeness may still exist. To provide more evidence on the representativeness of our data, we benchmark our expenditure data with measures of national consumer behavior. First, we compare observed spending among bank customers to data from the Household Final Consumption Expenditure collected by the Statistics Iceland. This comparison is not straightforward, as we observe outflows of funds from accounts, some of which cannot be classified as consumption or lack detailed categorization. Additionally, expenditure surveys include spending by tourists, who in a country like Iceland account for around 20% of total expenses (and close to 100% in categories like transportation and accommodation), but are absent from our dataset. Fortunately, in 2019, the statistical agency reported separate data on consumption by locals and tourists, enabling a more precise comparison with our bank data.

Figure 12 in the appendix illustrates how closely the expense shares in our dataset align with those reported for locals in the 2019 Household Final Consumption Expenditure by Statistics Iceland. The close match across multiple spending categories shows that our dataset is representative and reliable for capturing broader consumer behavior patterns.

2.6 Sample selection

We use a panel dataset of daily spending, income, borrowing, saving, and investing of 133,751 individuals from January 2018 to April 2024, equating to about 44.7% of the total adult population in Iceland. Depending on the specific exercise, we either utilize the entire dataset of bank customers or focus on a subset of *active* customers.

We call a customer active if he or she is registered as living in Iceland and appear to be economically active, specifically individuals for whom we observe periodic monthly income arrivals (e.g., labor market income or unemployment benefits, pension payments, invalidity benefits, and student loans) and expenses that can be classified as consumption. This criterion excludes dormant account holders and individuals whose primary banking activities occur

at other financial institutions. After applying this restriction, we are left with 93,637 active customers, accounting for 31.5% of the adult population.

For the purposes of this paper, limiting the sample to individuals who appear to exclusively bank with the collaborating institution may not always be ideal, as dormant accounts could contribute significantly to deposit base stickiness. For questions where we do need to have a complete picture of the personal finances of individuals we do restrict our sample to active customers. We clearly specify in each exercise which population is being used.

3 Individual Liquidity Allocation

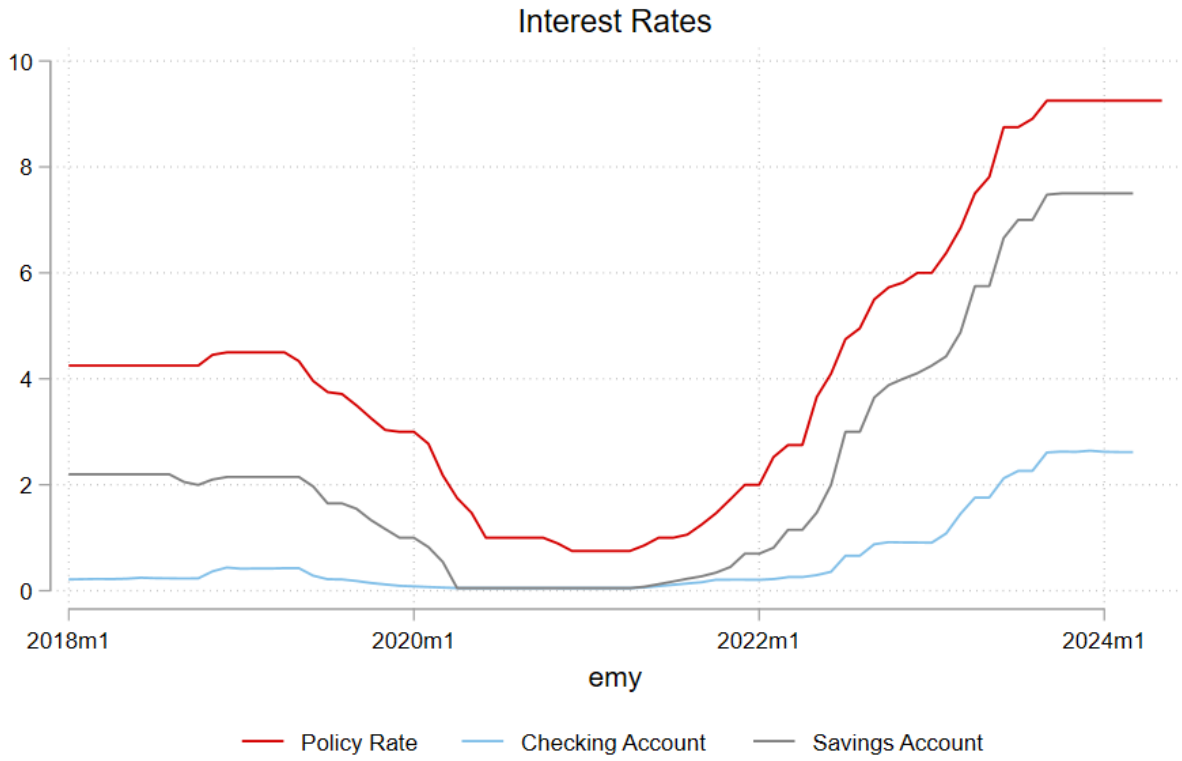
In this section, we analyze individuals' allocations of liquid assets. Specifically, we document who holds what. We begin by focusing on liquid safe assets, which share similar non-pecuniary characteristics but, as we will show, differ significantly in their rates of return. Understanding the allocation of liquid assets is of fundamental importance for households, banks, and the transmission of fiscal and monetary policy.

For households, holding a large share of assets in low-return instruments can lead to substantial income losses and exacerbate wealth inequality Fagereng et al. (2020). For banks, deposits serve as a low-cost funding source, making it essential to preserve their deposit franchise value and ensure financial stability Drechsler et al. (2023). Deposits also play a central role in the transmission of monetary policy. During episodes of monetary tightening, depositors reallocate funds to higher-return alternatives, prompting banks to reduce credit supply in the short run Drechsler et al. (2017), while potentially increasing it in the long run Wang (fthc). Finally, fiscal transfers to low-income households can increase deposit balances if allocation patterns depend on wealth levels, with significant implications for the allocation of credit between banks and non-bank lenders.

Funds in savings and brokerage accounts are liquid in the sense that they can be instantly converted into checking (transaction) accounts without delay, anytime in the case of savings

accounts and during trading hours in the case of brokerage accounts. However, the interest rates offered by these accounts vary significantly. Figure 2 presents the time series of interest rates for liquid accounts over the sample period. More specifically, it shows the returns on standard checking and savings accounts available to all customers as well as the central bank's policy rate, which proxies the safe return available in the market.[5] The figure highlights that the spread–the difference between the policy rate and deposit returns—is consistently positive and, in the case of checking accounts, it widens as interest rates rise. This indicates that holding funds in deposits is costly, especially when kept in checking accounts during periods of monetary tightening.

Figure 2: Interest Rates for Liquid Accounts



Comparing rates on savings and checking accounts, we see parallel trends prior to and significant divergence following episodes of central bank key rate decreases and increases.

[5]This interest rate closely tracks the interest earned on an account labeled "liquid funds" offered by the broker.

That is, the figure reflects a significantly larger interest-rate passthrough for savings accounts than checking accounts.[6] An implication of this framework is that, following differential changes in checking and savings account rates, there should be significant differences in levels of deposit flows between savings and checking accounts as their relative cost changes.

Our setting, where the high-rate and low-rate co-exist within the same institution, is ideal for testing the importance of interest rates in the allocation of liquid funds to low-rate and high-rate accounts as it allows us to control for various factors that have been suggested as explanations for the stickiness of deposits, including deposit insurance (Hanson et al., 2015), superior liquidity services (d'Avernas et al., 2023), and market power (Drechsler et al., 2017, 2021).

