Dynamic Competition for Sleepy Deposits

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February 18, 2026

Yale Economics

Outline

Motivation: “Sleepy” retail deposits

Retail depositors rarely shop for better terms.

- Account turnover is low: new checking/savings accounts are roughly 8–15% of existing accounts per year (average life $\approx$ 8 years).
- Account closings are mostly idiosyncratic (e.g., inactivity, no longer needed, moving, death); only about 17% of closures cite switching for better rates/services/fees.
- Estimated share inactive each year is very high ($\approx$ 94%).

Why this matters

Sleepiness changes the industrial organization of deposit markets.

- Competition: does depositor inertia soften competition, or induce dynamic "invest vs. harvest" incentives that can also intensify competition for active depositors?
- Bank value: how much of the deposit franchise value is attributable to sleepy deposits?
- Financial stability: how does the deposit franchise buffer banks when rates rise?
- Policy relevance: regulators (e.g., UK FCA) have pushed for more pass-through of interest rates to depositors; what happens if deposit competition becomes effectively static?

This paper: core questions

- How sleepy are retail depositors, and how does sleepiness vary with rates and demographics?
- What does sleepiness imply for deposit market markups and their cyclicality?
- How does a dynamic view change the relationship between concentration and markups?
- How large is the deposit franchise value effect, and who benefits most?
- What happens under counterfactuals that eliminate sleepiness / dynamic competition?

Related literature

- **Banking + IO: dick_demand_2008<empty citation>**, Egan et al. (2017), Xiao (2020), Wang et al. (2022)
  - Incorporates dynamics into supply and demand for bank deposits
- **Dynamic competition + Inertia in demand: beggs_multi-period_1992<empty citation>**, **dube_switching_2009<empty citation>**, **mackay_consumer_2024<empty citation>**, **brown_why_2023<empty citation>** and **einav_selling_2025<empty citation>**
  - Dynamic affects competition in the US deposit marketIncorporates dynamics into supply and demand for bank deposits
- **Bank deposits:** Berger and Hannan (1991), Argyle et al. (2025), Drechsler et al. (2023)

Outline

Data sources

- Account-level turnover microdata from a core account processing platform: 89 banks/credit unions, 12 million deposit accounts.
- FDIC Summary of Deposits (SoD), 1994-2023: deposits at the bank$\times$county$\times$year level
- RateWatch (2001-June 2023): bank$\times$county$\times$year average rates by account type
- Call Reports: bank-level cost shifters (salary expenses, premises/fixed-asset expenses).
- Final estimation panel: 341,395 bank$\times$county$\times$year observations, 2002-2023

Deposit rates and spreads

Paper's baseline rate measure uses **\$10k money market deposit account** rates from RateWatch.

- Deposit spread defined as $\rho_{jkt} := R_t^F - r_{jkt}$ ("price" of deposit services).
- Summary stats (baseline sample):
  - R_t^F: federal funds rate
  - Average deposit rate $\approx$ 34 bps.
  - Average spread $R_t^F - r_{jkt} \approx$ 97 bps.
  - Average market share per bank$\times$county observation $\approx$ 16%.

Stylized fact 1: low account openings (turnover)

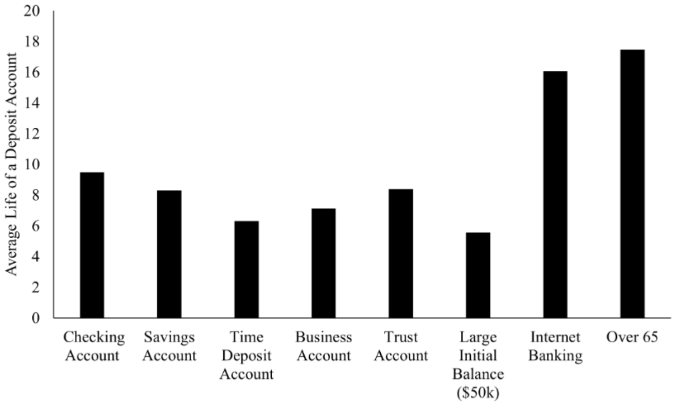


Figure 1: Avg. Life $= \frac{1}{\text{Turnover Rate}}$ where turnover rate is the fraction of newly opened accounts in a year.

