Credit Card Banking

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Credit cards are central to consumers

- There are **548 million** credit card accounts in the US in 2023
- They are the main way consumers spend:
  - **$6T** of purchase volume in 2023 (**70%** of retail consumer spending)
- Also main source of **unsecured consumer borrowing**
- 60% of credit card accounts (nearly half of households) are **borrowers**
  - credit card interest rate determines their marginal cost of consumption
  - are the low liquid wealth consumers that have been a focus in macro

Credit card rates are very high

1. Average annual percentage rate (APR) on credit cards in 2023 was **23%**
   - Spread of **18%** over Fed funds rate

2. Credit card spread is much larger than spreads on other loans or bonds:

3. Despite the high rates, consumers borrow a lot on credit cards
   - Total US credit card balances: **$1.1T**
   - 85% of balances are due to borrowers (accounts that are charged interest)

Card lending is important for banks

1. Credit card (CC) lending is only **4.5%** of **banks' balance sheets**
2. But because of their high rates they generate **16.6%** of banks' interest income
3. Main type of "personal lending"
4. Is the riskiest form of lending banks do: **unsecured** consumer lending
5. On average 53% of banks' annual default losses are due to CC lending
   - because CC charge-off rates are almost 10x higher than those on business or residential loans (3.96% vs. 0.46% and 0.43%)
6. Aggregate CC default losses are similar in magnitude to aggregate losses on corporate bonds despite CC lending being much smaller ($1T vs $11T)

Research Questions

1. **Why are credit card interest rates so high?**
   - analyze CC lending as an asset class
   - want to understand the pricing of credit card rates
   - compare its pricing to that of other types of lending.

2. **What are the economics of credit card banking?**
   - investigate all the streams of revenues and costs
   - is there market power in CC banking?
   - helps answer question #1

Why are credit card interest rates so high?

Potential explanations:

1. **Expected credit losses:** interest spreads are compensation for high average default losses

2. **"Rewards" costs:** banks pay consumers large "rewards" (cash, airline miles)

3. **Market power/rents:** banks charge high rates due to market power
   - Imperfect competition (Ausubel 1991)
   - Search/switching costs (Calem and Mester 1995, Stango and Zinman 2016)

4. **Risk premium:** CC default losses carry a high risk price
   - if default risk is undiversifiable and losses are high in bad economic states
   - is the risk premium consistent with risk pricing in other asset markets?

Data

- ***Federal Reserve Y-14M Capital Assessments and Stress Testing data***
  1. Comprehensive loan-level and portfolio data on domestic credit card operations of U.S. banks with $>$ \$100 billion in assets (i.e., included in stress tests)
  2. **20** unique BHCs accounting for $>$ 90% of card lending
  3. Account-level data includes: APR, FICO score, balance, credit limit, purchase volume, promotion status (teaser rate), fees, customer information
  4. Portfolio-level data includes: interest expenses, rewards, interchange income, operating expenses, fraud charges
  5. 330 million observations/month
  6. Sample: 2015m01 to 2023m12

$\Rightarrow$ Most detailed data available on credit card banking that allows us to calculate various components of revenues and expenses at the individual account level

Account-level analysis

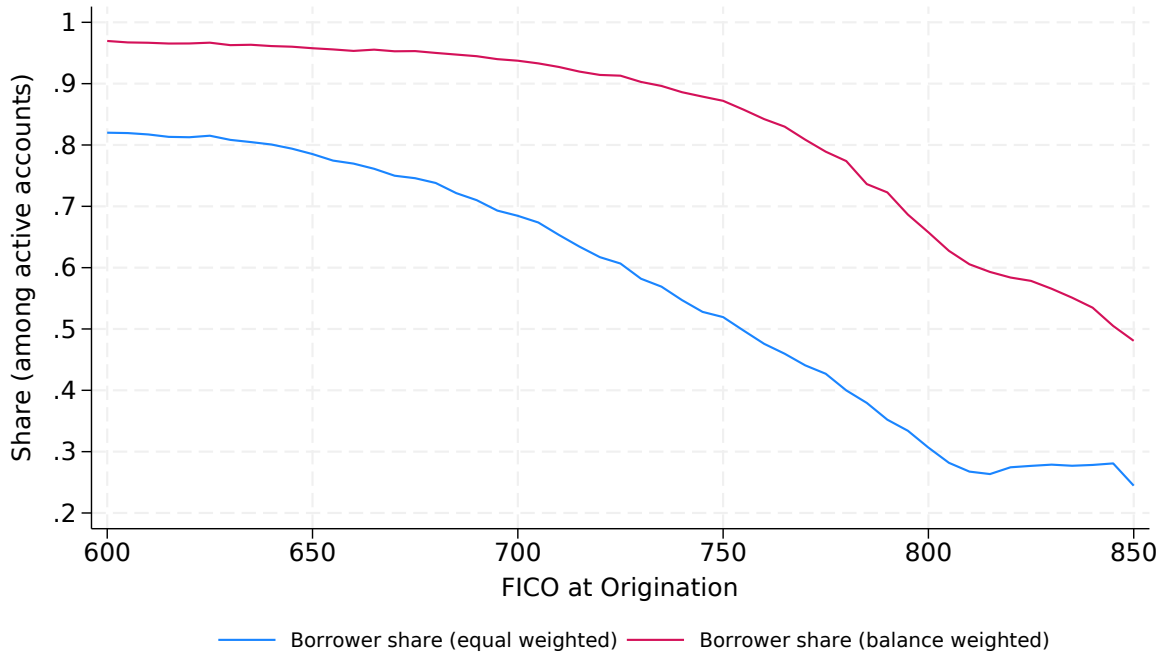
1. We extract account-level information for accounts originated over 2015m1-2017m12 and track their lifetime performance until 2023m12
   - focus on general purpose cards, remove non-rewards and private-label ("store") cards
   - examine all revenue and cost components: interest, charge-offs, interchange, fees, rewards, operating costs

2. In each month, we classify accounts into **borrowers** and **transactors**
   - borrowers: carry balance $\rightarrow$ pay interest (unless under promotion)
   - transactors: pay balance within 21-day "grace period" $\rightarrow$ no interest

3. We further sort the borrower/transactor accounts by their FICO score at origination into portfolios that we follow over time:
   - Sorting on original FICO creates a large spread in default risk
   - APR spread set based on original FICO and is usually fixed over account's life
   - Use portfolios' cash flows to analyze return and risk to CC lending for different credit risks

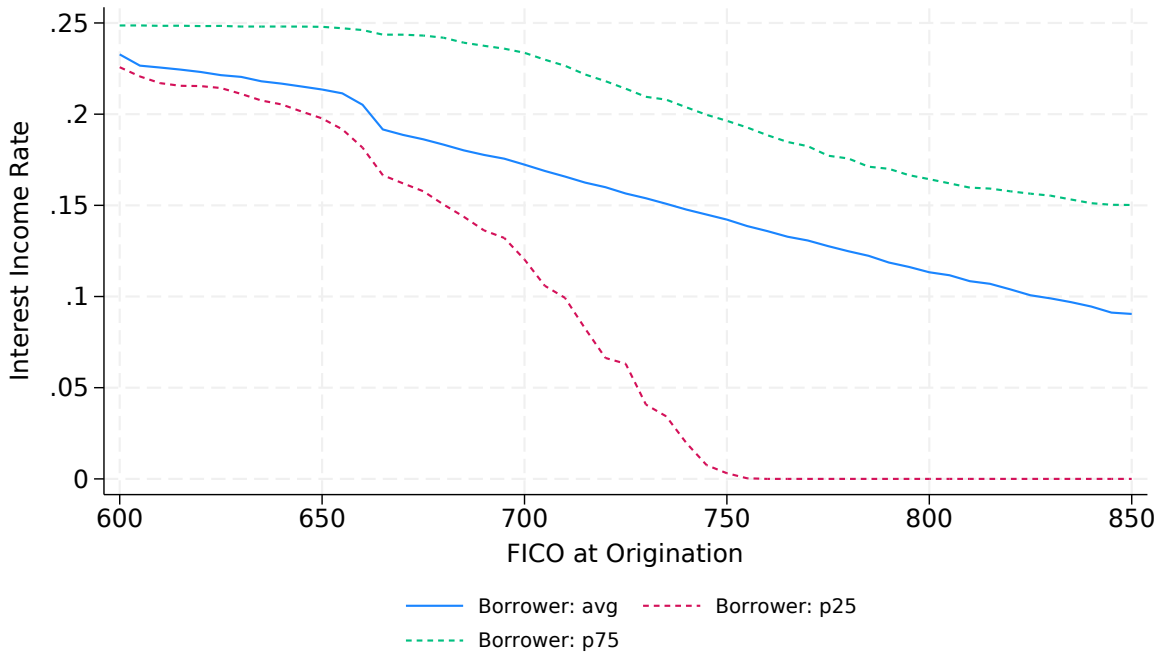
Borrowers and Credit Card Rates

Share of borrowers by original FICO score



- Below 750 FICO the majority of accounts are borrowers (blue line)
- Borrower's share of balances $>$ 50% at all FICOs (red line)
- Borrowers account for more than 85% of balance sheet

Effective interest rate paid by borrowers (2015-17 cohorts)

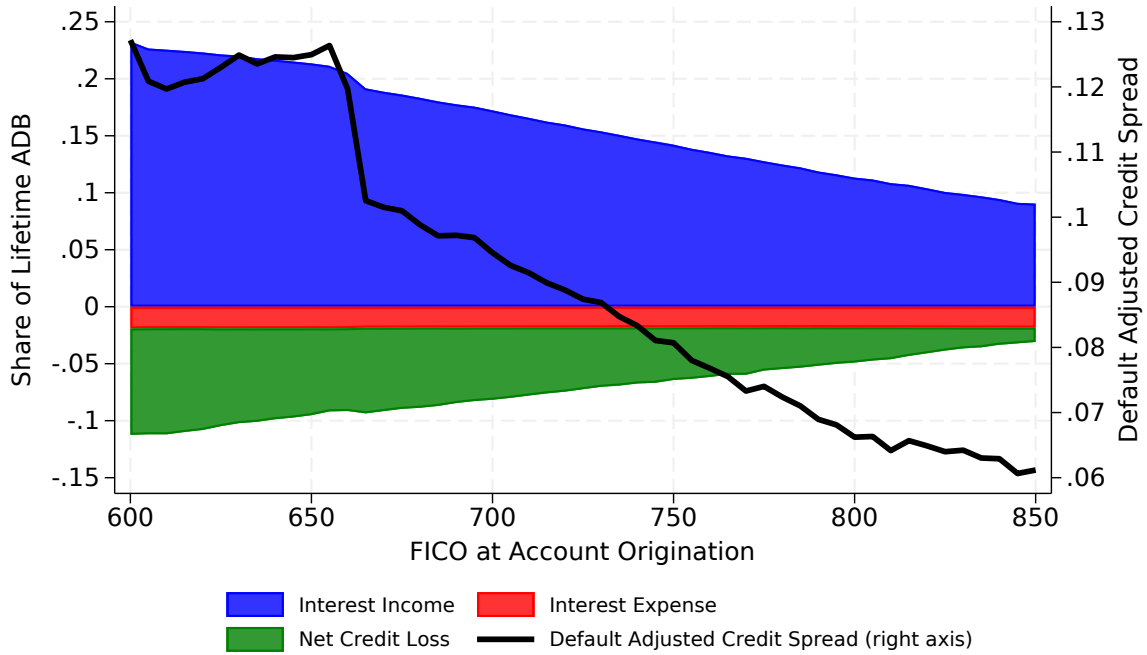


- Average rate is high for all FICO scores
  - even the highest FICO borrowers pay a very high rate/spread
  - *very large* compared to rates on other bonds/loans
- Credit card rate is strongly increasing in credit risk: from 10% for highest FICO to 23% lowest FICO
- 25th percentile $= 0$ for FICO > 750 because some accounts only borrow during 0% interest promotional period

Interest Spread and Defaults

Do credit spreads equal average charge-offs?

