Who Prices Deposits?
A Heterogeneous-Agent Model with Deposit Rate Determination

Martina Dosser[†]

This version: November 17, 2026

Updated regularly; please click here for the latest version

Abstract

This paper studies how wealth heterogeneity shapes banks' pricing incentives. Empirical evidence shows that deposits are highly concentrated among the wealthiest households and points to differences in depositors' rate sensitivity based on their income and wealth. Motivated by this evidence, I develop an incomplete-markets model with imperfect banking competition and idiosyncratic bank preferences that emphasizes the interaction between households' portfolio choice and banks' market power. Unlike in standard representative-agent frameworks, depositor heterogeneity in wealth and portfolio composition generates heterogeneous deposit demand elasticities, linking the wealth composition of a bank's customer base to its pricing behavior. In the model, deposit rates are largely determined by the deposit response of the wealthiest 10%, who hold the majority of deposits and drive the aggregate deposit demand elasticity banks face. I use the model to evaluate the impact of easier access to non-deposit assets and show that more frequent portfolio adjustment reduces reliance on deposits, weakens incentives to switch banks, and lowers deposit rates, partly offsetting the welfare gains from increased adjustment opportunities.

[*]I am indebted to my advisor, Per Krusell, and to Joshua Weiss for their support and guidance. I also thank Kieran Larkin, Kurt Mitman, Yimei Zou, Mitch Downey, Brian Higgins, Timo Boppart, Amalia Repele, Veronica Salazar-Restrepo, participants of the IIES Macro Group, the ENTER Jamboree 2026, and 6th WE_ARE_IN Macroeconomics and Finance Conference for their insightful comments and feedback. All errors are my own.

[†]IIES, Stockholm University. Email: martina.dosser@iies.su.se. Web: martinadosser.com.

1 Introduction

Deposits constitute a key savings instrument for a large share of households and a major source of bank funding. Their remuneration affects households' incentives to save and allocate their wealth across different savings instruments, while also determining banks' costs of attracting and retaining funds. The slow adjustment of deposit rates during the recent monetary tightening in Europe and the U.S. has put deposit rates and bank market power back at the center of the public debate, and has raised concerns about weak competition in deposit markets. Much of the debate asks whether banks compete enough for deposits; less attention is paid to whose deposits they compete for and how this shapes deposit rates.

Households differ in both their willingness to respond to deposit rates and the balances they supply. Recent empirical work points to differences in depositors' rate sensitivity, suggesting a role for household wealth and alternative investment opportunities in determining depositors' response to interest rates (d'Avernas et al., 2023; Cirelli and Olafsson, 2025; Albertazzi et al., 2026). At the same time, deposits are highly concentrated; in 2004, the top 10% of U.S. households ranked by gross financial wealth held more than half of total liquid deposits[1]. A similar concentration of deposits is reported for the euro area, where the wealthiest 10% held around 45% of household deposits in the third quarter of 2021 (Battistini et al., 2022). As banks' incentives to raise rates depend on the amount of funding, not the number of customers, they stand to attract or lose, deposit pricing may depend disproportionately on the responses of a relatively small group of households. Understanding deposit rate determination therefore requires answering two questions: (i) how much does a household contribute to a bank's deposit base and (ii) what determines that household's deposit demand elasticity?

I address these questions by developing a tractable framework that links wealth inequality, portfolio choice, and endogenous deposit pricing. I build an incomplete-markets model with imperfect competition in the banking market, where equilibrium deposit rates depend on households' intertemporal and bank-specific preferences as well as their income and wealth. Households choose both how much to save and at which bank to deposit. Idiosyncratic preferences for bank characteristics, such as location, customer service, and online banking, make deposits at different banks imperfect substitutes. I focus on a setting with atomistic banks which offer a single deposit rate to all their customers, and restrict attention to symmetric equilibria. This allows me to trace out the mechanism that links depositor heterogeneity to banks' pricing incentives, while keeping the model tractable.

The framework connects household heterogeneity to bank pricing through the composition

[1] Own calculations based on the 2004 Survey of Consumer Finances; liquid deposits comprise checking, savings, and money market deposit accounts (cf. Section 3.1).

of deposits: the elasticity faced by a bank is a deposit-weighted average of individual households' elasticities. Pricing therefore depends both on how strongly households respond to deposit rates and on where deposits are concentrated. That is, households matter in proportion to the funding they supply. In the model, household behavior and deposit returns are thus jointly determined: rates influence saving and portfolio choices, while the resulting distribution of household states shapes banks' pricing incentives. Crucially, the framework provides a tractable way to incorporate endogenous retail rate pricing into heterogeneous-agent models and can be readily adapted to study related questions pertaining to the interaction of heterogeneous bank customers and banks' pricing incentives.

I first establish the mechanism in a one-asset, two-period model in which households have identical preferences but differ in deterministic endowment profiles. This simple environment isolates why households' current and future resources affect bank choice and deposit demand: deposit demand adjusts along an intensive margin—the amount saved conditional on bank choice—and an extensive margin—the probability of choosing a particular bank. With logarithmic preferences, wealthier households are less elastic on the intensive margin but more elastic on the extensive margin. The intensive-margin result captures the wealth effect of an interest rate change on optimal savings. The extensive-margin result instead formalizes the following intuitive notion: a household's incentive to switch to a higher-paying bank is determined by the utility gain from a higher deposit rate. The relevant measure is the household's deposit expenditure weighted by the marginal utility of consumption. Hence, households who finance a larger share of their future consumption with deposits are more exposed to changes in their return on deposits and thus more elastic on the extensive margin.

I use this simple model to establish two key results. First, I characterize the link between logit bank choice and a deposit demand system with constant elasticity of substitution (CES). I show that, in addition to the well-known restriction to logarithmic utility (Anderson et al., 1987), using logit bank choice as a microfoundation for CES deposit demand requires that households have no future non-deposit resources. The result builds on an intuitive but subtle point: with positive future endowment, choosing a bank changes not only the return on deposits but also the present value of households' lifetime resources, thus linking households' deposit demand elasticities to their endowment profile. To the best of my knowledge, I am the first to show that a logit bank choice model with logarithmic preferences over consumption does, in general, not recover a CES demand system but instead gives rise to individual deposit demand elasticities that depend on households' idiosyncratic states.

Second, the model emphasizes the importance of the composition of a bank's deposit base in determining its pricing incentives. As households differ in how strongly they respond on either margin of deposit demand, the model gives rise to distributional state-dependence. The key

object for a bank's optimal pricing strategy is the interest rate elasticity of aggregate deposit demand, which is a deposit-weighted average of individual deposit demand elasticities. That is, understanding who drives bank pricing requires combining households' rate sensitivities with the funds they supply to banks. To formalize the role of deposit composition, I show that a representative household gives a misleading account of bank pricing. At symmetric deposit rates, a household endowed with mean wealth reproduces aggregate deposit holdings, but it understates the deposit demand elasticity faced by a given bank.

In the second part of the paper, I put the framework to work to study how portfolio composition and the high concentration of deposit holdings at the top of the wealth distribution affect equilibrium deposit rates. I extend the two-period model to an infinite-horizon, incomplete-markets setting, where households hold both liquid deposits and a higher-return asset that can be adjusted only intermittently. In order to keep the model tractable and to focus on the core mechanisms developed in this framework, I assume that portfolio adjustment opportunities arise stochastically. This setting captures the value of deposits as a liquidity buffer while allowing households' investment opportunities to influence deposit demand. Banks now compete not only with each other but also with the second asset, because households can respond to a lower deposit rate by shifting savings into the illiquid asset. In equilibrium, deposit rates thus influence saving and portfolio choices, while the resulting distribution of deposits and illiquid wealth determines the elasticity faced by banks and hence their optimal deposit rates.

The quantitative model delivers two key findings. First, aggregate deposit demand elasticity is determined almost entirely by the extensive margin, which accounts for about 85% of total elasticity. Second, wealthy households exert disproportionate influence on deposit pricing; they hold a large share of deposits and respond strongly to deposit rate changes through their bank choice. Decomposing the aggregate deposit demand elasticity into contributions by wealth percentile, I show that the top wealth decile accounts for approximately two-thirds of aggregate elasticity, while the bottom half of the wealth distribution contributes less than 3% to aggregate elasticity. Hence, *the wealthiest decile prices deposits*. This result highlights again the importance of accounting for the composition of deposits. For instance, a population-weighted measure of household elasticity would understate the elasticity banks face by almost 25%.

I leverage the established link between deposit pricing and the distribution of wealth to study the effect of a reform that allows for easier access to non-deposit assets. Specifically, I consider a permanent increase in adjustment opportunities, capturing financial innovations or policy and institutional changes that make non-deposit wealth more readily accessible, and investigate the consequences for equilibrium deposit rates and welfare. More frequent

portfolio adjustment makes the higher-return asset more attractive and reduces households' need for deposit buffers. Yet banks respond by lowering deposit rates instead of competing for funds: a permanent 10% increase in adjustment frequency leads to a substantial decline in aggregate elasticity and, thus, to a fall in the annualized deposit rate of about 23 basis points. Intuitively, as households become less reliant on deposits, they are less exposed to the deposit rate they are offered, which reduces their bank-choice sensitivity.

Endogenous pricing consequently changes the welfare assessment of easier portfolio adjustment. Households benefit from improved access to their wealth, but lower deposit returns offset part of that benefit. I find that the deposit rate response removes almost half of the average welfare gain that would arise under a counterfactual in which deposit rates are held fixed. Nonetheless, the reform is welfare improving for households that participate in the non-deposit asset market. To highlight the importance of distinguishing improved access for existing asset holders from broader participation in financial markets, I then consider a population of 'non-participants' with zero mass and show that they suffer substantial welfare losses. They are exposed to the fall in deposit rates without benefiting from improved adjustment opportunities.

Together, these results show how household inequality and investment opportunities shape the returns banks offer to savers. The framework provides an analytical foundation for heterogeneous deposit demand, a tractable quantitative implementation, and a way to evaluate policies whose effects operate jointly through household portfolios and banks' pricing responses.

Related literature. This paper contributes to four strands of the literature. First, I contribute to the literature on bank competition and deposit pricing. A large literature studies how bank market power and bank-side frictions shape deposit pricing and monetary transmission (Drechsler et al., 2017; Gerali et al., 2010; Polo, 2021; Wang, 2025). More recent work emphasizes the household side of deposit markets, examining how differences in depositors' rate sensitivity shape banks' pricing incentives. Cirelli and Olafsson (2025) show that wealthy households account for much of the reallocation of liquid portfolios in response to changes in interest-rate spreads. d'Avernas et al. (2023) highlight differences in customers' valuation of liquidity services, while Xiao (2020) studies how heterogeneous preferences for yields and transaction services shape sorting between banks and money-market funds and their interest-rate pass-through. Albertazzi et al. (2026) estimate a model in which substitution toward alternative savings products changes the composition and rate sensitivity of banks' deposit base. Related mechanisms arise in models with heterogeneous search costs (Yankov, 2024) and social interactions in depositors' attention (Eichenbaum et al., 2025).

Whereas these models attribute differences in rate sensitivity to preferences, search costs, or limited attention, in my model they arise from households' consumption, saving, and portfolio decisions. Household income, wealth, and investment opportunities shape both individual rate sensitivity and the balances households supply to banks, thus linking banks' pricing incentives to the distribution of income and wealth. Cirelli (2022) is closely related: in his framework, heterogeneous elasticities and the composition of deposit holdings also shape bank pricing, but he combines segmented asset-market access and multi-product banks to study the welfare effects of inflation. I instead combine competition through endogenous bank choice with saving and portfolio decisions over liquid deposits and an illiquid asset.

Second, the paper relates to work linking households' investment opportunities to deposit pricing. Bisetti and Sarkar (2025) and Chakraborty et al. (2026) show that greater household participation in equity markets strengthens depositors' outside options, inducing banks to offer higher deposit rates. Their findings highlight the role of competition from non-deposit investments in shaping deposit pricing. Evidence from digital platforms points in a similar direction. Digital banking facilitates deposit reallocation, with banks offering mobile apps and brokerage services experiencing larger deposit outflows and larger increases in deposit costs when policy rates rise (Koont et al., 2024), while fintech platforms increase competition from non-bank savings products by attracting deposits away from banks (Buchak et al., 2021). A related literature shows how central bank digital currencies can strengthen depositors' outside options, reducing banks' deposit market power and raising deposit rates (Andolfatto, 2021; Chiu et al., 2023; Paul et al., 2025). I study a related mechanism through a different margin, focusing on the impact of reduced portfolio adjustment frictions on deposit rates and welfare. Easier access to illiquid wealth reduces households' reliance on deposits as a liquidity buffer, altering both the composition of the deposit base and depositors' interest-rate sensitivities. While the existing literature generally finds that improved outside options lead to higher deposit rates, in my model they induce banks to lower deposit rates.

Third, the paper relates to the literature on how household heterogeneity shapes monetary policy transmission. This literature highlights how differences in consumption and saving behavior, income exposure, and asset ownership affect the aggregate response to monetary policy (Kaplan et al., 2018; Auclert, 2019; Bilbiie, 2025; Broer et al., 2020). Related work emphasizes the role of portfolio heterogeneity and asset-market participation in shaping consumption, portfolio adjustment, and aggregate investment responses (Luetticke, 2021; Melcangi and Sterk, 2025). I complement this literature by embedding discrete bank choice in a standard incomplete-markets model with portfolio choice. This provides a tractable framework for incorporating endogenous deposit pricing into heterogeneous-agent models and for studying questions pertaining to the role of household inequality in determining the

transmission of monetary policy through deposit markets.

Finally, the paper characterizes when discrete bank choice delivers CES deposit demand—and, crucially, when it does not. Anderson et al. (1987, 1988) establish the widely invoked equivalence between logit consumption choice under logarithmic utility and CES demand. Ulate (2021a) obtains a corresponding constant-elasticity benchmark in a bank-choice model with unit intertemporal elasticity of substitution and no future income. I generalize his bank-choice setting and show that the zero-future-income assumption is consequential: allowing savers to receive future income breaks the CES equivalence even under logarithmic consumption utility. Bank choice affects an agent's deposit rate and therefore the present value of lifetime resources, making utility differences across banks depend on households' resource profiles. Deposit demand elasticities therefore depend on households' income and wealth as well as the level of deposit rates, linking the distribution of household resources to banks' pricing incentives. Relatedly, Waugh (2023) and Mongey and Waugh (2025) use discrete consumption choice with non-logarithmic preferences to generate heterogeneous demand elasticities. My analysis identifies a distinct source of heterogeneity arising from the intertemporal consequences of bank choice under logarithmic utility.

Outline. The rest of the paper is structured as follows. Section 2 presents the two-period model and discusses the key mechanisms in detail. In Section 3, I extend the model to an infinite-horizon, incomplete-markets setting and discuss its numerical implementation. The key results of the quantitative model are presented in Sections 4 and 5, which characterize the stationary equilibrium and discuss the consequences of improved access to non-deposit assets, respectively. Finally, Section 6 concludes.

2 Establishing the Mechanism: A Toy Model

Environment. The model is set up in partial equilibrium, in order to focus on the mechanism that links households' wealth to banks' pricing decisions. The economy is populated by a large but finite number N of atomistic banks and a continuum of households with unit mass, who live for two periods. Households enter period one with initial endowment $a \in A = \mathbb{R}_{++} = (0, \infty)$, comprising initial wealth and current income. Its distribution, λ, is exogenously given. For simplicity, I refer to a as wealth throughout. In the second period, households receive income $y' > 0$, which is common to all households[2]. I maintain $y' > 0$

[2]This assumption is by no means necessary for the core results I am presenting. Assuming common future income allows me to focus on the implications of heterogeneous endowment profiles while simplifying the exposition.

throughout the two-period analysis, except when explicitly investigating the zero-future-income case. Since future income is common to all households, a household's idiosyncratic state is summarized by its initial wealth, a. Households are not allowed to borrow, and they can only save by placing deposits at banks. Their bank choice is subject to a taste shock, capturing idiosyncratic bank preferences[3]. Banks, in turn, take deposits from households and invest them at a higher return. I abstract from the redistribution of bank profits and assume them to be taxed away.

2.1 Banks

At the beginning of period one, banks raise deposits from households and invest the proceeds in bonds. Let D_j denote the face value of bank j's deposits payable at maturity and H_j the face value of its investments. Each bank chooses its deposit rate $R_j^D = 1 + r_j > 0$. Throughout the paper, I will refer to the gross deposit rate simply as deposit rate. Let the vector of deposit rates offered by all banks in the economy be denoted by $\mathbf{R^D}$ and the vector of rates set by bank j's competitors by $\mathbf{R^D_{-j}}$, i.e.

$$\mathbf{R^D_{-j}} = (R_1^D, R_2^D, ..., R_{j-1}^D, R_{j+1}^D, ..., R_N^D)$$

and $\mathbf{R^D} = (R_j^D, \mathbf{R^D_{-j}})$.

The banking sector is characterized by monopolistic competition. Households' idiosyncratic bank preferences make deposits at different banks imperfect substitutes, giving each bank market power. Crucially, I assume that each bank has a negligible market share and behaves atomistically: when choosing its deposit rate, each bank takes competitors' rates, $\mathbf{R^D_{-j}}$, and aggregate conditions as given. Section 2.2 describes household choices and the resulting deposit demand schedule, $D_j(R_j^D, \mathbf{R^D_{-j}})$, which is increasing in R_j^D. Throughout, each bank evaluates changes in deposit demand under the maintained assumption of atomistic behavior.

Banks invest by purchasing one-period zero-coupon bonds which are supplied perfectly elastically. These bonds have price $1/R$, where $R = 1 + r > 0$ is the exogenous gross policy rate, and repay their face value at maturity. Deposits also mature after one period and raise D_j/R_j^D in current resources. I focus on environments in which some deposit rate below the gross policy rate attracts positive deposits. Such a rate generates strictly positive profits, whereas any rate at or above the policy rate yields non-positive profits. Consequently, every profit-maximizing deposit rate lies below the policy rate, and the bank's optimization can be restricted to $R_j^D \in \mathcal{R}^{\mathcal{D}} = (0, R)$.

[3]The taste shocks are a reduced-form way of representing heterogeneous tastes for bank characteristics such as location, quality of customer service, opening hours, online banking services, etc.

Since deposits are the bank's only source of funding, its resource constraint is

$$\frac{H_j}{R} \leq \frac{D_j}{R_j^D}.$$

The bank maximizes end-of-period profits, $H_j - D_j$. For any given deposit rate and associated deposit volume, profits are strictly increasing in investment, H_j. The resource constraint therefore binds at an optimum. The bank's problem therefore reduces to

$$\max_{R_j^D \in \mathcal{R}^D} D_j(R_j^D, \mathbf{R^D_{-j}}) \left(\frac{R}{R_j^D} - 1 \right).$$

Defining the deposit demand elasticity internalized by the bank as

$$\Gamma_j(\mathbf{R^D}) \equiv \frac{R_j^D}{D_j(\mathbf{R^D})} \frac{\partial D_j(\mathbf{R^D})}{\partial R_j^D},$$

the optimality condition can be written as

$$R_j^D = R \underbrace{\frac{\Gamma_j(\mathbf{R^D}) - 1}{\Gamma_j(\mathbf{R^D})}}_{\mu_j(\mathbf{R^D})}. \tag{1}$$

Thus, the optimal pricing strategy implies a gross deposit rate that is set at a markdown, $\mu_j(\mathbf{R^D})$, below the gross policy rate. The markdown, in turn, is a function of the deposit demand elasticities, $\Gamma_j(\mathbf{R^D})$, which are derived from the household's problem and characterized in Section 2.5.