- Cross-sectional patterns suggest frictions (search/switching/inattention), not just persistent tastes

Stylized fact 2: why accounts close

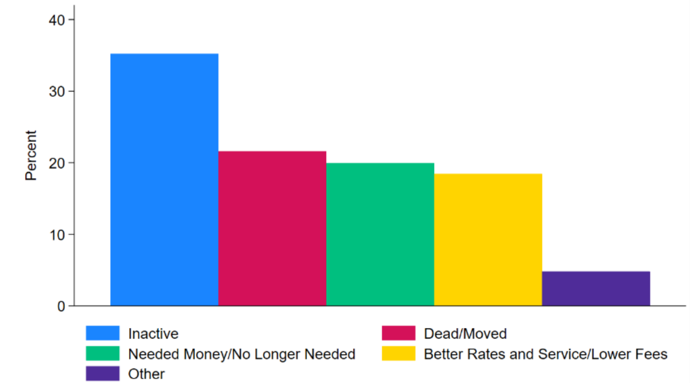


Figure 2

- Banks record closure reasons for about 75% of closures
- Most reasons are idiosyncratic

Outline

Model overview

Dynamic deposit market with **active vs. inactive** depositors.

- Each period depositors are either awake (active) or asleep (inactive).
- Active depositors choose a bank via discrete choice; inactive depositors keep last period's bank.
- Banks set deposit rates/spreads dynamically to maximize franchise value.
- Sleepiness generates **invest vs. harvest** incentives:
  - Harvest: inertia lowers elasticity $\Rightarrow$ lower offered rates (higher spreads).
  - Invest: capturing a depositor today raises future deposits (if they become inactive).

Depositor utility and demand among active

Active depositor i choosing bank j in market k at time t:

$$u_{ijkt} = \alpha\rho_{jkt} + \delta_{jkt} + \varepsilon_{ijkt}, \qquad \rho_{jkt} := R_t^F - r_{jkt}, \quad \alpha < 0.$$

With Type-I extreme value ε_{ijkt}, active market share:

$$s_{jkt}^{Active} = \frac{\exp(\alpha\rho_{jkt} + \delta_{jkt})}{\sum_{\ell \in J_k} \exp(\alpha\rho_{\ell kt} + \delta_{\ell kt})}. \tag{3}$$

Sleepiness (inactivity) process

- Depositor activity status: $D_{it} = 1$ if active, 0 if inactive.
- Activity given by:

$$D_{it}^* = S'_{k(i)t}\Gamma + X'_{it}\Theta + \eta_{it}, \qquad D_{it} = 1(D_{it}^* > 0). \tag{2}$$

- $S'_{k(i)t}$: federal funds rate, X'_{it} :
- Market-level inactivity share:

$$\phi_{kt} = 1 - \mathbb{E}[D_{it} \mid S_{kt}].$$

- Interpretation: reduced-form inattention / switching frictions; empirically ϕ_{kt} varies with rates and demographics.

Total deposits: active + inactive components

Total deposits held by bank j in market k at time t:

$$Dep_{jkt} = \underbrace{(1-\phi_{kt})M_{kt}s_{jkt}^{Active}}_{\text{Active depositor demand}} + \underbrace{\phi_{kt}(1+r_{jk,t-1})Dep_{jk,t-1}}_{\text{Inactive depositor demand}}. \tag{4}$$

- Active flow: $(1-\phi_{kt})M_{kt}s_{jkt}^{Active}$.
- Inactive stock: last period deposits roll over and earn interest.

Banks: flow profits and franchise value

Banks invest deposits at bank-level return R_{jt} and pay deposit rate r_{jkt} and marginal servicing cost c_{jkt}.

$$\pi_{jt} = \sum_{k \in K} Dep_{jkt} \Big((R_{jt} - R_t^F) + \rho_{jkt} - c_{jkt} \Big)$$

Franchise value:

$$V_{jt} = \mathbb{E}\Big[\sum_{s=t}^{\infty} \beta^{s-t} \pi_{js} \Big].$$

Equilibrium: stationary Markov perfect equilibrium in pure strategies (BBL approach).

Equilibrium: dynamic rate-setting game (BBL)

State S_{kt}: exogenous public (Ω_{kt}: fed funds rate, δ_{jkt}), endogenous public (W_{kt}: market shares), private (χ_{kt}: iid cost shocks).