1. For each original FICO borrower portfolio, we calculate the average rate of interest income, expense, and net charge-offs as a share of lifetime balances
   - Balance = Average Daily Balance (ADB)



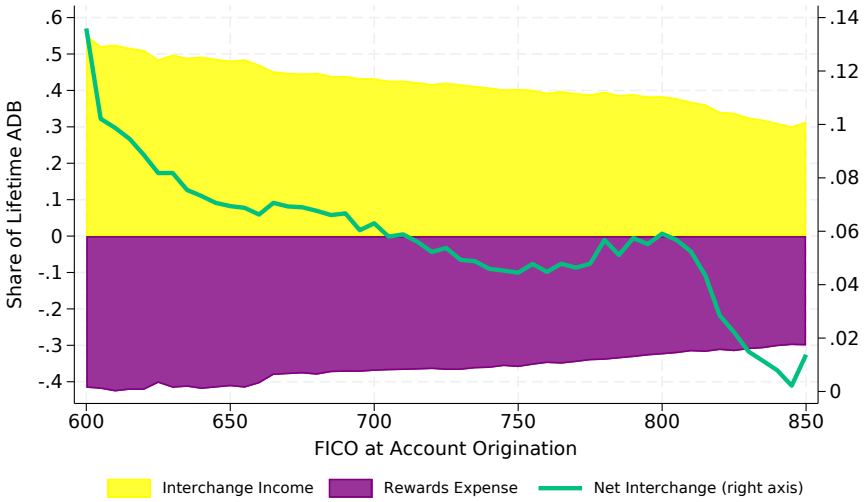
2. Net charge-offs increase substantially for lower original FICO socres
3. But interest spreads increase even more

$\Rightarrow$ Default-adj. credit spread (interest spread - charge-off rate) is strongly *increasing* in default risk: from 6% for highest FICO to 12% for low FICO

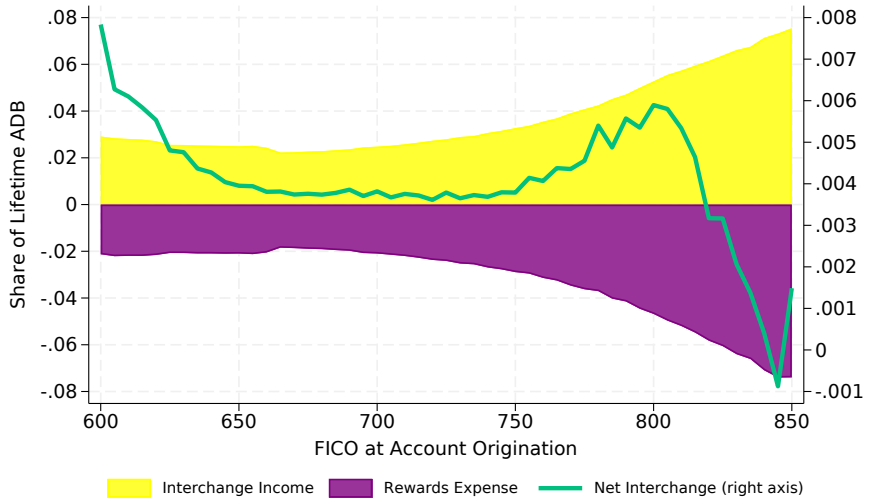
Rewards and Interchange

Interchange and rewards

- On average, interchange is 1.82% and rewards are 1.57% of purchase volume



(a) Transactors



(b) Borrowers

1. Transactors: net interchange income +5% of balances for almost all FICOs
2. Borrowers: interchange and rewards are much smaller relative to balances, but the net interchange is still *positive*

$\Rightarrow$ Rewards are covered by interchange income and not funded by interest income

Purchase Volume Fee Income

Operating Expenses and Market Power

Operating expenses

1. Banking is in large part a retail business, incurs high operating expenses
2. Due to its intensely retail orientation, credit card banking is especially high in operating expenses: 4-5% of balances (Capital One: 8.9%)
   - Much larger than for banking in general, where it is $\approx$ 1.5% of assets
   - Credit card banks spend *a lot* on marketing: 1–2% of assets vs 0.1%
     - Capital One: \$4B American Express: \$5.5B
     - Coca-Cola: \$5B Nike: \$4B

$\Rightarrow$ Suggests significant market power in credit card banking

Operating expenses and profit components

	Interest Spread (1)	Net Charge-off (2)	Gross Margin (3)
Operating Expense	0.622***	0.139	1.127**
	(0.119)	(0.149)	(0.528)
Origination FICO FE	Y	Y	Y
Observations	919	908	908
R^2	0.895	0.734	0.489

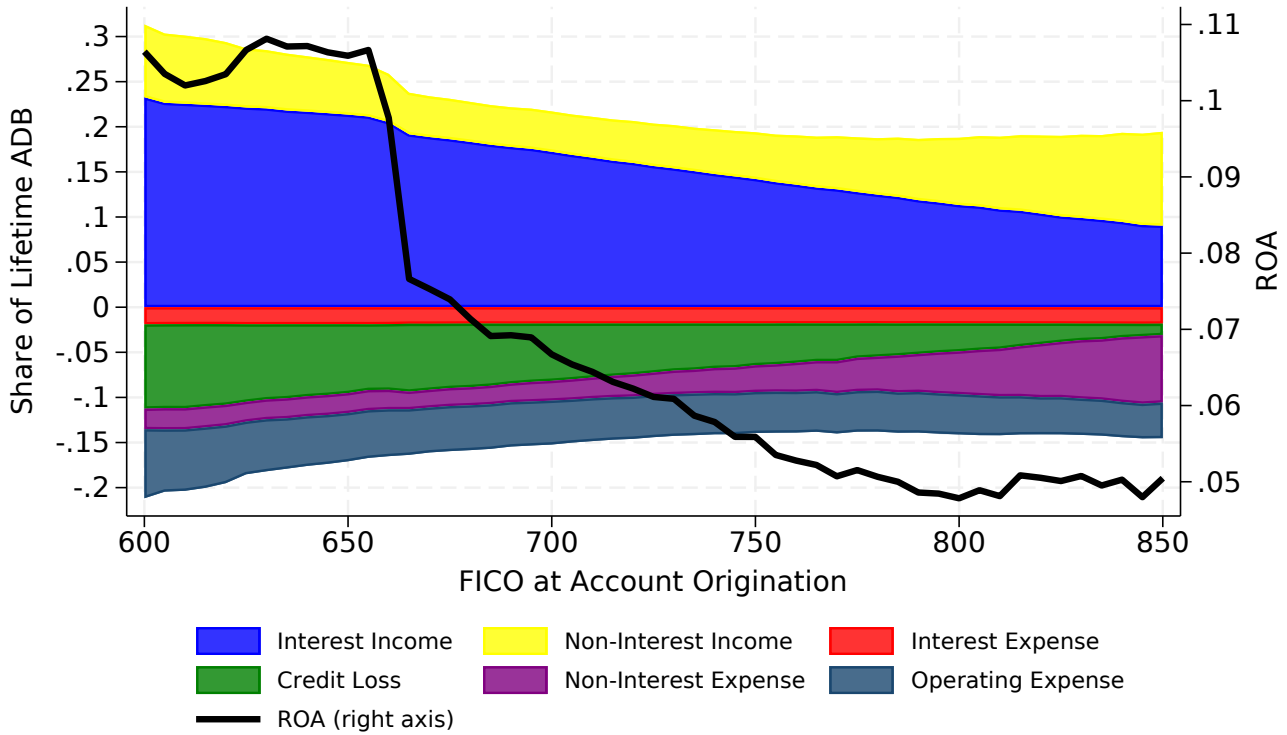
- Bank's operating expenses are strongly related to the interest spreads they charge and gross margins they earns on borrowers at a given FICO score

  $\Rightarrow$ operating expenses incurred to obtain pricing power

- No relationship between operating expenses and default losses

  $\Rightarrow$ higher operating expenses are *not* used for improving screening of borrower creditworthiness

Borrower ROA



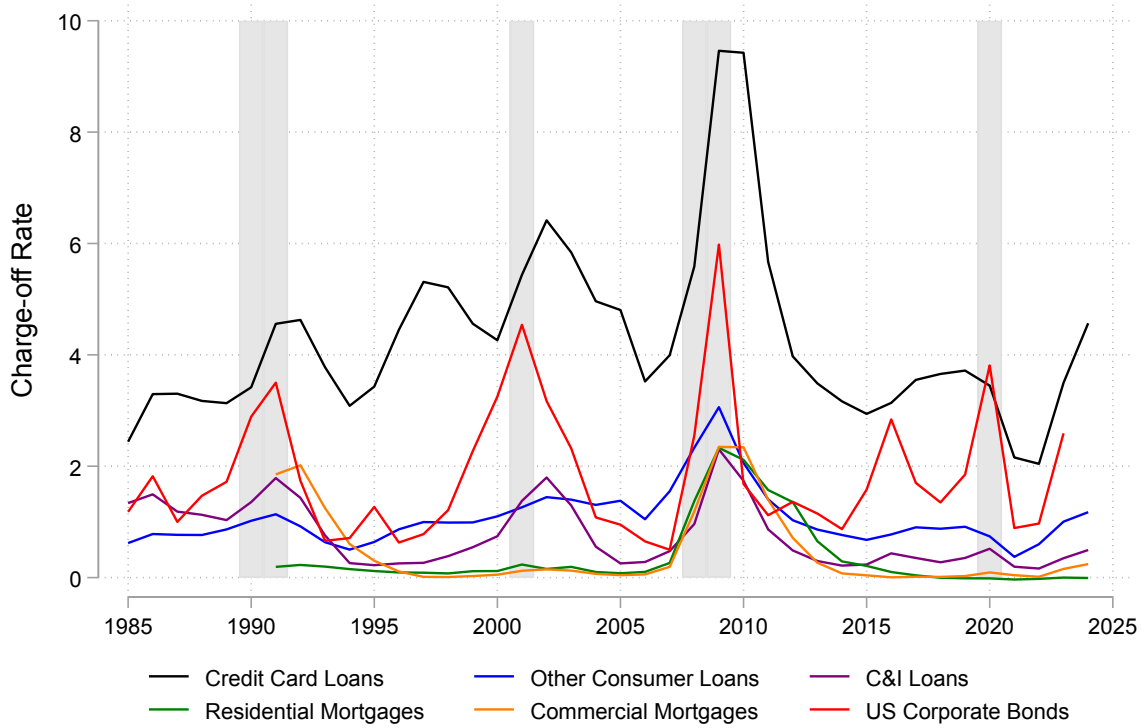
1. ROA increases from 5% (800 FICO) to 8% (660) to 11% (625)

$\Rightarrow$ ROA is high and increasing in default risk $\rightarrow$ suggests default risk premium