2.2 Households

The household's optimization problem can be subdivided into two stages. In the first stage, they choose at which bank to place their deposits. In the second stage, conditional on choosing a given bank, they solve a standard consumption-saving problem. That is, the second stage delivers policies that are contingent on the price of deposits, which is given by the inverse of the gross deposit rate[4].

[4]Deposits are assets with price $\frac{1}{R_j^D}$ that pay back their face value in the next period.

Stage 2. Conditional on choosing bank j, a saver chooses optimal savings $a'(a; R_j^D)$ in order to maximize lifetime utility from consumption. Each household thus solves, $\forall R_j^D$,

$$v(a; R_j^D) = \max_{c>0, a' \geq 0} u(c) + \beta u(y' + a') \quad \text{s.t.} \quad c = a - \frac{a'}{R_j^D}$$

where $\beta \in (0,1)$ is the discount factor and households have CRRA preferences with $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$, $\sigma > 0$, if $\sigma \neq 1$ and $u(c) = \log(c)$ if $\sigma = 1$. Note that both the conditional savings choice and value function depend on the bank choice only through the deposit rate but are unaffected by the taste shock.

The corresponding optimality conditions are summarized by the Euler equation

$$u'(c(a; R_j^D)) \geq \beta R_j^D u'(y' + a'),$$

which holds with strict inequality for agents that are at the borrowing constraint. The optimal savings choice conditional on choosing bank j is given by

$$a'(a; R_j^D) = \max\{0, (1 - \text{mpc}(R_j^D)) R_j^D a - \text{mpc}(R_j^D) y'\}$$

where, for unconstrained agents,

$$\text{mpc}(R_j^D) \equiv \frac{\partial c(a; R_j^D)}{\partial a} = \left(1 + \beta^{1/\sigma} \left(R_j^D\right)^{1/\sigma - 1}\right)^{-1}.$$

Hence, the second stage delivers a standard savings choice, which, for unconstrained agents, is an affine function of current resources and future income: it increases with current resources and decreases with future income. Choices along the intensive margin are conditional on choosing a given bank and, as such, entirely independent of rates offered at other banks.

Stage 1. In the first stage, savers make their bank choice solving, $\forall\ \mathbf{R^D}$,

$$\tilde{w}(a; \mathbf{R^D}) = E_\epsilon \left[\max_{j \in \{1,..,N\}} v(a; R_j^D) + \chi \epsilon_j \right],$$
$$\text{where} \quad \chi > 0,\ \epsilon_j \overset{\text{i.i.d.}}{\sim} G(-\gamma^{EM}, 1)$$

where γ^{EM} is the Euler-Mascheroni constant. That is, the choice-specific taste shocks are assumed to be i.i.d. across time, agents and banks and to follow a Gumbel distribution

(Extreme value Type I) with mean zero. The scale parameter[5], χ, measures the relative importance of the taste shock and, as such, captures the degree of bank market power.

The probability that an agent with wealth a chooses bank j, captured by subscript j, is given by a multinomial logit formula:

$$\begin{aligned}\Pr_j(a;\mathbf{R^D}) &= \Pr\Big[v(a;R_j^D)+\chi\epsilon_j \geq v(a;R_k^D)+\chi\epsilon_k \ \forall k\neq j\Big] \\ &= \frac{e^{v(a;R_j^D)/\chi}}{\sum_{k=1}^N e^{v(a;R_k^D)/\chi}}.\end{aligned}$$

This choice probability depends on the entire vector of deposit rates offered by all banks[6]. It is straightforward[7] to show that the probability of choosing bank j is (weakly) increasing in bank j's deposit rate and (weakly) decreasing in the deposit rates offered by bank j's competitors. Intuitively, the probability that an agent with wealth a chooses bank j depends on R_j^D relative to the deposit rate set by all other banks.

Deposit Demand. The expected deposit demand of an agent with wealth a faced by bank j is given by

$$d_j(a;\mathbf{R^D}) = \Pr_j(a;\mathbf{R^D})a'(a;R_j^D).$$

Hence, while the conditional savings policy is independent of other banks' deposit rates, the individual deposit demand inherits the dependence on the vector of all deposit rates from the choice probabilities. Intuitively, other banks' deposit rates affect the likelihood of choosing a given bank, but, having made that choice, the optimal amount deposited at a given bank is independent of the rates offered by other banks. Note that the expected deposit demand of a borrowing-constrained agent is trivially equal to zero. Throughout the rest of the paper, I will refer to the expected deposit demand simply as deposit demand.

The aggregate deposit demand faced by bank j is

$$D_j(\mathbf{R^D}) = \int_A d_j(a;\mathbf{R^D})\lambda(a)da.$$

Crucially, aggregate deposit demand depends on the entire wealth distribution. In particular,

[5]In order to emphasize the role of χ, I normalize the scale parameter of the distribution to one and explicitly scale the taste shock by χ.

[6]Note that an atomistic bank takes the denominator of each household's choice probability as given. It internalizes how its rate affects conditional saving and the numerator of the choice probability.

[7]By the envelope theorem, $\frac{\partial v(a;R_j^D)}{\partial R_j^D} = u'(c(a;R_j^D))\frac{a'(a;R_j^D)}{(R_j^D)^2} \geq 0$, with strict inequality when conditional saving is positive.

even with logarithmic preferences, the model does not generally admit aggregation to a representative-agent economy. This result stands in stark contrast with the well-known result that a random utility model can serve as a microfoundation for a CES-demand system and arises due to the intertemporal nature of deposit demand. Section 2.4 discusses the distributional state-dependence of aggregate deposit demand in more detail and Section 2.5.1 then highlights the non-trivial implications for the elasticity of individual and aggregate deposit demand.

2.3 Equilibrium

I focus on symmetric equilibria, where all banks set the same deposit rate, and restrict attention to equilibria with strictly positive deposit demand[8]. A symmetric equilibrium consists of a common deposit rate R^{D*} and household bank-choice and saving policies such that: (i) household policies solve the consumption-saving and bank-choice problems given $R_j^D = R^{D*}$ for all j; and (ii) each bank's choice $R_j^D = R^{D*}$ maximizes profits given competitors' rates and aggregate conditions, with deposit demand induced by household choices.

In a symmetric equilibrium, every bank is equally likely to be chosen by a customer, implying that each bank's market share is $\frac{1}{N}$. Note that equilibrium deposit rates constitute a Nash equilibrium where no bank has an incentive to deviate. Conceptually, the interest elasticity of deposit demand faced by a given bank is recovered by solving for one-shot deviation policies. Section 2.5 focuses in detail on the characterization of micro- and macro-level elasticities, i.e., the interest elasticity of individual and aggregate deposit demand.

For the remainder of the two-period model, I restrict attention to logarithmic utility, i.e. $\sigma = 1$, in order to illustrate the role of future non-deposit resources in breaking the link between logit bank-choice with log-utility and CES demand systems. Under this specification, the marginal propensity to consume of unconstrained households is constant at $\text{mpc} = \frac{1}{1+\beta}$ and, thus, independent of the deposit rate. Appendix B discusses the extension to general CRRA preferences.

2.4 Distributional State-Dependence of Deposit Demand

Following Anderson et al. (1988), many papers have exploited the close link between the Random Utility model and CES demand, in order to microfound the latter. Anderson et al. (1988) establish this link by showing that the CES demand system is isomorphic to the one generated by a nested logit model where consumers have log preferences over consumption

[8]By assuming that deposit demand is strictly positive, I am abstracting from autarky, i.e., an equilibrium with zero savings.

and choose a single consumption good among a variety of differentiated goods. However, this equivalence does not readily carry over to discrete choice problems with an intertemporal dimension. In the present model, choosing a bank affects both the return on saving and the present value of lifetime resources, $a + y'/R_j^D$. When future income is zero, lifetime resources are independent of the chosen bank's deposit rate. I first illustrate that the model recovers a CES deposit demand when future consumption is entirely financed by deposits and then show that allowing for future non-deposit resources generates state-dependent bank-choice probabilities and deposit demand.

The Zero-Future-Income CES Benchmark. When $y' = 0$, bank-choice probabilities are independent of wealth and satisfy

$$\Pr_j(a; \mathbf{R^D}) = \frac{\left(R_j^D\right)^{\beta/\chi}}{\sum_{\ell=1}^{N} \left(R^D{}_\ell\right)^{\beta/\chi}}.$$

Conditional savings expenditure is independent of the chosen bank and equals

$$\frac{a'(a; R_j^D)}{R_j^D} = \frac{\beta a}{1+\beta}.$$

Each household therefore allocates a constant share of current wealth to deposits. Let $\varepsilon = 1 + \beta/\chi$ and define the deposit return index

$$\tilde{R}^D = \left(\sum_{\ell=1}^{N} R^D{}_\ell^{\varepsilon-1} \right)^{1/(\varepsilon-1)}.$$

With a unit mass of households and mean wealth $\bar{a}$, aggregate deposit demand is

$$D_j(\mathbf{R^D}) = \tilde{D} \left(\frac{R_j^D}{\tilde{R}^D} \right)^{\varepsilon}, \qquad \tilde{D} \equiv \frac{\beta \bar{a}}{1+\beta} \tilde{R}^D. \tag{2}$$

Equation (2) has the familiar CES demand form[9], with elasticity of substitution ε and composite CES basket $\tilde{D}$. The wealth distribution enters only through mean wealth, so the deposit demand system aggregates exactly using mean wealth. I refer to this zero-future-income case as the CES benchmark throughout the remaining two-period analysis.

[9]For a more detailed treatment of the discrete-choice foundation of CES banking demand, see Ulate (2021b, Online Appendix A.3).

Bank-Choice and Aggregation with Positive Future Income. With positive future income, a rate change also revalues future income, introducing a wealth effect. Put differently, if $y' > 0$, households finance future consumption through both income and deposits. Households with greater current wealth finance a larger share through deposits and thus gain more if their deposit rate rises. Positive future income thus links bank-choice responsiveness to households' income and wealth profiles: for savers, the marginal increase in indirect utility from a higher deposit rate is strictly increasing in wealth (see Lemma 1). Based on this increasing-differences property, we can establish the following result.

Proposition 1 (Wealth dependence of bank choice)**.** *Let* $\mathcal{A}_+(R_j^D) \equiv \left(\frac{y'}{\beta R_j^D}, \infty\right)$ *denote the positive-saving domain conditional on choosing bank* j*. If* $y' > 0$ *and* $R_j^D > {R^D}_k$*, the odds of choosing bank* j *rather than bank* k *are weakly increasing in wealth and strictly increasing on* $\mathcal{A}_+(R_j^D)$*. If* $y' = 0$*, choice probabilities are independent of wealth.*

Proof. See Appendix C.1. □

Thus, in the present model, the presence of future non-deposit resources implies that wealthier households are relatively more likely to choose a higher-rate bank. This wealth-dependent bank choice prevents aggregation using mean wealth alone, even when conditional saving is affine.

Formally, aggregation using mean wealth requires that any two wealth distributions with the same finite mean generate the same deposit demand function, $D_j(\mathbf{R^D})$. To isolate wealth-dependent bank choice from the borrowing constraint[10], consider distributions supported on the common positive-saving domain

$$\mathcal{A}_+(\mathbf{R^D}) \equiv \bigcap_{j=1}^{N} \mathcal{A}_+(R_j^D) = \left(\frac{y'}{\beta \min_j R_j^D}, \infty\right).$$

On this domain, conditional saving is strictly positive at every bank and satisfies

$$a'(a; R_j^D) = \frac{\beta R_j^D a - y'}{1+\beta}.$$

Thus, each bank's conditional saving policy is affine in wealth.

Proposition 2 (Failure of aggregation with positive future income)**.** *Fix a rate vector* $\mathbf{R^D}$ *containing at least two distinct rates. For each bank* k *offering the lowest rate, there exist two wealth distributions supported on* $\mathcal{A}_+(\mathbf{R^D})$ *with the same finite mean but different aggregate deposit demand faced by bank* k*.*

[10] If some households have zero saving, the kink in the saving policy can itself make mean wealth insufficient for aggregation.

Proof. See Appendix C.1. □

Thus, the model does not admit aggregation to a representative household endowed with mean wealth. The contrast with equation (2) identifies the role of zero future income in sustaining the CES benchmark. With positive future income, wealthier households are relatively more likely to choose higher-rate banks. The resulting sorting makes the distribution of wealth relevant for aggregate deposit demand even when every conditional saving policy is affine. Thus, CES deposit demand in this model only obtains if, in addition to log-preferences in consumption, agents have no future income.

Note that at symmetric rates, choice probabilities equal $1/N$. If every household saves strictly positively, mean wealth therefore suffices to reproduce deposit levels at that rate vector. This pointwise equality does not imply aggregation of the deposit demand functions: an own-rate deviation generates wealth-dependent bank choice. Section 2.5.2 shows that the representative household fails to reproduce the own-rate elasticity.

2.5 Deposit Demand Elasticities

Since banks offer the same deposit rate to all their customers, deposit pricing is determined by the interest[11] elasticity of aggregate deposits faced by a bank. This macro-level elasticity captures how bank j's deposits respond to a rate change; for $D_j(\mathbf{R^D}) > 0$, define

$$\Gamma_j(\mathbf{R^D}) = \frac{\partial \log D_j(\mathbf{R^D})}{\partial \log R_j^D} = \frac{R_j^D}{D_j(\mathbf{R^D})} \int_A \frac{\partial d_j(a; \mathbf{R^D})}{\partial R_j^D} \lambda(a) da. \tag{3}$$

Hence, Γ_j depends on how individual depositors respond to an own-rate change. I will first discuss the main properties of individual (micro-level) deposit demand elasticities and then illustrate how individual behavior and the distribution of deposits feed into the macro-level elasticity.

2.5.1 Micro-Level Elasticities

As explained in section 2.3, elasticities are traced out as the relative response to a marginal deviation from the common deposit rate. I consider households with strictly positive conditional saving, $a > y'/(\beta R_j^D)$, for which expected deposits at bank j are positive and their

[11] Throughout the paper, interest-rate elasticities are defined with respect to the gross interest rate.

elasticity is well defined. The interest elasticity of deposit demand is given by

$$\gamma(a; R_j^D) \equiv \frac{\partial \log d_j(a; \mathbf{R^D})}{\partial \log R_j^D} = \underbrace{\frac{\partial \log \Pr_j(a; \mathbf{R^D})}{\partial \log R_j^D}}_{\gamma_{\text{ext}}(a; R_j^D)} + \underbrace{\frac{\partial \log a'(a; R_j^D)}{\partial \log R_j^D}}_{\gamma_{\text{int}}(a; R_j^D)}. \tag{4}$$

That is, the micro-level elasticity has two components, a bank choice elasticity (extensive margin) and a savings elasticity (intensive margin). While the individual choice probabilities and, as a result, deposit demand are functions of $\mathbf{R^D}$, the individual deposit demand elasticity only depends on bank j's deposit rate. This result hinges crucially on the assumption that banks behave atomistically and, thus, do not internalize their effect on the choice probabilities' denominator.

The Two Adjustment Margins. The intensive-margin elasticity measures the response of the household's conditional saving policy[12]:

$$\gamma_{\text{int}}(a; R_j^D) \equiv \frac{\partial \log a'(a; R_j^D)}{\partial \log R_j^D} = 1 + \frac{y'}{(1+\beta)a'(a; R_j^D)}. \tag{5}$$

With log-utility and $y' > 0$, saving responds more than proportionally to the deposit rate; savers consume less and allocate more resources to deposits:

$$\frac{\partial c(a; R_j^D)}{\partial R_j^D} = \frac{a'(a; R_j^D)}{\left(R_j^D\right)^2}\Big[1 - \gamma_{\text{int}}(a; R_j^D)\Big]. \tag{6}$$

When $y' = 0$, instead, the share of current wealth spent on consumption is independent of the deposit rate, and the intensive-margin elasticity equals one.

The extensive margin captures the response of households' bank choice; the envelope condition gives

$$\begin{aligned}\gamma_{\text{ext}}(a; R_j^D) &\equiv \frac{\partial \log \Pr_j(a; \mathbf{R^D})}{\partial \log R_j^D} = \frac{1}{\chi}\frac{\partial v(a; R_j^D)}{\partial \log R_j^D} \\ &= \frac{1}{\chi} u'(c(a; R_j^D)) \frac{a'(a; R_j^D)}{R_j^D}.\end{aligned} \tag{7}$$

The micro-level bank choice elasticity measures the relative importance of the taste shock and the deposit rate, where the latter is captured by the marginal gain from a percentage

[12] All results pertaining to the intensive margin are analogous to those obtained in a standard consumption-saving model.

change in the deposit rate. This utility gain can also be written as

$$R_j^D \frac{\partial v(a; R_j^D)}{\partial R_j^D} = \frac{\partial v(a; R_j^D)}{\partial a} \frac{a'(a; R_j^D)}{R_j^D}.$$

Resources allocated to saving, a'/R_j^D, determine the exposure to deposit returns, while the marginal value of wealth translates the additional resources generated by a rate increase into utility. Wealthier households save more but have a lower marginal value of wealth; with log-utility, the former outweighs the latter. Thus, as formalized below, wealthier households are more sensitive on the extensive margin - they are more likely to switch banks if a competitor offers a better rate.

Positive Future Income and Lifetime Resources. Under logarithmic utility, wealth and the deposit rate affect both adjustment margins through current wealth's share of present-value lifetime resources:

$$\hat{a}_j \equiv \hat{a}(a; R_j^D) = \frac{a}{a + y'/R_j^D}.$$

On the positive-saving domain, $\hat{a}_j \in (1/(1+\beta), 1)$ and the elasticities can be written as

$$\gamma_{\text{int}}(a; R_j^D) = 1 + \frac{1 - \hat{a}_j}{(1+\beta)\hat{a}_j - 1}, \qquad \gamma_{\text{ext}}(a; R_j^D) = \frac{\beta}{\chi} - \frac{1+\beta}{\chi}(1 - \hat{a}_j).$$

The boundary behavior highlights the different roles of the two margins. As wealth approaches the saving threshold from above, $\hat{a}_j \downarrow 1/(1+\beta)$: intensive-margin elasticity diverges while extensive-margin elasticity approaches zero. The large intensive elasticity reflects a response measured relative to a vanishing deposit balance. At a fixed deposit rate, as wealth tends to infinity, $\hat{a}_j \uparrow 1$ and the two margins converge to one and β/χ, respectively (see CES benchmark below).

Higher wealth or a higher deposit rate increases $\hat{a}_j$, reducing the relative importance of future income. The following proposition characterizes the resulting changes in the two margins and their sum.

Proposition 3 (Individual deposit demand elasticities)**.** *Suppose $y' > 0$. On the positive-saving domain:*

(i) Intensive-margin elasticity is strictly decreasing in wealth and the deposit rate, whereas extensive-margin elasticity is strictly increasing in both.

(ii) If $\chi < \beta(1+\beta)$, then, for every fixed deposit rate $R_j^D \in (0, R)$, total individual deposit

demand elasticity has a unique minimum in wealth on $\mathcal{A}_+(R_j^D)$. It is strictly decreasing below the minimum and strictly increasing above it.