Bank j's strategy: $\sigma_j : \mathsf{S}_{kt} \times \chi_{jkt} \to \rho_{jkt}$. Franchise value satisfies:

$$V(\mathsf{S}_{kt}, \boldsymbol{\sigma}) = \mathbb{E}_{\chi_{jt}, R_{jt}}\Big[Dep(\mathsf{S}_{kt}, \boldsymbol{\sigma})\big(R_{jt} - R_t^F + \sigma_j(\mathsf{S}_{kt}, \chi_{jt}) - c(\mathsf{S}_{kt}, \chi_{jt})\big) \Bigm| \mathsf{S}_{kt}\Big]$$

$$+ \beta\, \mathbb{E}_{\mathsf{S}_{kt+1}, \boldsymbol{\chi}_{t+1}}\Big[V(\mathsf{S}_{kt+1}, \boldsymbol{\sigma}) \Bigm| \boldsymbol{\sigma}, \mathsf{S}_{kt}\Big]. \tag{5}$$

Equilibrium: each bank prefers its strategy to any alternative Markov strategy,

$$V(\mathsf{S}, \boldsymbol{\sigma}) \geq V(\mathsf{S}, \sigma_j', \boldsymbol{\sigma}_{-j}) \quad \forall\, \mathsf{S},\ \forall\, \sigma_j',\ \forall\, j.$$

Dynamic vs. static pricing: invest–harvest decomposition

Differentiating the Bellman (simplified: constant R_t^F, constant qualities) yields:

$$\underbrace{p_j - c}_{\text{markup}} = \underbrace{\frac{-1}{\alpha(1 - s_j^{Active})}}_{\text{static pricing}} + \underbrace{\frac{\phi}{1-\phi} \frac{s_{j,-}}{s_j^{Active}} \frac{-1}{\alpha(1 - s_j^{Active})}}_{\text{harvesting incentive}} + \underbrace{\beta \nabla V_j(\mathrm{s} \mid \boldsymbol{\delta}, \mathrm{c}) \cdot \mathrm{d}_j}_{\text{investing incentive}}, \tag{6}$$

where d_j is the vector of diversion ratios from bank j.

- **Harvesting (↑ markups):** captive sleepy base lowers residual demand elasticity; strength increasing in ϕ and lagged share $s_{j,-}$.
- **Investing (↓ markups):** winning a depositor today yields future rents if they stay asleep; strength depends on β, ∇V, and diversion ratios.
- Two channels push in **opposite directions** $\Rightarrow$ net effect is an empirical question.

Outline

Estimation: three steps

1. **Sleepiness** ϕ_{kt}: combine account openings/turnover microdata and deposit autocorrelation in SoD using a control function.
2. **Demand** (active depositors): compute active market shares using ϕ_{kt}, estimate (α, δ_{jkt}) via Berry (1994).
3. **Costs / supply** (dynamic game): estimate reduced-form spread policy functions; recover cost parameters via BBL (Bajari et al. 2007) using the condition that observed policies maximize franchise value.

Step 1: identifying sleepiness from account openings

Under the model, new accounts identify active demand:

$$NewDep_{\ell jkt} = (1 - \phi(S_{kt}, X_{\ell kt})) M_{\ell kt} s_{jkt}^{Active} (1 - s_{jk,t-1}).$$

Rearrangement yields a moment linking turnover to sleepiness:

$$1 - \frac{NewDep_{\ell jkt}}{Dep_{\ell jkt}} \frac{1}{1 - s_{jk,t-1}} = \phi(S_{kt}, X_{\ell kt}) \frac{Dep_{\ell jk,t-1}}{Dep_{\ell jkt}} + e_{\ell jkt}. \tag{8}$$

Key finding: $\approx 94\%$ of depositors are inactive each year; sleepiness falls when the lagged fed funds rate is higher (people "wake up" when returns to shopping rise).

Sleepiness vs. persistence

Step 1: autocorrelation and control function

Autocorrelation in deposits confounds sleepiness with persistent quality.

