Credit Supply Shocks, Consumer Borrowing, and Bank Competitive Response

Evidence from Credit Card Markets

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Motivation

- Credit supply shocks to households affect their borrowing and consumption
- Shocks often occur through specific lenders: bank mergers, foreign banks, new entrants, etc.
- What is the competitive response of the other lenders to such a shock?
- This paper: using data from the Peruvian credit card market, study credit supply shock that increases availability of credit cards, find that existing lenders react to new card by curtailing credit availability

Motivation

- Why would an existing bank react to additional credit by a new entrant?
- Consider default externalities: additional credit supply to existing borrower may increase riskiness of existing debt contracts
- Theoretically important: Bizer and DeMarzo 1992 JPE, Parlour and Rajan 2001 AER, Hatchondo and Martinez 2017, etc.
- Implications of default externalities match stylized facts of credit card markets (Ausubel 1991 AER)
- **However**, empirical evidence is "quite thin" (Zinman 2014 JLS), as we would need to:
    1. Identify a credit supply shock
    2. Track how it affects lending from all banks
    3. Focus on a market where existing lenders can easily react

This Paper

- Research question: what is the effect of a new credit card on consumers and existing lenders?
- Identification challenge: getting a new credit card is endogenous
- Data: Peruvian credit card market; Credit Bureau data for 10mm borrowers (2005-2012)
- Exploit institutional feature: some conglomerates owned both banks and retail chains (supermarkets, retail stores, home improvement)
- Instrument: when a store opens, drastic increase in card issuance for individuals living around the new store
- Store openings are endogenous; control with openings of stores with no bank links that are otherwise similar