Proof. See Appendix C.2. □

The intensive-margin result reflects a smaller proportional saving response as exposure to the revaluation of future income declines. On the extensive margin, future income reduces bank-choice sensitivity below β/χ. As wealth or the deposit rate rises, this reduction shrinks. Equivalently, we can write

$$\gamma_{\text{ext}}(a; R_j^D) = \frac{\beta}{\chi} \frac{a'(a; R_j^D)}{a'(a; R_j^D) + y'}.$$

Hence, households become more responsive along the extensive margin as deposits finance a larger share of future consumption.

Thus, with positive future income, higher wealth or deposit rates push the two margins in opposite directions. Part (ii) shows when these opposing responses generate non-monotonicity in total elasticity. If taste-shock dispersion is sufficiently low, the increase in extensive-margin elasticity eventually more than offsets the decline in intensive-margin elasticity. Households with intermediate wealth then have the lowest total deposit demand elasticity.

Adjustment Margins in the CES Benchmark. The state dependence of the two adjustment margins disappears in the zero-future-income benchmark. When $y' = 0$, equations (5) and (7) yield

$$\gamma_{\text{int}}(a; R_j^D) = 1, \qquad \gamma_{\text{ext}}(a; R_j^D) = \frac{\beta}{\chi}.$$

Both margins are independent of wealth and the deposit rate, and their sum equals the CES elasticity ε. Assuming zero future income is therefore not innocuous under logarithmic utility: it eliminates the wealth effect described above, thereby removing state dependence from both adjustment margins. With positive future income, by contrast, state-dependent micro-level elasticities make the composition of a bank's customer base relevant for the aggregate elasticity it faces, as established in the next section.

2.5.2 Macro-Level Elasticities

Combining equations (4) and (3), the macro-level elasticity can be written as a deposit-weighted average of individual elasticities, i.e.

$$\Gamma_j(\mathbf{R^D}) = \int_A \gamma(a; R_j^D) \underbrace{\frac{d_j(a;\mathbf{R^D})}{D_j(\mathbf{R^D})}\lambda(a)}_{\omega_j(a;\mathbf{R^D})} da. \tag{8}$$

Here, $\omega_j(a;\mathbf{R^D})$ is the density of the deposit-weighted probability measure: each household group receives a weight equal to its share of bank j's deposits[13]. Throughout, I refer to this share as *deposit share*. Thus, individual elasticities enter the bank's pricing decision in proportion to the deposits they account for. A highly elastic group holding few deposits can therefore matter less for pricing than a less elastic group supplying a large share of bank funding.

Crucially, heterogeneous rate-sensitivity implies that the composition of a bank's deposit funding shifts towards more elastic customers when a bank raises its deposit rate; for $\omega_j(a;\mathbf{R^D}) > 0$,

$$\frac{\partial \omega_j(a;\mathbf{R^D})}{\partial R_j^D} = \frac{\omega_j(a;\mathbf{R^D})}{R_j^D}\left[\gamma(a;R_j^D) - \Gamma_j(\mathbf{R^D})\right] > 0 \iff \gamma(a;R_j^D) > \Gamma_j(\mathbf{R^D}). \tag{9}$$

The response of macro-level elasticity thus reflects both an elasticity effect and a composition effect. The elasticity effect captures the (deposit-weighted) average change in individual responsiveness to deposit rates as described in Section 2.5.1. The composition effect captures the redistribution of deposit shares: a marginal rate increase raises the shares of existing savers whose elasticity exceeds the bank's aggregate elasticity, while reducing those of households with lower elasticity. In the CES benchmark, individual elasticity is constant across households and rates, so both effects vanish.

The importance of wealth heterogeneity can be isolated at symmetric rates, where ex-post bank-choice probabilities[14] are identical across households. As established in Section 2.4, a representative household reproduces aggregate deposit levels at these rates when every household saves positively. The following proposition shows that heterogeneous responses nevertheless prevent it from reproducing aggregate elasticity.

Proposition 4 (Representative-household error at symmetric rates)**.** *Suppose $y' > 0$ and all banks offer the common gross deposit rate R^D, so that $\mathbf{R^D} = (R^D, \ldots, R^D)$. Let λ*

[13] Households with zero deposits receive zero weight.

[14] Ex-post bank-choice probabilities refer to the probability of a bank being chosen, given that all banks set the same rate but before the realization of the taste shock.

be a nondegenerate wealth distribution with finite mean $\bar{a}$, supported on $\mathcal{A}_+(R^D)$. The representative household with wealth $\bar{a}$ reproduces aggregate deposit demand but strictly understates aggregate elasticity:

$$D_j(\mathbf{R^D}; \lambda) = d_j(\bar{a}; \mathbf{R^D}), \qquad \Gamma_j(\mathbf{R^D}; \lambda) > \gamma(\bar{a}; R^D).$$

If $y' = 0$, both deposit levels and elasticities aggregate exactly using mean wealth.

Proof. See Appendix C.3. □

The representative household reproduces the intensive-margin contribution to the aggregate deposit slope but understates its extensive-margin contribution. Put differently, at the same symmetric rate[15], the representative household understates the proportional deposit outflow caused by a marginal rate cut by bank j, thereby overstating the bank's local pricing power. The zero-future-income (CES) benchmark exhibits no such discrepancy. Positive future income therefore makes wealth heterogeneity relevant for deposit responses even at symmetric rates, where deposit levels depend only on mean wealth.

Taking Stock. The two-period model has established the state-dependence of both micro- and macro-level elasticities and highlighted the crucial role of a bank's customer composition in determining deposit rates. Section 2.5.1 has shown that wealthier agents are less elastic on the intensive margin but more elastic on the extensive margin. Section 2.5.2 shows that which households drive deposit pricing depends not only on this wealth gradient in individual elasticities, but also on where deposits are concentrated: households holding a larger share of the bank's deposits receive greater weight in its pricing decision. The next section embeds this mechanism in an infinite-horizon model with income risk and an endogenous wealth distribution, allowing deposit rates to affect wealth accumulation and the resulting distribution to feed back into bank pricing.

3 Quantitative Model

Environment. The model is cast in discrete time and the economy is populated by two types of agents, a continuum of households and a large but finite number N of banks. In particular, N is assumed to be large enough so that each bank only has a negligible market share, behaves atomistically and does not internalize its effect on the denominator of the choice

[15]This is a partial-equilibrium comparison at a given symmetric rate vector; it does not establish a ranking of equilibrium deposit rates.

probabilities. Unlike in the two-period model, households have now access to two different savings instruments: they can save via (liquid) bank deposits and an alternative higher-return asset, which is subject to adjustment frictions. I maintain the partial-equilibrium setting and do not explicitly model the market for the non-deposit asset; bank profits continue to be taxed away. Instead, I assume that both banks and households can access this higher-return asset but, in contrast to banks, households face frictions when doing so. This asset has price $\frac{1}{R_t}$ and I keep referring to R_t as the exogenously given, gross real policy rate.

Households. The household's problem is an infinite-horizon extension of the problem described in the two-period model, where households now can save in both deposits and the illiquid asset. Households are endowed with stochastic, idiosyncratic income y, which follows a Markov chain on the finite set Y with transition probabilities $\pi(y', y) = \Pr(y_{t+1} = y' | y_t = y)$. The probability of adjusting illiquid-asset holdings in any given period is equal to α. As before, households have CRRA preferences over consumption, $u(c) = (c^{1-\sigma} - 1)/(1-\sigma)$ for $\sigma \neq 1$ and $u(c) = \log c$ for $\sigma = 1$, with intertemporal elasticity of substitution equal to $\frac{1}{\sigma}$, and discount factor $\beta \in (0, 1)$. Households choose a bank, consumption and savings to maximize expected lifetime utility,

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \sum_{j=1}^{N} \widetilde{u}_{j,t}, \qquad \widetilde{u}_{j,t} = \begin{cases} u(c_t) + \chi \epsilon_{j,t}, & \text{if bank } j \text{ is chosen,} \\ 0, & \text{otherwise,} \end{cases}$$

where $\epsilon_{j,t}$ are bank-specific taste shocks, specified below. Households take prices as given and choose exactly one bank per period. Expectations are taken over income, adjustment opportunities and taste shocks. Conditional on choosing bank j, the budget constraint is

$$c_t + \frac{a_{t+1}}{R^D_{j,t}} + \frac{b_{t+1}}{R_t} = y_t + a_t + b_t, \qquad a_{t+1} \geq 0, \quad b_{t+1} \geq 0,$$

with $b_{t+1} = R_t b_t$ in any period in which the household cannot adjust its illiquid-asset holdings. That is, households who cannot adjust in the current period cannot access the illiquid account.

As I focus on symmetric equilibria, all agents foresee that banks will set a common deposit rate in the future. The household's problem can then be rewritten recursively as follows. Let $w(y, a, b, \lambda)$ denote the continuation value, as defined below. As in the two-period model, both adjusters (A) and non-adjusters (N) solve their respective maximization problem conditional on having chosen bank j. For an adjuster, the conditional savings decision is found by solving,

$\forall R_j^D$,

$$v^A(y,a,b,\lambda;R_j^D) = \max_{c,a',b'} u(c) + \beta \mathbb{E}_{y'|y} w(y',a',b',\lambda') \tag{10}$$
$$\text{s.t.} \quad c = y + a + b - \frac{a'}{R_j^D} - \frac{b'}{R},$$
$$c > 0, a' \geq 0, \quad b' \geq 0, \quad \lambda' = H(\lambda).$$

Agents who cannot adjust in the current period cannot access the illiquid account, which thus evolves according to $b' = Rb$. Their problem is thus, $\forall R_j^D$,

$$v^N(y,a,b,\lambda;R_j^D) = \max_{c,a'} u(c) + \beta \mathbb{E}_{y'|y} w(y',a',Rb,\lambda') \tag{11}$$
$$\text{s.t.} \quad c = y + a - \frac{a'}{R_j^D},$$
$$c > 0, a' \geq 0, \quad \lambda' = H(\lambda),$$

where $\lambda \in \mathcal{M}$ is the distribution of households over the individual state space $Z = Y \times A \times B$, with deposit holdings $a \in A = [0,\infty)$ and holdings of the illiquid asset $b \in B = [0,\infty)$, $\mathcal{M}$ is the set of probability measures on Z, and $H : \mathcal{M} \to \mathcal{M}$ is the aggregate law of motion.

Since all banks offer the same rate in the future, the household's saving decision does not depend on its future bank choice, and consumption and saving depend on the current bank only through the rate R_j^D (see Appendix A.1).

The bank choice problem is analogous to the two-period model, i.e., households choose where to place their deposit by solving, $\forall\ \mathbf{R^D} = (R_1^D, \ldots, R_N^D)$,

$$\tilde{w}^x(y,a,b,\lambda;\mathbf{R^D}) = \mathbb{E}_\epsilon \left[\max_{j\in\{1,\ldots,N\}} v^x(y,a,b,\lambda;R_j^D) + \chi\epsilon_j \right] \quad \forall x \in \{A,N\}, \tag{12}$$

where $\chi > 0$ and the ϵ_j are i.i.d. across banks, households and time and follow a Gumbel distribution with location $-\gamma^{EM}$ and scale 1, so that their mean is zero. The term $\tilde{w}^x(\cdot)$ is the ex-ante value before observing the taste shock and depends on the vector of all deposit rates in the economy, as they affect the optimal bank choice. Since taste shocks are extreme value distributed, the ex-ante value is given by the well-known log-sum formula ((McFadden, 1974)), i.e.,

$$\tilde{w}^x(y,a,b,\lambda;\mathbf{R^D}) = \chi \ln \sum_{k=1}^{N} e^{v^x(y,a,b,\lambda;R_k^D)/\chi} \quad \forall x \in \{A,N\}.$$

As before, choice probabilities for adjusters and non-adjusters follow the logit formula. Using

the ex-ante value $\tilde{w}^x$, they can be written as

$$\Pr_j^x(y,a,b,\lambda;\mathbf{R^D}) = \frac{\exp\left(v^x(y,a,b,\lambda;R_j^D)/\chi\right)}{\exp\left(\tilde{w}^x(y,a,b,\lambda;\mathbf{R^D})/\chi\right)} \quad \forall x \in \{A,N\}. \tag{13}$$

The continuation value is then

$$w(y,a,b,\lambda) \equiv \alpha\tilde{w}^A(y,a,b,\lambda;\mathbf{R^D}^*(\lambda)) + (1-\alpha)\tilde{w}^N(y,a,b,\lambda;\mathbf{R^D}^*(\lambda)),$$

i.e., the value before the adjustment status and taste shocks are realized, evaluated at the symmetric equilibrium deposit rate, $\mathbf{R^D}^*(\lambda) = (R^{D*}(\lambda),\ldots,R^{D*}(\lambda))$.

Deposit Demand and Banks. Individual and aggregate expected deposit demand faced by bank j are given by

$$d_{j,t}^x(y,a,b;\mathbf{R^D}) = a_{t+1}^x(y,a,b;R_j^D)\Pr_{j,t}^x(y,a,b;\mathbf{R^D}) \quad \forall x \in \{A,N\}$$

and

$$D_{j,t}(\mathbf{R^D}) = \int_Z \left(\alpha\, d_{j,t}^A(y,a,b;\mathbf{R^D}) + (1-\alpha)\, d_{j,t}^N(y,a,b;\mathbf{R^D})\right) d\lambda_t.$$

Aggregate deposit demand elasticity is defined as in the two-period model. Let $\pi_A = \alpha$ and $\pi_N = 1-\alpha$ denote the probability of being an adjuster and non-adjuster, respectively, and define the deposit-weighted measure

$$d\omega_{j,t}^x(y,a,b;\mathbf{R^D}) = \frac{\pi_x d_{j,t}^x(y,a,b;\mathbf{R^D})}{D_{j,t}(\mathbf{R^D})}\, d\lambda_t,$$

where the deposit shares, $\omega_{j,t}^x$, depend on households' individual states, including the adjustment status. The weights sum to one across household states and adjustment statuses, and represent the share of bank j's deposits held by a household in a given state. Then,

$$\Gamma_{j,t}(\mathbf{R^D}) \equiv \frac{\partial \log D_{j,t}(\mathbf{R^D})}{\partial \log R_{j,t}^D} = \sum_{x\in\{A,N\}} \int_Z \gamma_t^x(y,a,b;R_{j,t}^D)\, d\omega_{j,t}^x(y,a,b;\mathbf{R^D}), \tag{14}$$

The bank problem is analogous to the two-period model (see Section 2.1); I restate it here for convenience. Each bank j sets its deposit rate at date t to maximize end-of-period profits, taking $\tilde{w}^x$ in (13) as given, i.e.,

$$\max_{R_j^D\in\mathbb{R}_{++}} D_{j,t}(R_j^D, \mathbf{R^D_{-j}}) \left(\frac{R_t}{R_j^D} - 1\right). \tag{15}$$

The bank's optimality condition then implies that, given its competitors' deposit rate $\mathbf{R}^{\mathbf{D}}_{-\mathbf{j}}$, bank j's optimal rate $R^D_{j,t}$ is set at a markdown, $\mu_{j,t}(R^D_{j,t}, \mathbf{R}^{\mathbf{D}}_{-\mathbf{j}}) \in (0,1)$, below the gross policy rate. That is, it satisfies

$$R^D_{j,t} = \mu_{j,t}(R^D_{j,t}, \mathbf{R}^{\mathbf{D}}_{-\mathbf{j}})\, R_t, \qquad \mu_{j,t} = \frac{\Gamma_{j,t}(R^D_{j,t}, \mathbf{R}^{\mathbf{D}}_{-\mathbf{j}}) - 1}{\Gamma_{j,t}(R^D_{j,t}, \mathbf{R}^{\mathbf{D}}_{-\mathbf{j}})}. \tag{16}$$

Banks do not set rates above the policy rate, since profits would be negative. Crucially, the macro-level deposit demand elasticity and, thus, optimal deposit rates are a function of the endogenous distribution over assets and income.

Equilibrium. I focus on symmetric equilibria, where every bank chooses the same deposit rate and optimal pricing strategies are traced out as one-shot deviation policy. Below, I formally define the symmetric equilibrium for this economy.

Definition 1 (Symmetric sequential competitive equilibrium)**.** Given an initial distribution λ_0 and a path $\{R_t\}_{t\geq 0}$, a symmetric sequential competitive equilibrium consists of sequences of deposit rates $\{R^{D*}_t\}_{t\geq 0}$, value functions $\{v^x_t, \tilde{w}^x_t, w_t\}_{t\geq 0}$, policy functions $\{a^x_{t+1}, b^x_{t+1}, c^x_t, \Pr^x_{j,t}\}_{t\geq 0}$, for $x \in \{A, N\}$, measures $\{\lambda_t\}_{t\geq 0}$, and aggregate laws of motion $\{H_t\}_{t\geq 0}$ such that, for all $t \geq 0$ and $j \in \{1, \ldots, N\}$,

1. for all $R^D_j \in \mathbb{R}_{++}$, $a^x_{t+1}(\cdot; R^D_j)$, $b^x_{t+1}(\cdot; R^D_j)$ and $c^x_t(\cdot; R^D_j)$ solve the household's maximization problem in (10) and (11), with associated value functions $v^A_t(\cdot; R^D_j)$ and $v^N_t(\cdot; R^D_j)$,

2. for all $\mathbf{R}^{\mathbf{D}} \in \mathbb{R}^N_{++}$, $\tilde{w}^x_t(\cdot; \mathbf{R}^{\mathbf{D}})$ satisfies the household's bank choice problem in (12), with associated choice probabilities $\Pr^x_{j,t}(\cdot; \mathbf{R}^{\mathbf{D}})$, and w_t is the associated continuation value,

3. R^{D*}_t solves bank j's optimization problem in (15) at $\mathbf{R}^{\mathbf{D}}_{-\mathbf{j}} = (R^{D*}_t, \ldots, R^{D*}_t)$,

4. λ_t follows the aggregate law of motion H_t, which is generated by the households' policy functions and choice probabilities at R^{D*}_t, the adjustment probability α and the income transition probabilities π.

The following sections discuss the calibration and the quantitative results, where I discuss the key properties of the stationary equilibrium. A symmetric stationary equilibrium is a symmetric sequential competitive equilibrium with a constant policy rate in which the distribution is invariant, $\lambda_t = \lambda^*$, and deposit rates, value functions, policy functions and the law of motion are constant over time.

3.1 Calibration

The model is calibrated to quarterly frequency; Table 1 summarizes the calibrated parameters and Table 2 reports the targeted moments and model counterparts. I calibrate the model to the U.S. economy using data from the Survey of Consumer Finances (SCF) for the year 2004 and bank-level data from the Consolidated Reports of Condition and Income (Call Reports).

In line with the two-period model in Section 2, I set the coefficient of relative risk aversion to one. The net real policy rate is fixed at $r = 0.005$ per quarter, equivalent to approximately 2% per annum.

Core endowments follow an AR(1) process in logs with persistence ρ_y and standard deviation of innovations σ_ϵ. I follow Auclert et al. (2024) and set $\rho_y = 0.95$ and $\sigma_\epsilon = 0.287$, implying a cross-sectional standard deviation of log core income of 0.92. Following Castaneda et al. (2003), Luetticke (2021) and Kindermann and Krueger (2022), I augment the core income process with a rare superstar state. Capturing the upper tail of the wealth distribution is crucial for the model's pricing implications, since deposit concentration determines the weights entering aggregate deposit demand elasticity. Households enter the superstar state with probability ζ and return to the median core state with probability ι. A household in the superstar income state receives endowment y_{top}, which is set to η_y times the highest core income level. Following Luetticke (2021), I set $\iota = 1/16$ per quarter; this value is based on evidence by Guvenen et al. (2014) who estimate the probability of exiting the top 1% income group. Matching a share of households in the superstar state equal to 1% then requires setting the entry rate equal to $\zeta = 0.06\%$. Endowments are normalized to have stationary mean one. The ratio of superstar income relative to the top-core income is calibrated jointly with the household parameters described below.