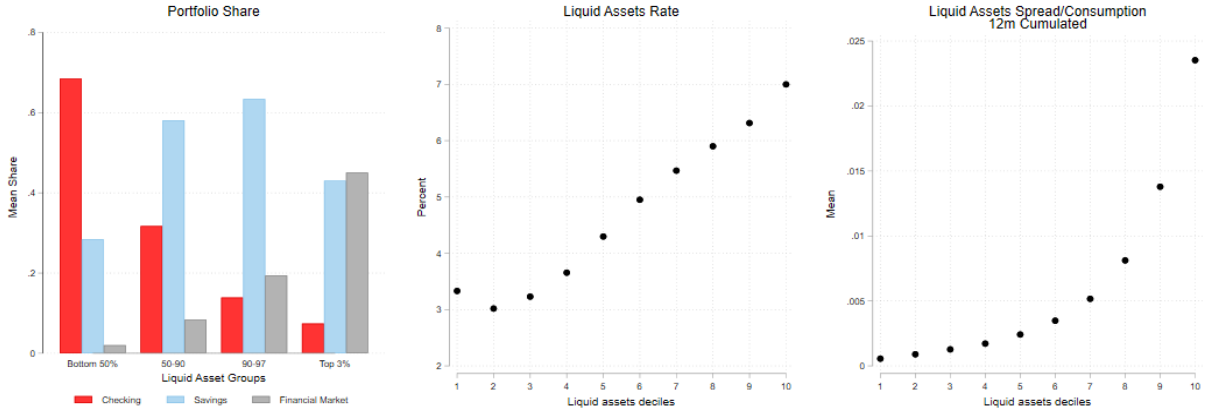
Other studies suggest that technological advancements, including, e.g., online banks (see, e.g., Erel et al., 2023) and payment technology (see, e.g., Lu et al., 2024) are changing the stickiness of deposits. Our setting also allows us to exclude these factors as key drivers because we study accounts within the same depository institution that provides their customers with a very good online banking facilities and in a country where the use of online banking is the highest in the world, with more or less all individuals having access to all their bank accounts through their online banksand in a country where there only one clearing house and for decades, all transfers, both within banks and between different banks, have been cleared instantly, and depositors therefore do not have any experience with delays associated with deposit transfers.

Given the substantial differences in returns between accounts offering nearly identical non-pecuniary benefits, we proceed to examine how individuals allocate their funds. The left panel of Figure 3 depicts the heterogeneity in asset holdings across the liquid asset distribution. Specifically, it groups individuals by their level of liquid assets at each point in time and calculates the average share of each asset within the liquid portfolio for members of each group. The left panel shows that wealthier households allocate a smaller share of their

[6] An important implication of this is that savings accounts share features with Money Market Mutual Funds (MMMFs) whose rates follow the Central Bank key rate closely.

liquid portfolio to low-return checking deposits, instead favoring higher-return liquid assets such as savings accounts or financial assets held with brokers.

Figure 3: Portfolio Shares, Return and Cost of Liquidity



Note: Plots use average data from year 2023 and 2024. Groups of households are computed at each point in time using their liquid asset holdings. Liquid asset rate is defined as the weighted average return on liquid assets. Liquid asset spread over consumption is computed as the cumulative forgone interest income on safe liquid assets during the last 12 months over the same period cumulative expenses. Only individuals defined as active are use in the computation.

A lower portfolio share allocated to low-return assets implies that wealthier households achieve higher returns on their liquid portfolios, making the return on liquid safe assets wealth-dependent. The middle panel of Figure 3 illustrates the average return on liquid assets for 2023/2024, grouped by deciles of liquid assets at each point in time.[7]. The wealth dependence of returns on assets with similar characteristics, and its implications for wealth inequality, have been highlighted in prior research (see Fagereng et al., 2020). However, less attention has been given to the extent of interest income foregone within the part of financial portfolio consisting of liquid safe assets, which are the sole assets in financial portfolios of the majority of households.

A higher return on liquid assets implies a lower cost per unit of liquidity but does not necessarily reduce the total cost, as the latter scales with wealth. The right panel of Figure 3

[7]Liquid return is computed as: $r_i = \sum_j \left(\frac{a_{ij}}{\sum_j a_{ij}} \right) \cdot r_j$ and a_{ij} the ISK amount that individual i holds in asset j and r_j the nominal return on asset j.

illustrates the twelve-month forgone interest income for individuals, expressed as a share of expenses over the same period, which we define as the *cost of liquidity*.[8] The figure quantifies the share of consumption expenses individuals forgo by not allocating all their liquid assets to high-return safe market funds. In particular, Figure 3 shows that although wealthier households benefit from higher returns on their liquid assets, the cost of liquidity—measured as forgone consumption—rises with wealth. Wealthy households, in particular, forfeit over 2% of their annual consumption expenses.[9]

Our next objective is to identify the characteristics of individuals who, on average, allocate a larger share of their funds to low-return assets. In other words, we aim to describe the attributes of *sleepy* or passive depositors. To do so, we begin by estimating the following regression:

$$y_{it} = X'_{it} \cdot \beta + \alpha_t + \nu_i + \varepsilon_{it} \tag{1}$$

where y_{it} is the individual variable of interest in month t—i.e., the share in low-return checking deposits, the return on liquid assets, or the cost of liquidity in terms of consumption—X'_{it} represents individual time-varying characteristics such as wealth and age, α_t denotes time fixed effects, and ν_i captures individual fixed effects. Our goal is to understand the role of individual characteristics in liquid asset allocation, i.e., the variation in ν_i, identifying individuals who persistently achieve lower returns on liquid assets or face higher costs on liquidity.

Table 2 shows that, as anticipated, the return on the liquid asset portfolio correlates with the level of individual wealth (columns (1)-(4)). However, the increase in the return is not sufficient to offset the increasing cost of liquidity with wealth (columns (5)-(6)). The substantial increase in the R^2 when including individual fixed effects (even columns) compared to when they are excluded (uneven columns) highlights the importance of individual

[8] For each month t, the cost of liquidity is computed as: $\frac{\sum_{s=0}^{11}(r_{t-s}-r_{i,t-s})\cdot a_{i,t-s}}{\sum_{s=0}^{11} c_{i,t-s}}$, where $a_{i,t-s}$ is the total value of liquid assets held by individual i in month $t-s$, r_{t-s} the safe return obtained in the market and $c_{i,t-s}$ the monthly value of consumption expenses.

[9] Similar results are obtained if income is used instead of expenses.

characteristics in explaining the heterogeneous returns. In other words, some individuals consistently enjoy higher returns, hold a smaller share in low-return assets, and pay a lower cost of liquidity, even after accounting for changes in wealth levels, age, and time factors.