This Paper

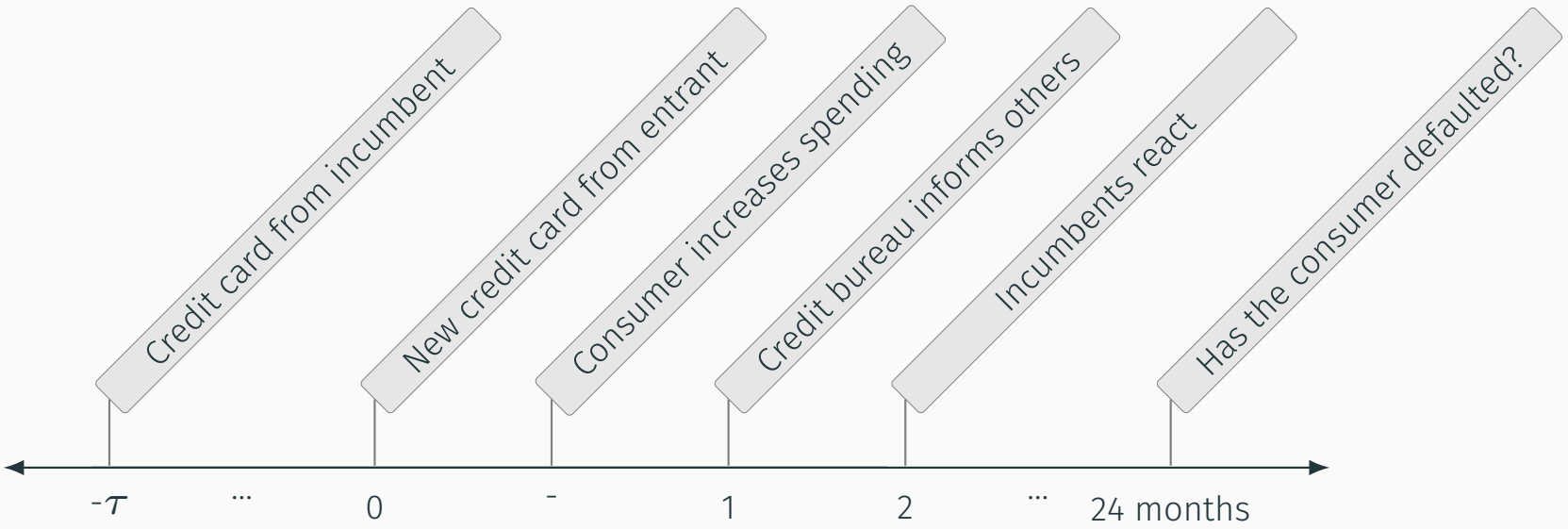


Figure 1: Timeline of a New Credit Card

Findings

Given an increase in credit supply from a new credit card,

1. Consumers react by borrowing 10% more
    - Suggests credit constrained consumers with high MPC
    - Similar U.S. findings (Gross & Souleles QJE 2002, Adams et al AER 2009)
2. Consumers twice as likely to default two years after new credit card
    - Agrees with U.S. evidence (Domowitz & Sartain JF 1999)
3. Existing lenders curtail credit by 20% through the following quarter
4. Still, total credit card limits remain larger than before the new card
    - Novel evidence of default externalities for consumer credit

Store Openings: District Characteristics

Table 1: District Characteristics One Year Before a Store Opening

New Store is ...	Unrelated	Bank–Related	T–Stat.
Total Population (thousands)	279.54	257.33	0.514
Month When Store Opened	2009.82	2009.41	1.154
College Educated (%)	43.77	47.12	-1.460
Age (in years)	42.27	42.13	0.337
Bank Branches in District (per 100k hab)	20.25	20.50	-0.055
Total Credit (excl. mortgages)	7711.00	8100.60	-0.621
From Credit Cards	3054.30	2728.38	1.192
Credit Card Limits	11810.52	10354.77	1.055
Credit Card Usage Ratio (%)	35.26	33.93	0.769
Number of Credit Cards	2.26	2.10	2.536
Number of Creditor Banks	1.89	1.89	-0.096
Credit History (in years)	5.91	5.89	0.161
Number of Districts	36	82	
Number of Opening Stores	38	102	
Number of Individuals in Sample (thousands)	34.77	28.07	

Model Specification: Instrumental Variables

First Stage:

$$\begin{aligned}\Delta\text{Num. Credit Cards}_{izt} = {} & \tilde{\alpha}_i + \tilde{\delta}_t + \tilde{\nu}_t C_z + \tilde{\gamma}\, \Delta X_{zt} \\ & + \tilde{\rho_1}\ \text{First Store Opening}_{zt} \\ & + \tilde{\rho_2}\ \text{Subsequent Store Openings}_{zt} \\ & + \pi_1\ \text{First Bank-Related Store Opening}_{zt} \\ & + \pi_2\ \text{Subsequent Bank-Related Store Openings}_{zt}\end{aligned} \tag{1}$$

Second Stage:

$$\text{Outcome}_{izt} = \text{First-stage controls} + \beta\ \Delta\text{Num. } \widehat{\text{Credit}}\text{ Cards}_{izt} \tag{2}$$

Outcomes:

1. $\Delta \log(100 + \sum \text{Total Credit}_{izt})$
2. Default event between t and $t + h$
3. $\Delta \log(100 + \sum \text{Total Credit Limits}_{izt})$

First Stage Results

Table 2: Effect of bank-related Store Openings on New Credit Cards

Dependent Variable	Δ Num. Cards from store–related banks
First bank-related	1.985***
store openings	(0.021)
Subsequent bank-related	0.161 ***
store opening	(0.008)
Mean Dep. Var. $(\times 100)$	1.759
Observations	117,305,635
Number of Clusters	2,869,533

- First store in town increases card issuance from 1.8% to 4.0% monthly.
- Subsequent store openings increase it from 1.8% to 2.0%.
- Regressors include consumer and time fixed effects, plus district–level controls
- Robust to a battery of alternative specifications