Table 1: Calibrated parameters

Parameter	Value	Description	Source / target
β	0.9724	Discount factor	see Table 2
σ	1	Relative risk aversion	Standard value
α	0.616	Adjustment probability	see Table 2
ρ_y	0.95	Income persistence	Auclert et al. (2024)
σ_ϵ	0.287	Income innovation s.d.	Auclert et al. (2024)
ι	6.25%	Superstar exit probability	Guvenen et al. (2014)
ζ	0.063%	Superstar entry probability	Guvenen et al. (2014)
η_y	1.92	Superstar/top-core income	see Table 2
r	2%	Real policy rate (p.a.)	Standard value
χ	0.009	Taste dispersion	see Table 2

The remaining parameters, β, α, η_y, and χ are targeted to match moments of the wealth and deposit distribution as well as the deposit spread. As the focus of the paper centers on deposits and deposit-substitutes, I interpret total wealth in the model as total financial assets, following the definition by Carroll et al. (2017). I construct the empirical counterparts for deposits and non-deposit financial assets using data from the SCF for the year 2004. Deposits comprise checking, savings, and money market deposit accounts, while the second asset comprises non-deposit financial assets and time deposits in the SCF[16]. The illiquid asset thus groups assets with different degrees of liquidity and the adjustment frictions are interpreted as capturing the average degree of liquidity. I construct the deposit rate from Call Reports data for 2000-2007 by summing interest expenses on checking and savings accounts and dividing by the combined balances in these accounts. I then use the average federal funds rate over the same period to obtain the deposit spread; this yields an average spread of approximately 2 percentage points per annum.

Table 2: Targeted moments

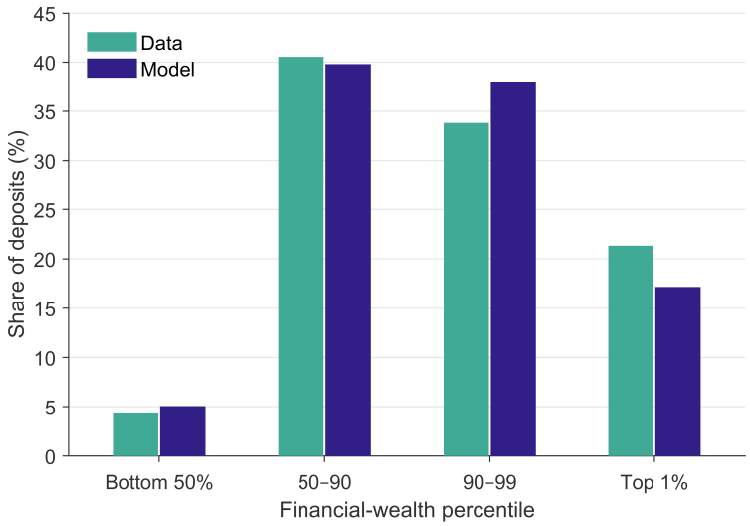
Moment	Target	Model	Source
Financial wealth / GDP	1.511	1.511	SCF, Flow of Funds
Deposits / financial wealth (%)	11.44	11.44	SCF
Deposit share of top decile (%)	55.15	55.15	SCF
Deposit spread (pp p.a.)	2.00	2.00	Call Reports

Note: Financial wealth denotes gross financial assets included in the calibration, without subtracting liabilities. The wealth-to-GDP ratio uses annual GDP. The top decile is defined by financial wealth, and its deposit share is measured relative to total deposits. The deposit spread is the federal funds rate minus the deposit rate, expressed in annualized percentage points. SCF moments use 2004 data; the deposit spread uses averages over 2000–2007.

The household parameters are calibrated jointly to match wealth relative to annual GDP, the deposit-to-wealth ratio, and the share of deposits held by the wealthiest decile. The discount factor, β, and adjustment probability, α, primarily govern the amount of wealth households accumulate and the demand for liquid buffers, respectively, while the income level in the superstar state helps discipline wealth and deposit concentration. These parameters are fitted jointly to match the three household targets; the taste dispersion parameter, χ, is instead calibrated separately to match the target for the deposit spread. Conditional on the targeted deposit rate, χ does not affect household saving choices in the symmetric stationary

[16]Specifically, total wealth includes all financial assets except for cash-value of life insurance, other managed assets and other financial assets, i.e. *Total wealth = fin - cashli - othma - othfin - prepaid*. Time deposits are included in the illiquid asset as they are substantially less liquid than checking or savings accounts.

Figure 1: Deposit shares: Model vs. Data



Note: The figure shows the deposit shares of different wealth groups in the data and in the model. Deposit shares refer to the share of total deposits held by a given group. Households are ranked by gross financial wealth. Data are from the 2004 Survey of Consumer Finances.

equilibrium. The deposit spread therefore identifies χ separately through banks' pricing incentives[17]. Table 2 compares the targeted moments with their model counterparts.

The parameter values for the discount factor and the adjustment probability deserve a brief discussion; β is somewhat lower than typical values for the quarterly discount factor but substantially higher than the discount factor in Auclert et al. (2024), who use the same high-income risk calibration for the core income process. The calibrated adjustment probability, $\alpha = 0.616$, implies that households can rebalance their portfolios approximately once every five months on average. Adjustment opportunities, thus, arise more frequently than in standard, two-asset HANK models. However, the illiquid asset in my model is capturing non-deposit financial wealth[18] and excludes highly illiquid assets such as housing.

Figure 1 illustrates the model's performance in capturing the deposit distribution. Despite targeting only the top deciles deposit share, the model does well in matching the overall distribution of deposits, but slightly underestimates the share of deposits held by the wealthiest Top 1%. Additional distributional moments are reported in Appendix A.2.

Solution method. As discussed in Section 3, choice probabilities do not enter the Euler equation in a symmetric rational-expectations equilibrium. The model can therefore be solved in two blocks, a household block and a bank block. Given the deposit rate, the household

[17] See Appendix A.2 for a brief discussion.
[18] Indeed, Carroll et al. (2017) refer to this wealth basket as 'liquid wealth'.

block is solved like a partial-equilibrium Huggett model with two assets and positive asset supply. Given households' policies, value functions and distribution, the bank block computes the deposit demand a bank would face if it deviated from the symmetric deposit rate.[19] The key to solving the bank problem is therefore to compute one-shot deviation policies: a household that deposits at the deviating bank chooses consumption and its portfolio at the deviating rate, anticipating that all banks offer the symmetric rate from the next period on. Each candidate deviation thus requires a single backward step rather than a new solution of the household problem. Deposit demand at the deviating bank aggregates these policies, weighted by bank-choice probabilities, over the full stationary distribution of adjusting and non-adjusting households. The equilibrium deposit rate is the fixed point at which the rate households take as given coincides with the bank's optimal rate. Appendix D describes the solution method in detail.

4 Quantitative Results

The two-period model in section 2 has highlighted the wealth distribution's central role in determining the economy's equilibrium deposit rate. In an infinite-horizon setting with incomplete markets, the wealth distribution is itself endogenous: deposit rates influence households' saving and portfolio choices, while the resulting distribution shapes the elasticity of deposit demand faced by banks.

A central question of this paper concerns the interaction between depositors' optimal policies and equilibrium deposit rates. As discussed, how much banks are able to mark down the policy rate depends on the elasticity of deposit demand, which is distributionally state-dependent. Recall that the deposit demand elasticity faced by a given bank j is a deposit-weighted average of individual elasticities. I restate the expression for aggregate deposit demand elasticity here for convenience, using $s = (y, a, b)$ for a household's idiosyncratic state

$$\Gamma_j(\mathbf{R^D}) = \sum_{x\in\{A,N\}} \int_Z \gamma^x(s; R_j^D)\, d\omega_j^x(s; \mathbf{R^D}), \qquad d\omega_j^x(s; \mathbf{R^D}) = \frac{\pi_x d_j^x(s; \mathbf{R^D})}{D_j(\mathbf{R^D})}\, d\lambda(s).$$

As before, the macro-level elasticity is the sum of the intensive- and extensive-margin elasticities,

$$\Gamma_j(\mathbf{R^D}) = \Gamma_{j,int}(\mathbf{R^D}) + \Gamma_{j,ext}(\mathbf{R^D}),$$

which represent the deposit-weighted averages of their micro-level counterparts. A household

[19] With atomistic banks, the number of banks scales deposits and profits per bank but does not affect household policies or the equilibrium deposit rate. I set $N = 1{,}000$ in the numerical implementation.

contributes more to aggregate elasticity when it demands more deposits or when those deposits respond more strongly to the bank's rate. Understanding equilibrium deposit pricing therefore requires answering two questions: (i) what is the deposit demand elasticity of an agent in state s and (ii) how large is that agent's deposit share?

4.1 Individual Deposit Demand Elasticities

As in the two-period model, individual deposit demand responds to a bank's deposit rate through two margins: the amount deposited conditional on choosing that bank and the probability of choosing it. The quantitative model retains this mechanism while allowing households to hold portfolios with different degrees of liquidity. Individual deposit demand elasticities now depend on income, liquid and illiquid holdings, and access to portfolio adjustment.

For positive deposit choices, the individual deposit demand elasticity[20] decomposes into the response of conditional deposit holdings and the response of bank choice, i.e.

$$\gamma^x(s; R_j^D) \equiv \frac{\partial \log d_j^x(s; \mathbf{R^D})}{\partial \log R_j^D} = \underbrace{\frac{\partial \log a'^x(s; R_j^D)}{\partial \log R_j^D}}_{\gamma^x_{\text{int}}(s; R_j^D)} + \underbrace{\frac{\partial \log Pr_j^x(s; \mathbf{R^D})}{\partial \log R_j^D}}_{\gamma^x_{\text{ext}}(s; R_j^D)}. \tag{17}$$

Both elasticity components retain their economic interpretation established in the two-period model. The intensive margin captures how households change their deposit holdings conditional on choosing the bank. Crucially, saving in deposits in a two-asset model reflects not only the trade-off between consumption and saving but also the choice between liquid and illiquid assets. As in the two-period model, the extensive margin is proportional to the deposit rate semi-elasticity of indirect utility, i.e.

$$\gamma^x_{\text{ext}}(s; R_j^D) = \frac{1}{\chi} \frac{\partial v^x(s; R_j^D)}{\partial \log R_j^D} = \frac{u'\left(c^x(s; R_j^D)\right) a'^x(s; R_j^D)}{\chi R_j^D}. \tag{18}$$

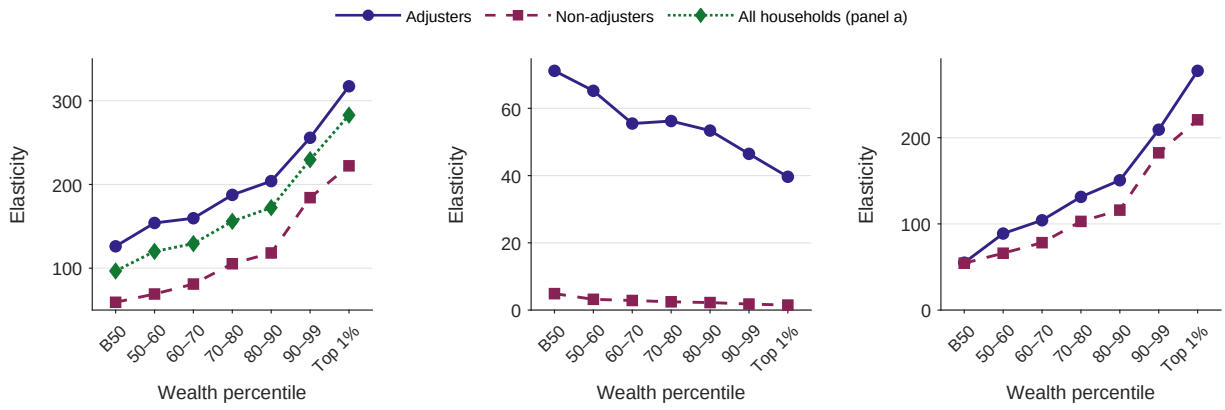
A higher rate is more valuable when it applies to a larger deposit position and when the resulting resources have a higher marginal utility value[21]. Bank-choice sensitivity reflects this gain relative to the dispersion of bank-specific preferences, governed by χ.

Figure 2 summarizes how rate sensitivity varies across wealth groups and adjustment

[20] As in the two-period model, individual elasticities are derived as relative responses to a unilateral, one-period deviation in bank j's gross deposit rate, R_j^D, holding competitors' rates, the household's current state, and future equilibrium opportunities fixed.

[21] With logarithmic utility, the expression is particularly simple; in that case, the extensive-margin elasticity is proportional to the ratio of expenditure on deposits to consumption.

Figure 2: Micro-level elasticities



(a) Elasticity (b) Intensive margin (c) Extensive margin

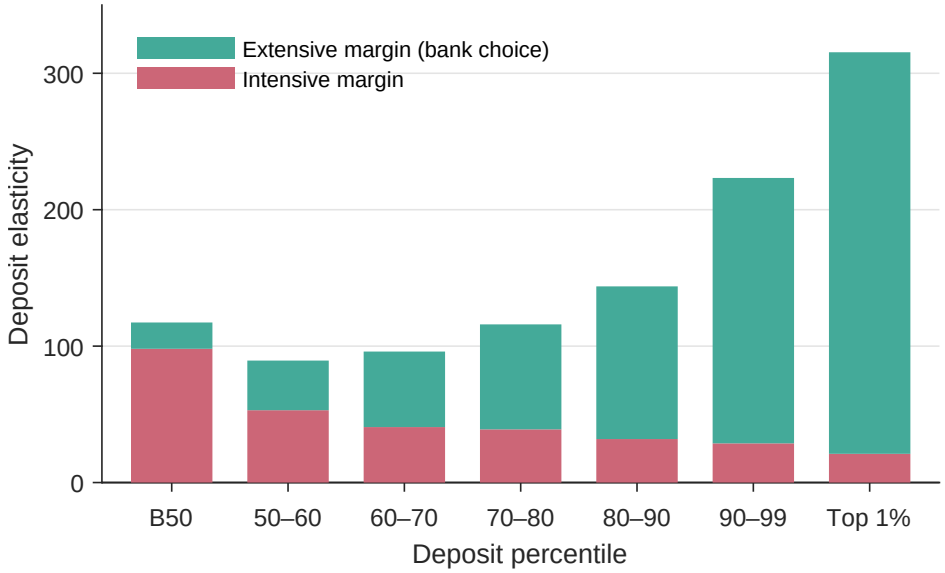
Note: The figure shows deposit demand elasticity by adjustment status (Panel (a)) and its intensive-margin (Panel (b)) and extensive-margin component (Panel (c)). Households are ranked by total wealth. Within each group, elasticities are deposit-weighted averages of household elasticities.

status. It groups households by total wealth and reports within-group elasticities[22]. Both for adjusters and non-adjusters, the deposit demand elasticity is increasing in wealth (Panel 2a), highlighting the dominance of the extensive margin (2c). In line with the discussion in Section 2, those with almost no wealth are relatively more sensitive on the intensive margin, while wealthier agents are more sensitive on the extensive margin. While non-adjusters choose consumption and deposits subject to the prescribed evolution of their illiquid account, adjusters can also reallocate resources between liquid and illiquid assets. Their conditional deposit responses therefore reflect different feasible portfolio adjustments, as well as consumption-saving decisions. In particular, non-adjusters have a lower intensive-margin elasticity capturing the absence of the portfolio margin.

Figure 2 shows a strong relation between micro-level elasticities and wealth. It masks, however, an important dimension of heterogeneity. Households within each group can differ in income and, crucially, portfolio composition. Households with the same total wealth but different portfolios may choose different deposit positions and consumption levels. Figures 10 and 11 in Appendix A.3 illustrate this point by plotting the policy functions for deposits and illiquid assets for different income and wealth levels. As emphasized by equation 18, under logarithmic preferences, the extensive-margin elasticity is proportional to deposits relative to consumption. Thus, all else equal, two agents with the same consumption level might substantially differ in terms of their (extensive-margin) elasticity depending on the deposits

[22]Within-group elasticities weight individual elasticities by the within-group deposit share of each household.

Figure 3: Elasticity by demanded deposits



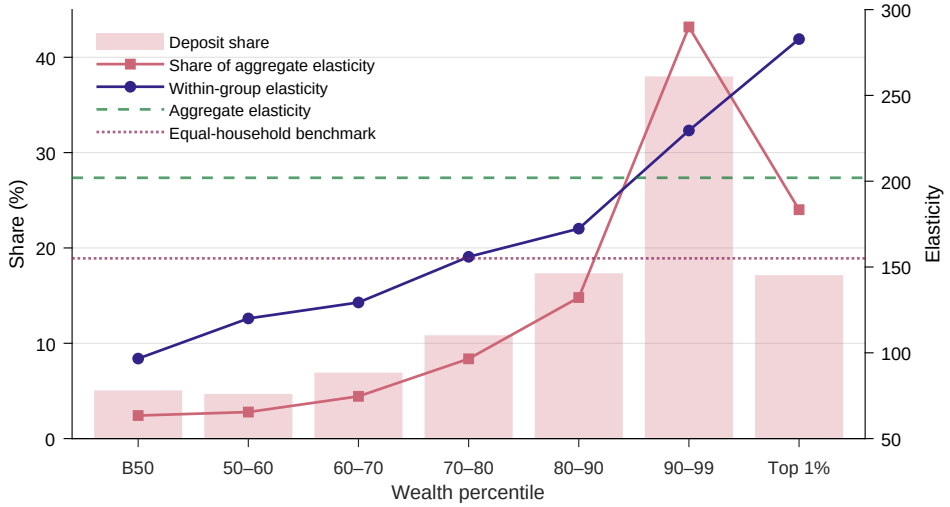
Note: The figure shows the intensive-margin (rose) and the extensive-margin elasticity (teal); within each group, elasticities are weighted by chosen deposits. Households are ranked by the deposits they demand, a'; households who choose zero deposits are in the bottom group and have zero weight in the within-group elasticity.

they demand. Figure 3 illustrates this by plotting deposit demand elasticity, decomposed into its two components, across the deposit demand distribution. The figure emphasizes again the paper's key findings: (1) for deposit-rich households, the extensive-margin elasticity constitutes the largest part of their deposit demand elasticity; (2) the intensive-margin elasticity is falling and the extensive-margin elasticity is rising in deposits. Figure 9 in Appendix A.3 reports a complementary comparison for the extensive-margin elasticity, which is the dominant driver of total elasticity. At a given income or wealth level, the extensive-margin elasticity is higher for savers who demand larger deposits and this positive deposit-gradient is stronger at lower income and lower wealth levels. For a given deposit choice, households with less cash-on-hand consume less; choosing a higher-paying bank provides a larger utility gain. A large individual elasticity does not necessarily imply a large contribution to bank pricing, since the household may supply few deposits. The next subsection combines the rate sensitivities documented here with equilibrium deposits to identify which households determine aggregate deposit supply elasticity.