- Control function: regress spreads on cost shifters (salaries, fixed expenses) to recover latent demand:

$$\rho_{jkt} = \lambda Z_{jt} + v_{jkt}.$$

- Second stage: regress deposits on lagged deposits and the control:

$$Dep_{jkt} = (\Upsilon_1' S_{kt} + \Upsilon_2' X_{kt})(1 + R_{t-1}^F - \rho_{jk,t-1}) Dep_{jk,t-1} + H(v_{jkt}) + \iota_{jkt}.$$

Identifying assumptions

Table 3: Sleepiness Estimates

	Microdata only		SoD only		Combined	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Upsilon_{1,\text{cons}}$	0.868***	0.877***	0.977***	0.979***	0.904***	0.945***
	(0.008)	(0.010)	(0.001)	(0.002)	(0.007)	(0.006)
Υ_{1,R_t^F}		-0.416*		-0.105***		-0.355**
		(0.249)		(0.041)		(0.169)
$\Upsilon_{2,\text{over 65}}$		0.0526***				0.017***
		(0.005)				(0.005)
$\Upsilon_{2,\text{over \$50k}}$		-0.094***				-0.130***
		(0.006)				(0.007)
$\Upsilon_{2,\text{internet banking}}$		0.036***				0.002
		(0.007)				(0.007)
Observations	8,878	8,878	341,395	341,395	350,273	350,273
Within R-squared	0.966	0.966	0.963	0.963	0.962	0.966
Bank FE			X	X	X	X
County-Year FE			X	X	X	X

Step 2: demand among active depositors (new)

- Compute active deposits using $\hat{\phi}_{kt}$:

$$Dep_{jkt}^{Active} := \max\left\{0,\ Dep_{jkt} - \hat{\boldsymbol{\Upsilon}}'\begin{pmatrix} S_{kt} \\ \tilde{X}_{kt} \end{pmatrix}(1 + R_{t-1}^F - \rho_{jk,t-1})Dep_{jk,t-1}\right\}.$$

- Use **berry_estimating_1994<empty citation>** to estimate (α, δ) from:

$$\log(s_{jkt}^{Active}) = \alpha\rho_{jkt} + \delta_j + \mu_{kt} + e_{jkt}. \tag{11}$$

- Endogeneity of ρ_{jkt}: use cost shifters Z_{jt} as instruments

Table 4: Demand Estimates

	Total Market (No Inertia)		Active Market	
	OLS	CF	OLS	CF
	(1)	(2)	(3)	(4)
ρ_{jkt}	-3.17***	-290.4***	-16.2***	-388.7***
	(1.14)	(15.3)	(2.05)	(29.3)
Observations	294,809	294,809	294,809	294,809
Rate Elasticity of Demand	0.004	0.392	0.022	0.525
R^2	0.733	0.734	0.625	0.626
Bank fixed effects	✓	✓	✓	✓
County-Year fixed effects	✓	✓	✓	✓

Step 3a: costs, state space, and policy function (BBL)

- Parameterize net marginal costs $(R_{jt} - c(S_{kt}, \chi_{jkt}))$as:

$$c_{jkt} := \omega + \zeta R_t^F + \gamma' Z_{jt} + \chi_{jkt}.$$

  R_t^F included because lending returns may vary with the short rate; also isolates markup variation driven by invest-versus-harvest incentives.

- **State space** S_{kt}: (i) R_t^F, (ii) R_{t-1}^F, (iii) lagged market shares, (iv) cost shifters Z_{kt}, (v) product qualities δ_{kt}, (vi) county demographics, (vii) private cost shocks χ_{jkt}.

Step 3b: state transitions and forward simulation (BBL)

- Recover policy functions
  - $\sigma : S_{kt} \times \chi_{jkt} \rightarrow \rho_{jkt}$: first-order polynomial in all states + sums of competitors' characteristics (costs, lagged shares)
- State transitions:
  - Endogenous states: deterministic transition
  - δ_{jkt}, Z_{jt} remain constant
  - Short term rate from FED's forecast
- Forward simulation:
  - Given policies and state transitions, forward-simulate to obtain value functions.
  - Pick cost parameters that rationalize observed policies
  - Perturb policies and minimize the expected sum of squared violations

Table 6: Marginal Cost Estimates

ζ	0.695
	(0.030)
ω	-0.008
	(0.003)
γ_1	5.139×10^{-6}
	(1.190×10^{-6})
γ_2	0.013
	(0.325)