2. Consistent with high ROA of CC banks: 3X the average bank's ROA (FDIC Quarterly Report, 2024Q2) ROA CC Banks

Default Risk Premium

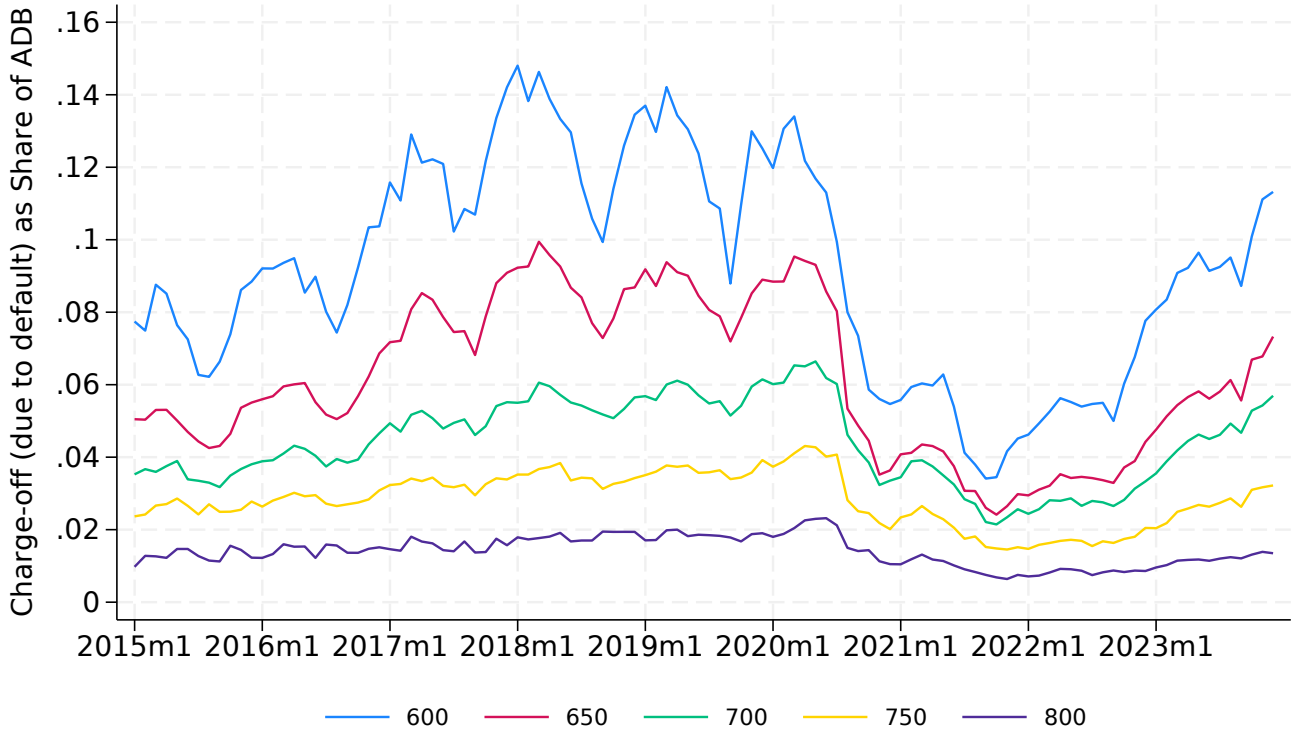
Charge-off rates on types of loans/bonds



1. Credit losses co-move strongly, especially in recessions
   $\Rightarrow$ CC default risk is undiversifiable across loan/bond markets
2. CC lending has the highest and most sensitive charge-off rates

$\Rightarrow$ High ROA of CC lending may be a default risk premium

Credit card charge-off rates across FICO over time



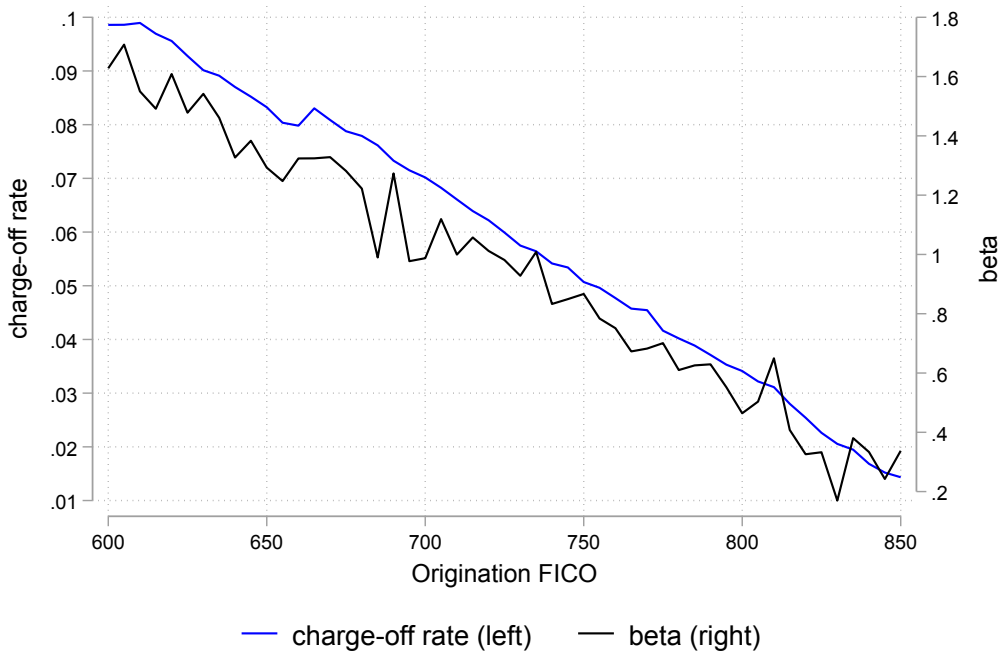
1. Charge-off rates covary strongly across FICO scores
   $\Rightarrow$ charge-off rates load on a common default risk factor in CC market
2. Lower FICO portfolio's charge-off rate is higher and more volatile
   $\Rightarrow$ greater sensitivity to the default risk factor
3. We estimate a one-factor model of default risk & risk premia

Risk exposure by FICO

1. For each FICO portfolio i we estimate:

$$\Delta\text{Charge-off Rate}_{i,t} = \alpha_i + \beta_i \Delta\text{Charge-off Rate}_t + \epsilon_{i,t}$$

2. Charge-off rate$_t$: the charge-off rate on aggregate credit card lending
   - our proxy for the aggregate default risk factor

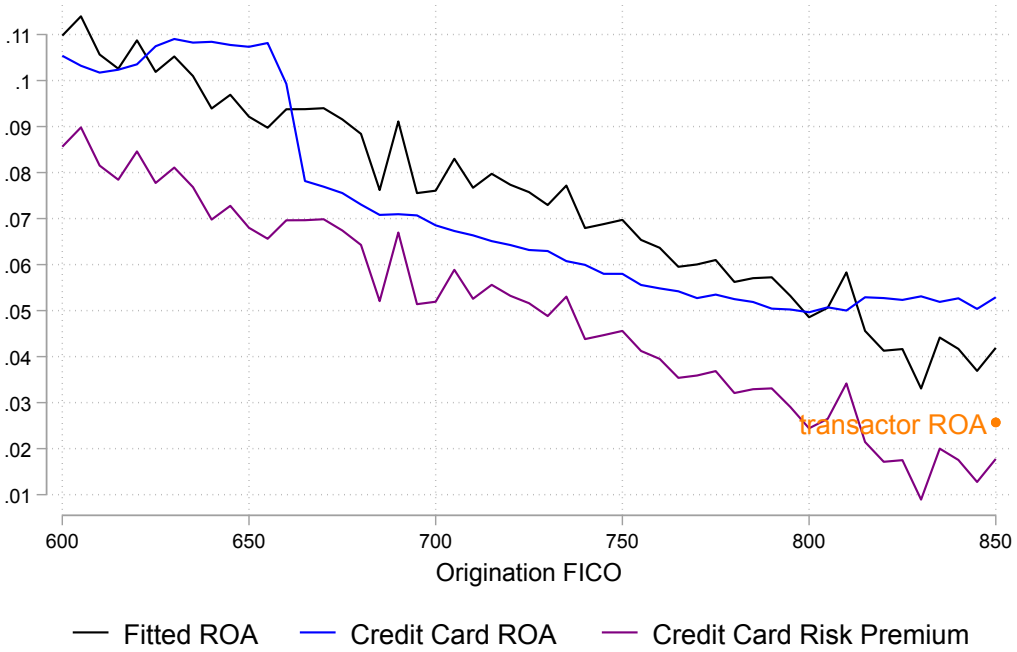


$\Rightarrow$ FICO portfolios' charge-off risk has a strong 1-factor structure

3. Charge-off beta β_i is strongly increasing in portfolio's average charge-off rate

Estimated risk premium

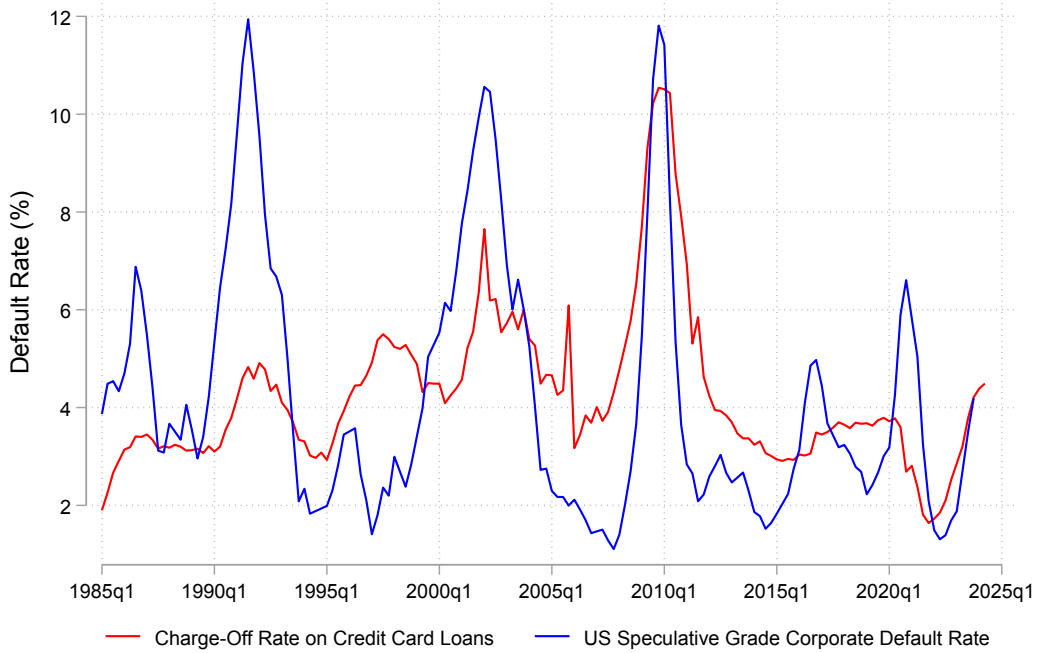
We estimate: $ROA_i = \lambda + \gamma\beta_i + \nu_i$



1. Aggregate Default Risk Premium = Price of default risk $\gamma = 5.3\%$
2. Zero-beta rate $\lambda = 2.41\%$
   - close to ROA of transactor portfolio (no default risk) = 2.57%
3. Banking sector ROA = 1.5% $\rightarrow$ adj. for default risk: 0.97% to 1.24%

$\Rightarrow$ CC lending earns a 1.17% to 1.44% alpha relative to the overall banking sector