Table 2:

	(1) Share in Checking	(2) Share in Checking	(3) Int Rate	(4) Int Rate	(5) Cost of Liq.	(6) Cost of Liq.
age	1.628	0.0487	-0.0293	-0.00383	-0.0449	-0.137
	(0.0628)	(0.136)	(0.00150)	(0.00715)	(0.00191)	(0.00489)
age^2	-0.0136	0.000164	0.000261	0.0000117	0.000488	0.00133
	(0.000614)	(0.00119)	(0.0000150)	(0.0000672)	(0.0000205)	(0.0000466)
log liquid assets	-12.28	-9.628	0.357	0.274	0.250	0.172
	(0.0927)	(0.105)	(0.00234)	(0.00357)	(0.00354)	(0.00236)
Constant	165.8	169.5	-2.202	-1.617	-2.031	1.338
	(1.899)	(4.362)	(0.0456)	(0.193)	(0.0582)	(0.122)
Individual FE	N	Y	N	Y	N	Y
Time FE	Y	Y	Y	Y	Y	Y
Observations	1363200	1363200	1363200	1363200	1359678	1359678
Adjusted R^2	0.306	0.763	0.800	0.867	0.279	0.743

Note: Regression of individual liquid portfolio share in checking deposits, interest rate on liquid assets and the cost of liquidity, all numbers are in percent. This latter is the 12-month forgone interest income in terms of consumption expenses. The panel of individuals is a stable panel of active individuals. The data frequency is monthly and the time spans between January 2018 and March 2024. Only individuals with positive amount in the checking account are considered and with at least $5000 ISK in liquid assets. Forgone interest over expenses are winsorized at the 1% level. Individually clustered standard errors in parentheses.

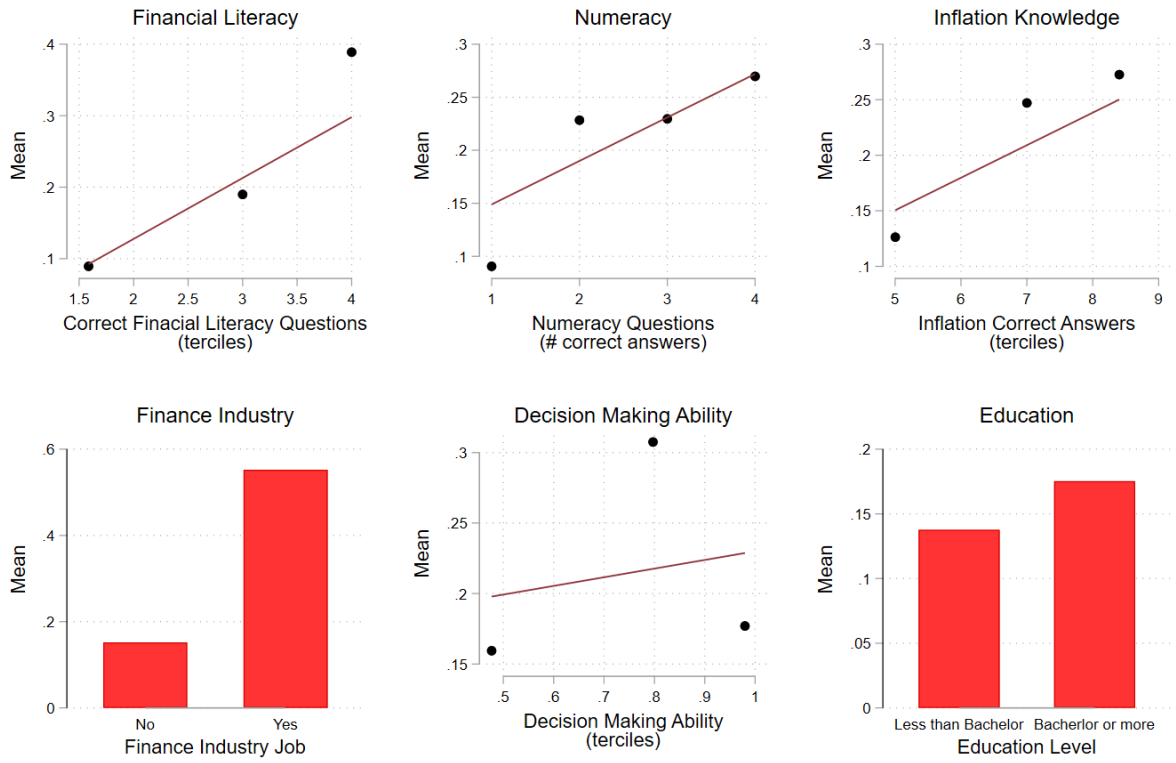
We leverage survey data on bank customers to explore the characteristics of individual depositors who, on average, allocate their liquid assets in a lower-return portfolio or pay a higher cost for holding liquidity. The importance of financial literacy has been widely emphasized in the literature[10] and to capture this, our survey includes questions on financial knowledge, numeracy, understanding of the effects of inflation, and whether the individual works in a finance-related job. Additionally, we incorporate measures of decision-making ability and educational attainment.

Figure 14 shows the average values of the estimated fixed effects for the interest rate in the liquid portfolio resulting from the regression in (1), and Appendix A contains similar results for the share of checking deposits and the cost of liquidity. The top row emphasizes

[10]See Lusardi and Mitchell (2014)

the importance of financial knowledge for achieving higher returns on liquid assets. The top-left panel shows that individuals in the top tercile of financial literacy earn, on average, 0.3 percentage points higher interest rates on their liquid assets compared to those in the bottom tercile. This difference is after considering the role of wealth and age and is obtained during a period when the average return on the highest-yielding liquid asset was 4%. Similar patterns emerge for numeracy and knowledge of inflation. Additionally, the figure highlights a positive correlation between employment in the finance industry and higher liquid asset returns. Conversely, the findings for decision-making ability are less clear.

Figure 4: Interest Rate Fixed Effects and Individual Characteristics

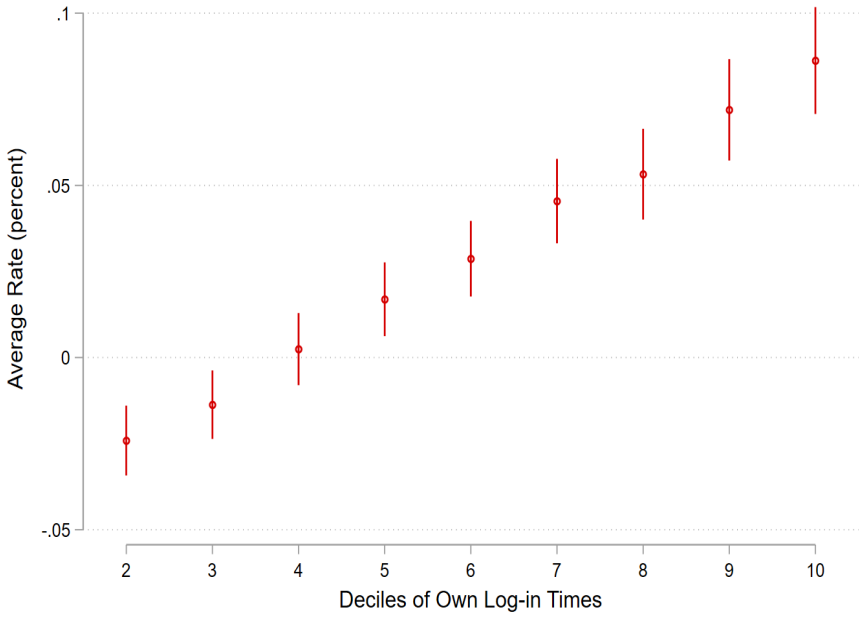


Note: the figure shows the average value of the individual fixed effects obtain in regression (1) for individuals with different characteristics. For details on the surveys and questions see Appendix X.