4.2 Who Prices Deposits?

The implications of household heterogeneity for bank pricing depend on how individual deposit demand responses aggregate. Households differ both in their rate sensitivities and in

Figure 4: Deposit shares and elasticity



Note: The figure shows the deposit shares by wealth group and each group's within-group elasticity (right) and contribution to aggregate elasticity (left; share of aggregate elasticity). Dashed line: aggregate deposit-demand elasticity. Dotted line: counterfactual elasticity if depositors' elasticities were weighted by their population mass (equal-household benchmark).

the amount of deposits they demand. The elasticity faced by a bank therefore depends on the distribution of deposits across households, rather than on the sensitivity of the average household. Put differently, the allocation of deposits across households determines how individual sensitivities translate into competitive pressure on bank pricing.

Equation (14) distinguishes a group's rate sensitivity from its contribution to aggregate elasticity. A group contributes disproportionately to aggregate elasticity when its deposit-weighted elasticity exceeds the aggregate average (cf. equation (9)). Conversely, a group can hold a substantial share of deposits while exerting relatively little competitive pressure if those deposits are comparatively insensitive to rates.

Figure 4 reports each wealth group's share of deposits, deposit-weighted elasticity (within-group elasticity) and contribution to aggregate elasticity. As is evident from equation (14), the elasticity of agents who demand more deposits has a higher weight in the aggregate deposit-demand elasticity. In particular, the bottom 50 hold only around 5% of deposits and are the least elastic; they have little to no impact on the macro-level elasticity. The wealthiest one percent, on the other hand, are the most elastic group. Their contribution to aggregate elasticity is exceeded only by that of the 90-99th percentile, who hold the largest share of deposits and, thus, have a larger weight in aggregate elasticity. Taken together, the top wealth decile thus accounts for almost 70% of aggregate elasticity: *the wealthiest 10% price deposits*. As discussed in Section 4.1, the deposit demand elasticity of wealthy households is almost entirely driven by the extensive margin. Thus, in the model, deposit prices are largely

determined by the readiness of wealthy agents to switch banks if they were to offer a better rate. Indeed, decomposing aggregate elasticity into its two components shows that the share of the extensive-margin component in aggregate elasticity is almost 85%.

Figure 4 also plots the counterfactual aggregate elasticity that would obtain if all savers would contribute equally to the deposit-demand elasticity faced by a given bank. Equal weighting of depositors underestimates aggregate elasticity by almost 25%. Focusing on the extensive margin, we can write the aggregate extensive-margin elasticity[23] as

$$\Gamma_{j,ext}(\mathbf{R^D}) = \mathbb{E}\left[\gamma^x_{ext}(s; R^D_j)\right] + \text{Cov}\left(\gamma^x_{ext}(s; R^D_j), \frac{d^x_j(s; \mathbf{R^D})}{D_j(\mathbf{R^D})}\right), \tag{19}$$

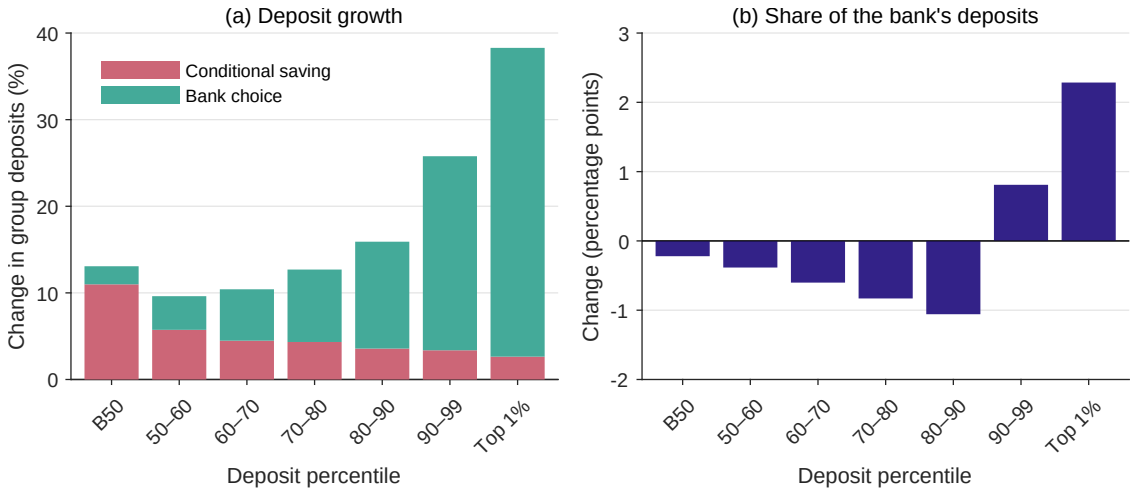
where expectations are taken over the distribution, $\lambda(s)$, and adjustment status, π^x. Hence, a population-weighted average of extensive-margin elasticity underestimates the aggregate, extensive-margin elasticity whenever deposit-rich households are more rate-sensitive on the extensive margin.

Composition and Elasticity Effect. The decomposition in equation (19) emphasizes the key role of a bank's deposit composition in determining the aggregate elasticity, thus, the bank's pricing behavior. To understand the role of a changing deposit composition, consider a single bank who contemplates increasing its deposit rate by 40 basis points p.a., while all its competitors keep their deposit rate at the equilibrium rate level. A bank that considers such a unilateral deviation from the equilibrium deposit rate needs to take into account how the macro-level deposit demand elasticity responds both through the change in individual elasticities (elasticity effect) and the change in deposit composition (composition effect).

Figure 5 emphasizes this point by illustrating the deposit response, by wealth percentile, to this unilateral, one-period deviation in bank j's rate. Holding competitors' rates, the current household distribution, and future equilibrium opportunities fixed, the figure visualizes the composition effect of the rate change. Following a unilateral increase in bank j's deposit rate, both conditional saving at bank j and the likelihood of choosing bank j increase across all wealth groups. The deposit share of the bottom 90 falls and an even larger share of deposits demanded at bank j originates from the top 10 %. Wealthier depositors not only respond with a larger relative change in their deposit demand but also demand a large share of aggregate deposits to begin with. The figure highlights the core mechanisms present in this paper: the extensive margin dominates the deposit demand response and wealthier agents respond much more strongly on that margin. A unilateral rate hike increases bank

[23] Cirelli (2022) applies the same decomposition of deposit demand elasticities. In his model the extensive margin is a choice between asset types; here, the extensive margin refers to the bank choice.

Figure 5: Deposit response



Note: The figure shows the deposit response to a one-shot, unilateral rate deviation of 40 bp p.a. by a given bank j. Left: The figure plots the percentage change in demanded deposits by deposit percentile, relative to the group's baseline deposit demand. The change in deposit demand is decomposed into the change in conditional saving at bank j (rose) and the change in the probability of choosing bank j (teal). Right: The figure plots the change in each group's share of bank j's deposits, in percentage points.

j's deposits predominantly by increasing the bank's market share, while the greater rate-sensitivity of wealthier savers imply that the bank's market-share gain is concentrated in the 'wealthy-depositor market'. This also provides some intuition for why such a deviation is not profitable for the bank - the counterfactual rate deviation would predominantly attract the most elastic depositors and, thus, suppress the markdown the bank can charge.

These results give household heterogeneity two roles in deposit pricing. First, it shapes the level of aggregate elasticity, and through the pricing condition the markdown: most of aggregate elasticity comes from the bank-choice margin, and is driven by wealthy households, who hold most deposits. Second, it shapes how aggregate elasticity itself changes when a bank changes its rate. Because households differ in their elasticities, a higher rate shifts deposit weight toward the most elastic households, and this composition effect raises aggregate elasticity. How deposits are allocated across households therefore matters both for the competitive pressure banks face at the symmetric rate and for how that pressure changes when one bank changes its offer. The next section uses this lens to study a reform that makes illiquid wealth easier to access, which changes households' deposit reliance and therefore the elasticity banks face.

Table 3: Consequences of more frequent portfolio adjustment

	Baseline	Fixed-rate counterfactual	Equilibrium
Deposit rate (% p.a.)	0.000	0.000	-0.226
Deposits / total wealth (%)	11.44	9.56	9.18
Aggregate bank profits	0.0035	0.0029	0.0031
Welfare gain (CEV; %)	—	0.048	0.027
Households losing (%)	—	0.0	0.0

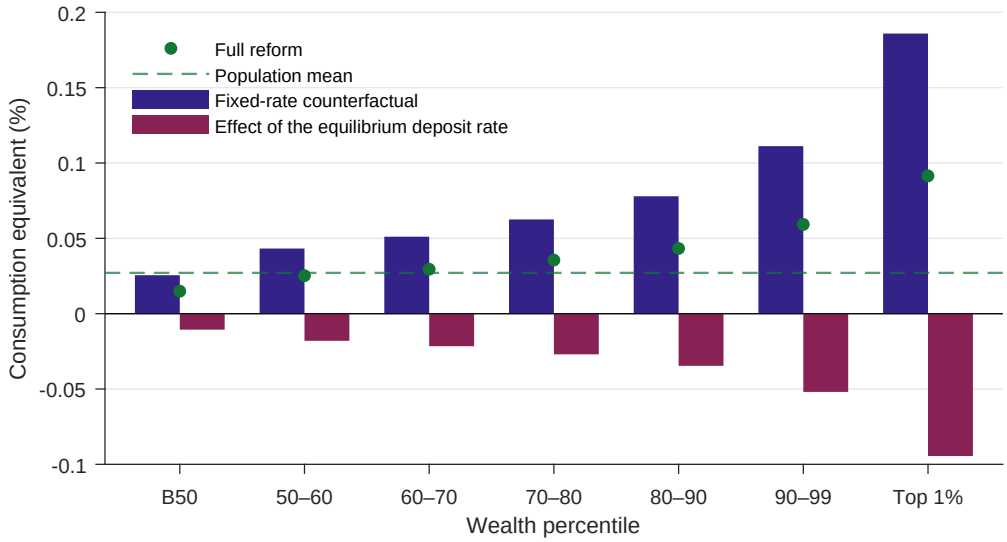
Note: The adjustment probability increases permanently by 10% relative to its baseline value, from 0.6158 to 0.6774. Rates, liquidity ratios and profits refer to stationary equilibria. The welfare gain is the population-mean consumption equivalent variation, accounting for the transition. The fixed-rate counterfactual keeps the deposit rate at its baseline level.

5 Reducing Adjustment Frictions: Deposit Rates and Welfare Consequences

The model lends itself to studying policies that aim to reduce portfolio adjustment frictions and improve households' access to non-deposit financial wealth. In the model, infrequent portfolio adjustment opportunities capture one such barrier. That is, since portfolio adjustments are not frictionless, households have an incentive to hold a liquidity buffer by placing part of their wealth in low-return deposits. I now study the impact of a policy reform that permanently increases the frequency with which households can adjust their portfolio. Specifically, I investigate how a permanent increase in α of 10% affects portfolio composition, welfare, and the equilibrium deposit rate. Without endogenous markdowns, the impact of such a reform would be trivial - lowering adjustment frictions reduces the need for a liquidity buffer, which allows households to shift their portfolio more towards the higher-paying asset, while leaving deposit rates unchanged. In the model at hand, however, a change in portfolio composition affects the macro-level elasticity and, thus, equilibrium deposit rates. To distinguish the benefit of easier adjustment from the deposit-rate response, I compare the equilibrium reform with a counterfactual that holds the deposit-rate path at its original level.

Long-Run Consequences of Easier Access. Table 3 compares the new steady state with the baseline and the fixed-rate counterfactual. Following a permanent increase in adjustment opportunities, aggregate deposits fall and investment in the illiquid asset rises (Appendix Table 6). As adjustment opportunities occur more frequently, the illiquid asset becomes more attractive and households shift a larger share of their portfolio towards the illiquid asset. The lower demand for deposits reduces the funds available to banks, who suffer a fall

Figure 6: Welfare incidence across wealth groups



Note: The figure shows the consumption-equivalent variation between the pre- and post-reform economy, under the fixed-rate counterfactual (blue bars) and the full equilibrium (green dots). Purple bars show the difference between equilibrium and fixed-rate welfare gains. Welfare gains are measured at the reform date and account for the transition to the new steady state. Wealth groups are computed before the reform. Dashed line: population mean in equilibrium.

in profits[24]. In equilibrium, however, banks lower the deposit rate by 22.6 basis points per annum, which partially counteracts the negative effect of lower deposits on bank profits. In isolation, an increase in adjustment opportunities is (weakly) welfare-improving for every household. Lower deposit rates, however, partially crowd out the welfare gains from easier portfolio management. Figure 6 summarizes the direct and indirect consequences on welfare. Welfare gains are positive throughout the distribution and larger for wealthier households. Easier access to wealth therefore benefits households despite the fall in deposit rates, which removes almost half of the gain. Table 7 illustrates related comparative statics results when varying the size of the increase in the adjustment probability.

The Fall in Deposit Rates. As non-deposit assets become more attractive, banks respond by lowering the rates they offer instead of competing for households' savings. Recall from the pricing condition (16) that a bank's pricing incentives are determined by the deposit demand elasticity of its customers, which, in turn, is the deposit-weighted average of households' individual elasticities. To illustrate why banks do not compete more strongly to retain their funding, I trace out the impact and long-run response of the macro-level elasticity. The impact

[24]Rebating bank profits to households would introduce an additional welfare channel: lower profits would reduce dividend income. Since bank profits are small relative to aggregate income, the effect would likely be limited.

response of deposits and deposit demand elasticities allows to disentangle the immediate effect of changed savings incentives from the feedback effect from the change in the wealth distribution.

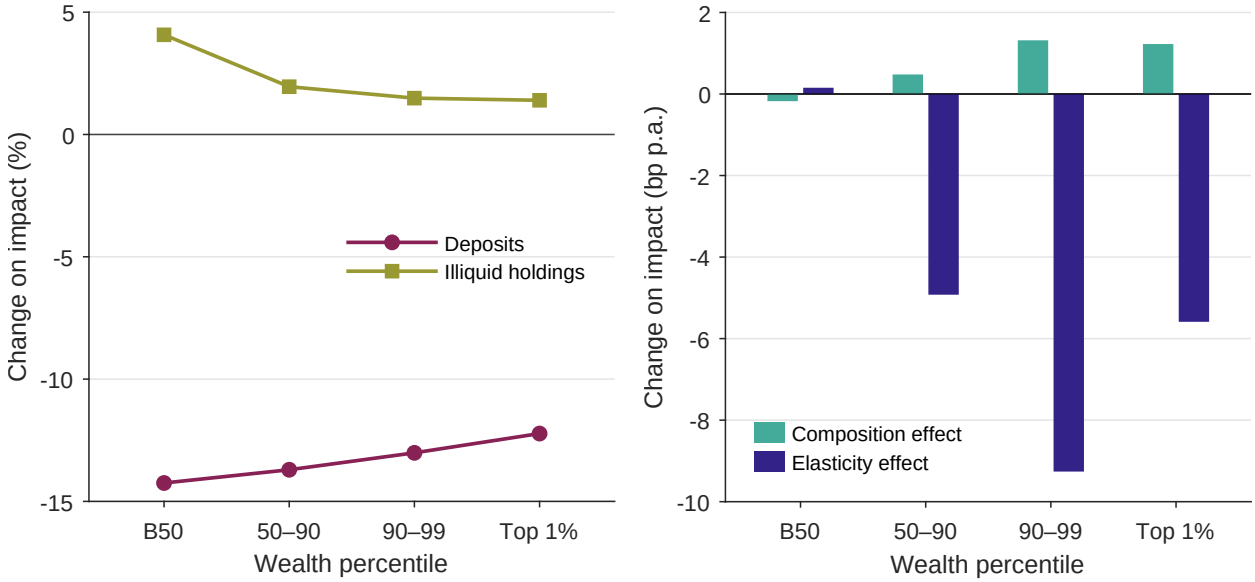
In the fixed-rate counterfactual, households cut their chosen deposits[25] on impact and raise their illiquid holdings; consumption is essentially unchanged (Panel B of Appendix Table 6). The triggered fall in the deposit rate further reinforces deposit outflows. Figure 7 shows how the impact decline in deposits is distributed across wealth groups. Every wealth group cuts chosen deposits by a similar proportion and moves them into the illiquid asset (panel 7a), implying that group shares of aggregate deposits stay largely unchanged.

Panel 7b links the fall in deposits across the wealth distribution to the change in deposit rates. Recall from Section 4 that a change in aggregate elasticity can be decomposed into an elasticity and a composition effect. On impact the distribution λ is fixed, so the reform changes aggregate elasticity through the weights, which change both directly with α and with households' deposits, and through the individual elasticities. Holding conditional deposit choices and individual elasticities fixed, increasing the share of adjusters raises aggregate elasticity because adjusters' deposits are more rate-sensitive (cf. Section 4), thus creating upward pressure on deposit rate. This positive contribution to the composition effect is partly counteracted by a shift in deposits towards non-adjusters. That is, on impact, adjusters shift their portfolio towards the illiquid assets, while non-adjusters are prevented from doing so. Overall the composition effect is small and more than offset by a negative elasticity effect, which drives the fall in aggregate elasticity. The households in the top 10% account for three quarters of the elasticity effect. In the long run, when the distribution has shifted as well, the elasticity effect still dominates.

Table 8 summarizes the decomposition into composition and elasticity effects, on impact and in the long run, and splits the elasticity effect further into its intensive- and extensive-margin component. Households become less sensitive on the extensive margin, while their intensive-margin elasticity rises slightly. In line with the discussion in Section 4, extensive-margin elasticities fall because smaller buffers lower the value of a better rate: with logarithmic utility, equation (18) implies that a household's extensive-margin elasticity is proportional to its chosen deposits relative to consumption. Households respond to more frequent portfolio opportunities by shifting their portfolio towards less liquid assets while leaving their consumption largely unchanged. Hence, as their wealth is less exposed to deposit rate differentials, households become less responsive on the extensive margin. Even in the long run, when the distribution has shifted, nearly the whole decline comes from lower individual

[25]The impact change in aggregate deposits is mainly driven by households who can adjust in the current period, since only they can move funds into the illiquid asset.

Figure 7: Impact responses by wealth group



(a) Deposits and illiquid holdings

(b) Decomposition of deposit rate change

Note: The figure shows the equilibrium impact response in deposits and illiquid asset choice (Panel (a)) and the contribution of the composition and elasticity effect to the impact change in deposit rates (Panel (b)). Households are grouped by their pre-reform wealth.

elasticities. Most of the decline already occurs in the fixed-rate counterfactual; the lower equilibrium rate reinforces the fall in deposit demand elasticity, as households cut deposits further. The reform thus lowers the deposit rate because households' deposits become less rate-sensitive, not because deposits move to less sensitive households, and most of the decline comes from the top 10%, who hold most of the rate-sensitive deposits.

Welfare Consequences under Limited Participation. Despite the fall in deposit rates, every household gains from more frequent rebalancing opportunities in this economy. This result comes with two caveats. First, the model underestimates the portfolio share held in deposits for the majority of households (cf. Table 4). Given the high baseline adjustment probability and the absence of transitory income shocks, households do not have a strong enough motive to build large liquidity buffers. This explains the limited effect of lower equilibrium deposit rates on welfare - only a small share of households' wealth is exposed to the fall in deposit rates.

Second, in the model, nearly every household holds some non-deposit financial wealth. Calvo adjustment frictions provide an incentive to hold deposits but do not perform well in capturing non-participation in the illiquid asset market. The near-full participation thus misses an important feature of the data: in 2004, around 37% of households had zero non-

deposit financial wealth. To compute the welfare loss of non-participants following the reform, I solve the household problem for agents who have no access to the illiquid asset market and assume that this restricted-access group has zero mass[26]. Table 9 in Appendix A.4 reports the welfare losses for non-participants across the wealth distribution. The post-reform fall in deposit rates implies an average welfare loss that is almost five times as high as the welfare gain for participants. This highlights the importance of capturing different dimensions of the wealth distribution when evaluating a policy reform that affects access to non-deposit financial wealth. While households who are already holding some non-deposit asset benefit from more frequent adjustment opportunities, the reform might very well imply an overall welfare loss if non-participants keep being excluded from capital markets.