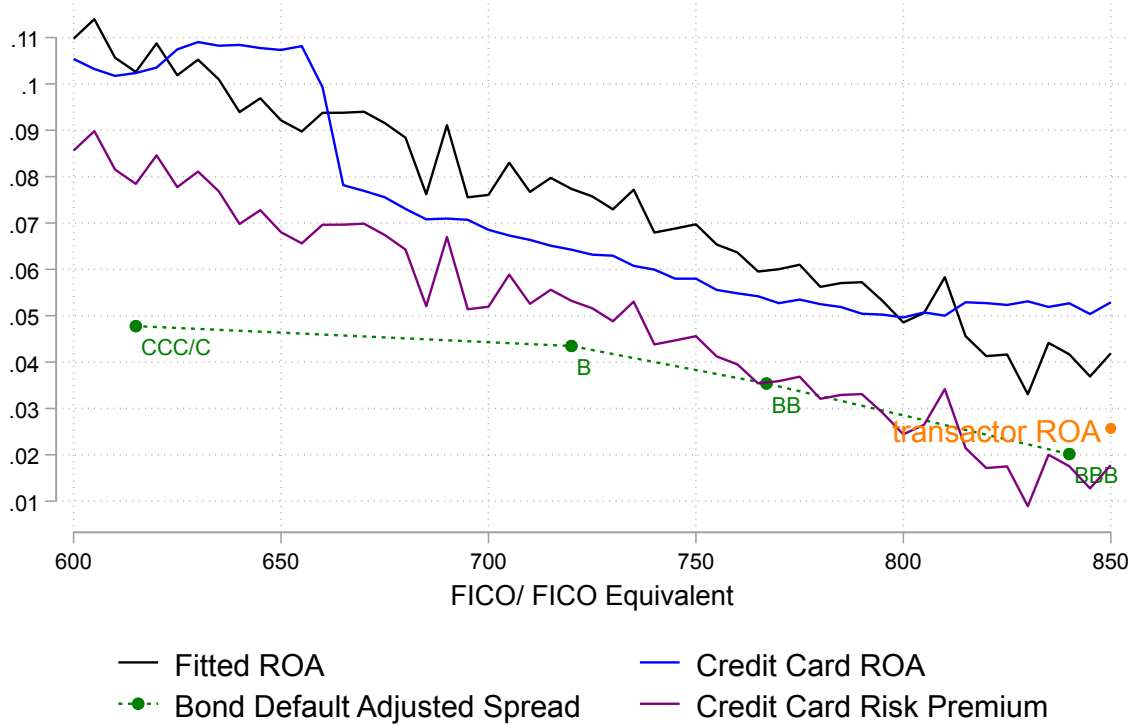
Commonality with corporate bond defaults



1. Speculative-grade bonds' default rates co-move strongly with credit card defaults and are similar in magnitude
   - corporate bond recovery rates (40%) are much higher than credit cards' (15%)
2. Corporate bonds market is very large, sensitive to default cycle

$\Rightarrow$ We compare risk premiums of corporate bonds with credit cards

Comparison to high-yield bonds



1. Map bond ratings to comparable FICO scores
2. BBB to B bonds have similar risk premiums to matching FICO credit card portfolios $\Rightarrow$ price in similar compensation for default risk
3. However, lowest-rated bonds (CCC/C) have $\sim$3% lower risk premium than matching FICO credit card portfolio (620 FICO)

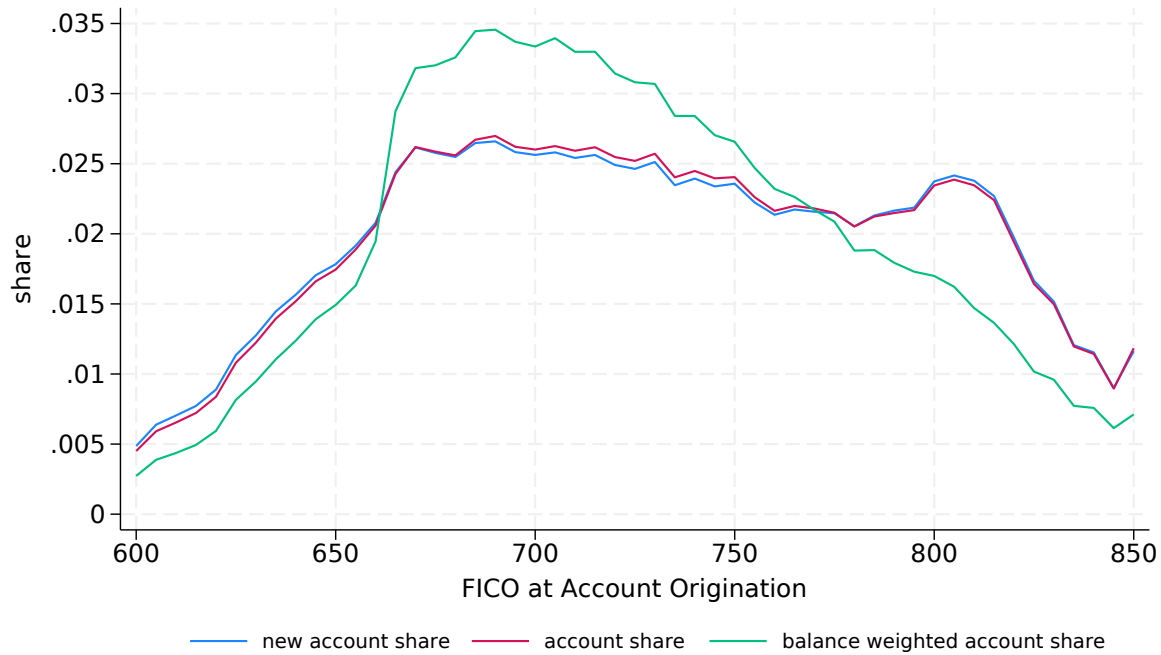
Cap. Req.

Takeaways

1. Credit card interest spreads are far higher than those on other types of loans/bonds
2. There are large cross-sectional differences in FICO portfolio ROAs, which can be explained by a large default risk premium
   - risk premium is similar to that in corporate bonds
3. Interest spreads can be decomposed into: defaults (5.75%) + operating expenses (4.85%) + risk premium (5.26%) + alpha (1.17%)
   - net interchange (+0.4%) and fees (+2.31%) add to interest spreads
4. Card lending's ROA is four times the banking sector average $\rightarrow$ due to default risk premium + alpha

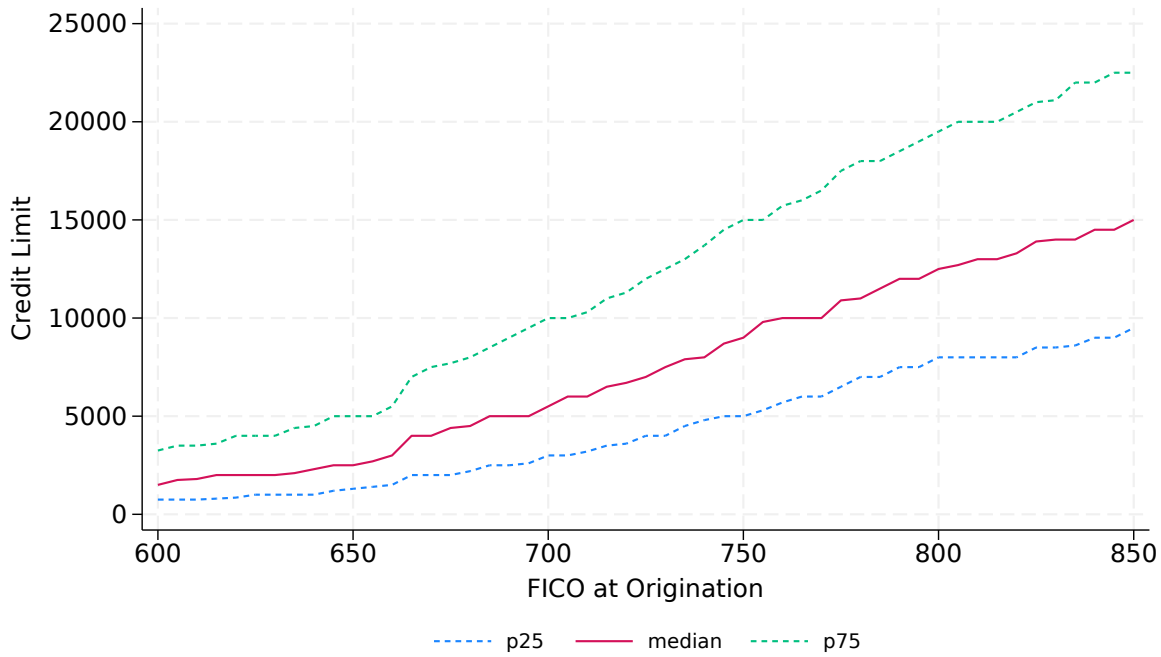
Appendix

Distribution of FICO scores



- FICO score estimates borrower's expected default probability over next 2 years
- New accounts FICOs (blue) are in 600-850, mode is 695, prime is > 660
- Aggregate balances are highest for 660-750 FICOs Back

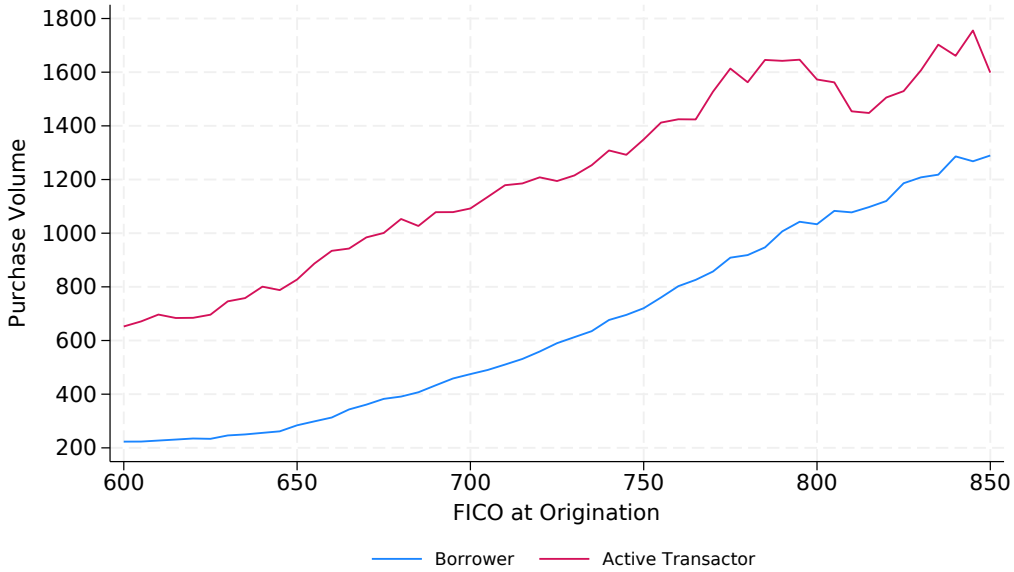
Credit limits



- Banks use credit limits to manage adverse selection
- Credit limit increases strongly with FICO Back