Finally, we examine the role of attention in liquidity allocation. Specifically, we estimate (1), incorporating deciles of attention for each individual. Attention is measured by the number of times each individual logs into the bank app each month, with these log-in

frequencies partitioned into 10 bins for each individual. This measure thus captures how attentive the depositor is compared to her own self. The regression also controls for deciles of individual wealth to isolate fluctuations in attention that are orthogonal to changes in wealth. Figure 5 displays the coefficients for the interest rate in the liquid portfolio, while Appendix A presents the corresponding results for shares and the cost of liquidity. The figure shows that periods with more frequent log-ins to the bank app are associated with higher returns on liquid assets, indicating a positive relationship between attentiveness and portfolio performance.

Figure 5: Attention and Interest Rates



Note: The figure presents the point estimates and standard errors of the coefficient for the deciles of attention on the return of the liquid asset portfolio. Attention deciles are calculated for each individual based on the number of log-ins to the bank app. Panel is balanced. Standard errors are clustered at the individual level.

4 Deposits Fluctuations

Given that holding liquidity can be costly, especially during periods of high interest rates, this section investigates the events that trigger portfolio reallocations by depositors. Specifically,

we examine what triggers funds to move, who moves them, and where they are reallocated. We begin by showing that portfolio allocation correlates strongly with fluctuations in individuals' wealth levels and appears to depend on the interest rate spread, but only when individuals are releatively wealthy.

We first focus on how the share of low-return checking deposits in a depositor's portfolio responds to changes in her wealth. Simultaneously, we analyze the role of the interest rate spread—the difference between savings and checking account rates—in this share. Finally, we consider the interaction between these two factors, asking not just whether the spread influences portfolio choice, but who is most affected.

For this analysis, let share_{it} denote the fraction of individual i's liquid portfolio allocated to checking deposits in month t, and let d_{it} represent the individual's decile of own wealth. Wealth deciles are calculated uniquely for each individual, ranking their wealth level from 1 (lowest) to 10 (highest) over the sample period. Lastly, let spread_t denote the spread between checking and savings accounts interest rates. Using a stable panel of active bank customers, we estimate the following regression:

$$\text{share}_{it} = \alpha \cdot \text{spread}_t + \sum_{j=1}^{10} \beta_j \cdot \text{I}_{(d_{it}=j)} + \sum_{j=1}^{10} \gamma_j \cdot \text{I}_{(d_{it}=j)} \cdot \text{spread}_t + X'_{it} \cdot \delta + \nu_i + \varepsilon_{it} \qquad (2)$$

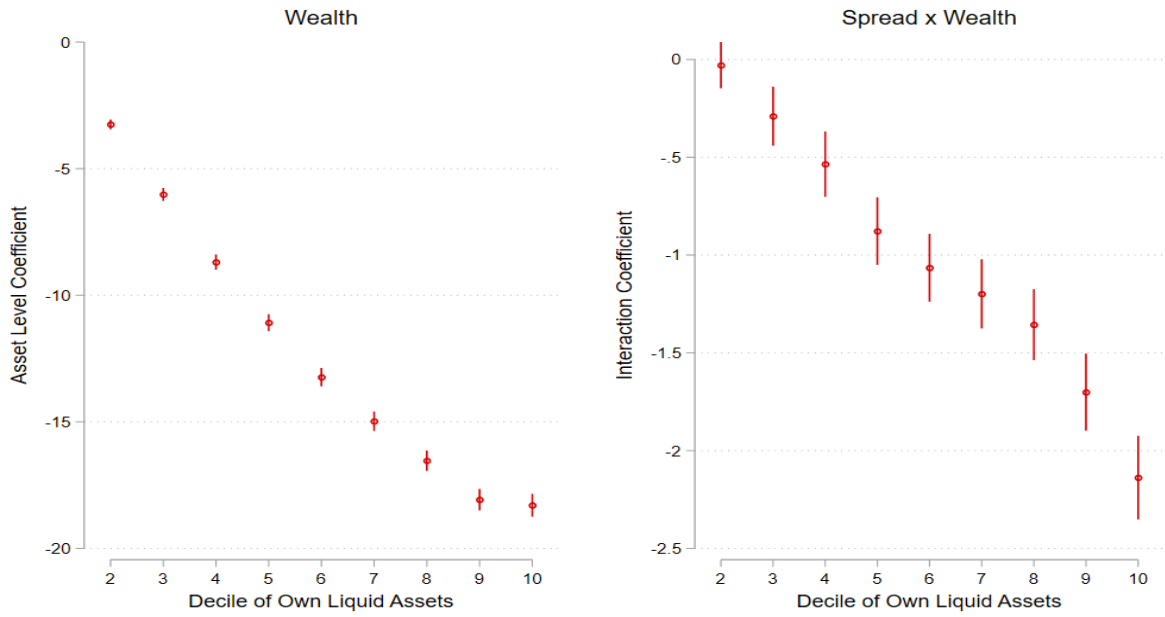
where $\text{I}(d_{it} = j)$ is an indicator function equal to one if agent i is in decile j of their wealth at month t, ν_i is an individual fixed effect and X'_{it} are time varying controls such as age.

Figure 6 presents the results on how within-individual variation in wealth and its interaction with the spread between savings and checking account interest rates are associated with liquid wealth allocations.[11] Technically, we are reporting correlations. In practice, our set of fixed effects does impose a bar though for selection, omitted-variable bias, and reverse causality. All regressions control for selection on time-invariant (un)observables by including individual fixed effects, and we always compare individuals' values to their own averages. The left panel shows the effects of individuals' wealth levels—the β_j coefficients in equation (2)—on

[11] Table X in the appendix provides detailed regression estimates.

the share of low-return checking deposits in their portfolios. The right panel illustrates the interaction between individuals' wealth deciles and the spread between checking and savings account rates, represented by the γ_j coefficients.

Figure 6: Effect of Wealth Levels and Interest Rate Spreads on Checking Deposit Share



Note: The figure shows the estimated coefficients from equation (2). Deciles of individuals' wealth levels are calculated relative to each individual history of wealth in the dataset. The left panel plots the β_j coefficients, capturing the effect of changes in individuals' wealth. The right panel shows the γ_j coefficients, capturing the effect of the spread across different individual wealth levels. The panel is stable using only active individuals, and standard errors are clustered at the individual level.

The left panel reveals that as individuals wealth increases, they tend to hold a smaller share of their liquid wealth in checking deposits. The effect is substantial: moving from the lowest to the highest decile of their own wealth distribution reduces the share of checking deposits by 20 percentage points. The right panel highlights that individuals respond to increases in the cost of low-return deposits (as measured by the spread) by reducing their portfolio share, but this responsiveness is observed only during periods when they are relatively wealthy, compared to their own personal history. At the peak of their wealth during the sample period, a 1 percentage point increase in the spread is correlated with a 2 percentage point reduction

in the share of checking deposits. In contrast, when individuals are at lower wealth levels, the share of low-return deposits appears largely unresponsive to changes in their cost.