Outline

Motivation and Questions

Data and Stylized Facts

Model

Estimation Strategy

Counterfactual: eliminating sleepiness

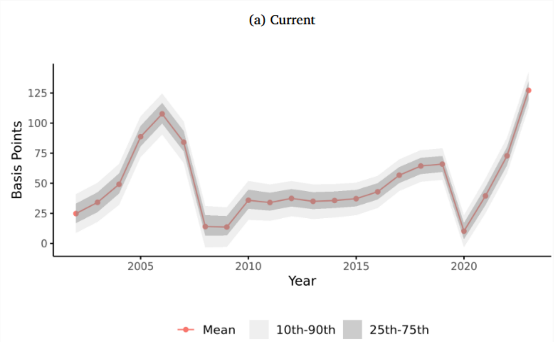
Conclusion

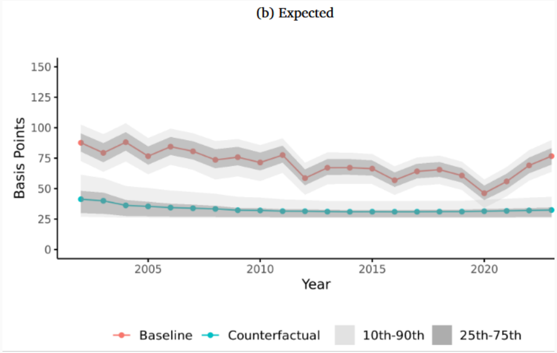
Counterfactual: static competition ($\phi = 0$)

Compare the estimated dynamic model against a counterfactual in which **all depositors are always active** ($\phi = 0$).

- Competition becomes static Bertrand-Nash: no invest-versus-harvest tradeoff.
- Isomorphic to the limiting case of the UK FCA policy requiring full pass-through of short rates into deposit rates.
- Intuition: forcing full pass-through constrains banks to a single constant spread $\Rightarrow$ today's spread choice also determines tomorrow's $\Rightarrow$ dynamic link is shut down.

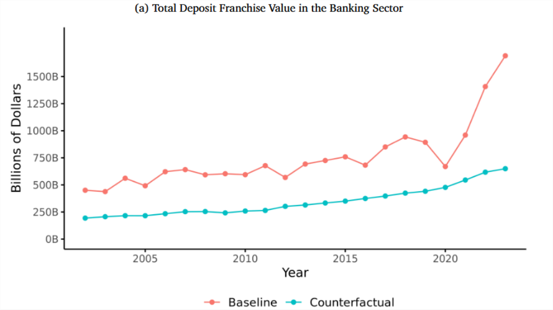
Counterfactual: markups and concentration

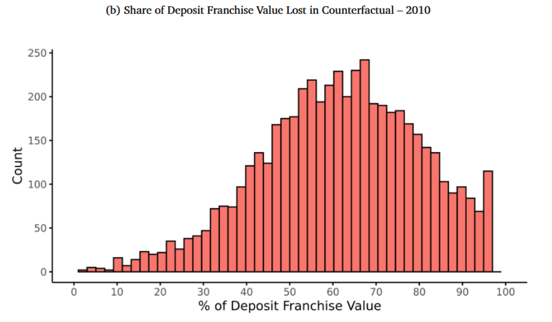




- Dynamic model: average markup $\approx$ 68 bps; static counterfactual: $\approx$ 32 bps (**53% lower**).
- Dynamic competition eliminates the positive concentration–markup (HHI) relationship: banks harvest sleepy bases even in low-HHI markets.

Counterfactual: franchise value decomposition





- Franchise value decreases by ≈ **54%** (≈ $1 trillion if implemented in 2023).
- Heterogeneity: low-quality and high-cost banks lose the most from eliminating sleepiness.
  Heterogeneity
- Financial stability: for JPM, BofA, Wells Fargo, default probabilities rise ≈10 pp in normal times and >**20 pp** during the 2022–23 tightening cycle.

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- Retail depositors are extremely inactive; most switching is not active shopping.
- A dynamic model with sleepiness rationalizes invest-versus-harvest incentives.
- Sleepiness substantially raises average markups and makes them procyclical.
- Dynamic competition changes the mapping from concentration to markups.
- Sleepiness explains a large share of deposit franchise value and matters for stability.