Second Stage Results: Consumer Borrowing

Table 3: Effects of Consumer Credit Supply Shocks on Consumer Borrowing

Dependent Variable	$\Delta \log$ Total Credit
Δ Num. Cards from store–related banks	11.022***
	(2.664)
Mean Dep. Var. $(\times 100)$	0.3767
Observations	110,080,649
Number of Clusters	2,864,805

- Total credit (excluding mortgages) increases by 11% after a new card

Second Stage Results: Consumer Default

Table 4: Effects of Consumer Credit Supply Shocks on Consumer Default

Default in...	1 quarter (1)	4 quarters (2)	8 quarters (3)
Δ Num. Cards from store–related banks	−1.89	11.45***	17.82***
	(2.05)	(3.92)	(4.61)
Mean Dep. Var. $(\times 100)$	3.079	9.473	15.5
Relative Effect (%)	-61.3	120.9	115.0
Observations	40,544,359	40,544,359	40,544,359
Number of Clusters	1,194,563	1,194,563	1,194,563

- Cumulative default hazard doubles one year after a new card
- Default defined as 60+ days past due or in formal bankruptcy

Second Stage Results: Reaction of Existing Lenders

Table 5: Strategic Reaction of Competing Banks (Credit Limits)

Dependent Variable	$\log$ Card Limits, Unrel. Banks	$\log$ Total Card Limits
	(1)	(2)
Number of Credit Cards (store–related banks)	-27.4***	24.1***
	(4.6)	(2.4)
Number of Credit Cards (store–related banks) $_{t-12}$	-50.9***	-4.8
	(8.0)	(4.4)
Mean Dep. Var. $(\times 100)$	733.5	860.5
Observations	85,685,251	85,685,251
Number of Clusters	2,336,927	2,336,927

- Credit limits of existing lenders goes down significantly (27% initially and then by 50% of the remaining limits).
- Total credit limit initially increases by 24% and then stabilizes
- Regression run in levels to capture delayed reactions