6 Conclusion

This paper develops a framework that integrates a random utility model, where savers have idiosyncratic preferences for banks, into a standard, incomplete markets setting. The discrete choice set-up introduces an extensive margin of deposit demand; agents not only choose how much but also at which bank to save. I show that an individual's deposit demand elasticity is intrinsically linked to their marginal utility of wealth, thus giving rise to state-dependent micro-and macro-level deposit demand elasticities. Within the context of a two-period model, I elaborate on the key mechanisms at work and illustrate the necessary conditions under which the model recovers a CES deposit demand system. In order to illustrate the feedback mechanism between deposit rates and the wealth distribution, I then extend the model to a two-asset, infinite-horizon setting with incomplete markets. Deposit rates are largely driven by the wealthiest households—they hold a large share of deposits and are quick to adjust their bank-choice or portfolio allocation if better opportunities arise. This result highlights the importance of banks' deposit composition for equilibrium rates and responses to households investment opportunities. Following a reform that allows for easier portfolio adjustments, households decrease their bank-reliance, which reduces their rate-sensitivity. In the model, a reduction in portfolio adjustment frictions, thus, reduces the long-run deposit rate, partly offsetting the welfare gains from easier portfolio adjustment.

[26]This assumption allows to compute the welfare loss of non-participants while abstracting from their impact on the equilibrium deposit rate. Apart from the access restriction, these households have the same preferences and income process and choose consumption and deposits at the prevailing deposit rate.

References

Albertazzi, U., Faber, F., Gavazza, A., Georgescu, O.-M., and Lecomte, E. (2026). Bank deposit pricing in the euro area. ECB Working Paper Series 3255, European Central Bank.

Anderson, S. P., de Palma, A., and Thisse, J.-F. (1987). The CES is a discrete choice model. *Economics Letters*, 24(2):139–140.

Anderson, S. P., de Palma, A., and Thisse, J.-F. (1988). The ces and the logit: Two related models of heterogeneity. *Regional Science and Urban Economics*, 18(1):155–164.

Andolfatto, D. (2021). Assessing the impact of central bank digital currency on private banks. *The Economic Journal*, 131(634):525–540.

Auclert, A. (2019). Monetary policy and the redistribution channel. *American Economic Review*, 109(6):2333–2367.

Auclert, A., Bardóczy, B., Rognlie, M., and Straub, L. (2021). Using the sequence-space Jacobian to solve and estimate heterogeneous-agent models. *Econometrica*, 89(5):2375–2408.

Auclert, A., Rognlie, M., Straub, L., and Tapák, T. (2024). When do endogenous portfolios matter for hank.

Battistini, N., Bobasu, A., and Gareis, J. (2022). The recent drivers of household savings across the wealth distribution. *Economic Bulletin Boxes*, 3.

Bilbiie, F. O. (2025). Monetary policy and heterogeneity: An analytical framework. *Review of Economic Studies*, 92(4):2398–2436.

Bisetti, E. and Sarkar, A. (2025). Poverty spreads in deposit markets.

Broer, T., Harbo Hansen, N.-J., Krusell, P., and Öberg, E. (2020). The new keynesian transmission mechanism: A heterogeneous-agent perspective. *The Review of Economic Studies*, 87(1):77–101.

Buchak, G., Hu, J., and Wei, S.-J. (2021). Fintech as a financial liberator. Working Paper 29448, National Bureau of Economic Research.

Carroll, C., Slacalek, J., Tokuoka, K., and White, M. N. (2017). The distribution of wealth and the marginal propensity to consume. *Quantitative Economics*, 8(3):977–1020.

Castaneda, A., Diaz-Gimenez, J., and Rios-Rull, J.-V. (2003). Accounting for the us earnings and wealth inequality. *Journal of Political Economy*, 111(4):818–857.

Chakraborty, I., Chava, S., and Wang, K. (2026). How do banks attract deposits from households?

Chiu, J., Davoodalhosseini, S. M., Jiang, J., and Zhu, Y. (2023). Bank market power and central bank digital currency: Theory and quantitative assessment. *Journal of Political Economy*, 131(5):1213–1248.

Cirelli, F. (2022). Bank-dependent households and the unequal costs of inflation.

Cirelli, F. and Olafsson, A. (2025). What makes depositors tick? bank data insights into households' liquid asset allocation. Technical Report DP20612, CEPR Discussion Paper, Paris and London.

d'Avernas, A., Eisfeldt, A. L., Huang, C., Stanton, R., and Wallace, N. (2023). The deposit business at large vs. small banks. Working Paper 31865, National Bureau of Economic Research.

Drechsler, I., Savov, A., and Schnabl, P. (2017). The deposits channel of monetary policy. *The Quarterly Journal of Economics*, 132(4):1819–1876.

Eichenbaum, M. S., Puglisi, F., Rebelo, S., and Trabandt, M. (2025). Banks and the state-dependent effects of monetary policy. (33523).

Gerali, A., Neri, S., Sessa, L., and Signoretti, F. (2010). Credit and banking in a dsge model of the euro area. *Journal of Money, Credit and Banking*, 42(s1):107–141.

Guvenen, F., Kaplan, G., and Song, J. (2014). How risky are recessions for top earners? *American Economic Review*, 104(5):148–153.

Kaplan, G., Moll, B., and Violante, G. L. (2018). Monetary policy according to hank. *American Economic Review*, 108(3):697–743.

Kaplan, G. and Violante, G. L. (2022). The marginal propensity to consume in heterogeneous agent models. *Annual Review of Economics*, 14(1):747–775.

Kindermann, F. and Krueger, D. (2022). High marginal tax rates on the top 1 percent? lessons from a life-cycle model with idiosyncratic income risk. *American Economic Journal: Macroeconomics*, 14(2):319–366.

Koont, N., Santos, T., and Zingales, L. (2024). Destabilizing digital "bank walks". Working Paper 32601, National Bureau of Economic Research.

Luetticke, R. (2021). Transmission of monetary policy with heterogeneity in household portfolios. *American Economic Journal: Macroeconomics*, 13(2):1–25.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In Zarembka, P., editor, *Fontiers in Econometrics*, pages 105–142. Academic press, New York.

Melcangi, D. and Sterk, V. (2025). Stock market participation, inequality, and monetary policy. *The Review of Economic Studies*, 92(4):2656–2690.

Mongey, S. and Waugh, M. E. (2025). Pricing inequality. Working Paper 33399, National Bureau of Economic Research.

Paul, P., Ulate, M., and Wu, J. C. (2025). A macroeconomic model of central bank digital currency. Working Paper 33968, National Bureau of Economic Research.

Polo, A. (2021). Imperfect pass-through to deposit rates and monetary policy transmission. Bank of England Staff Working Paper series 933, Bank of England.

Ulate, M. (2021a). Alternative models of interest rate pass-through in normal and negative territory. *International Journal of Central Banking*, 17(1):3–34.

Ulate, M. (2021b). Going negative at the zero lower bound: The effects of negative nominal interest rates. *American Economic Review*, 111(1):1–40.

Wang, O. (2025). Banks, low interest rates, and monetary policy transmission. *The Journal of Finance*, 80(3):1379–1416.

Waugh, M. (2023). Heterogeneous agent trade. *NBER Working Paper*, (w31810).

Weidner, J., Kaplan, G., and Violante, G. (2014). The wealthy hand-to-mouth. *Brookings Papers on Economic Activity*, 1:77–153.

Xiao, K. (2020). Monetary transmission through shadow banks. *The Review of Financial Studies*, 33(6):2379–2420.

Yankov, V. (2024). In search of a risk-free asset: search costs and sticky deposit rates. *Journal of Money, Credit and Banking*, 56(5):1053–1098.

Young, E. R. (2010). Solving the incomplete markets model with aggregate uncertainty using the Krusell–Smith algorithm and non-stochastic simulations. *Journal of Economic Dynamics and Control*, 34(1):36–41.

Appendix

A Quantitative Model: Additional Results and Derivations

A.1 Euler Equations in the Symmetric Equilibrium

As discussed in Section 3, in a symmetric equilibrium, the Euler equation does not depend on an agent's future bank choice, but only on his current bank choice. To see this, note that evaluated at a symmetric equilibrium, where $R_k^{D*} = R^{D*}(\lambda), \forall k$, and writing R^{D*} for short, the log-sum formula reduces to

$$\tilde{w}^x(y,a,b,\lambda;\mathbf{R^{D*}}) = \chi \ln \sum_{k=1}^{N} e^{v^x(y,a,b,\lambda;R^{D*})/\chi} = v^x(y,a,b,\lambda;R^{D*}) + \chi \ln N \quad \forall x \in \{A,N\}.$$

Hence, $w(y,a,b,\lambda) = v(y,a,b,\lambda) + \chi \ln N$, where

$$v(y,a,b,\lambda) = \alpha v^A(y,a,b,\lambda;R^{D*}) + (1-\alpha)v^N(y,a,b,\lambda;R^{D*}).$$

As $\chi \ln N$ is a constant, the derivatives of w and v coincide. Note that this relies on symmetry: if rates differed across banks, the marginal value would be an average across banks, weighted by the choice probabilities.

The Euler equation for deposits thus reads

$$u'(c^x(y,a,b,\lambda;R_j^D))\frac{1}{R_j^D} \geq \beta \mathbb{E}_{y'|y} \frac{\partial v(y',a^{x,\prime},b^{x,\prime},\lambda')}{\partial a'}, \tag{20}$$

for $x \in \{A,N\}$, where $a^{x,\prime}$ and $b^{x,\prime}$ denote the household's optimal choices, with $b^{N,\prime} = Rb$. Likewise, for adjusters, the Euler equation for the illiquid asset is given by

$$u'(c^A(y,a,b,\lambda;R_j^D))\frac{1}{R} \geq \beta \mathbb{E}_{y'|y} \frac{\partial v(y',a^{A,\prime},b^{A,\prime},\lambda')}{\partial b'}. \tag{21}$$

Each holds with equality if the corresponding asset choice is positive.

A.2 Additional Results: Calibration and Model Fit

Table 4 and Table 5 report the model's distributional fit and the average marginal propensity to consume. Overall, the model performs well in capturing the distribution of deposits, despite producing a somewhat lower deposit and wealth concentration than observed in

the data. However, the model misses the strong wealth concentration at the top as well as underestimates the portfolio share of deposits for the Bottom 90 and overestimates the liquidity ratio of the top decile. Without transitory income shocks and a comparatively high adjustment probability, households do not have strong enough incentives to hold a large liquidity buffer. Conversely, the top of the wealth distribution includes the majority of superstar earners who want to hold at least some deposits to insure against the income loss upon exit from the superstar income state.

Table 4: Portfolio composition across the wealth distribution

	Wealth share (%)		Deposit share (%)		Liquidity ratio (%)	
Wealth percentile	Data	Model	Data	Model	Data	Model
Bottom 50%	0.84	2.53	4.31	5.06	58.42	22.99
50–90	22.82	36.25	40.54	39.80	20.32	12.58
90–99	40.21	42.17	33.82	37.99	9.62	10.28
Top 1%	36.13	19.05	21.33	17.15	6.75	10.28

Note: The table reports the each groups' share of total (financial) wealth and deposits and each groups' liquidity ratio both in the data and in the model. Households are ranked by total financial wealth. The liquidity ratio is group deposits divided by group total wealth.

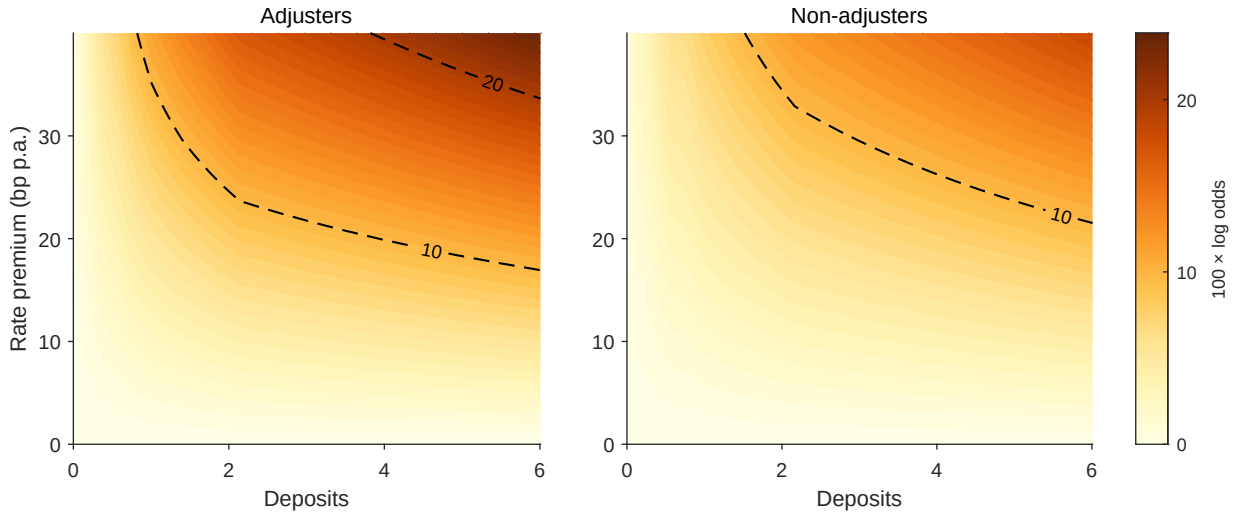
Table 5: Aggregate moments

Moment	Data	Model
Wealth Gini	0.858	0.766
Deposit Gini	0.831	0.763
Average MPC (%)	15-25	19.10
Hand-to-mouth share (%)	9-17	15.01

Notes: The wealth and deposit Gini are computed from the SCF, 2004. Hand-to-mouth consumers in the model are households with zero wealth. The marginal propensity to consume (MPC) reports the fraction of an unexpected transfer of 3% of average income that is consumed within the first quarter, averaged over the stationary distribution. Estimates for the quarterly MPC and the share of hand-to-mouth consumers are from Kaplan and Violante (2022) and Weidner et al. (2014), respectively.

Identification of Taste Dispersion. As discussed in Section 3.1, the dispersion of bank-specific preferences, χ, can be identified separately from the parameters governing household saving behavior. In a symmetric stationary equilibrium, all banks offer the same deposit rate. The expected value from bank choice then equals the conditional household value plus the state-independent term, $\chi \log N$. Changing χ therefore shifts value levels without affecting

Figure 8: Relative bank-choice probability



Note: The figure shows the log-odds of bank j being chosen over a competitor as a function of households' chosen deposits (x-axis) and the rate premium offered by bank j (y-axis). Colours show the log odds of choosing bank j over another bank, $100 \log(\Pr_j/\Pr_k)$; dashed lines represent contour lines.

saving incentives or the stationary wealth distribution. At the targeted deposit rate, the household parameters can consequently be calibrated independently of χ.

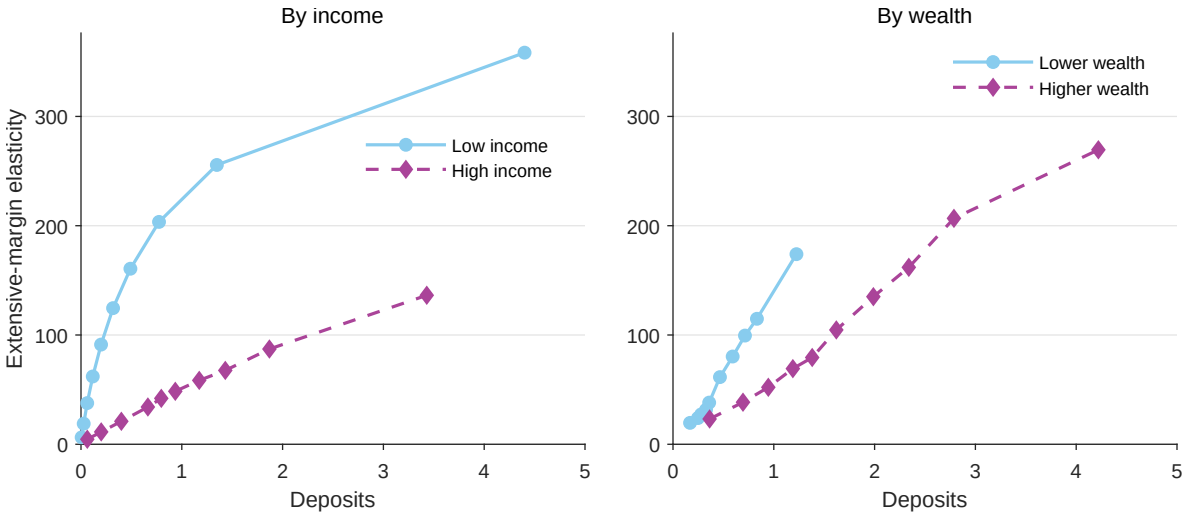
The deposit spread identifies χ through banks' pricing incentives. While each bank receives the same choice probability in the symmetric equilibrium, a smaller χ makes households more responsive to differences in banks' rates. Conditional on the household allocation, the extensive margin of the deposit demand elasticity is proportional to $1/\chi$, while the intensive margin is independent of χ. The targeted spread fixes the elasticity required by optimal bank pricing and therefore uniquely determines χ.

A.3 Additional Figures: Stationary equilibrium

Bank-choice Probabilities. Figure 8 shows the bank-choice margin in terms of choice probabilities. It plots the log-odds[27] of bank j as a function of households deposits (x-axis) and the rate premium offered by bank j (y-axis). With logit bank choice, a household chooses bank j over another bank k with relative probability $\Pr_j / \Pr_k = \exp\{(v_j - v_k)/\chi\}$. Under a constant-elasticity specification, this ratio would be the same for all households and the contour lines would be horizontal. In the model, at a given rate premium, households with large deposits are more likely to choose the higher-paying bank. All else equal, adjusters respond more strongly than non-adjusters with the same deposits.

[27] Choice probabilities are computed for a one-shot, unilateral deviation by bank j, while all other banks choose the equilibrium deposit rate.

Figure 9: Extensive-margin elasticity and chosen deposits at given income and wealth



Note: The figure shows the extensive-margin elasticity as a function of chosen deposits. Left: households with low (light blue) and high (purple) income. Right: households with low (light blue) and high (purple) total wealth. Within each line, households are sorted by chosen deposits into ten groups of equal population; each point plots a group's mean deposits against its deposit-weighted extensive-margin elasticity.

Elasticities and Policy Functions. With logarithmic utility, the extensive-margin elasticity is proportional to deposits relative to consumption (equation (18)). All else equal, the extensive-margin elasticity is thus increasing in deposit demand. Figure 9 compares households with similar income, or similar wealth, but different deposit demand. In each case, extensive-margin elasticity rises with chosen deposits. At a given deposit choice, households with lower income or lower wealth are more elastic: they consume less, implying a larger ratio of deposits to consumption.