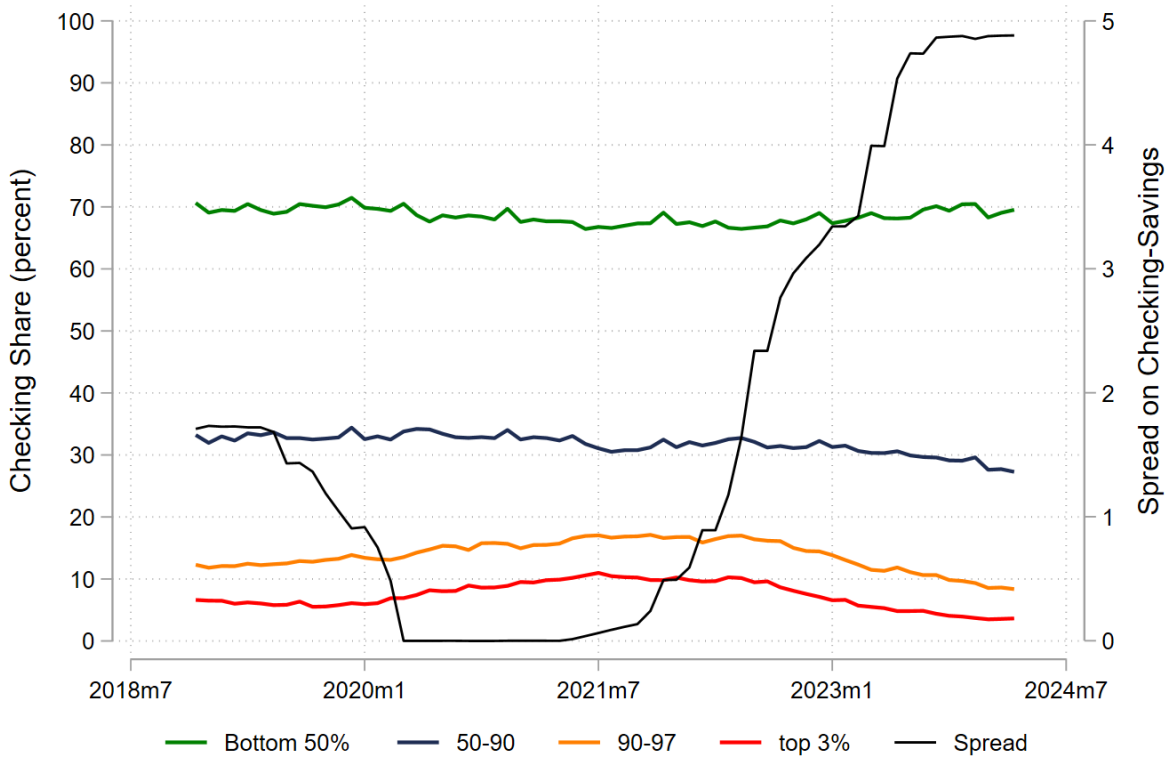
Next, we provide evidence on the strong connection between changes in wealth and contrast this with the less evident relationship with the spread. Figure 7 shows the average share of checking deposits in portfolios that include all liquid assets. Individuals are grouped based on their level of liquid assets at each point in time. As noted in Section 3, the figure highlights the importance of wealth levels in determining the share of low-return checking accounts. It also shows that even as the return gap between checking and savings accounts (right axis) increases more than fivefold between 2022 and 2024, the shares of checking deposits across the wealth distribution remain relatively stable, except for the top wealthiest individuals.

Our data set enables us to track the movement of funds between accounts within the bank and transfers to broker accounts. Figure 8 highlights that the reallocation of funds between accounts is relatively common, with 40% of individuals making at least one transfer per month between its own checking and savings accounts. The right panel further shows that, conditional on making at least one transfer in a month, individuals reallocate funds on an average of three days. However, the overall pattern remains largely unaffected by changes in the spread between checking and savings accounts. Both the share of individuals transferring funds and the average number of transfers remain consistent, regardless of whether the spread is zero or 5%.

We provide further evidence on the role of fund inflows and outflows in shaping portfolio allocations. Specifically, we calculate the share of individuals who, conditional on making a portfolio reallocation into their checking account on a given day, also exhibit an outflow of funds from the same account on that day.[12] The left panel of Figure 9 (black line) shows that 90% of all inflows into checking accounts are accompanied by simultaneous outflows. Furthermore, the red line illustrates the median size of inflows relative to outflows, indicating

[12]While we cannot determine whether the outflow is for consumption purposes, we can rule out that it is directed to a broker account.

Figure 7: Portfolio Share in Checking Account

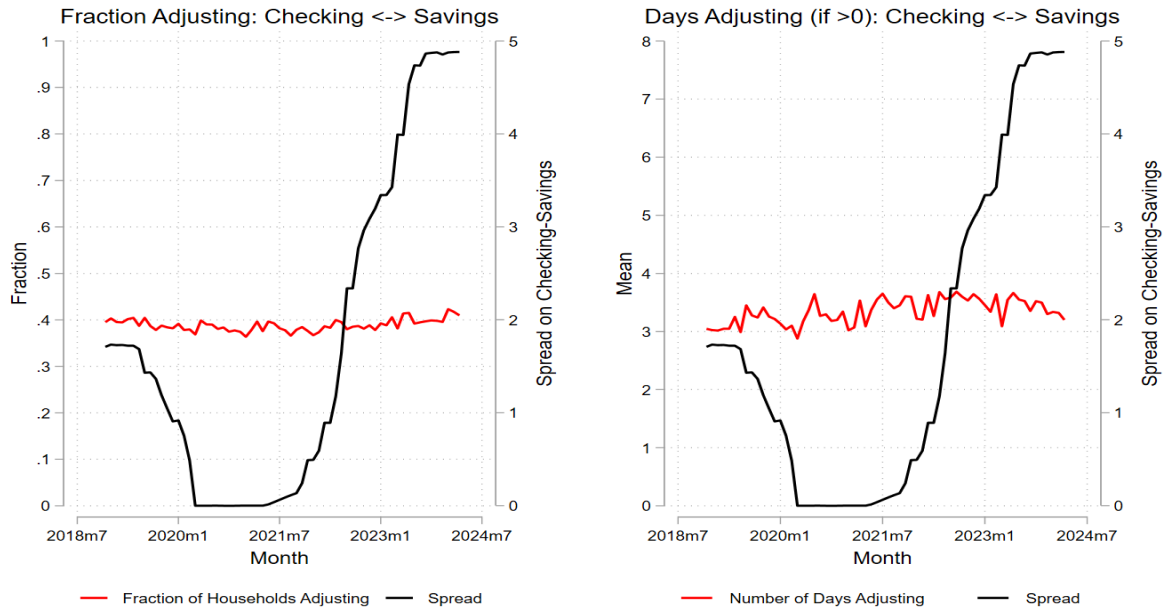


Note: The figure shows the average share of checking deposits in the liquid asset portfolio for active individuals grouped by their wealth level at each point in time. The spread represents the difference in returns between standard savings and checking accounts.

that the median inflow closely matches the outflow. This pattern suggests that inflows into checking accounts are largely driven by the need to consume or make payments.

The right panel of Figure 9 provides analogous information for reallocations out of checking accounts. The black line in the right panel shows the share of individuals who, conditional on reallocating funds from checking into a saving account on a given day, also received an inflow into checking on that same day. It reveals that approximately half of these individuals make such reallocations on days when they experience an income flow. Furthermore, the median size of the transfer into a higher return account closely matches the inflow of funds into checking. This pattern highlights the importance of income inflows in driving reallocations from checking accounts to high-return accounts.