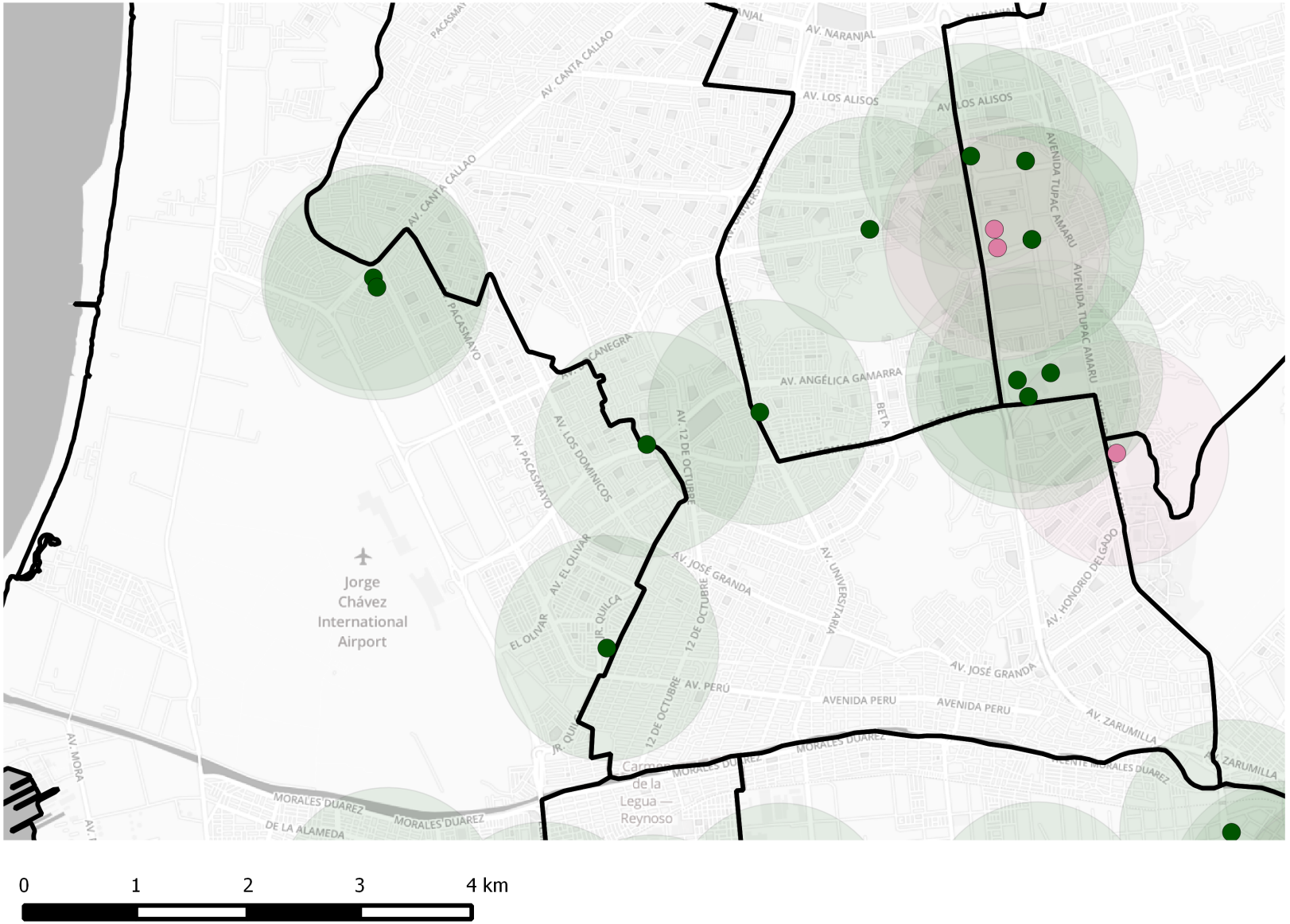
Results: Heterogeneous Effects

- By educational attainment:
  - Similar increase in borrowing across schooling levels
  - But consumers without college education experience a much larger increase in default and curtailing from existing lenders
  - Cole et al (RFS 2014): education improves financial decision–making
- By employment status:
  - Sole proprietors experience a much larger increase in borrowing that salaried workers and contractors
  - Similarly, they default more and experience larger curtailing from existing lenders
  - Perhaps default externalities are stronger for more opaque borrowers?

Robustness Checks to Alternative Channels

- Credit bureau data conflates transactional users with revolvers
  - Transactional borrowers pay back at the end of the month or grace period; no borrowing costs
  - Solution: regression on accrued interests; effects still strong
- "Black friday effect" suggests that the combination of credit and sales drives borrowing
  - Solution: regress on supermarkets (fewer durable goods sold, "black fridays" not as important)
- Weak instrument: a store might intend to serve district A but open on district B due to zoning restrictions
  - Solution: weight store entries by their importance in the district

Robustness: Weighted Instruments



Conclusion

- Expansions in credit supply increase consumer indebtedness and default
- Existing lenders reduce their credit supply, but total credit still goes up
- Effects of competition and market entry
    - Trade-off between credit and risk
- Empirical studies of credit shocks need to take into account equilibrium effects and reaction of existing lenders
    - Need to measure total shift in credit

Appendix

Motivation: Theory (optional)

Consumer Behavior: debt increases default risk

- Moral hazard (Bizer and DeMarzo): larger future repayment creates less incentives to exert effort in the future
- Strategic default (Parlour and Rajan): consumers can abscond

Equilibrium

- The market either breaks down or enters a *salting the earth* equilibrium

Marginal Analysis: marginal cost depends on each bank's exposure

- Marginal cost of existing lenders is higher than of new entrants: more debt makes existings loan less profitable

Motivation: Banks' Marginal Analysis (Single Lender)

$$\text{Bank Expected Profit}: \quad \mathbb{E}[b \cdot \{\underbrace{R \cdot [1 - pd] - r}_{\text{Net Margin } M}\}]$$

$$\text{FOC}(x): \quad M = \underbrace{R \cdot b}_{\text{Exposure}} \cdot \frac{\partial pd}{\partial b} \Big|_{b=X}$$