Comments

- There are persisten idiosyncratic tastes
- Banks are multi-product firms; low prices might not only reflect inves-harvest but also cross-subsidization from other products (e.g., credit cards, mortgages)
- Banks use introductory pricing, the invest-harvest tradeoff might not be the most important
  - Price discrimination could be a first order concer
  - Spread increasing on time
- Intensive margin: people do not close account they might stop using them

Sleepiness vs. persistent preferences

Figure 3: Sleepiness versus Unobserved Preference Heterogeneity: Evidence from Market Entry

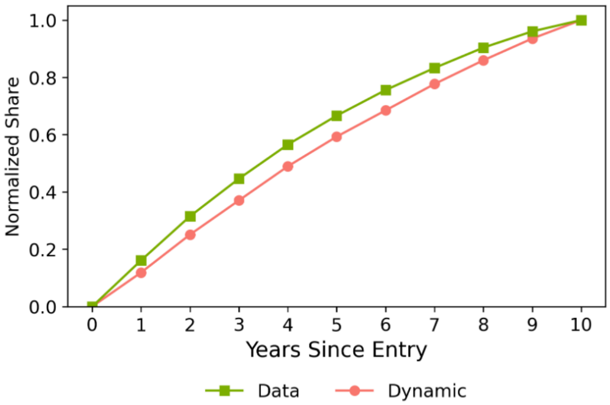

Figure 5

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Comments

- They estimate sleepiness at the group level (ℓ)
- They do not observe the balance in the account, hence they estimate sleepiness from the number of accounts, not from the amount of deposits.
-

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Control function: identifying assumptions

Problem: naive regression of deposits on lagged deposits is biased—banks with persistently high quality δ_{jkt} have both high deposits and high spreads, confounding sleepiness with persistent demand.

Control function approach (eqs. 9–10):

$$\text{First stage:} \quad \rho_{jkt} = \lambda Z_{jt} + \underbrace{v_{jkt}}_{\text{latent demand}} \tag{9}$$

$$\text{Second stage:} \quad Dep_{jkt} = (\Upsilon_1' S_{kt} + \Upsilon_2' X_{kt})(1 + R^F_{t-1} - \rho_{jk,t-1}) Dep_{jk,t-1} + H(v_{jkt}) + \iota_{jkt} \tag{10}$$

Two identifying assumptions:

1. Control function correctly specified: $\mathbb{E}[v_{jkt} \mid Z_{jt}] = 0$. Cost shifters Z_{jt} (salaries, fixed expenses) affect spreads but not demand directly.
2. Latent demand correctly specified: $\mathbb{E}[(1 + R^F_{t-1} - \rho_{jk,t-1}) Dep_{jk,t-1} \cdot \iota_{jkt}] = 0$. After controlling for $H(v_{jkt})$, lagged deposits are uncorrelated with the residual.

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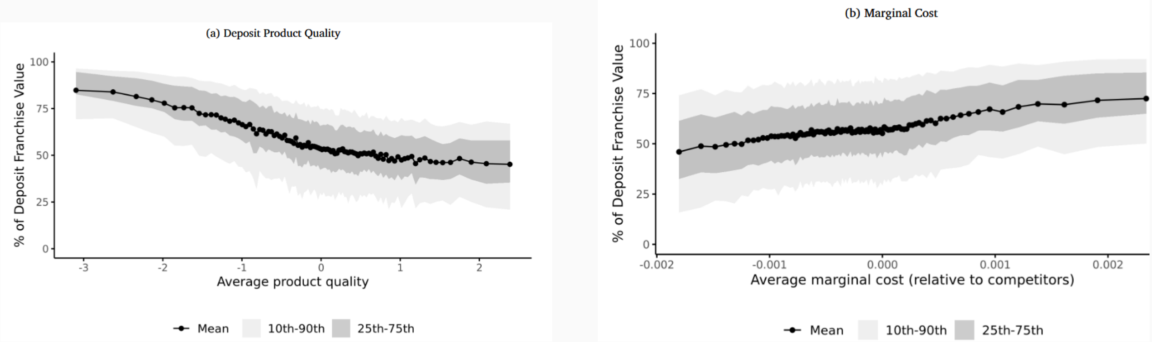
Heterogeneity: who benefits most from sleepiness?



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