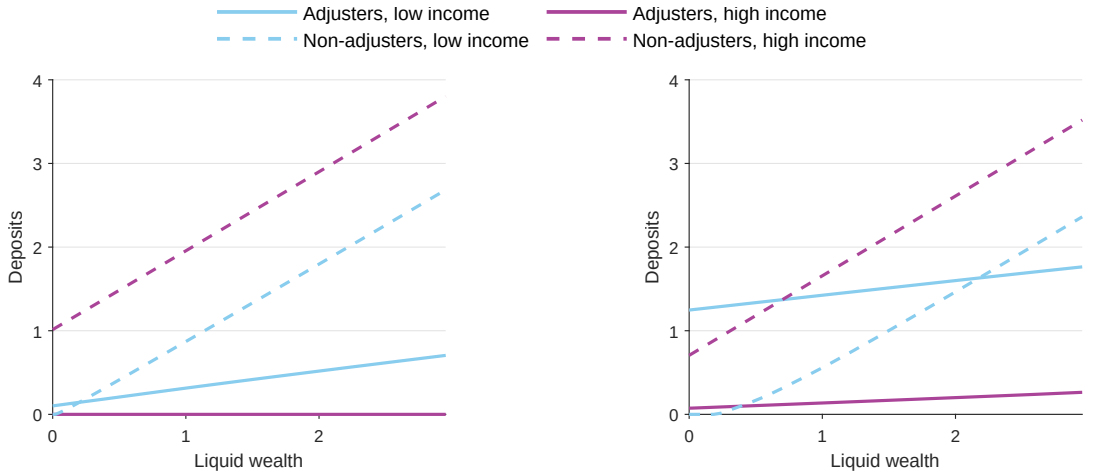
Figures 10 and 11 show the policy functions of adjusters and non-adjusters at a low and a high income state, along liquid wealth at given illiquid wealth and along illiquid wealth at given liquid wealth. At a given liquid wealth level, adjusters' deposits rise with illiquid wealth, while non-adjusters' deposits fall. Non-adjusters cannot access illiquid wealth in the current period, but the resources available to them in the future increase with illiquid wealth.

A.4 Additional Results: Reducing Adjustment Frictions

Table 6 reports the stationary portfolio, bank-profit, and elasticity responses underlying the main-text comparison (panel A), and the corresponding impact responses (panel B).

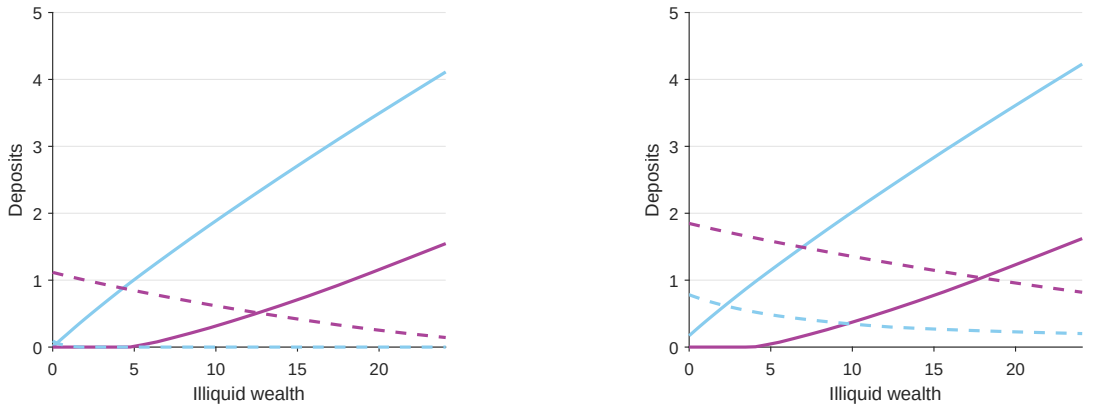
Table 7 summarizes the impact of a change in adjustment probabilities of different sizes; it reports the headline equilibrium results of Table 3 for increases in the adjustment probability

Figure 10: Policy functions: deposits



(a) Low illiquid wealth

(b) High illiquid wealth

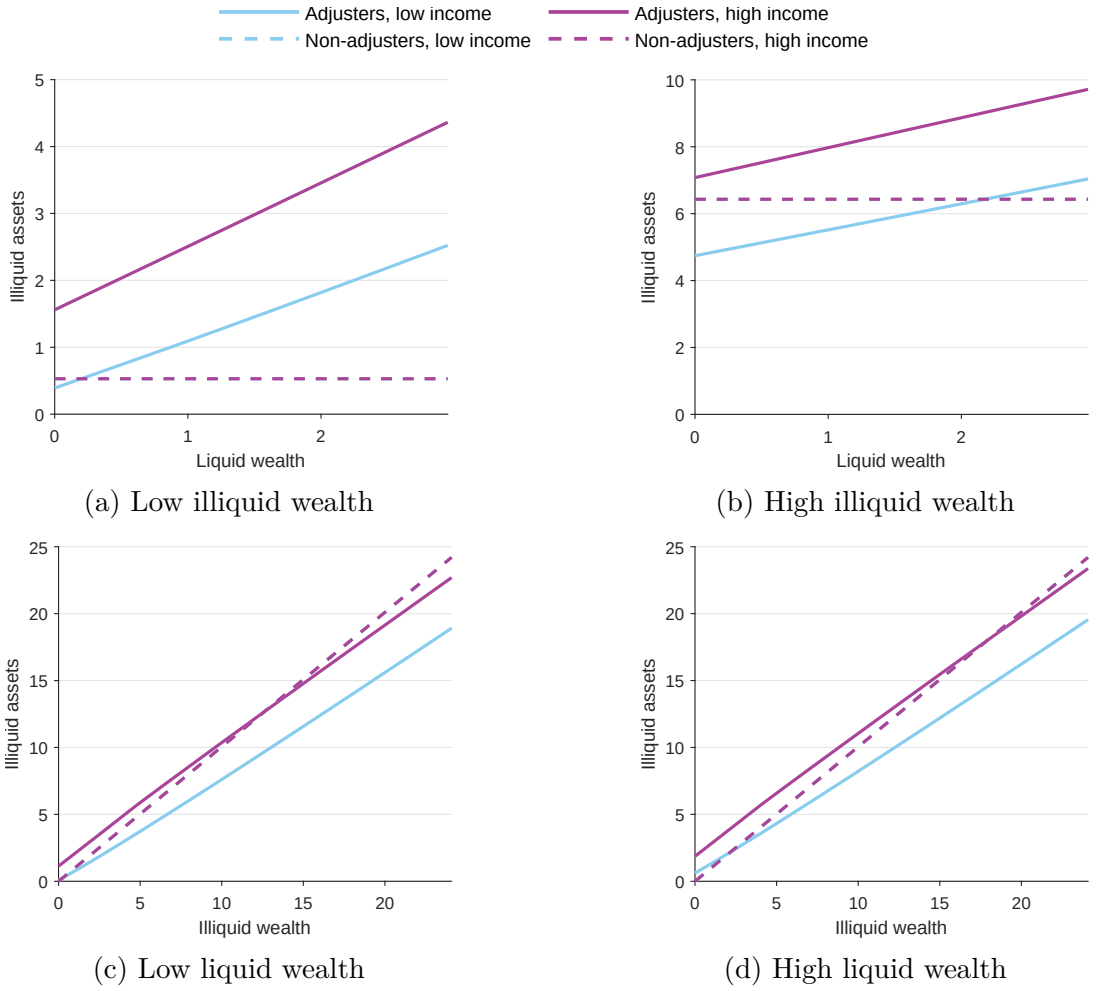


(c) Low liquid wealth

(d) High liquid wealth

Note: The figure plots optimal deposit choice at low (light blue) and high (purple) core income states as a function of liquid wealth (Panel (a): low illiquid wealth; Panel (b): high illiquid wealth) and illiquid wealth (Panel (c): low liquid wealth; Panel (d): high liquid wealth). Solid lines are adjusters and dashed lines are non-adjusters.

Figure 11: Policy functions: illiquid assets



(a) Low illiquid wealth

(b) High illiquid wealth

(c) Low liquid wealth

(d) High liquid wealth

Note: The figure plots optimal illiquid asset choice at low (light blue) and high (purple) core income states as a function of liquid wealth (Panel (a): low illiquid wealth; Panel (b): high illiquid wealth) and illiquid wealth (Panel (c): low liquid wealth; Panel (d): high liquid wealth). Solid lines are adjusters and dashed lines are non-adjusters.

Table 6: Consequences of more frequent adjustment: long run and impact

	Baseline	Fixed-rate counterfactual	Equilibrium
A. New steady state			
Deposit rate (% p.a.)	0.000	0.000	-0.226
Deposits	0.691	0.582	0.558
Illiquid holdings	5.354	5.505	5.522
Total wealth	6.045	6.087	6.080
Deposits / total wealth (%)	11.44	9.56	9.18
Aggregate bank profits	0.00346	0.00291	0.00311
Aggregate deposit elasticity	202.0	187.1	181.1
Intensive-margin component	32.1	38.9	35.8
Extensive-margin component	169.8	148.2	145.2
B. Impact			
Deposit rate (% p.a.)	0.000	0.000	-0.167
Deposits (% change)	—	-11.3	-13.2
Illiquid holdings (% change)	—	1.5	1.7
Consumption (% change)	—	0.02	0.08
Aggregate deposit elasticity	202.0	190.7	186.3

Note: The table compares aggregate moments for the pre- and post-reform economy and the fixed-rate counterfactual, both for the new steady state (Panel A) and for the first quarter following the change in adjustment probabilities (Panel B).

of 5%, 10%, 25% and 50%, showing that both the welfare gains and the decline in deposit rates are larger for larger increases in the adjustment probability.

Composition and Individual Elasticities. Table 8 separates the change in aggregate elasticity into composition and elasticity effect, both on impact and in the long-run. Composition includes the larger share of households adjusting, changes in chosen deposits across states and, in the long run, the shift in the distribution. On impact the distribution is predetermined, so composition can change only through households' deposit choices and a larger share of adjusters; in the long run, it also reflects the shift in the distribution.

Composition contributes little at either horizon, even in the long run, when the distribution has shifted. Nearly the whole decline comes from lower individual extensive-margin elasticities. Individual intensive elasticities, which measure a household's deposit response relative to its deposit position, rise slightly: positions shrink by more, in proportion, than responses. In the fixed-rate counterfactual the split is similar, with a smaller total.

Welfare Consequences under Limited Participation. A permanent increase in the adjustment frequency leaves households that are able to access the illiquid asset market strictly

Table 7: Consequences of more frequent adjustment: size of the increase

Increase in α	+5%	+10%	+25%	+50%
Adjustment probability α	0.6466	0.6774	0.7697	0.9237
Deposit rate (% p.a.)	-0.111	-0.226	-0.592	-1.883
Deposits / total wealth (%)	10.26	9.18	6.40	2.42
Aggregate bank profits	0.0033	0.0031	0.0026	0.0015
Welfare gain (CEV; %)	0.013	0.027	0.071	0.155
Households losing (%)	0.0	0.0	0.0	0.0

Note: The table reports the comparative statics results for varying sizes of the increase in the adjustment probability. Each column raises the adjustment probability permanently from its baseline value by the stated percentage. Rates, liquidity ratios and profits refer to the new stationary equilibrium. The welfare gain reports the consumption-equivalent variation between the pre- and post-reform steady states.

Table 8: Change in aggregate deposit elasticity

	Equilibrium		Fixed-rate counterfactual	
	Impact	Long run	Impact	Long run
Composition effect	+2.7	+0.1	+2.7	0.0
Individual extensive-margin elasticities	−20.9	−23.2	−18.4	−19.6
Individual intensive-margin elasticities	+2.5	+2.3	+4.5	+4.8
Total	−15.7	−20.9	−11.2	−14.9

Note: The composition effect measures the change in deposit weights, evaluated at baseline individual elasticities. The elasticity effect is evaluated at the post-reform deposit weights (first quarter and new steady state, respectively).

Table 9: Steady-state welfare of non-participants and participants

Wealth group	Non-participants (share, %)	Participants
Bottom 50%	−0.068 (56.3)	0.015
50–90	−0.163 (36.1)	0.033
90–99	−0.385 (6.8)	0.059
Top 1%	−0.758 (0.8)	0.091
All	−0.129 (100)	0.027

Note: Consumption-equivalent variation in percent, comparing the reform's steady state with the baseline steady state at the respective equilibrium deposit rate. Non-participants have $b = 0$ and zero mass; they are averaged over their stationary distribution at the baseline rate and assigned to the wealth groups using the baseline economy's wealth cutoffs. Parentheses report the percentage of non-participants within each wealth group. Participants are households in the baseline economy, weighted by population.

better off. However, non-participants, i.e. households who cannot hold the illiquid asset, will not benefit from the increase in adjustment probability; instead, they are only exposed to the fall in the deposit rate. A model with Calvo adjustment frictions will notoriously underestimate the share of these non-participants. To nonetheless investigate the welfare consequences for non-participants, I solve for the consumption-savings choice of households who have the same preferences and income process but can only save in deposits. I assume that non-participants have zero mass, thus abstracting from their effect on the equilibrium deposit rate. I then calculate the consumption-equivalent variation between the pre- and post-reform steady states. Table 9 summarizes the CEV for participants and non-participants. As for participants, wealthier non-participants are more exposed to the reform; they suffer larger welfare losses because they hold more deposits which, after the reform, earn a lower rate. The average welfare loss for non-participants is almost five times as high as the welfare gain of participants.

B Micro-level Elasticities under General CRRA Preferences

This section discusses the main implications for micro elasticities under general CRRA preferences with $u'(c) = c^{-\sigma}$, $\sigma > 0$. I retain the atomistic-bank assumption and restrict attention to households with strictly positive deposits. The decomposition in equation (4), the consumption-response relation in equation (6) and the extensive margin elasticity in equation (7) remain valid.

Elasticity Responses: The Effect of Income and Deposit Rates. Define

$$\mathrm{mpc}(R_j^D) \equiv \frac{\partial c(a; R_j^D)}{\partial a} = \frac{1}{1 + \beta^{1/\sigma} {R_j^D}^{1/\sigma - 1}}, \qquad \hat{a}_j = \frac{a}{a + y'/R_j^D}.$$

The Euler equation $c(a; R_j^D)^{-\sigma} = \beta R_j^D (y' + a'(a; R_j^D))^{-\sigma}$ and the budget identity $c(a; R_j^D) = a - a'(a; R_j^D)/R_j^D$ imply

$$c(a; R_j^D) = \frac{\mathrm{mpc}(R_j^D) a}{\hat{a}_j}, \qquad \frac{a'(a; R_j^D)}{R_j^D} = \frac{a(\hat{a}_j - \mathrm{mpc}(R_j^D))}{\hat{a}_j},$$

with positive-saving domain $\mathrm{mpc}(R_j^D) < \hat{a}_j \leq 1$ (and $\hat{a}_j < 1$ when $y' > 0$). Differentiating conditional saving with respect to the gross rate gives

$$\gamma_{\mathrm{int}}(a; R_j^D) = (1 - \mathrm{mpc}(R_j^D)) \left(1 + \frac{R_j^D c(a; R_j^D)}{\sigma a'(a; R_j^D)}\right).$$

Substituting the policies into this expression and the general envelope representation yields

$$\begin{aligned} \gamma_{\mathrm{int}}(a; R_j^D) &= (1 - \mathrm{mpc}(R_j^D)) \left[1 + \frac{\mathrm{mpc}(R_j^D)}{\sigma(\hat{a}_j - \mathrm{mpc}(R_j^D))}\right], \\ \gamma_{\mathrm{ext}}(a; R_j^D) &= \frac{a^{1-\sigma}(\hat{a}_j - \mathrm{mpc}(R_j^D))\hat{a}_j^{\sigma-1}}{\chi\, \mathrm{mpc}(R_j^D)^{\sigma}}. \end{aligned} \tag{22}$$

For $\sigma \neq 1$, $\hat{a}_j$ alone is insufficient to characterize individual elasticity: $\mathrm{mpc}(R_j^D)$ varies with the rate and the extensive margin also depends on $a^{1-\sigma}$. The single-index representation in the main text is therefore specific to logarithmic utility.

Proposition 5. *Under CRRA preferences with $\sigma > 0$ and $y' \geq 0$, on the positive-saving domain:*

(i) Intensive-margin elasticity is strictly decreasing in wealth when $y' > 0$ and independent of wealth when $y' = 0$. It is strictly decreasing in the gross deposit rate unless $y' = 0$ and $\sigma = 1$, in which case it is constant.

(ii) The wealth and gross-rate derivatives of extensive-margin elasticity both have the sign of $\gamma_{\mathrm{int}}(a; R_j^D) - 1$.

Proof. At fixed R_j^D, the representations above give

$$\frac{\partial \gamma_{\mathrm{int}}(a; R_j^D)}{\partial a} = -\frac{(1 - \mathrm{mpc}(R_j^D))\, \mathrm{mpc}(R_j^D) R_j^D y'}{\sigma (a'(a; R_j^D))^2}.$$

This derivative is strictly negative when $y' > 0$ and zero throughout the wealth domain when $y' = 0$, establishing strict decrease and independence of wealth, respectively.

For the rate derivative, direct differentiation and substitution of the saving policy give

$$\frac{\partial \gamma_{\text{int}}(a; R_j^D)}{\partial R_j^D} = -\frac{\text{mpc}(R_j^D)(1 - \text{mpc}(R_j^D))}{\sigma^2 R_j^D} \left[(\sigma - 1)^2 + \frac{a R_j^D y'}{(a'(a; R_j^D))^2} \right].$$

Since $0 < \text{mpc}(R_j^D) < 1$, $R_j^D > 0$, and $a'(a; R_j^D) > 0$, the bracket is positive unless $y' = 0$ and $\sigma = 1$. The derivative is therefore strictly negative in every other case. When $y' = 0$ and $\sigma = 1$, equation (22) gives $\gamma_{\text{int}}(a; R_j^D) = 1$ at every positive gross rate, establishing constancy.

Finally, differentiation of $\gamma_{\text{ext}}(a; R_j^D) = c(a; R_j^D)^{-\sigma} a'(a; R_j^D)/(\chi R_j^D)$, using equation (6), yields

$$\begin{aligned}
\frac{\partial \gamma_{\text{ext}}(a; R_j^D)}{\partial a} &= \frac{u''(c(a; R_j^D)) a'(a; R_j^D)}{\chi R_j^D} (1 - \gamma_{\text{int}}(a; R_j^D)), \\
\frac{\partial \gamma_{\text{ext}}(a; R_j^D)}{\partial R_j^D} &= \frac{\gamma_{\text{ext}}(a; R_j^D)}{R_j^D} (\gamma_{\text{int}}(a; R_j^D) - 1) \left(1 + \frac{\sigma a'(a; R_j^D)}{R_j^D c(a; R_j^D)} \right).
\end{aligned}$$

Since $u''(c(a; R_j^D)) < 0$, $a'(a; R_j^D)/R_j^D > 0$, and $\gamma_{\text{ext}}(a; R_j^D) > 0$, both derivatives have the sign of $\gamma_{\text{int}}(a; R_j^D) - 1$. Thus both derivatives are strictly positive when $\gamma_{\text{int}}(a; R_j^D) > 1$, zero when $\gamma_{\text{int}}(a; R_j^D) = 1$, and strictly negative when $\gamma_{\text{int}}(a; R_j^D) < 1$. □

By equation (6), intensive-margin elasticity exceeds one precisely when a rate increase reduces current consumption. Proposition 5 therefore links this consumption response to the extensive-margin elasticity: the bank-choice elasticity increases in wealth and rates precisely when a rate increase reduces current consumption. In particular,

$$\gamma_{\text{int}}(a; R_j^D) \geq 1 \quad \iff \quad 1 + \text{mpc}(R_j^D)(\sigma - 1) - \sigma \hat{a}_j \geq 0.$$

If $\sigma \leq 1$, intensive-margin elasticity is larger than one and current consumption falls with the rate throughout the positive-saving domain, except when $\sigma = 1$ and $y' = 0$. If $\sigma > 1$, the displayed inequality holds precisely when

$$\hat{a}_j \leq \frac{1 + \text{mpc}(R_j^D)(\sigma - 1)}{\sigma}.$$

At fixed R_j^D, sufficiently wealthy households have $\hat{a}_j$ above this threshold: their intensive-margin elasticity is below one, current consumption rises with the rate, and the extensive

margin decreases in wealth and rates. In particular,

$$\lim_{a\to\infty} \gamma_{\text{int}}(a; R_j^D) = 1 - \text{mpc}(R_j^D) + \frac{\text{mpc}(R_j^D)}{\sigma} \geq 1 \iff \sigma \leq 1.$$

When $y' > 0$, the intensive margin diverges as saving approaches zero.