Purchase volume

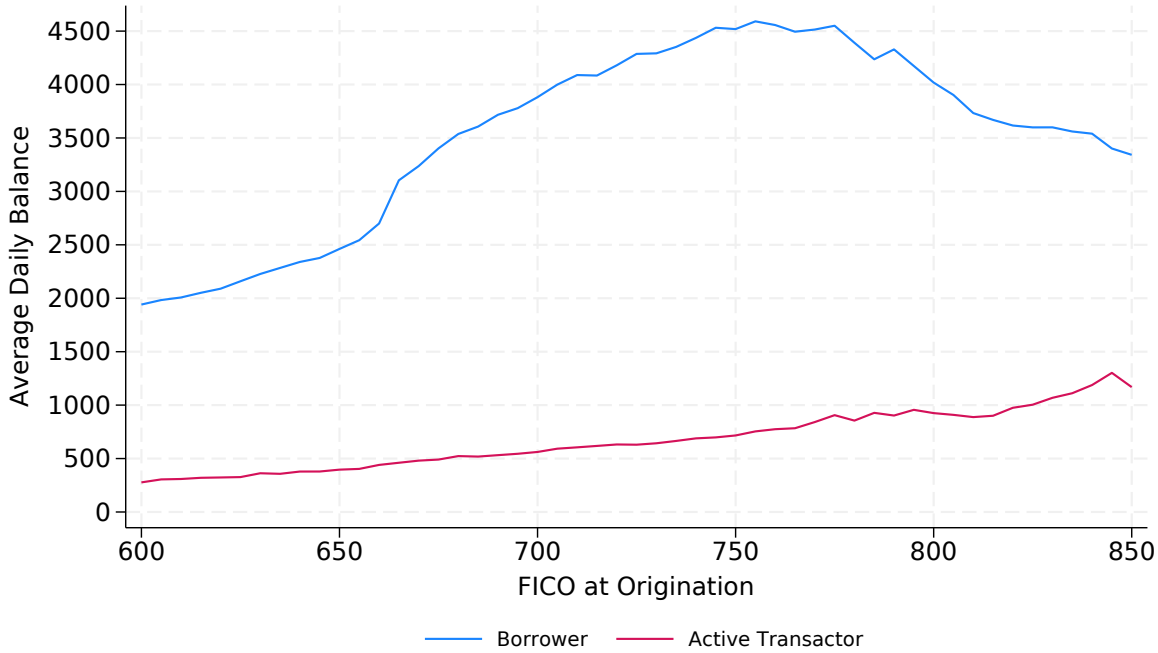
1. Interchange fees are paid to the issuing bank and the credit card network
2. Interchange fees and rewards are a fraction of the *purchase volume* ADB
3. Banks pass through a large share of interchange to cardholders as rewards
   - On average, interchange is 1.82% and rewards are 1.57% of purchase volume



3. Transactors have much higher purchase volumes than borrowers Credit Limits
   - don't accumulate a balance → can do a lot more purchasing
   - interchange and rewards are much more important for transactors

Back

Average balances of borrowers and transactors



- Borrowers' balances are much larger than transactors'
  - Highest average borrowing balance is about $4,500 for 740-770 FICOs
  - Transactors' balance is due to previous month's purchase volume
- Borrowers account for more than 85% of balance sheet Back

FICO score and APR spreads

	APR Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Controls		FICO	FICO, FICO^2				
Cohort FE	Y	Y	Y	Y	Y		
Origination FICO FE				Y	Y		
Bank FE					Y	Y	
Origination FICO $\times$ Cohort FE						Y	Y
Origination FICO $\times$ Bank FE							Y
Observations	30,366	30,366	30,366	30,366	30,366	30,366	30,332
R^2	0.021	0.474	0.505	0.547	0.709	0.722	0.871

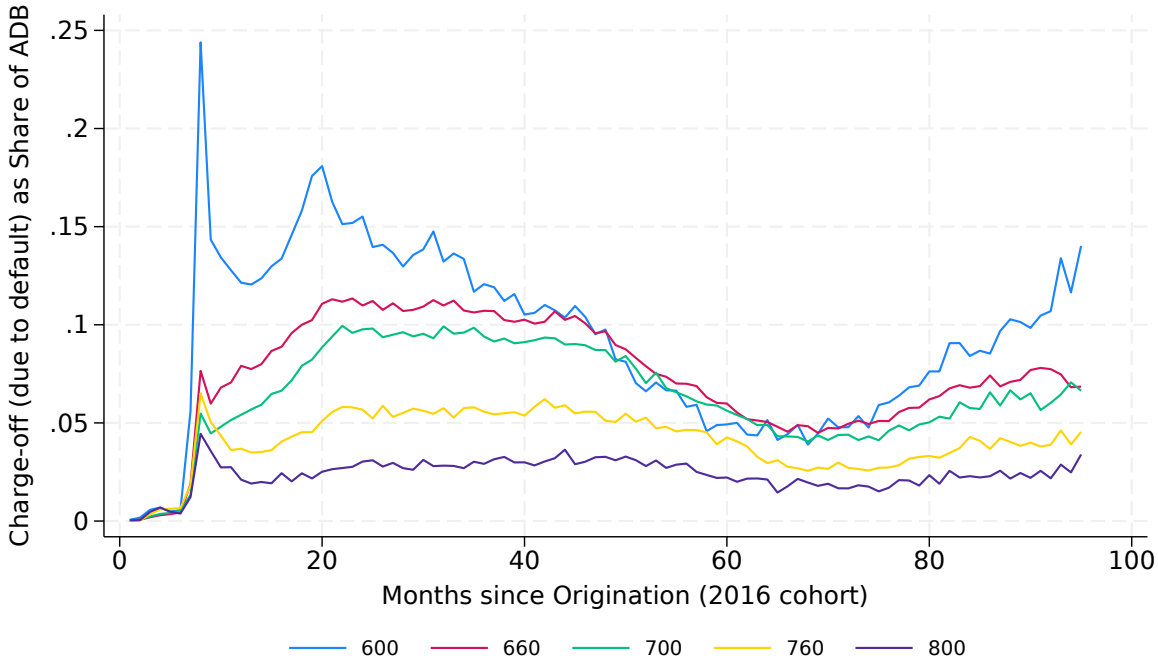
- Account's origination FICO score strongly predicts its APR spread, which is set at origination and usually remains fixed for the account's life.
- This is due to the CARD Act, which prohibits banks from increasing an account's APR spread on outstanding borrowing. Back

FICO score and charge-off rates

	Charge-off Rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Controls		FICO	FICO, $FICO^2$				
Cohort FE	Y	Y	Y	Y	Y		
Origination FICO FE				Y	Y		
Bank FE					Y	Y	
Origination FICO × Cohort FE						Y	Y
Origination FICO × Bank FE							Y
Observations	32,173	32,173	32,173	32,173	32,173	32,173	32,132
R^2	0.007	0.085	0.277	0.311	0.489	0.508	0.728

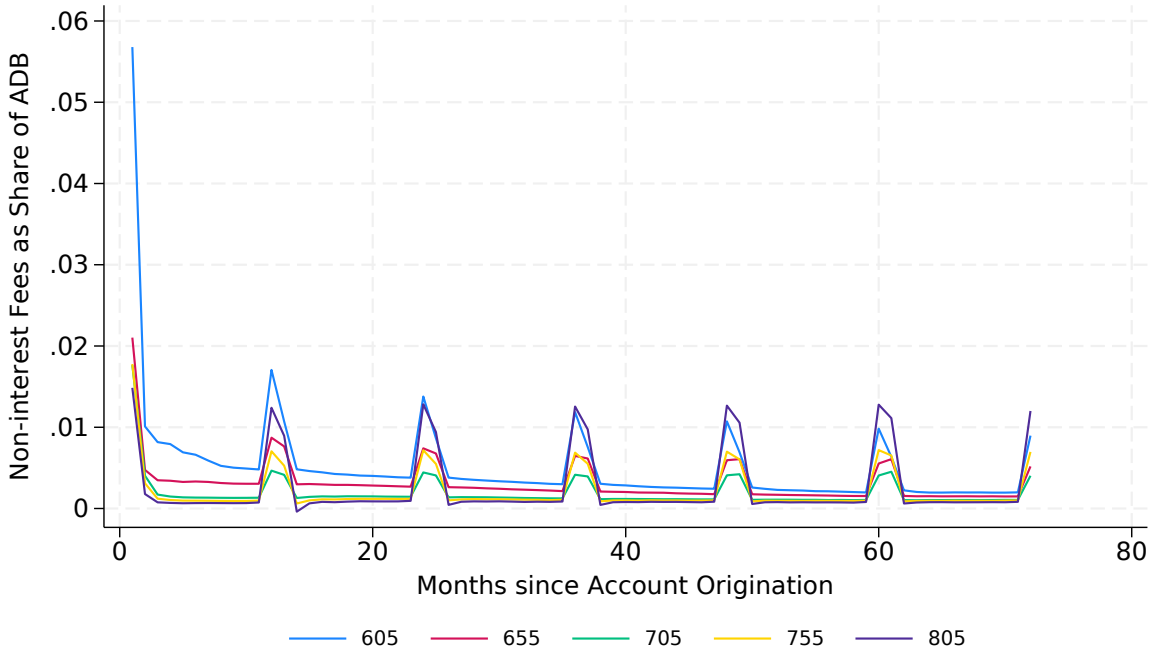
- FICO score has significant predictive power for ex-post default rates Back

Life cycle of charge-offs



- Origination FICO predicts charge-off rates over accounts' life cycle
  - annual charge-offs increase from around 3% (800 fico) to 10% (660 fico) and 15% (600 fico) Back

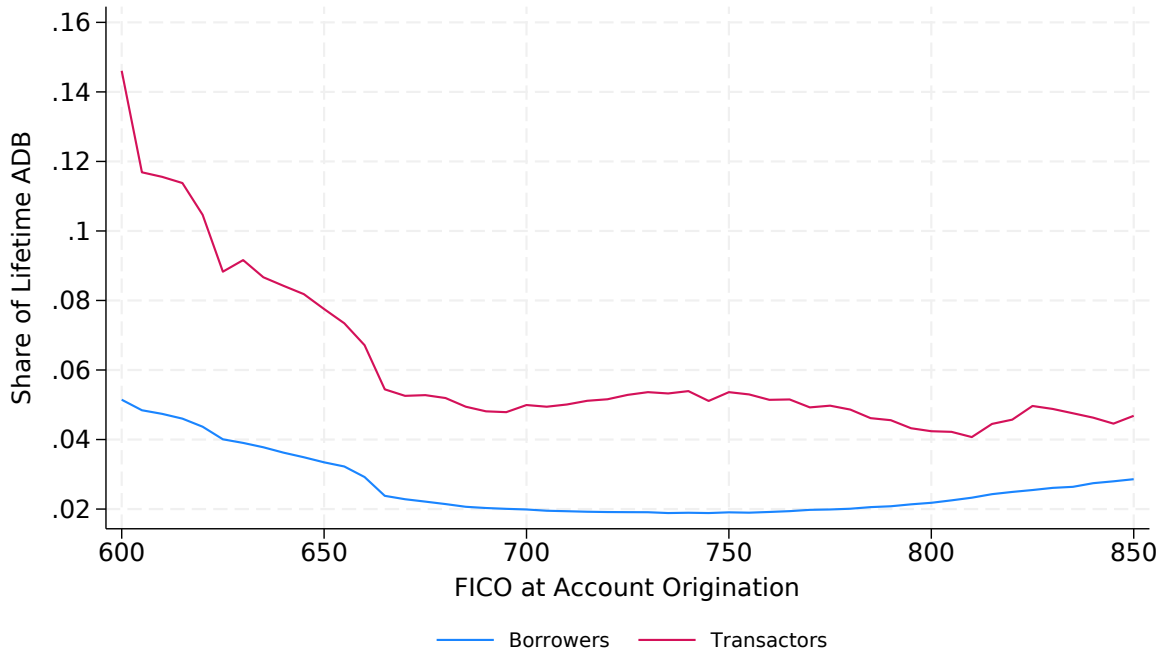
Fee Income over account lifetime



1. Fee income: annual fees, balance transfer fees, and late penalties
   - are seasonal, e.g. annual fees are charged every 12 months
2. Fee income is large, particularly for highest and lowest FICO borrowers
3. Low FICO borrowers pay very high balance transfer fees at the beginning