Figure 8: Adjustments

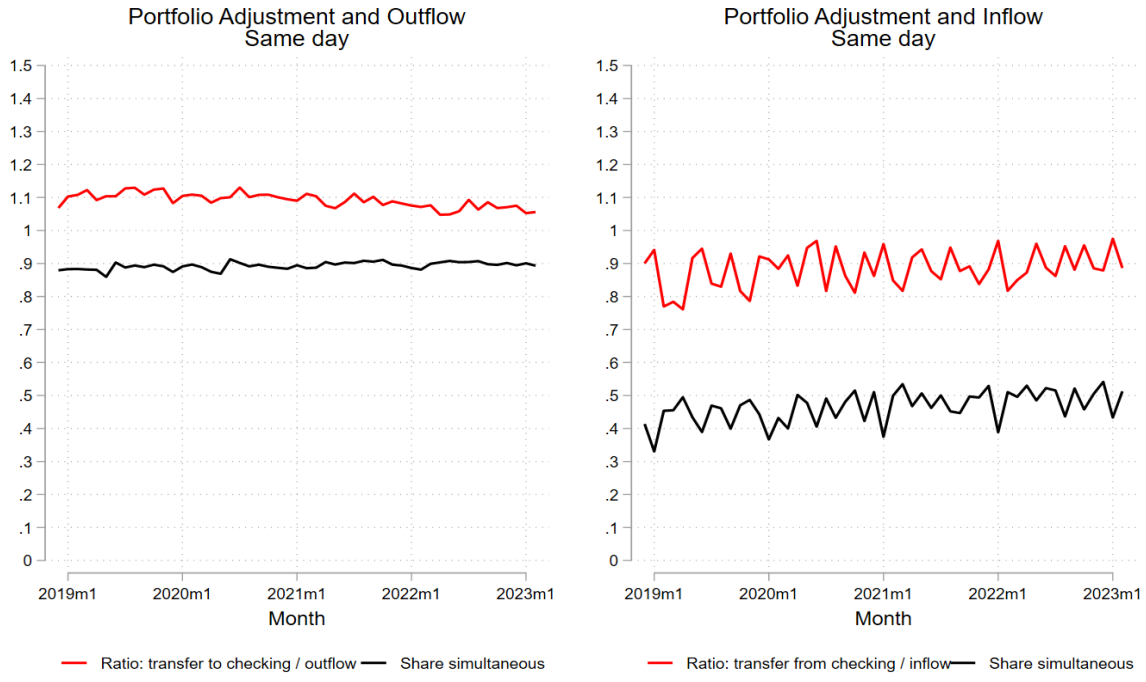


Note: Left: fraction of individuals moving funds between checking and savings at least once a month. Right: average number of days funds move between checking and savings conditional on at least one movement in the month. Calculation uses only active bank customers.

4.1 Events Response

In this section, we examine how individuals adjust their portfolios in response to cleanly identify events. Specifically, we explore the impact of income changes—both anticipated and unanticipated—on portfolio allocation. We also investigate the role of large consumption expenses, such as house purchases and other atypical expenditures, in driving reallocation decisions. Lastly, we use unexpected movements in the policy rate to instrument for changes in the cost of holding deposits to understand how sudden shifts in the cost of liquidity influence individuals' portfolio choices. By studying these events, we aim to shed light on the underlying mechanisms that prompt individuals to reevaluate their asset distribution.

Figure 9: Portfolio Adjustments Following Expense and Income Flows



Note: The figure illustrates the share of individuals reallocating funds from checking accounts to higher-return accounts (right panel) and vice versa (left panel). The black line represents the share of individuals who, conditional on making a transfer into or out of checking, also experience a corresponding outflow or inflow of funds on the same day. The red line shows the median size of the transfer relative to the accompanying inflow or outflow.

4.2 Managing an Anticipated Income Change

All workers in Iceland receive holiday allowance amounting to a minimum of two accumulated working days for each worked month or 10.7%. Some workers get the allowance transferred monthly into an account which funds are automatically transferred separately into the clients checking or savings account on the 11th of May each year or the next working day thereafter. While workers can monitor the balance, they cannot access the funds until that specific day. This represents an example of funds that individuals anticipate will become liquid on a particular day, making it a fully anticipated income windfall.

This event provides a useful example to study how individuals manage an income inflow,

in this case, one that is fully anticipated. To understand their behavior, we conduct the following event study:

$$y_{i,t+s} = \alpha + \beta_s \cdot \mathrm{a}_t + \varepsilon_{i,t+s} \tag{3}$$

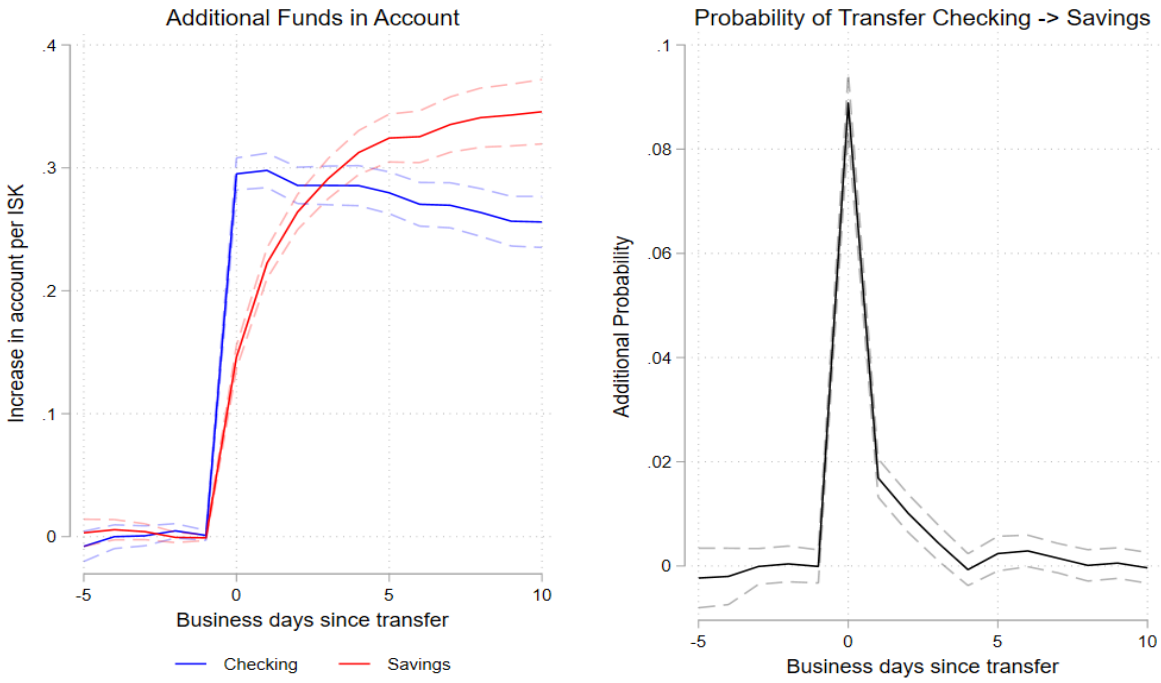
where t represent May 11th, the day of the transfer, and s denote the business days surrounding that transfer, with $-5 \leq s \leq 10$. We run two specifications. In the first, $y_{i,t+s}$ represents the ISK value in the checking and savings accounts on the day corresponding to $t+s$, and a_t is the ISK amount that became liquid on May 11th. This specification is run only for individuals who receive the transfer. In the second specification, a_t is an indicator function that equals one if the individual received a transfer from the vacation account, and $y_{i,t+s}$ is another indicator that equals one if the individual reallocates funds between checking and savings on the day $t+s$.

Figure 10 displays the estimated results from both specifications. In both the left and right panels, we observe that despite the transfer being fully anticipated, there is no change in the size of funds nor any significant reallocation of funds before the transfer. The left panel shows that the vacation allowance increases funds in both checking and savings accounts. On average, individuals allocate 30 cents of each additional Krona to their checking account and another 15 cents to their savings account on the day of the transfer. Notably, the balance in savings accounts continues to grow in the days following the holiday allowance transfer, while funds in the checking account decline.