Taking Stock. Logarithmic utility imposes three restrictions that do not extend to general CRRA preferences. First, for $\sigma \neq 1$, equation (22) also depends on $\text{mpc}(R_j^D)$, which varies with the rate, and on $a^{1-\sigma}$.

Second, as shown by Proposition 5, the extensive margin need not increase with wealth or the gross deposit rate. For $\sigma > 1$ and $y' > 0$, sufficiently wealthy households have $\gamma_{\text{int}}(a; R_j^D) < 1$, so both margins decrease with wealth. Total individual elasticity can also fall below one. For $\sigma > 1$, holding the gross deposit rate and future income fixed, equation (22) implies

$$\lim_{a\to\infty} \gamma_{\text{ext}}(a; R_j^D) = 0, \qquad \lim_{a\to\infty} \gamma(a; R_j^D) = 1 - \text{mpc}(R_j^D) + \frac{\text{mpc}(R_j^D)}{\sigma} < 1.$$

Thus, sufficiently wealthy households have a total deposit demand elasticity below one, in contrast to the case with $\sigma \leq 1$.

Third, zero future income no longer implies constant individual elasticity. Setting $\hat{a}_j = 1$ in equation (22) gives

$$\gamma_{\text{int}}(a; R_j^D) = 1 - \text{mpc}(R_j^D) + \frac{\text{mpc}(R_j^D)}{\sigma}, \qquad \gamma_{\text{ext}}(a; R_j^D) = \frac{1 - \text{mpc}(R_j^D)}{\chi\, \text{mpc}(R_j^D)^\sigma} a^{1-\sigma}.$$

For $\sigma \neq 1$, the intensive margin depends on the rate through $\text{mpc}(R_j^D)$, while the extensive margin depends on both wealth and the rate. The cancellation that produces a constant total elasticity when $y' = 0$ is thus specific to logarithmic utility.

C Proofs

This section reports the proofs for the results in Section 2; it thus refers to the two-period model with logarithmic preferences.

C.1 Proofs: Bank choice and aggregation

Lemma 1 (Increasing differences)**.** *If $y' > 0$, $v(a, R)$ exhibits increasing differences in (a, R) on $\mathbb{R}^2_{++}$. For $R_j^D > R_k^D$,*

$$v_a(a; R_j^D) \geq v_a(a; R_k^D),$$

with strict inequality whenever $a'(a; R_j^D) > 0$. If $y' = 0$, the value difference is independent of wealth.

Proof. The envelope theorem and the optimal saving policy give

$$v_R(a; R) = \frac{\partial v(a; R)}{\partial R} = \frac{\beta a'(a; R)}{R(a'(a; R) + y')} = \max\left\{0, \frac{\beta R a - y'}{R(Ra + y')}\right\}.$$

If $y' > 0$, this expression is continuous and weakly increasing in wealth, with

$$\frac{\partial v_R(a; R)}{\partial a} = \frac{(1+\beta)y'}{(Ra + y')^2} > 0 \qquad \text{whenever } a'(a; R) > 0.$$

For $R_j^D > R_k^D$, the value difference

$$v(a; R_j^D) - v(a; R_k^D) = \int_{R_k^D}^{R_j^D} v_R(a; R)\, dR$$

is therefore weakly increasing in wealth, establishing increasing differences. It is constant where $a'(a; R_j^D) = 0$. If $a'(a; R_j^D) > 0$, then $\beta R_j^D a > y'$ and the value difference has strictly positive wealth derivative:

$$\frac{\partial}{\partial a}\left[v(a; R_j^D) - v(a; R_k^D)\right] = \int_{\max\{R_k^D, y'/(\beta a)\}}^{R_j^D} \frac{(1+\beta)y'}{(Ra + y')^2}\, dR > 0.$$

If $y' = 0$, the envelope expression reduces to $v_R(a; R) = \beta/R$, so the value difference is independent of wealth. □

Proposition 1

Proof. The logit choice formula implies

$$\Pr_j(a; \mathbf{R^D}) = \frac{\exp(v(a, R_j^D)/\chi)}{\sum_{\ell=1}^N \exp(v(a, R_\ell^D)/\chi)}, \qquad \log \frac{\Pr_j(a; \mathbf{R^D})}{\Pr_k(a; \mathbf{R^D})} = \frac{v(a, R_j^D) - v(a, R_k^D)}{\chi}.$$

The odds statements follow from Lemma 1. If $y' = 0$, Lemma 1 implies that all pairwise value differences, and hence all pairwise choice odds, are independent of wealth. Since the

probabilities sum to one, each probability is therefore independent of wealth. □

Proposition 2

Proof. Fix k with $R_k^D = \min_j R_j^D$ and write $\underline{a}_k = y'/(\beta R_k^D)$, so $\mathcal{A}_+(\mathbf{R^D}) = (\underline{a}_k, \infty)$. Suppose that D_k is determined by mean wealth for every finite-mean distribution on this interval. Comparing the two-point distribution[28] at a_1, a_2 with the degenerate distribution at its mean gives

$$d_k(\theta a_1 + (1-\theta)a_2; \mathbf{R^D}) = \theta d_k(a_1; \mathbf{R^D}) + (1-\theta) d_k(a_2; \mathbf{R^D})$$

for every $a_1, a_2 > \underline{a}_k$ and $\theta \in (0,1)$. Hence $d_k(\cdot; \mathbf{R^D})$ is affine on $(\underline{a}_k, \infty)$. On this interval,

$$d_k(a; \mathbf{R^D}) = \frac{\beta R_k^D}{1+\beta}(a - \underline{a}_k)\Pr_k(a; \mathbf{R^D}).$$

Since $0 < \Pr_k \leq 1$, individual deposits converge to zero as $a \downarrow \underline{a}_k$. An affine function with this boundary value is proportional to $a - \underline{a}_k$. Hence, affinity of $d_k(\cdot; \mathbf{R^D})$ implies that

$$\Pr_k(a; \mathbf{R^D}) = \frac{1+\beta}{\beta R_k^D} \frac{d_k(a; \mathbf{R^D})}{a - \underline{a}_k}$$

is constant in wealth.

By Proposition 1, the odds $\Pr_\ell(a; \mathbf{R^D})/\Pr_k(a; \mathbf{R^D})$ are strictly increasing in wealth on $\mathcal{A}_+(\mathbf{R^D})$ whenever $R_\ell^D > R_k^D$. For $R_\ell^D = R_k^D$, the odds equal one. Since choice probabilities sum to one,

$$\frac{1}{\Pr_k(a; \mathbf{R^D})} = \sum_{\ell=1}^{N} \frac{\Pr_\ell(a; \mathbf{R^D})}{\Pr_k(a; \mathbf{R^D})}.$$

Since bank k offers the lowest deposit rate, and the rate vector contains at least two distinct rates, at least one term on the right-hand side is strictly increasing, while the remaining terms are constant or strictly increasing. Hence, $1/\Pr_k(a; \mathbf{R^D})$ is strictly increasing and $\Pr_k(a; \mathbf{R^D})$ is strictly decreasing in wealth, contradicting its constancy. This establishes the proposition. □

[28] The argument uses discrete wealth distributions for convenience.

C.2 Proofs: Micro-level elasticities

Proposition 3

Proof. On the positive-saving domain $a > y'/(\beta R_j^D)$, equations (5) and (7) and the conditional saving policy imply

$$\gamma_{\text{int}}(a; R_j^D) = \frac{\beta R_j^D a}{\beta R_j^D a - y'}, \qquad \gamma_{\text{ext}}(a; R_j^D) = \frac{\beta R_j^D a - y'}{\chi(R_j^D a + y')}.$$

For part (i), differentiating with respect to wealth and the deposit rate gives

$$\frac{\partial \gamma_{\text{int}}(a; R_j^D)}{\partial a} = -\frac{\beta R_j^D y'}{(\beta R_j^D a - y')^2} < 0, \qquad \frac{\partial \gamma_{\text{int}}(a; R_j^D)}{\partial R_j^D} = -\frac{\beta a y'}{(\beta R_j^D a - y')^2} < 0,$$
$$\frac{\partial \gamma_{\text{ext}}(a; R_j^D)}{\partial a} = \frac{(1+\beta) R_j^D y'}{\chi(R_j^D a + y')^2} > 0, \qquad \frac{\partial \gamma_{\text{ext}}(a; R_j^D)}{\partial R_j^D} = \frac{(1+\beta) a y'}{\chi(R_j^D a + y')^2} > 0.$$

The strict inequalities follow from $y' > 0$, establishing part (i).

For part (ii), summing the wealth derivatives yields

$$\frac{\partial \gamma(a; R_j^D)}{\partial a} = R_j^D y' \left[\frac{1+\beta}{\chi(R_j^D a + y')^2} - \frac{\beta}{(\beta R_j^D a - y')^2} \right].$$

Since both denominators are strictly positive,

$$\frac{\partial \gamma(a; R_j^D)}{\partial a} > 0 \quad \Longleftrightarrow \quad \frac{\beta R_j^D a - y'}{R_j^D a + y'} > \sqrt{\frac{\beta \chi}{1+\beta}}.$$

The ratio $(\beta R_j^D a - y')/(R_j^D a + y')$ equals $\chi \gamma_{\text{ext}}(a; R_j^D)$. For any fixed $R_j^D \in (0, R)$, it is continuous and, by part (i), strictly increasing in wealth. It approaches zero as $a \downarrow y'/(\beta R_j^D)$ and β as $a \to \infty$. Under $\chi < \beta(1+\beta)$,

$$0 < \sqrt{\frac{\beta \chi}{1+\beta}} < \beta.$$

There is therefore a unique wealth level $a_* \in \mathcal{A}_+(R_j^D)$ at which the wealth derivative of total elasticity is zero. The derivative is strictly negative below a_* and strictly positive above it. Hence $\gamma(a; R_j^D)$ has a unique minimum in wealth on $\mathcal{A}_+(R_j^D)$. □

C.3 Proofs: Macro-level elasticities

Proposition 4

Proof. At symmetric rates, each household chooses bank j with probability $1/N$. By the support assumption, every household saves positively at the common rate R, so

$$d_j(a; \mathbf{R^D}) = \frac{\beta R a - y'}{N(1+\beta)}.$$

This expression is affine in wealth, so

$$D_j(\mathbf{R^D}; \lambda) = \frac{\beta R \bar{a} - y'}{N(1+\beta)} = d_j(\bar{a}; \mathbf{R^D}) > 0.$$

Define the household's own-rate deposit response, evaluated at symmetric rates, by

$$\delta_j(a) \equiv \left. \frac{\partial d_j(a; \mathbf{R^D})}{\partial R_j^D} \right|_{\text{sym}}.$$

Using the conditional saving and choice-probability responses established above, the household's own-rate deposit response at symmetric rates is

$$\delta_j(a) = \frac{1}{N}\left[\frac{\beta a}{1+\beta} + \frac{(\beta R a - y')^2}{\chi R (1+\beta)(Ra + y')}\right].$$

The first term is the intensive-margin contribution to the response; the second is the extensive-margin contribution. Differentiating twice with respect to wealth, holding R fixed, gives

$$\delta_j''(a) = \frac{2(1+\beta) R y'^2}{N \chi (Ra + y')^3} > 0.$$

Thus δ_j is strictly convex. Jensen's inequality therefore yields

$$\left. \frac{\partial D_j}{\partial R_j^D} \right|_{\text{sym}} = \int \delta_j(a)\, d\lambda(a) > \delta_j(\bar{a}).$$

Using the definitions of elasticity and the equality of deposit levels,

$$\Gamma_j(\mathbf{R^D}; \lambda) = \frac{R}{D_j(\mathbf{R^D}; \lambda)} \int \delta_j(a)\, d\lambda(a) > \frac{R}{d_j(\bar{a}; \mathbf{R^D})} \delta_j(\bar{a}) = \gamma(\bar{a}; R).$$

If $y' = 0$, both $d_j(a; \mathbf{R^D})$ and $\delta_j(a)$ are linear in wealth, so their aggregate values equal their values at $\bar{a}$. Hence aggregate and representative-household elasticities coincide. □

D Solution Method

Below, I describe the solution method employed to solve for the stationary equilibrium and transition paths. I rely on the endogenous grid method (EGM), but the procedure can be easily adapted to related methods such as value function iteration. Objects computed in outer iteration k carry the superscript k; within the inner loop, where the deposit rate is fixed, I drop it to ease notation. Throughout, $W(y,a',b') = \sum_{y'} \pi_y(y'|y) \left[\alpha v^A(y',a',b') + (1-\alpha)v^N(y',a',b')\right]$ denotes the expected continuation value and W_a, W_b its derivatives.

D.1 Stationary Equilibrium

Let r and r^D denote the net policy and deposit rate, respectively, i.e. $R = 1 + r$ and $R^D = 1 + r^D$.

1. Construct grids G_Y (with transition matrix π_y), G_A (liquid deposits), G_B (illiquid assets) and G_R (deposit rates). Guess $r^{D,0}$ and set $k = 0$.

2. Given $r^{D,k}$, solve the household problem as described in the inner loop below. Output on $G_Y \times G_A \times G_B$: $W^k(y,a',b')$, $W^k_a(y,a',b')$, $W^k_b(y,a',b')$ and the stationary distribution $\lambda^k(y,a,b)$.

3. One-shot deviation. Since households choose their bank every period, the bank's problem is static, and the deviating bank faces households whose continuation is the stationary W^k. For each $\tilde{r} \in G_R$ and each Calvo status $x \in \{A, N\}$:

   (a) perform one EGM step on (W^k_a, W^k_b) at deposit rate $\tilde{r}$ to obtain $c^{x,k}(y,a,b;\tilde{r})$, $a'^{,x,k}(y,a,b;\tilde{r})$ and, for adjusters, $b'^{,A,k}(y,a,b;\tilde{r})$ (non-adjusters: $b' = (1+r^P)\,b$);

   (b) compute $v^{x,k}(y,a,b;\tilde{r}) = u\left(c^{x,k}\right) + \beta\, W^k\left(y, a'^{x,k}, b'^{x,k}\right)$, interpolating W^k;

   (c) compute the probabilities $Pr^{x,k}(y,a,b;\tilde{r})$ of choosing the deviating bank given that all other banks set $r^{D,k}$ (equation (13));

   (d) aggregate the deviating bank's deposit supply

$$D^k(\tilde{r}) = \sum_{y,a,b} \lambda^k(y,a,b)\Big[\alpha Pr^{A,k}(y,a,b;\tilde{r}) a'^{,A,k}(y,a,b;\tilde{r}) + (1-\alpha) Pr^{N,k}(y,a,b;\tilde{r}) a'^{,N,k}(y,a,b;\tilde{r})\Big].$$

4. Given aggregate deposit demand for any possible $\tilde{r} \in G_R$, solve for profit-maximizing deposit rate $r^{D,max,k}$.

5. If $|r^{D,\max,k} - r^{D,k}| < \text{tol}_r$, stop. Otherwise set $r^{D,k+1} = \vartheta\, r^{D,\max,k} + (1-\vartheta)\, r^{D,k}$, where $\vartheta \in (0,1]$, set $k \leftarrow k+1$, and return to step 2.

Inner Loop. Given r^D, choice probabilities do not affect the household's consumption–saving and portfolio choices: in the symmetric equilibrium the expected value of the bank choice differs from v only by a constant (cf. equations (20) and (21)). The household block is therefore a standard two-asset problem with Calvo-type adjustment, which I solve with the endogenous grid method (EGM) by iterating backward on (W_a, W_b) until convergence (see, e.g., Luetticke, 2021; Auclert et al., 2021). The stationary distribution is computed following Young's method (Young (2010)).

D.2 Transition Dynamics

Below, I describe how to solve for a perfect-foresight path following an unexpected shock at time $t = 1$.

1. Compute the stationary equilibrium. Choose T and guess $\{r_t^{d,k}\}_{t=1}^{T-1}$; set $r_T^{d,k} = r^{D,SS}$, terminal continuation objects $(W, W_a, W_b)_{T+1} = (W, W_a, W_b)^{SS}$ and initial distribution $\lambda_1 = \lambda^{SS}$.

2. Given $\{r_t^{d,k}, r_t\}_{t=1}^{T}$, solve the household problem following the algorithm described in the inner loop, with (r_t^d, r_t) in place of (r^D, r); iterate backward for $t = T, \ldots, 1$ to solve for the household policies and values and then solve the distribution forward starting from λ_1 and using date-t policies. Output: $\{W_{t+1}^k, W_{a,t+1}^k, W_{b,t+1}^k, \lambda_t^k\}_{t=1}^{T}$.

3. One-shot deviations. For each $t < T$, the deviation problem uses only the equilibrium continuation at $t+1$, so periods can be solved independently. For each $t < T$, $\tilde{r} \in G_R$ and $x \in \{A, N\}$:

   (a) perform one EGM step on $(W_{a,t+1}^k, W_{b,t+1}^k)$ at deposit rate $\tilde{r}$ and policy rate r_t to obtain $c_t^{x,k}$, $a_{t+1}^{x,k}$ and, for adjusters, $b_{t+1}^{A,k}$ as functions of $(y, a, b; \tilde{r})$ (non-adjusters: $b_{t+1} = (1 + r_t)\, b$);

   (b) compute $v_t^{x,k}(y, a, b; \tilde{r}) = u\big(c_t^{x,k}\big) + \beta\, W_{t+1}^k\big(y, a_{t+1}^{x,k}, b_{t+1}^{x,k}\big)$;

   (c) compute $Pr_t^{x,k}(y, a, b; \tilde{r})$ given that all other banks set $r_t^{d,k}$ (equation (13));

   (d) aggregate

$$D_t^k(\tilde{r}) = \sum_{y,a,b} \lambda_t^k(y,a,b) \Big[\alpha\, Pr_t^{A,k}(y,a,b;\tilde{r}) a_{t+1}^{A,k}(y,a,b;\tilde{r}) + (1-\alpha)\, Pr_t^{N,k}(y,a,b;\tilde{r}) a_{t+1}^{N,k}(y,a,b;\tilde{r})\Big].$$

4. Given $D_t^k(\tilde{r})$, solve for profit-maximizing deposit rate $r_t^{d,max,k}$ $\forall t < T$.

5. If $\max_{t<T} |r_t^{d,\max,k} - r_t^{d,k}| < \text{tol}_r$, stop. Otherwise set $r_t^{d,k+1} = \vartheta\, r_t^{d,\max,k} + (1-\vartheta)\, r_t^{d,k}$ for all $t < T$, $k \leftarrow k+1$, and return to step 2.