interchange income

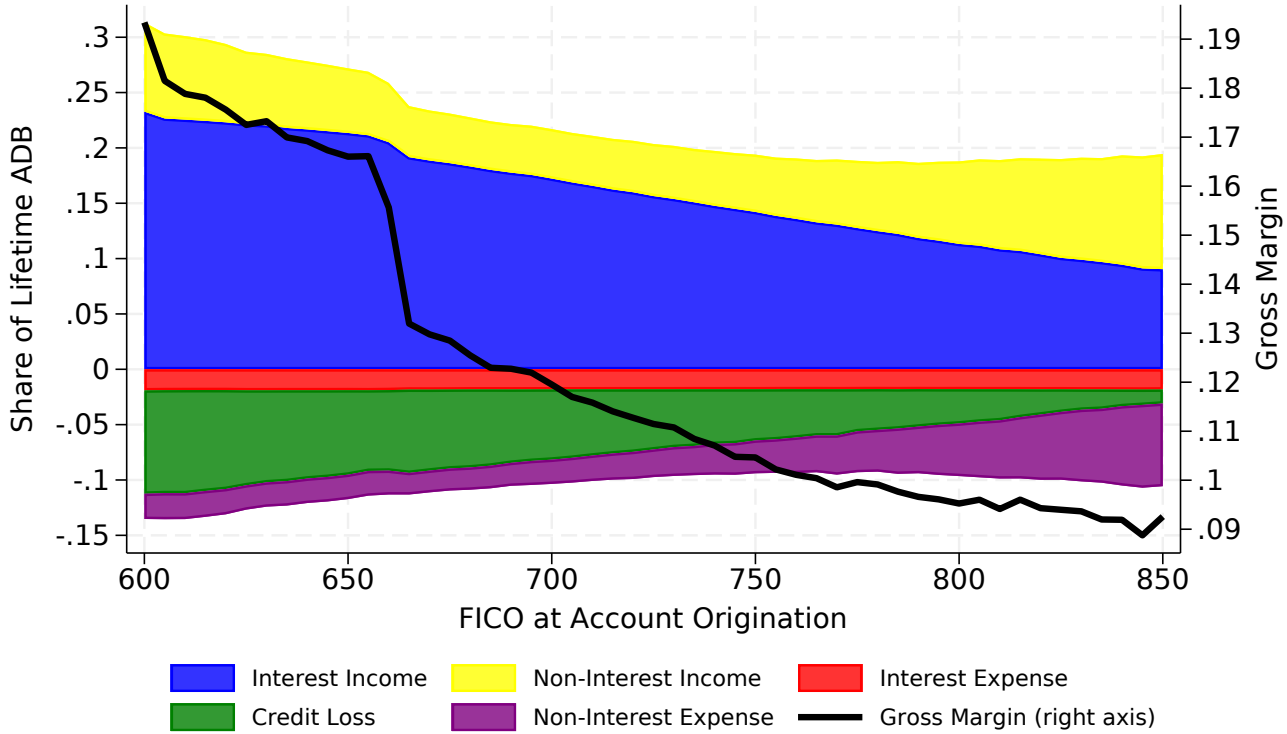
Fee income by origination FICO



- Fee income (as a share of balance) is high for transactors, driven by annual fees and relatively low ADB
- For both transactors and borrowers, fee income is highest for subprime FICO, driven by balance transfer fees and late penalties

interchange income

Gross margin (Borrowers)

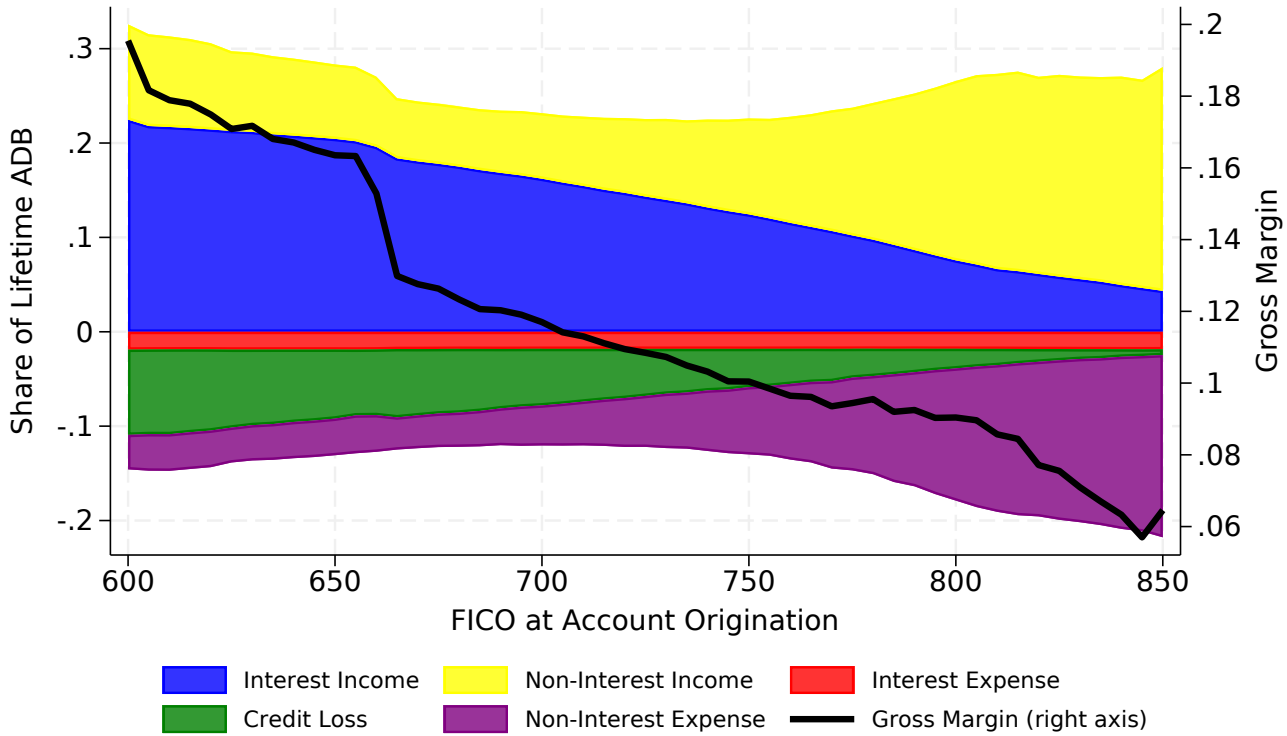


1. Default-adjusted credit spread + net non-interest income
2. Gross lending margin increases from 9.5% (850 FICO) to 13% (660) and 19% (600)

$\Rightarrow$ Gross Margins are very large and increase strongly with accounts' credit risk

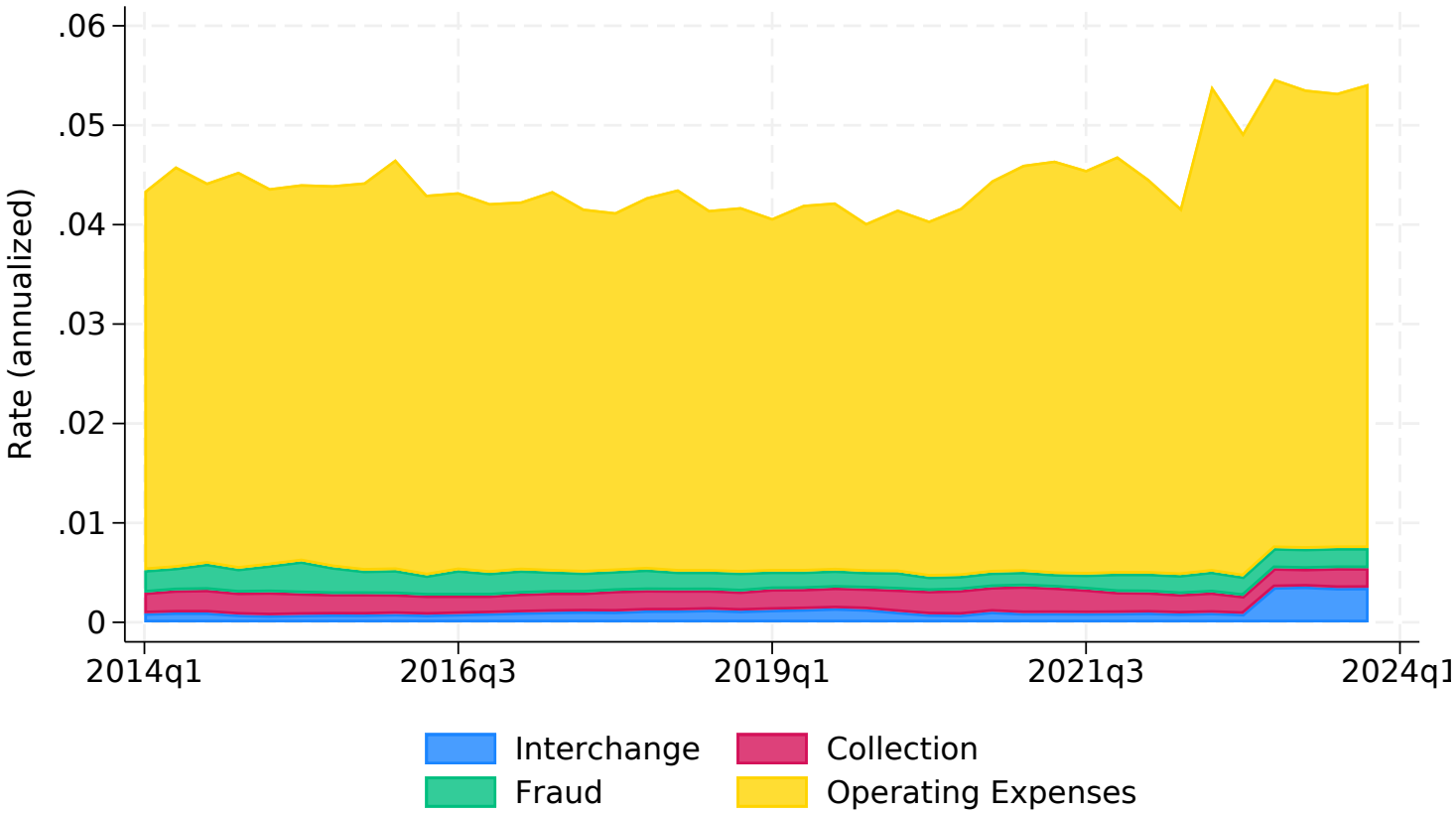
3. Borrowers are paying very high all-in costs net margin borrower
   - Even the safest borrowers pay 10% default-adjusted spread over the short rate

Gross margin (All Accounts)



- Gross lending margin: profits before fixed operating costs = default-adjusted cost of borrowing
- Default-adjusted borrowing costs are uniformly high
- Default-adjusted cost is higher for lower FICOs net margin borrower