As funds can be directly deposited into savings accounts, the question arises whether individuals actively manage their portfolio. The right panel confirms that, indeed, on the exact day of the transfer and the following days, individuals move funds from the checking account into the higher-return savings account. We see this as additional evidence that individuals quickly respond to additional income by reallocating funds.

4.3 Managing an Unanticipated Income Shock

Figure 10: Response to Transfer from Vacation Account



Note: the left panel plots the change in the balance of checking and savings accounts following an anticipated vacation allowance transfer. The right panel shows the additional probability of reallocating funds between checking and savings accounts after the transfer.

4.4 Portfolio Response to a Monetary Policy Shock

5 Model Predictions

6 Conclusion

Retail deposits are generally considered sticky, allowing banks to maintain a low deposit beta. However, regular events throughout history remind us that deposits sometimes move. Deposits thus appear to be considered both sticky and volatile. Existing studies have examined various potential explanations for deposit insensitivity to interest rates, including deposit insurance (Hanson et al., 2015), superior liquidity services (d'Avernas et al., 2023), and market power

(Drechsler et al., 2021) as well as the volatile nature of deposits (see, e.g., Blickle et al., 2024). However, there is quite limited evidence on the deposit allocations of individuals coming from settings where researchers are able to follow the money, i.e., where it is possible to observe the money comes from, how depositors allocate them to different accounts or investments, as well as how various characteristics and circumstances interact with these behaviors.

In this paper, we combine high-frequency, comprehensive, and detailed panel of bank data, providing a close-to-full picture of the financial lives of individuals, and experimental data from a series of surveys administered to bank customers, to perform comprehensive analysis of deposit behavior that reconcile these seemingly contrasting deposit dynamics. We document significant heterogeneity in portfolio allocation among assets with similar characteristics but large differences in rates of return. Specifically, wealthier, more educated individuals with higher financial literacy consistently achieve higher returns on liquid safe assets.

We also show that portfolio allocations respond to changes in wealth, with wealthier individuals reallocating funds to higher-return assets. Moreover, this reallocation occurs almost immediately after income is received. Conversely, reductions in high-return deposits happen when individuals incur large expenses. Finally, our evidence points to wealthier individuals as the ones most likely to reallocate towards high-return assets following an increase in deposit spreads.

To sum, our analysis of depositor behaviors using detailed individual-level, high-frequency panel of bank data over a long period of time provides new and valuable insights regarding the mobility of bank deposits. Our findings provide useful knowledge as to how to design interventions aimed to minimize the financial stability risk of the banking system.

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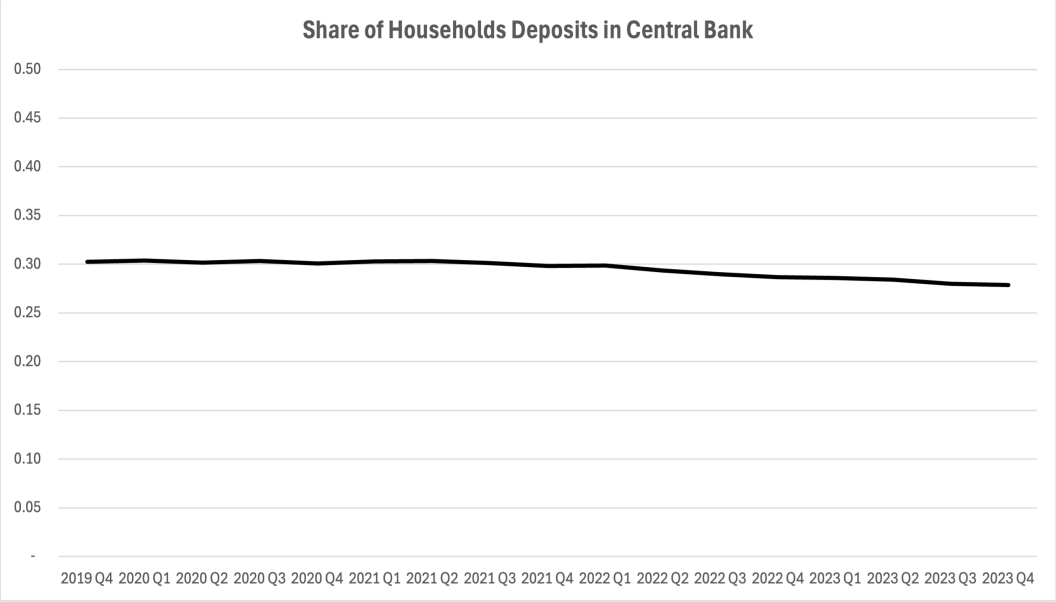
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A Additional Figures and Tables

Table 3: Comparison of Population and Sample Characteristics

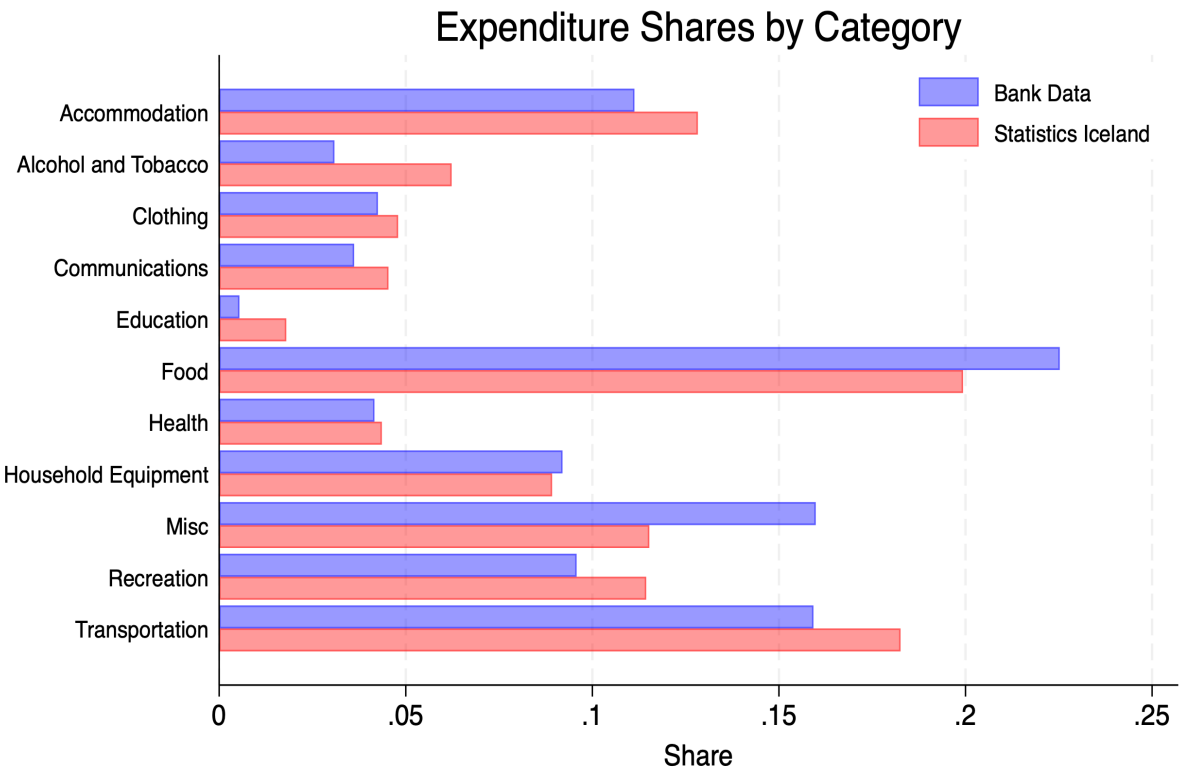
	Mean (SD)		Difference in Means
	Population (1)	Sample (2)	(1) - (2)
Female	0.50 (0.50)	0.51 (0.50)	-0.01
Married	0.41 (0.49)	0.46 (0.50)	-0.05
Capital Region	0.64 (0.48)	0.71 (0.45)	-0.07
Age	46.34 (18.35)	47.70 (17.18)	-1.36
Age $\leq$ 20	0.03 (0.18)	0.01 (0.10)	0.02
20 $<$ Age $\leq$ 30	0.20 (0.40)	0.18 (0.39)	0.01
30 $<$ Age $\leq$ 40	0.19 (0.39)	0.17 (0.38)	0.01
40 $<$ Age $\leq$ 50	0.17 (0.37)	0.18 (0.38)	-0.01
50 $<$ Age $\leq$ 60	0.16 (0.37)	0.19 (0.39)	-0.03
60 $<$ Age	0.26 (0.44)	0.27 (0.45)	-0.01
Family Size	1.75 (8.11)	2.13 (1.21)	-0.38