Motivation: Banks' Marginal Analysis (Multiple lenders)

$$\text{FOC}(x_j): \quad M\Big|_{b=X} = \underbrace{R\, b_j}_{\text{Exposure of j}} \frac{\partial pd}{\partial b}\Big|_{b=X}$$

Heterogeneity of Results: Borrowing

Table 6: Heterogeneous Effects on Consumer Borrowing

Dependent Variable	$\Delta \log$ Total Credit				
Classification	Type of Worker			Schooling Level	
	Contractor (1)	Sole Proprietor (2)	Salaried (3)	Secondary (4)	College (5)
New Credit Card (store–related banks)	8.62**	18.76***	8.35*	10.68**	10.75***
	(3.97)	(5.52)	(4.73)	(4.59)	(3.20)
Store Opening (all stores, repeat)	0.09***	0.04	0.05***	0.08***	0.03*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
Store Opening (all stores, first)	0.03	−0.10	0.06	0.04	−0.03
	(0.08)	(0.10)	(0.07)	(0.07)	(0.07)
Mean Dep. Var. $(\times 100)$	.4276	.2702	.3755	.3595	.4566
Observations	49,864,911	23,421,466	36,794,272	56,064,899	46,256,893
Number of Clusters	1,260,256	616,848	987,701	1,619,203	992,847

Key results: Sole proprietors increase borrowing by 19% compared to 8% for other groups

Heterogeneity of Results: Default

Table 7: Heterogeneous Effects on Consumer Default

Dependent Variable	Default in 8 quarters				
Classification	Type of Worker			Schooling Level	
	Contractor (1)	Sole Proprietor (2)	Salaried (3)	Secondary (4)	College (5)
New Credit Card (store–related banks)	17.62***	28.26***	18.13***	38.40***	6.15*
	(4.88)	(6.74)	(5.89)	(6.34)	(3.64)
Store Opening (all stores, repeat)	0.09***	0.05	0.04*	0.06***	0.06***
	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)
Store Opening (all stores, first)	-0.31***	-0.53***	-0.35***	-0.52***	-0.16
	(0.11)	(0.15)	(0.12)	(0.10)	(0.10)
Mean Dep. Var. $(\times 100)$	15.17	16.49	15.32	18.68	12.01
Relative Effect (%)	116.2	171.4	118.3	205.6	51.2
Observations	36,899,714	17,457,867	26,710,297	40,620,796	35,153,254
Number of Clusters	1,052,575	522,197	813,956	1,317,278	887,621

Key results: Sole proprietors and individuals w/out college education increase default more.

Heterogeneity of Results: Reaction of Lenders

Table 8: Heterogeneous Effects on Credit Limit Decisions

Dependent Variable	$\log$ Credit Card Limits, All Banks†				
Classification	Type of Worker			Schooling Level	
	Contractor	Sole Proprietor	Salaried	Secondary	College
	(1)	(2)	(3)	(4)	(5)
Number of Credit Cards (store–related banks)	19.40***	23.06***	19.64***	46.85***	15.43***
	(3.36)	(6.09)	(4.21)	(4.80)	(2.64)
Number of Credit Cards (store–related banks) $_{t-12}$	20.84***	−42.94***	14.65	−17.87***	31.22***
	(6.13)	(8.61)	(9.21)	(5.77)	(6.72)
Controls and store openings (incl. lagged)	Y	Y	Y	Y	Y
Mean Dep. Var. $(\times 100)$	881.8	845.3	841	834	901.9
Observations	39,021,267	18,258,805	28,405,179	42,491,489	37,480,549
Number of Clusters	1,040,517	504,707	791,703	1,274,432	882,836

Key results: Sole proprietors and individuals w/out college education experience curtailing.