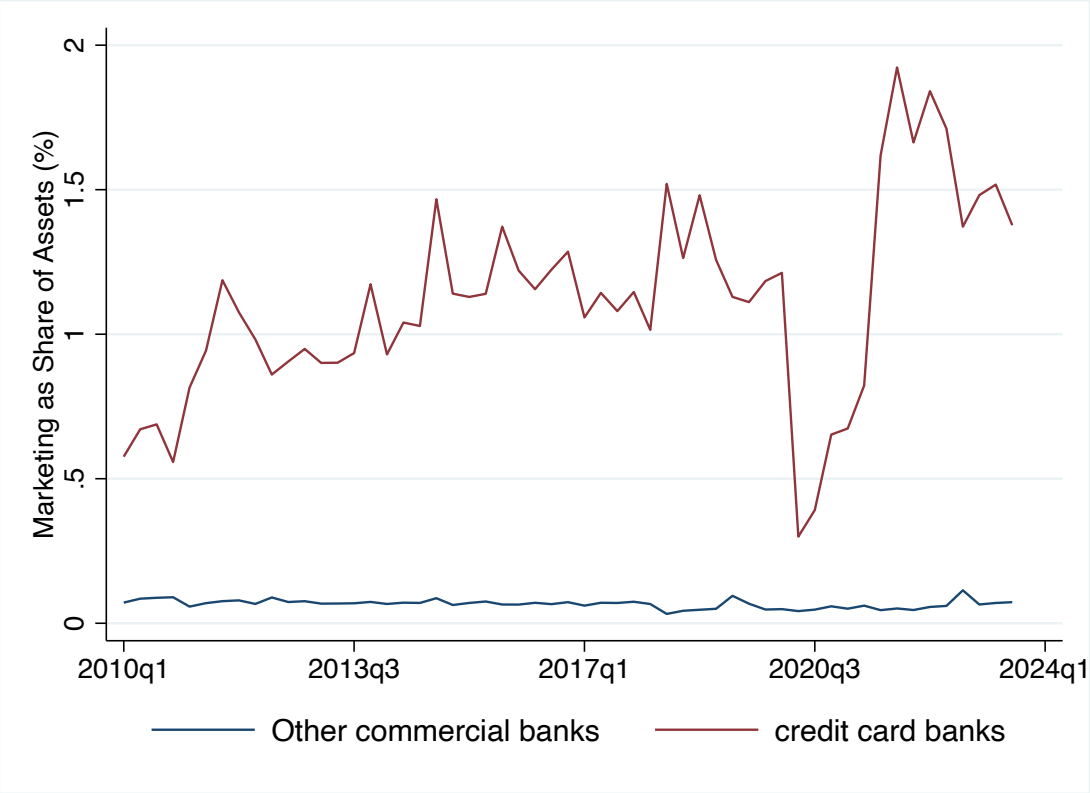
Operating expenses



1. Fed's Y14M data reports operating expenses
2. Operating expenses are 4-5% of balances
   - Much larger than for banking in general, where it is $\approx$ 1.5% of assets
3. Fraud and collection expenses are small

operating expense

Marketing expenses

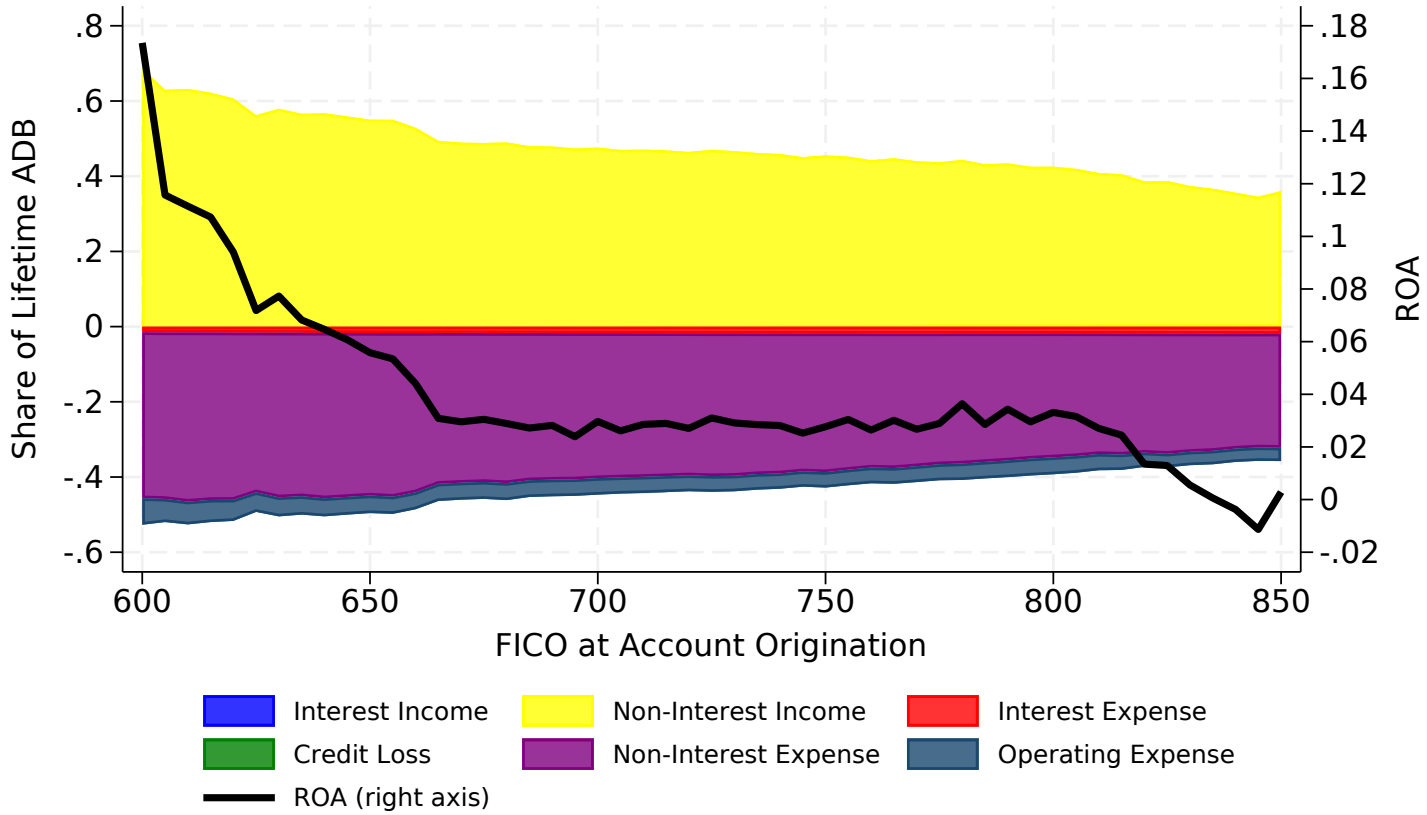


1. Credit card banks spend *a lot* on marketing: 1-2% of assets (call reports)
2. They are some of the largest marketers (2023):
   - Capital One: \$4B American Express: \$5.5B
   - Coca-Cola: \$5B Nike: \$4B

$\Rightarrow$ Suggests significant market power in credit card banking

operating expense

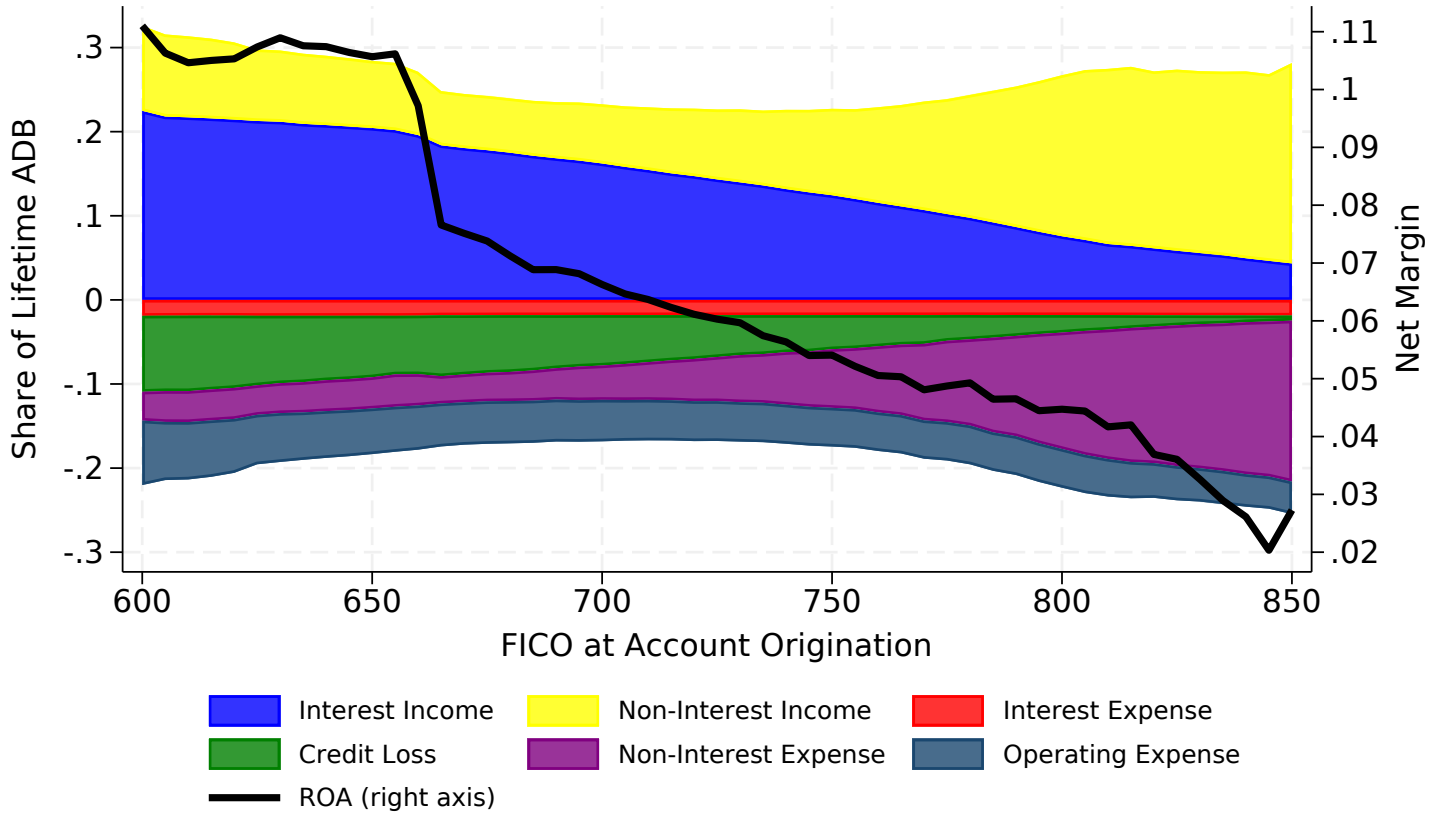
ROA (Transactors)



- Higher for low FICO transactors due to transfer and late fees
- Transactor profits are flat at around 3.5% from 680<FICO<820

net margin borrowers

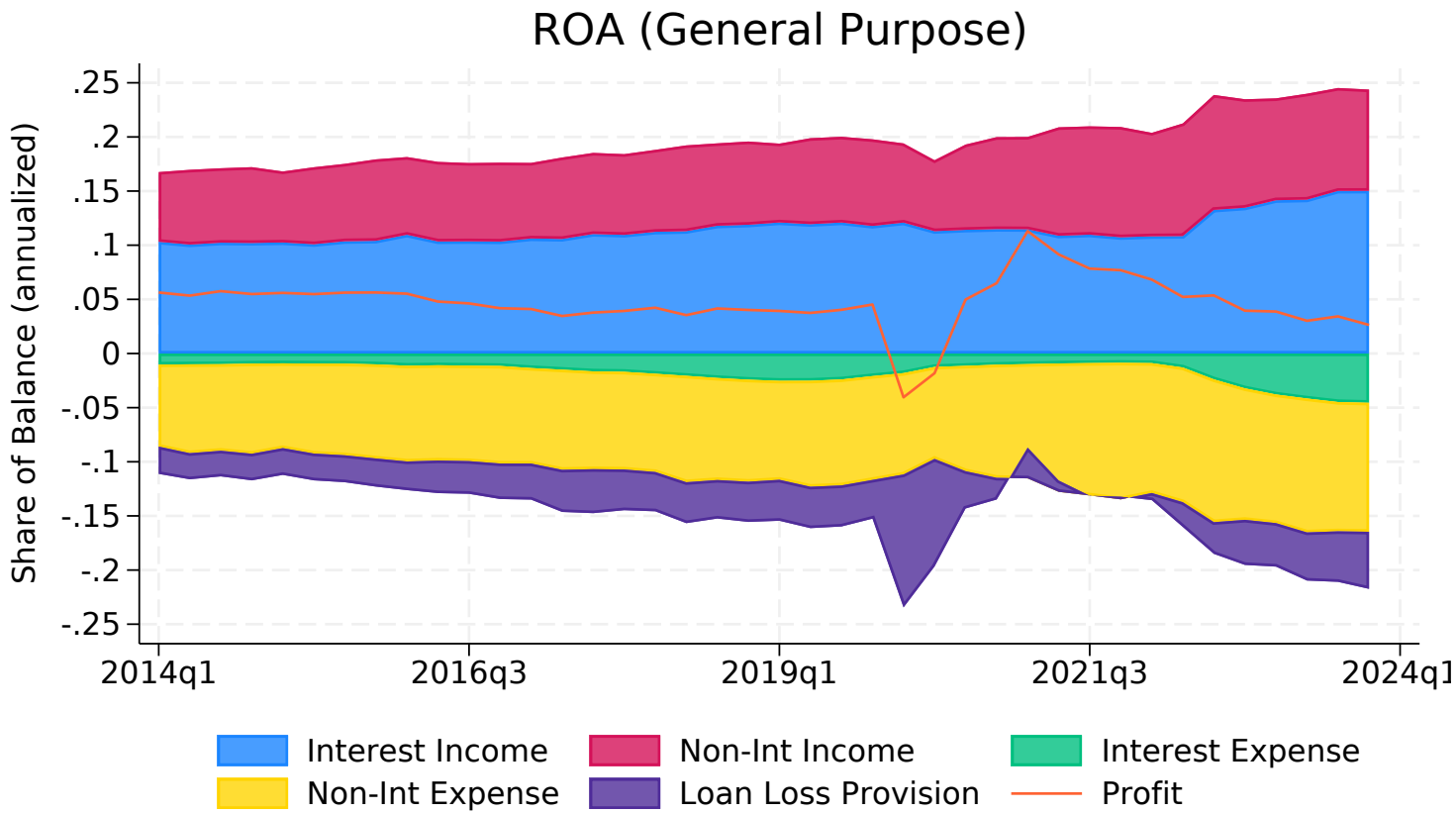
ROA (All accounts)



- Average credit card ROA is 6.24%

net margin borrowers

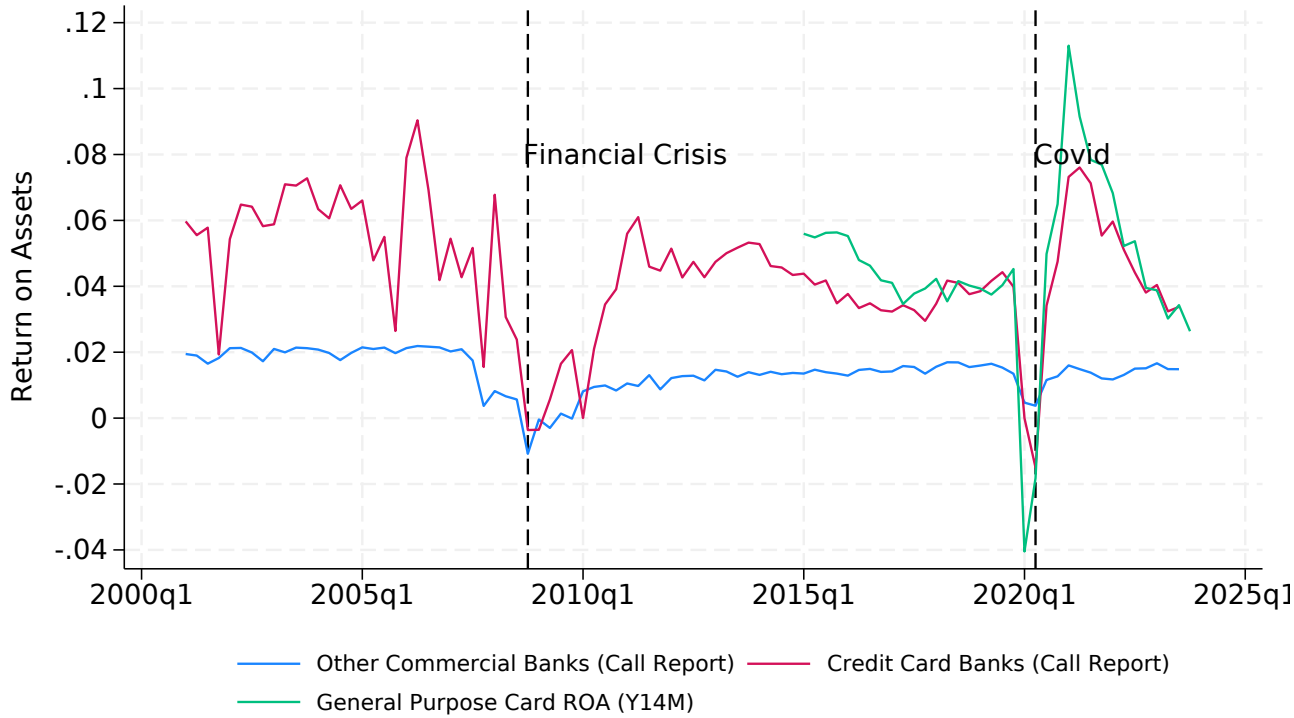
General purpose credit card portfolio ROA



- Credit card ROA is stable at around 5% for the past 10 years
- Large provision for loan losses during Covid was not realized and quickly reverted

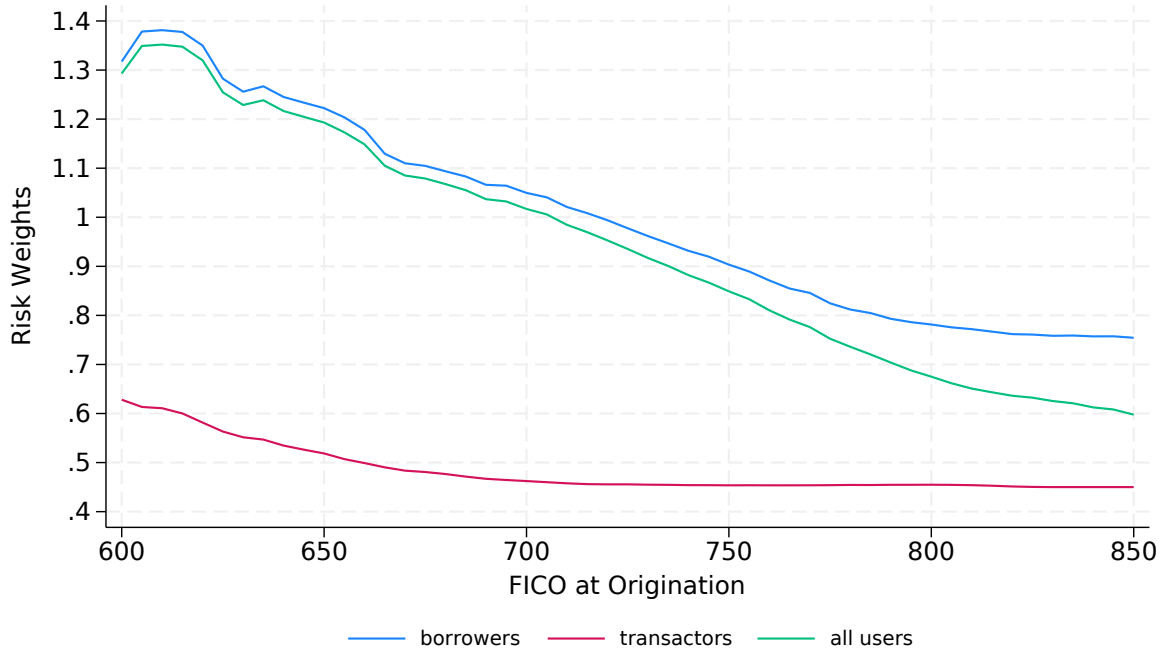
net margin borrowers

Credit card bank ROA



1. ROA from Call Reports of banks with high credit card share
2. ROA is 3X the average bank's ROA
3. Not as high as acc-level ROA as banks have other, lower-return, business segments
4. FDIC Quarterly Report (2024Q2):
   - Credit card banks: ROA 3.18% ROE 31.03%
   - Average bank: ROA 1.20% ROE 12.26% net margin borrowers

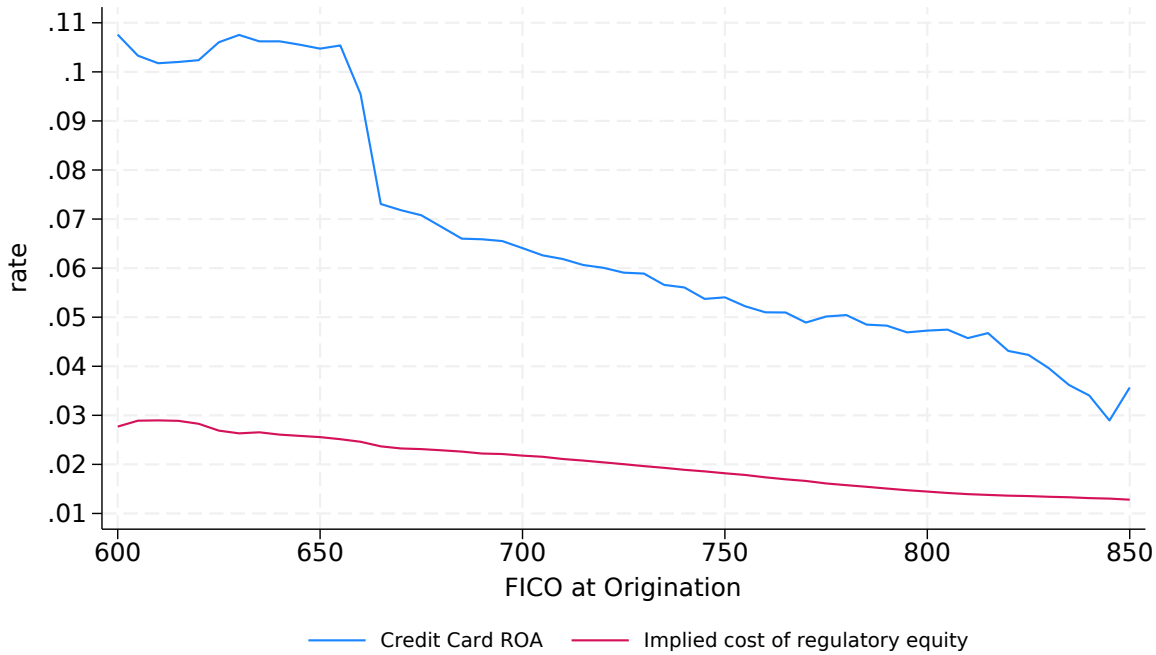
Credit card loan risk weights



- Risk weight is determined by bank's internal assessments of account's probability of default
  - subject to a lower bound of 45% for transactors and 75% for borrowers
  - Borrower risk weight is more than twice as high as transactors

risk premium

Credit card cost of regulatory capital



1. CC cost of reg. capital = CC risk weight $\times$ bank's cost of reg. capital
2. Bank's pre-tax ROA (1.5%) divided by risk-weighted asset (70%) gives the banking sector cost of reg. capital (2.14%)
3. Required return on regulatory equity does <u>not</u> bind $\Rightarrow$ does <u>not</u> drive ROA

risk premium