Figure 11:



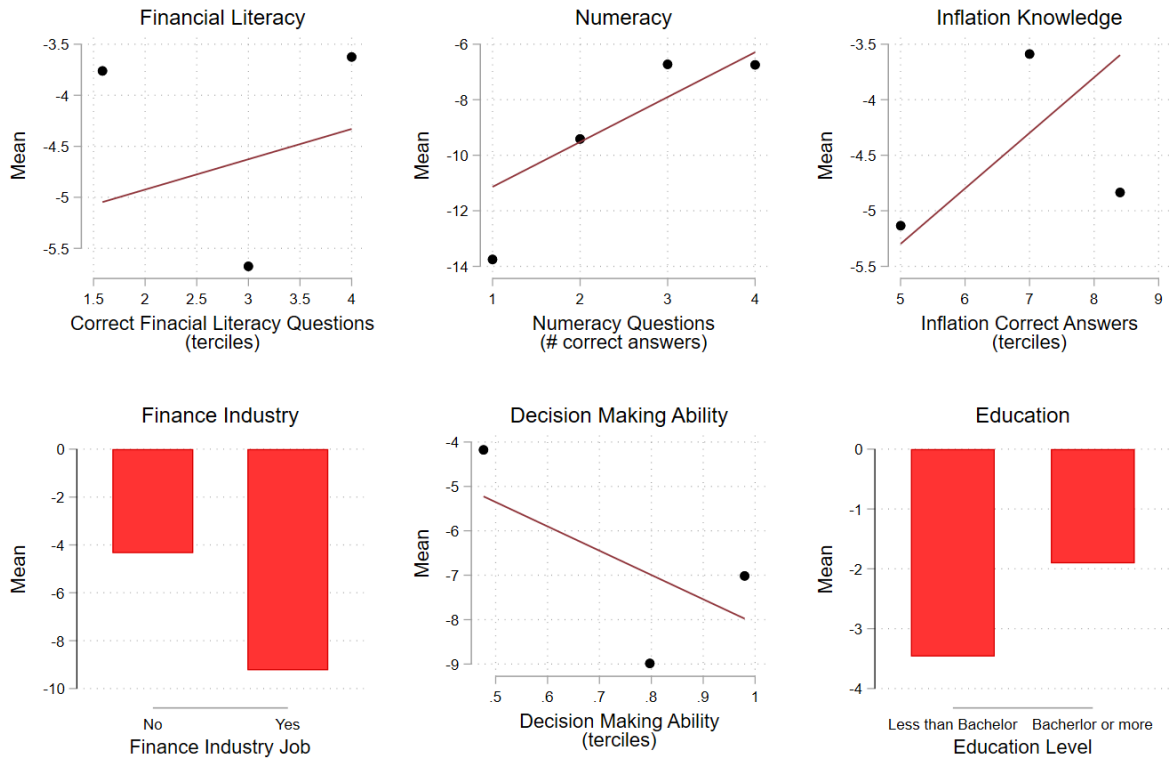
Note: The figure shows the share of household deposits held at the collaborating bank relative to total household deposits reported by the Central Bank of Iceland.

Figure 12:



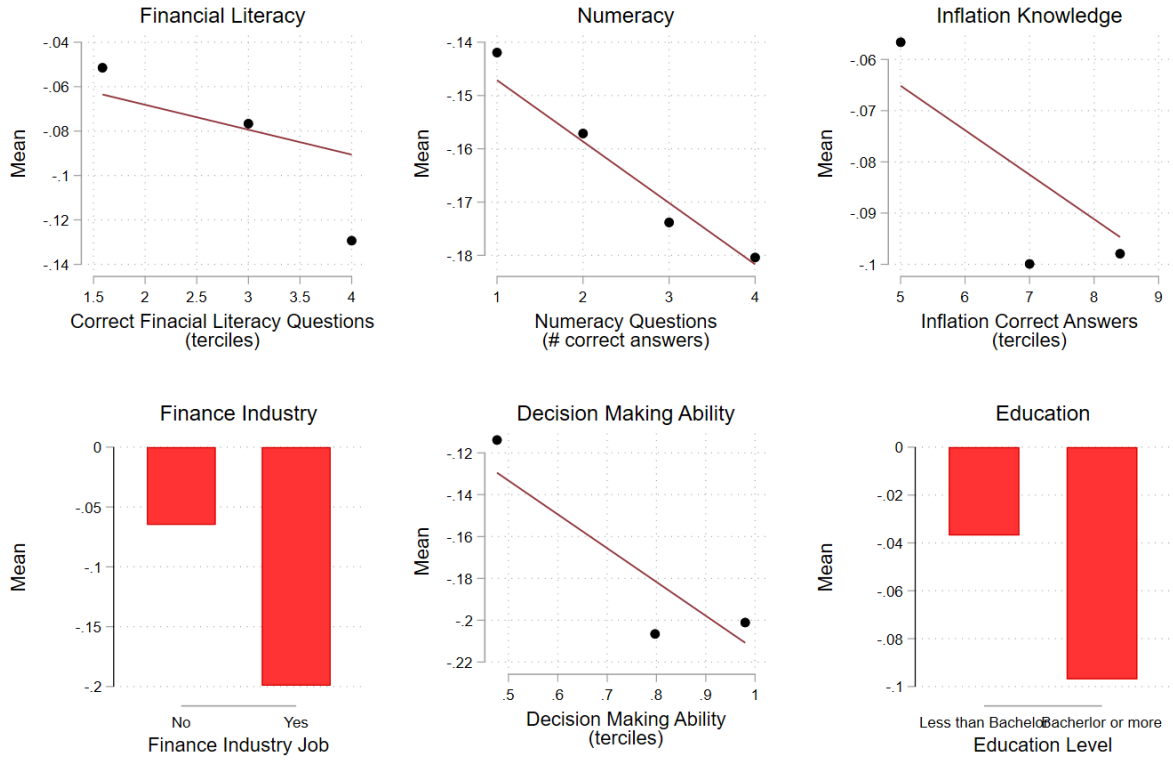
Note: Shares from the Statistic of Iceland correspond to consumption by locals in 2019 excluding housing.

Figure 13: Shares Fixed Effects and Individual Characteristics



Note:

Figure 14: Cost of Liquidity Fixed Effects and Individual Characteristics



Note:

Figure 15:



Note: