Financial Technology Adoption:
Network Externalities of Cashless Payments in Mexico

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Motivation

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Payment technologies can benefit both sides of the market

- Consumers benefit from lower transaction costs
  - Costs of traveling to a bank (Bachas, Gertler, Higgins, Seira 2018)
  - Crime risks of carrying cash (Economides and Jeziorski 2017)
- Retail firms
  - Reduce risk of cash theft (Rogoff 2014)
  - Attract consumers who prefer these payment technologies

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Two-sided markets generate **indirect network externalities**

- Can lead to multiple adoption equilibria
- Moving to the Pareto-dominating equilibrium requires coordination (Katz and Shapiro 1986; Gowrisankaran and Stavins 2004)

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- Moving to the Pareto-dominating equilibrium requires coordination (Katz and Shapiro 1986; Gowrisankaran and Stavins 2004)

Thus, **coordination failures** can constrain financial technology adoption

And spillovers of financial technology adoption might be large

- Most research focuses on direct effects for households who adopt (Dupas and Robinson 2013; Callen et al 2019; Breza et al 2020)

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Combine administrative data on debit card rollout with rich collection of microdata on consumers and retail firms

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2. Spillovers to other consumers not directly affected by shock:
   - Other consumers adopt cards (21% ↑)
   - Richer shift 13% of supermarket consumption to corner stores
3. Corner store sales ↑ 6% and supermarket sales ↓ 12%
4. Over half of total consumer gains are spillovers
   - Implies that indirect network externalities are large
   - Consumer gains from spillovers exceed debit card rollout costs by 37x

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   - Cost of adoption only reduced for cash transfer beneficiaries

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4. Data on firm technology adoption; outcomes for firms and other consumers
   - Combine nine data sets, both administrative and survey

Administrative data

1. Administrative data on debit card rollout
   - Number of beneficiaries and payment method $\times$ locality $\times$ month
     - Provided by Prospera (cash transfer program)
   - All card transactions by cash transfer recipients who receive card
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3. Consumer card adoption
   - Quarterly number of debit cards $\times$ issuing bank $\times$ municipality
     - Provided by National Banking and Securities Commission

Survey data

1. Income–expenditure survey: nationally representative household sample
   - All consumption including cash
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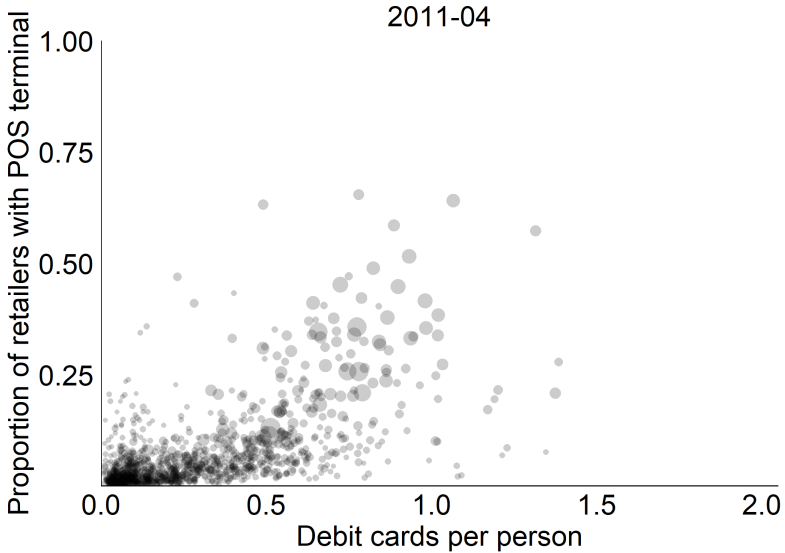
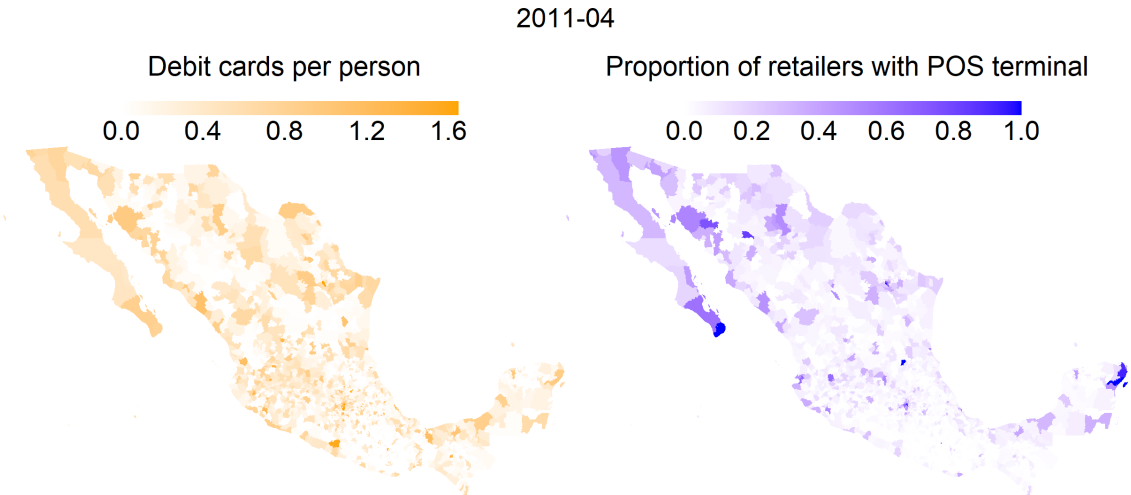
4. High-frequency price data
   - 10 million price quotes at barcode-level product $\times$ store $\times$ week level
     - Accessed on-site at National Statistical Institute

Context and identification

Debit cards and point-of-sale terminals over time (Mexico)



Debit cards and POS over time and space (Mexico)



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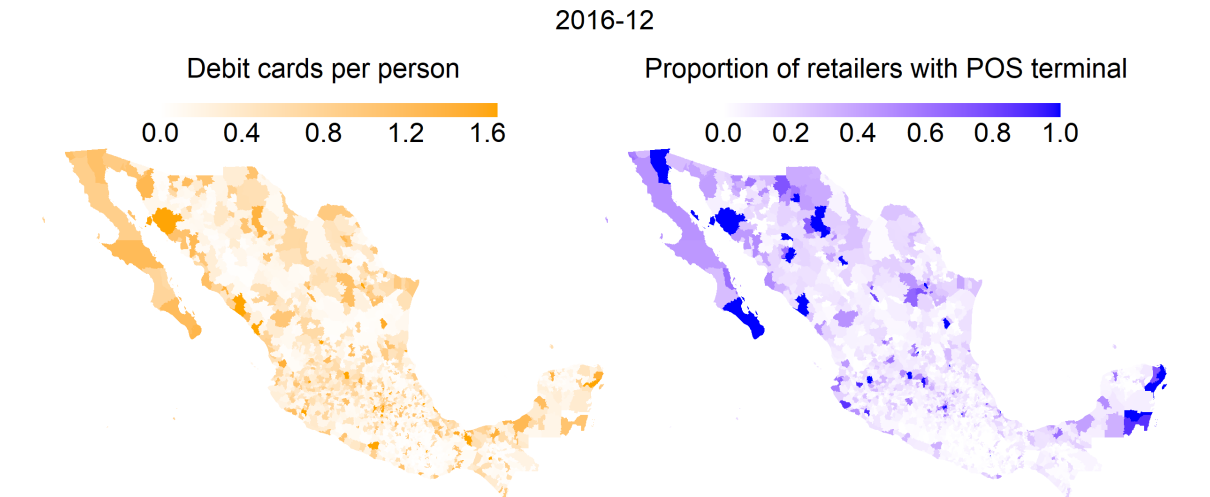


Natural experiment from debit card rollout

Over 2009–2012, Mexico's conditional cash transfer program Prospera distributed about 1 million debit cards

- In urban localities (population $>$ 15,000)

Pre-intervention: Urban recipients of government cash transfer program

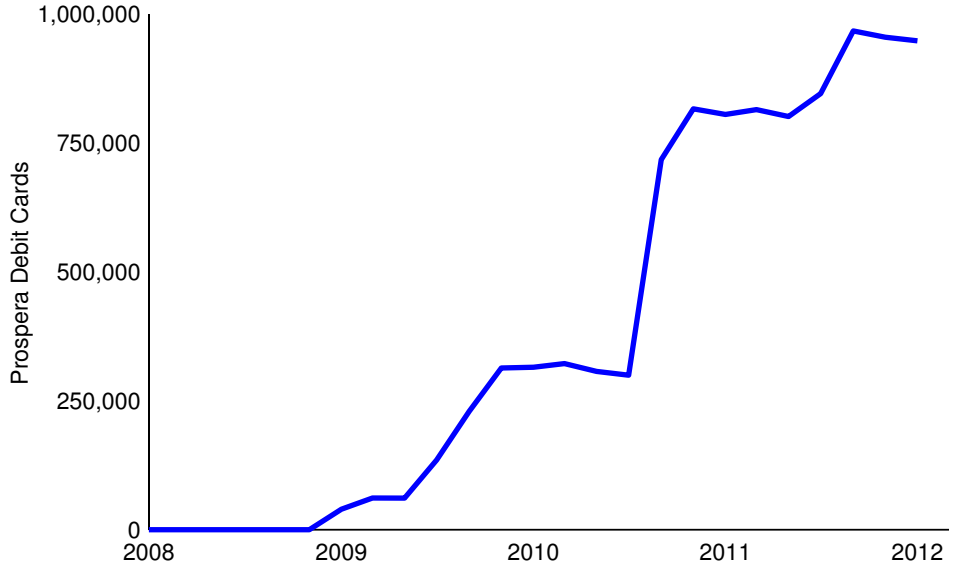
- Receive transfers in a Bansefi bank account
- Paid every two months ($150 average)

Intervention: Visa debit cards attached to accounts

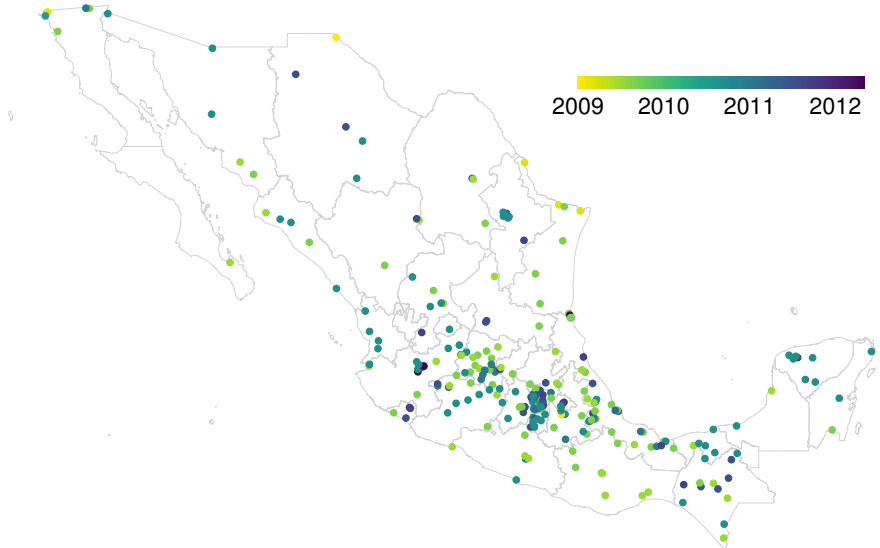
- Can withdraw funds from any bank's ATM
- Use as debit cards at stores accepting Visa

▸ Prospera ▸ Distance ▸ ATM use ▸ Transactions ▸ Savings ▸ Calendar ▸ Pamphlet ▸ Beneficiaries

Debit card rollout over time



Debit card rollout over time and space



Timing of debit card rollout

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- Government faced capacity constraints and wanted administrative outcomes in early localities to be representative
- Test whether timing of card shock correlated with levels or changes in financial infrastructure or other locality observables ▸ Show

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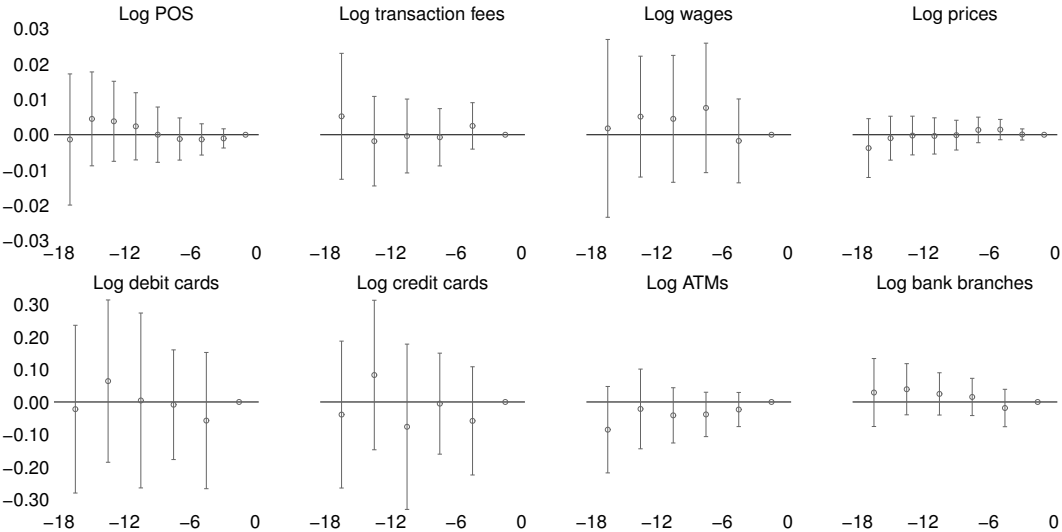
No differential change in number of beneficiaries or benefit amounts ▸ Show

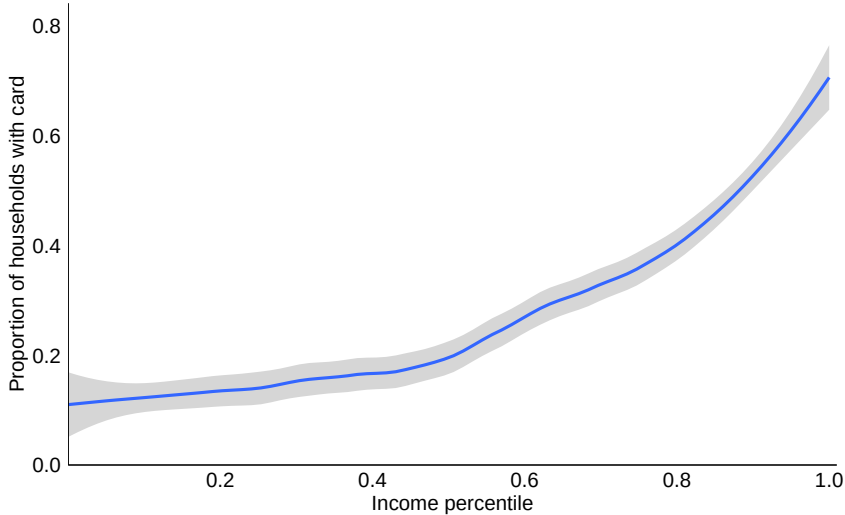
▸ Prospera ▸ Distance ▸ ATM use ▸ Transactions ▸ Savings ▸ Calendar ▸ Pamphlet ▸ Beneficiaries

Balanced pre-trends in financial and other variables



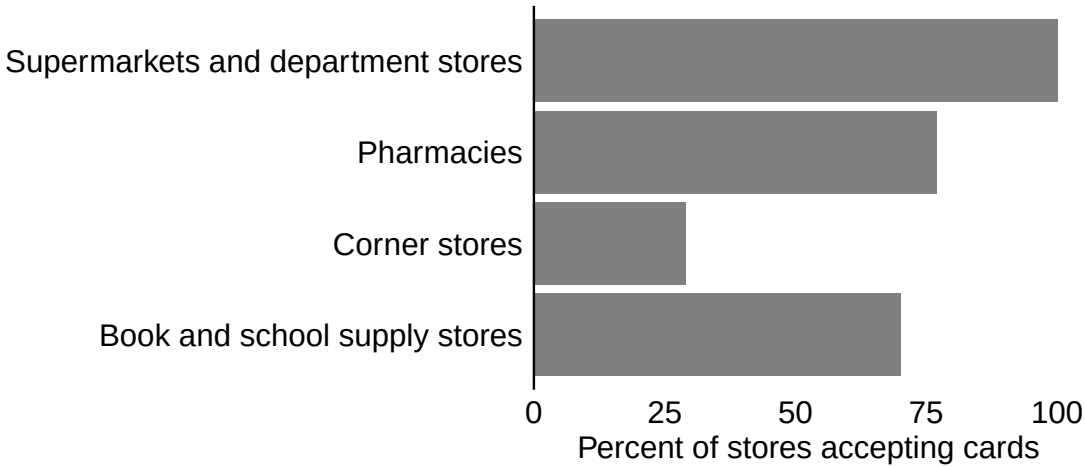
Prevalence of debit and credit cards before rollout

Mexican Family Life Survey 2009 (restricted to urban localities)



Prevalence of POS terminals by store type

Overall: 32% of retailers had a POS terminal prior to rollout



Costs of POS adoption

Low-adoption equilibrium requires network externalities and fixed cost of adoption

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POS rented to retailer from bank

- Requires firm to have an account at that bank
- Non-bank e-payment companies (e.g. Square) did not enter until 2013

Low initial cost ($23) but $27/month if transact $<$ $2000/month on POS

- Constraint binds for 95% of corner stores

Per-transaction cost: 1.75% for retail

Potential tax cost (frequently mentioned in focus groups)

Non-monetary costs e.g. paperwork (but not required to be formal)


ACEPTAMOS TODAS LAS TARJETAS DE CRÉDITO...
RECUPERA TU ENERGÍA
Coca-Cola

1) Increased financial technology adoption by small retailers

POS adoption

Data: Universe of point-of-sale terminal "contract changes" (adoptions, cancellations, etc.), accessed at Mexico's Central Bank

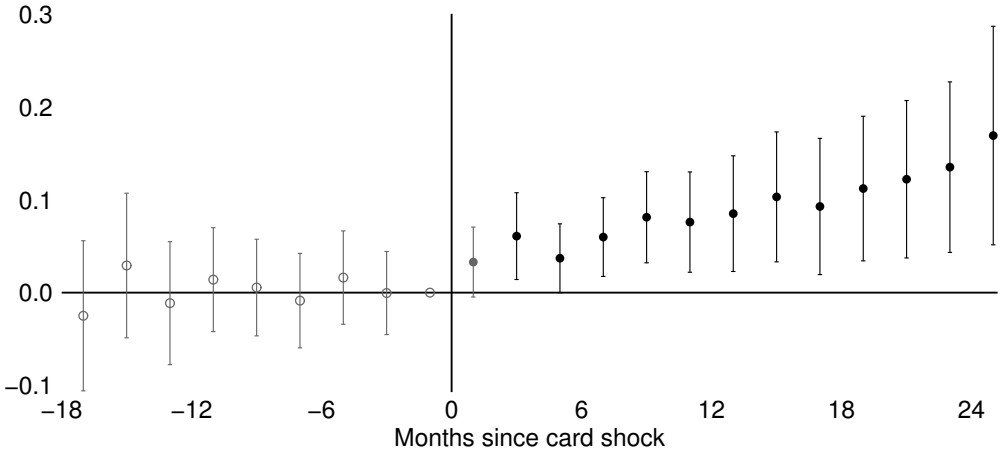
- 2006–2017
- 5 million contract changes; 1.7 million adoptions
- Combine with data set on all active POS contracts in 2017 to back out initial POS in 2006
- Construct number of POS by store type by locality over time

$$\log \textit{Number of POS}_{jt} = \xi_j + \delta_t + \sum_{k=-18}^{24} \phi_k D_{jt}^k + \varepsilon_{jt}$$

- Estimate separately for each major store type
  - Store type is based on merchant category code (Ganong and Noel 2018)

Corner stores increase adoption of POS

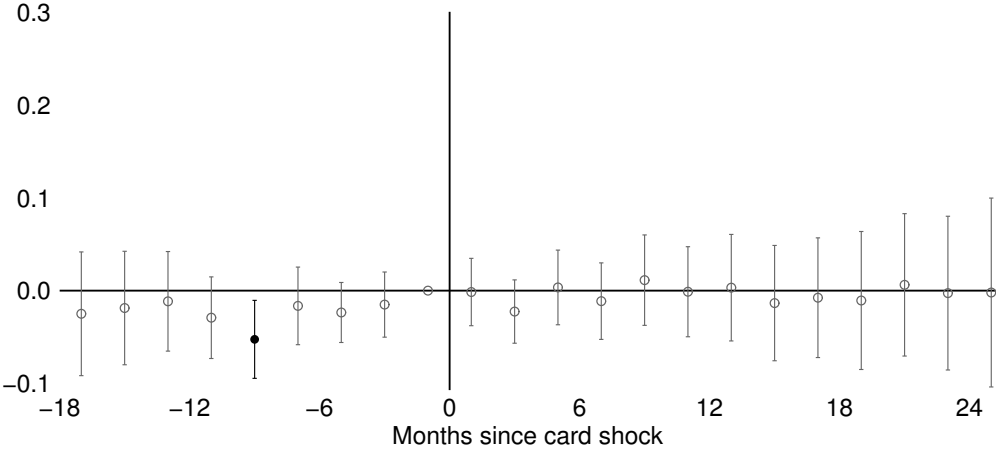
$$\log \textit{Number of corner store POS}_{jt} = \xi_j + \delta_t + \sum_k \phi_k D_{jt}^k + \varepsilon_{jt}$$



▸ In levels ▸ Bank response ▸ Prices ▸ Card use

Supermarkets do not change adoption of POS

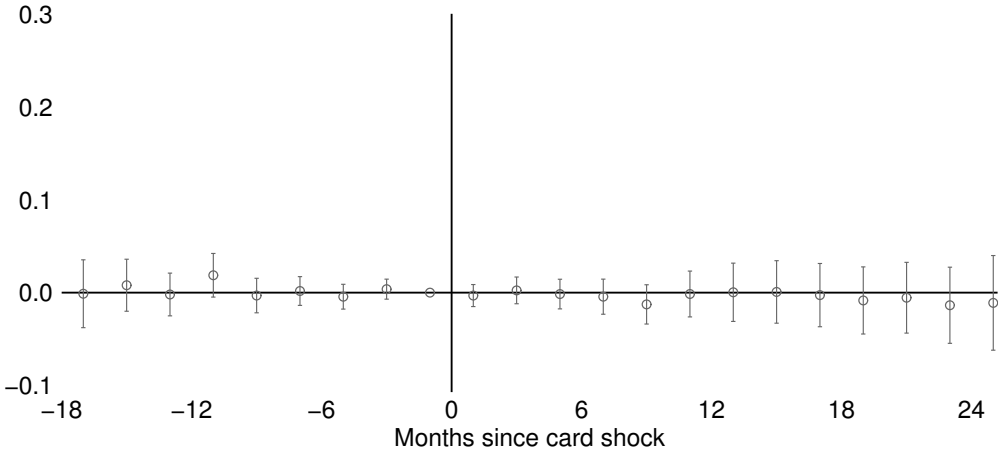
$$\log \textit{Number of supermarket POS}_{jt} = \xi_j + \delta_t + \sum_k \phi_k D^k_{jt} + \varepsilon_{jt}$$



▸ In levels ▸ Bank response ▸ Prices

Other retailers do not change adoption of POS

$$\log \textit{Number of other POS}_{jt} = \xi_j + \delta_t + \sum_k \phi_k D^k_{jt} + \varepsilon_{jt}$$



▸ In levels ▸ Bank response ▸ Prices

2) Spillovers to other consumers

Spillovers to other consumers' card adoption

Data: From Mexico's National Banking and Securities Commission

- Total debit cards by bank by municipality by quarter
- 2008Q4 (pre-rollout) to 2016Q4
- Remove cards issued by Bansefi (Prospera cards)

$$\log \textit{Number of Debit Cards}_{jt} = \lambda_j + \delta_t + \sum_k \phi_k D^k_{jt} + \varepsilon_{jt}$$

- Doesn't rule out that new cards are adopted by the same household
  - But in a post-rollout survey of beneficiaries who received cards, only 5% reported anyone in household had any bank account at another bank

Spillovers to other consumers' card adoption

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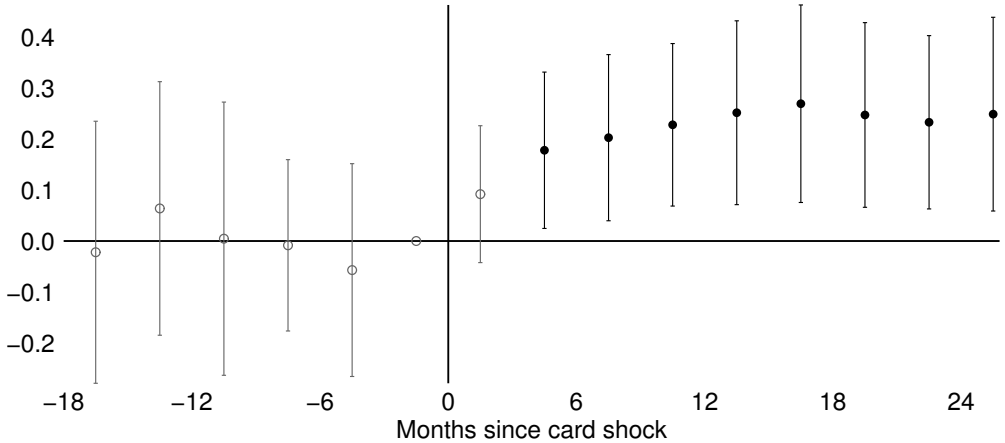

▸ Credit + debit ▸ Balanced panel ▸ Word-of-mouth ▸ By ATM density ▸ Bank response

Increased consumption at corner stores

Data: Consumption module of repeated cross-section national survey

- ENIGH 2006, 2008, 2010, 2012, 2014
- Nationally representative
- For each item consumed, has store type
- Look at whether spending across store types changes after card shock
  - Look for heterogeneity throughout income distribution

$$\log Spending^{s}_{it} = \lambda_{j(i)} + \theta_{q(i)t} + \gamma D_{j(i)t} + \sum_{q=2}^{5} \psi_q \mathbb{I}(quintile = q)_{it} \times D_{j(i)t} + \varepsilon_{it}$$

- As before, restrict to treated localities

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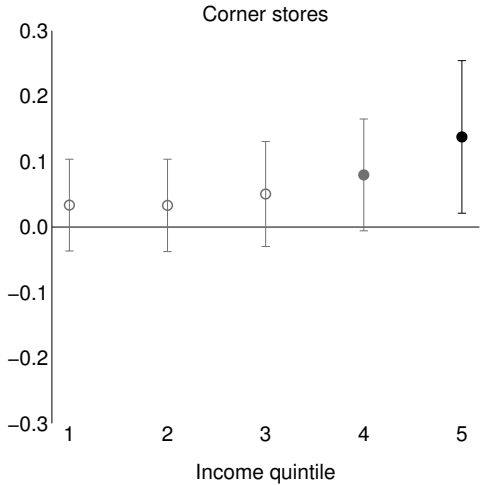

▸ Simple diff-in-diff ▸ Quantities ▸ Prices ▸ By category: quintile 5 ▸ Minimum card payments ▸ Consumption shares

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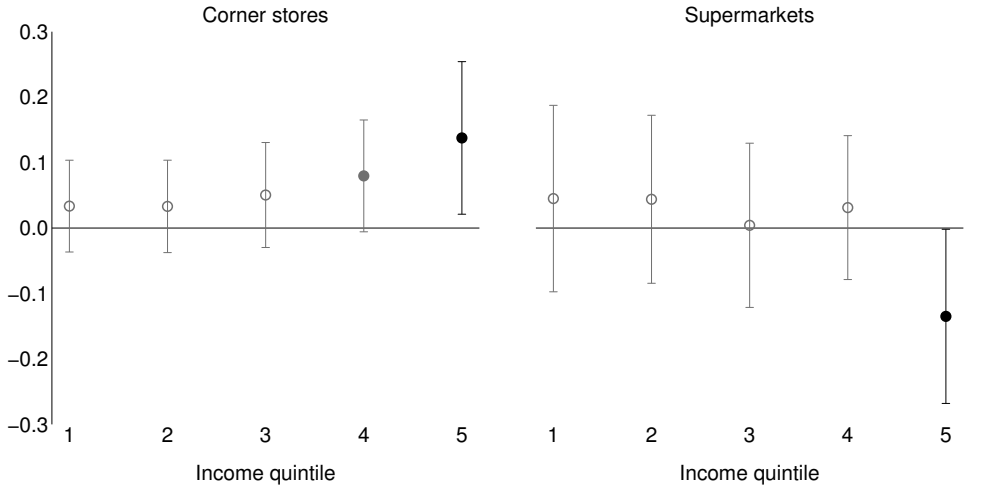
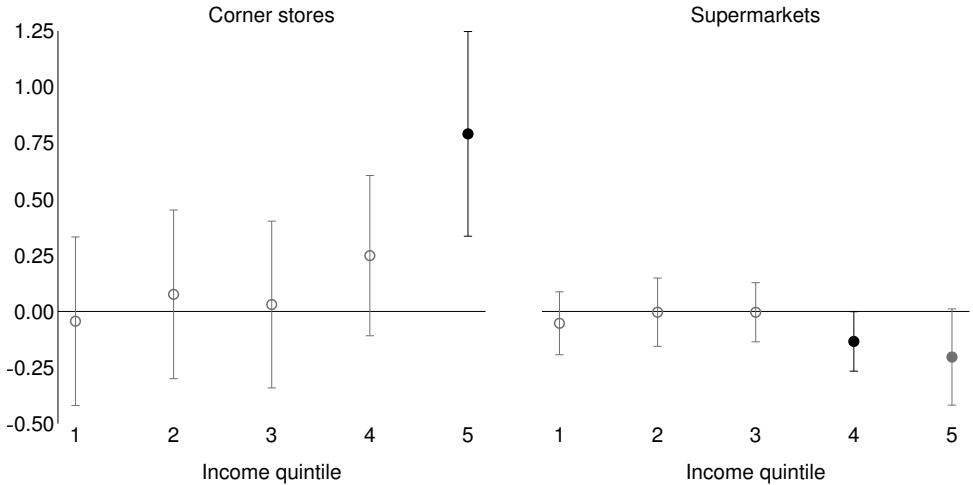


Driven partly by changing number of trips

$$\textit{Weekly trips}^{s}_{it} = \lambda_{j(i)} + \theta_{q(i)t} + \gamma D_{j(i)t} + \sum_{q=2}^{5} \psi_q \mathbb{I}(\textit{quintile} = q)_{it} \times D_{j(i)t} + \varepsilon_{it}$$



3) Retail sales and profits

Retail sales and profits

Data: Mexico's Economic Census (panel)

- Revenues and costs by category
- Includes all sales (including cash) for universe of firms
- Caveat: only two points in time (2008 and 2013)
  - These bracket rollout; exploit variation in how long since shock
- 1 million retailers that existed in both waves, of which:
  - 354,820 are corner stores; 172,441 in card rollout localities
  - 20,879 are supermarkets; 13,782 in card rollout localities

Corner store sales and profits increase

$$y_{it} = \gamma_i + \delta_t + \sum_k \gamma_k \mathbb{I}(\text{received cards at } k)_{j(i)} \times D_{j(i)t} + \varepsilon_{it}$$

	(1) Log Sales	(2) Log Inventory Costs	(3) Log Wage Costs	(4) Log Number Workers	(5) Log Rent Costs	(6) Log Capital	(7) Log Electricity Costs	(8) asinh Profits	(9) Charged VAT or Paid Social Security
Panel A: Corner stores ($N = 172{,}441$)									
Shock 3–4.5 years ago	0.081**	0.059*	−0.022	0.000	−0.028	0.047	−0.029	0.212**	0.014
	(0.036)	(0.034)	(0.020)	(0.005)	(0.025)	(0.083)	(0.034)	(0.099)	(0.009)
Shock 1.5–3 years ago	0.045	0.022	−0.022	0.000	0.022	0.024	0.005	0.143	0.031**
	(0.037)	(0.035)	(0.019)	(0.004)	(0.023)	(0.089)	(0.034)	(0.104)	(0.012)
Pooled coefficient									
Shock 1.5–4.5 years ago	0.061*	0.039	−0.022	0.000	−0.002	0.035	−0.011	0.175*	0.023***
	(0.034)	(0.032)	(0.017)	(0.004)	(0.022)	(0.082)	(0.032)	(0.096)	(0.008)
Panel B: Supermarkets ($N = 13{,}782$)									
Shock 3–4.5 years ago	−0.143**	−0.155**	−0.151	−0.014	0.314	−0.064	0.180	−0.228	−0.054
	(0.063)	(0.062)	(0.316)	(0.019)	(0.300)	(0.085)	(0.254)	(2.353)	(0.082)
Shock 1.5–3 years ago	−0.119*	−0.124**	−0.346	−0.022	0.135	0.144	0.153	0.149	−0.013
	(0.062)	(0.062)	(0.348)	(0.019)	(0.256)	(0.116)	(0.259)	(2.341)	(0.081)
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	(0.058)	(0.057)	(0.308)	(0.019)	(0.242)	(0.086)	(0.253)	(2.326)	(0.080)
Firm and time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

▸ By period ▸ Prices ▸ Wages ▸ Fired ▸ Transaction fees ▸ Survival ▸ Consumption ▸ Size ▸ Owners ▸ Churning

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	(0.036)	(0.034)	(0.020)	(0.005)	(0.025)	(0.083)	(0.034)	(0.099)	(0.009)
Shock 1.5–3 years ago	0.045	0.022	−0.022	0.000	0.022	0.024	0.005	0.143	0.031**
	(0.037)	(0.035)	(0.019)	(0.004)	(0.023)	(0.089)	(0.034)	(0.104)	(0.012)
Pooled coefficient									
Shock 1.5–4.5 years ago	0.061*	0.039	−0.022	0.000	−0.002	0.035	−0.011	0.175*	0.023***
	(0.034)	(0.032)	(0.017)	(0.004)	(0.022)	(0.082)	(0.032)	(0.096)	(0.008)
Panel B: Supermarkets ($N = 13{,}782$)									
Shock 3–4.5 years ago	−0.143**	−0.155**	−0.151	−0.014	0.314	−0.064	0.180	−0.228	−0.054
	(0.063)	(0.062)	(0.316)	(0.019)	(0.300)	(0.085)	(0.254)	(2.353)	(0.082)
Shock 1.5–3 years ago	−0.119*	−0.124**	−0.346	−0.022	0.135	0.144	0.153	0.149	−0.013
	(0.062)	(0.062)	(0.348)	(0.019)	(0.256)	(0.116)	(0.259)	(2.341)	(0.081)
Pooled coefficient									
Shock 1.5–4.5 years ago	−0.131**	−0.140**	−0.246	−0.018	0.227	0.037	0.167	−0.045	−0.034
	(0.058)	(0.057)	(0.308)	(0.019)	(0.242)	(0.086)	(0.253)	(2.326)	(0.080)
Firm and time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

▸ By period ▸ Prices ▸ Wages ▸ Fired ▸ Transaction fees ▸ Survival ▸ Consumption ▸ Size ▸ Owners ▸ Churning

Corner store sales and profits increase

$$y_{it} = \gamma_i + \delta_t + \sum_k \gamma_k \mathbb{I}(\text{received cards at } k)_{j(i)} \times D_{j(i)t} + \varepsilon_{it}$$

	(1) Log Sales	(2) Log Inventory Costs	(3) Log Wage Costs	(4) Log Number Workers	(5) Log Rent Costs	(6) Log Capital	(7) Log Electricity Costs	(8) asinh Profits	(9) Charged VAT or Paid Social Security
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4) Quantifying the indirect network externalities

Quantifying the indirect network externalities

Goal: quantify what proportion of total consumer gains are spillovers to other consumers

- To do so, estimate consumer gains for three types of consumers
  1. Prospera beneficiaries who receive cards
  2. Existing cardholders
  3. New adopters

Estimate a demand model that combines features of

- Atkin, Faber, Gonzalez-Navarro (2018)
- Björnerstedt & Verboven (2016)
- Einav et al. (2017)

Consumer gains from supply-side POS adoption

For each shopping trip, consumer makes discrete–continuous choice

Consumer gains from supply-side POS adoption

For each shopping trip, consumer makes discrete–continuous choice

Discrete choice over which store

Consumer gains from supply-side POS adoption

For each shopping trip, consumer makes discrete–continuous choice

Discrete choice over which store

Continuous choice over goods at store

- Cobb-Douglas preferences over goods
- Preferences for store characteristics enter utility

$$u_{ist} = \left(\prod_g x_{igst}^{\phi_{a(i)gst}} \right)^{\alpha_{k(i)}} \cdot \exp\left(\theta_{k(i)} POS_{ist} + \xi_{a(i)k(i)st} + \varepsilon_{ist} \right)$$

for consumer i of type k in census tract a at store type s at time t; g indexes goods

Consumer gains from supply-side POS adoption

Plug in Marshallian demand $x_{igst} = \phi_{a(i)gst}(y_{it}/p_{a(i)gst})$

Integrate over ε_{ist} assuming extreme value 1 and integrate over POS_{ist}

Subtract off outside option $s = 0$ (open air markets)

Leads to equation for difference in log expenditure shares (at census tract $\times$ consumer type $\times$ store type $\times$ time):

$$\log \phi_{akst} - \log \phi_{ak0t} = -\alpha_k(\log P_{ast} - \log P_{a0t}) + \theta_k \overline{POS}_{z(a)st} + \eta_{j(a)ks} + \delta_{kst} + \nu_{akst}$$

where $\log P_{ast} = \sum_g \phi_{agst} \log p_{agst}$ (Stone price index)

Consumer gains from supply-side POS adoption

$$\log \phi_{akst} - \log \phi_{ak0t} = -\alpha_k(\log P_{ast} - \log P_{a0t}) + \theta_k \overline{POS}_{z(a)st} + \eta_{j(a)ks} + \delta_{kst} + \nu_{akst}$$

Estimate with three consumer groups k

- Prospera beneficiaries
- Existing credit card holders
- Others (includes existing debit card holders and new adopters)

Endogeneity of demand

- Hausman instrument for prices
- Debit card shock as instrument for POS adoption

$-\theta_k/\alpha_k$ is price-equivalent value of no stores with POS $\rightarrow$ all stores with POS

$-(\theta_k/\alpha_k)\Delta POS_{ks}$ is value to consumers of supply-side response to shock

▸ θ_k/α_k interpretation ▸ Consumer surplus derivation

Consumer gains from supply-side POS adoption

Dependent variable: difference in log expenditure shares			
	Log prices ($-\alpha_k$)	Stores with POS (θ_k)	Share spent at corner
Prospera beneficiaries	−3.33*	0.24	0.46
	(1.92)	(0.31)	
Credit card holders	−2.02	0.57**	0.28
	(1.29)	(0.22)	
Others	−2.92**	0.55***	0.37
	(1.26)	(0.21)	
First-stage joint F-test		46.56	
Number of observations		21,775	
Locality × consumer type × store type FE		Yes	
Store type × consumer type × time FE		Yes	

Consumer gains from supply-side POS adoption

Beneficiaries: 1.9% ↑ consumer surplus on average

Existing cardholders: 0.5% ↑ consumer surplus

New card adopters: depends on cost of adoption

- Bounds: 0–0.4% ↑ consumer surplus

52–55% of **total** ΔCS is spillovers to non-beneficiaries

- Intuition:
  - Twice as many existing cardholders as beneficiaries
  - Existing cardholders richer, and absolute spending enters CS formula

Cost–benefit

Cost of producing debit cards: $2.18 per card

Aggregate cost of card rollout = $2.3 million

Aggregate value of consumer gains **only from spillovers** is 37 times as large

Conclusion

Coordination failures around indirect network externalities in two-sided markets constrain adoption of financial technologies

Large spillovers of an adoption subsidy targeted to a subset of consumers

- Over half of consumer surplus from policy shock to financial technology adoption accrue to other consumers

Results speak to political economy of government policy to subsidize financial inclusion of poor households

- Such spending may be politically popular even among richer tax payers due to spillovers

Appendix

Background on Prospera

Large program: 24% of Mexican households receive benefits

One of first conditional cash transfer programs

- Targeted to poorest households with children 0–18 or pregnant women
- Conditional on school attendance and health check-ups/vaccinations

Started in rural localities in 1997 as Progresa

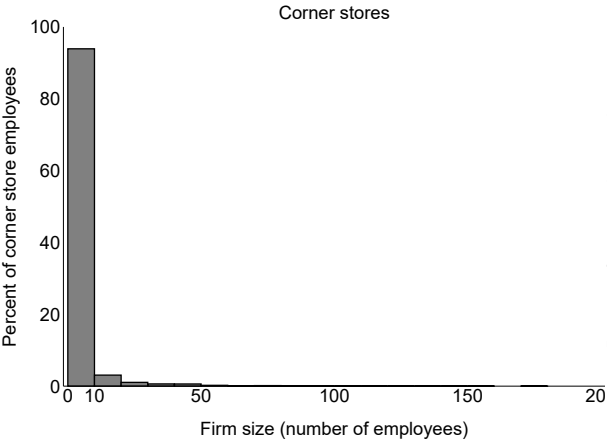
Expanded to urban areas in 2002–2003 as Oportunidades

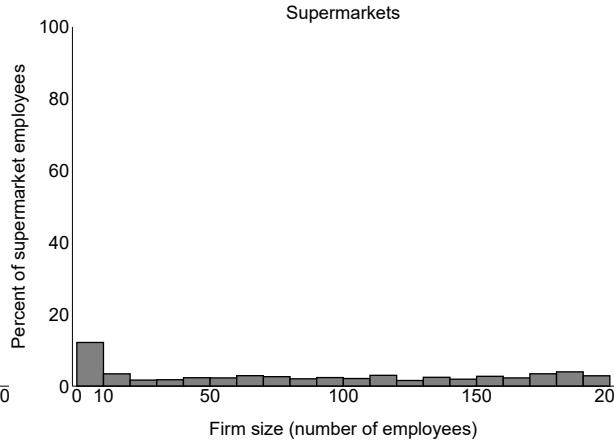
Urban beneficiaries given Bansefi bank account in 2005

- Eligible to get a debit card on own, but no automatic transfers
- Debit card rollout automatically switched them to this type of account

▸ Rollout

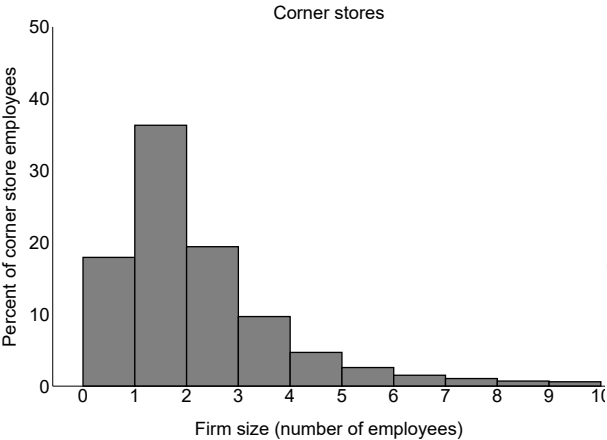
Distribution of retail employment share by firm size

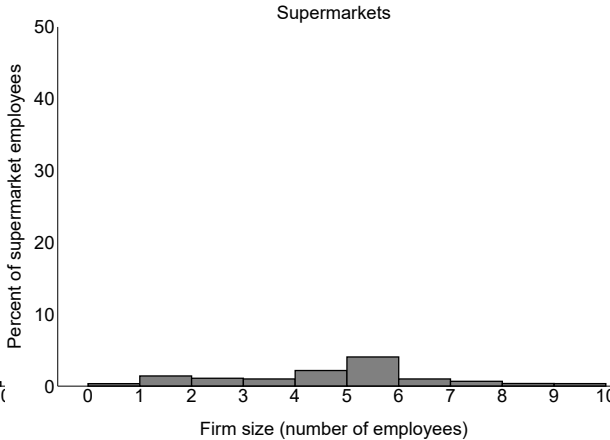




▸ Profits

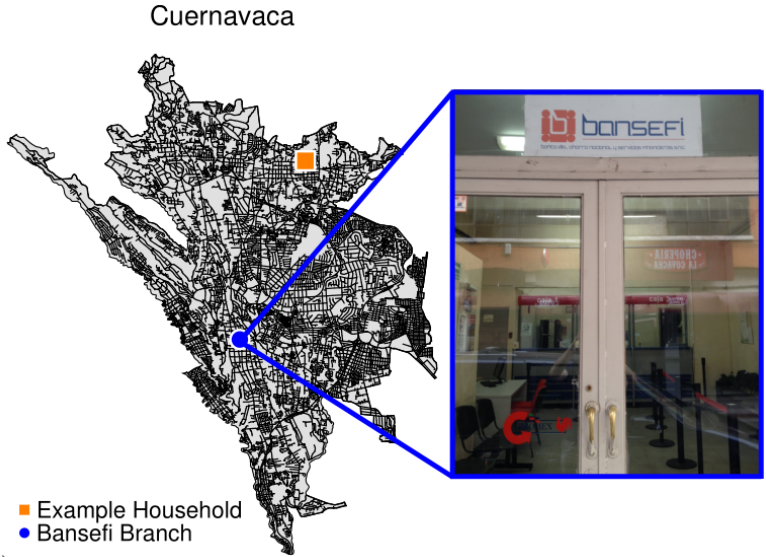
Employment share distribution of retailers with $<$ 10 employees





▸ Profits

Debit cards reduce travel distance



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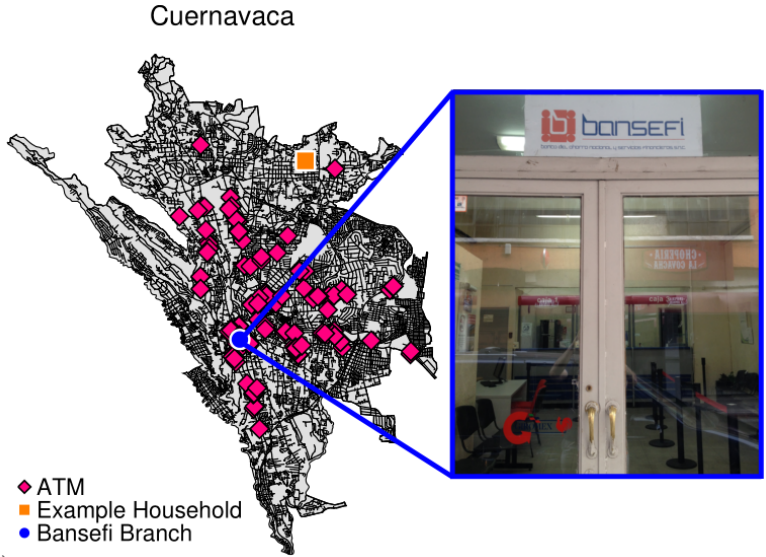

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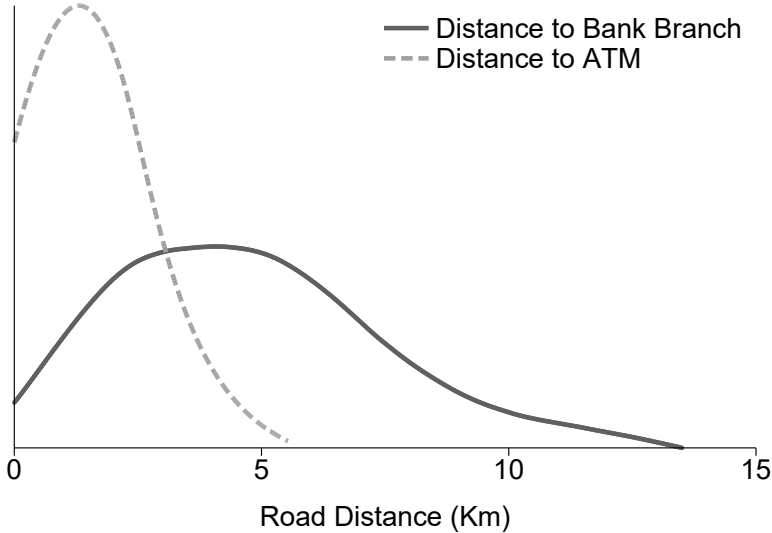
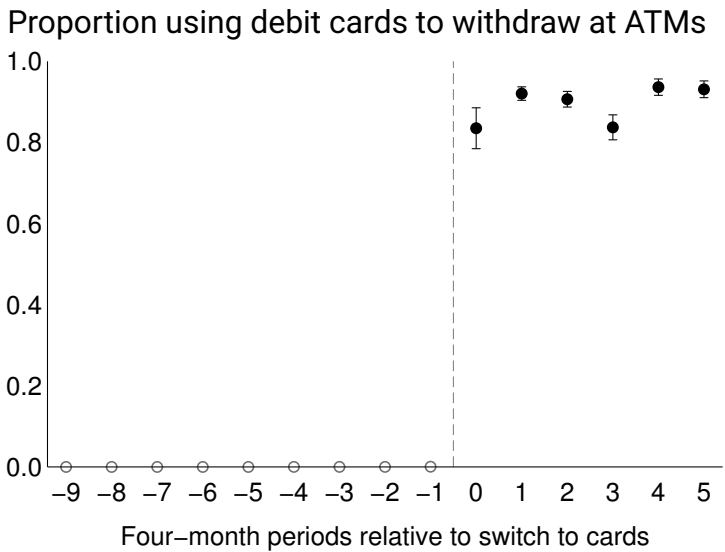
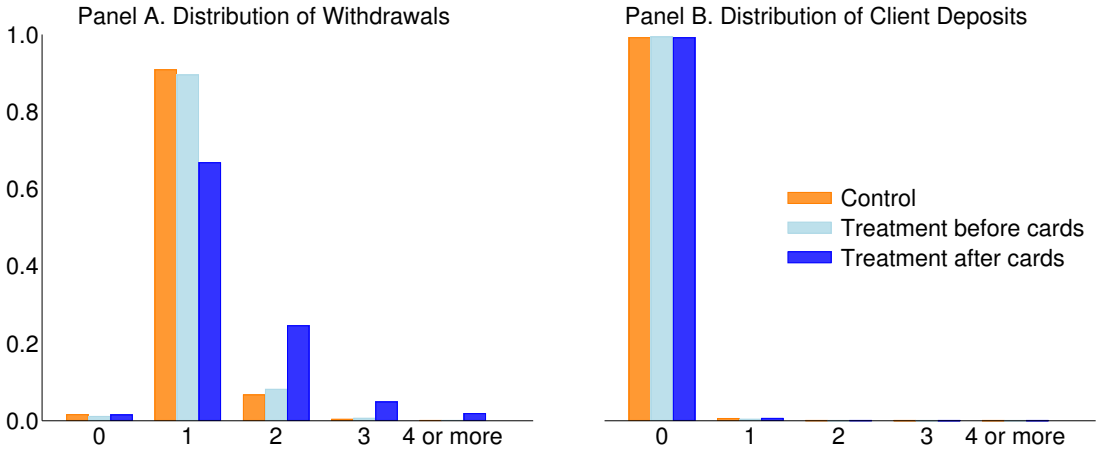


Recipients use their cards at ATMs



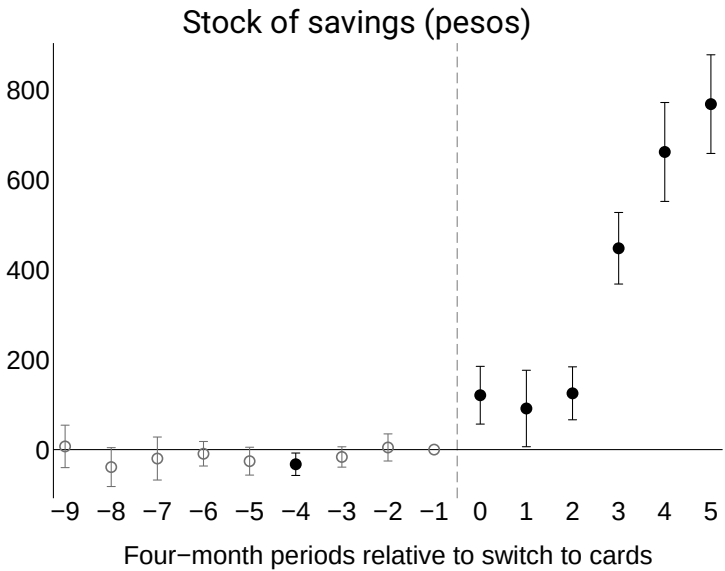
▸ Rollout details ▸ Rollout timing

Recipients make more withdrawals



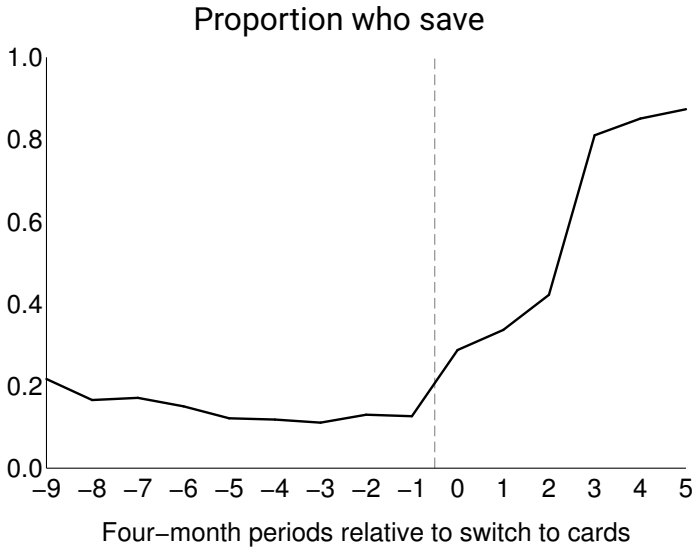
▸ Rollout details ▸ Rollout timing

Debit cards lead to more savings

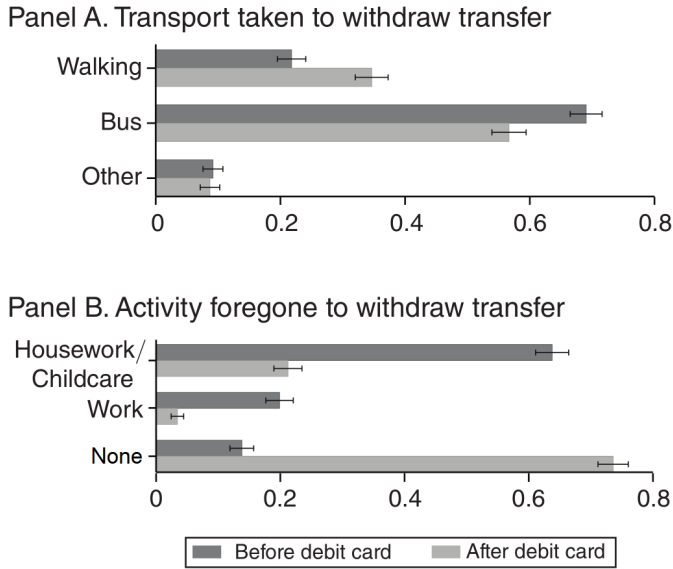


▸ Rollout details ▸ Rollout timing

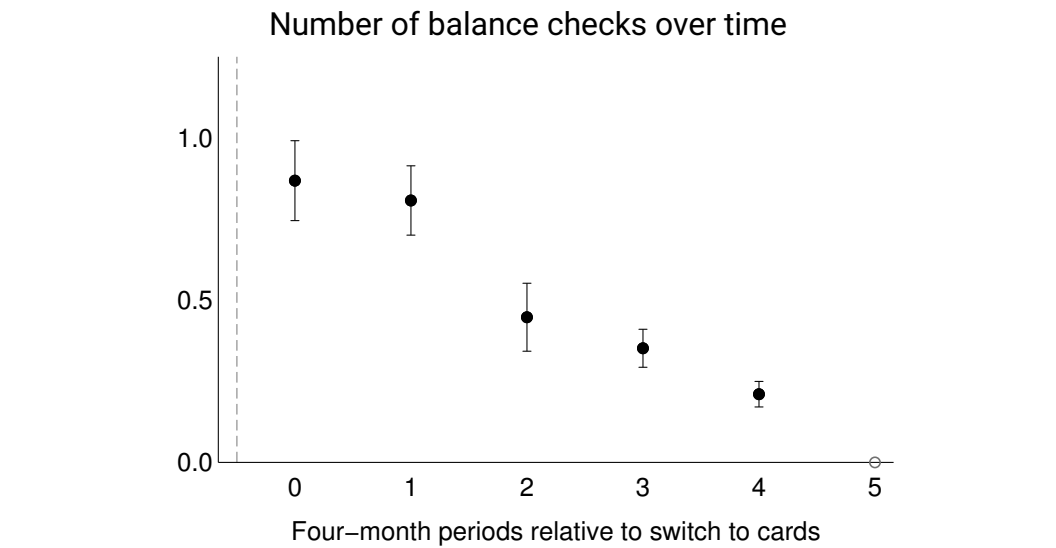
Some start saving right away; others after delay



Mechanism 1: Travel costs to access money



Mechanism 2: Checking balance to monitor bank, build trust



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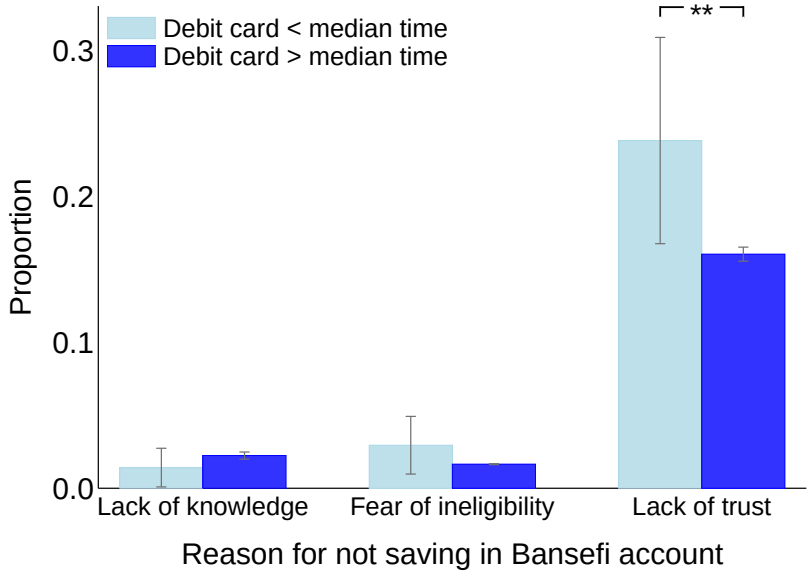

Increase in overall savings or substitution?

	(1)	(2)	(3)	(4)
Consumption	−175.36**	−150.51**	−136.52**	−155.11**
	(81.31)	(70.43)	(61.75)	(62.07)
	[−353.11, −1.52]	[−306.24, −2.30]	[−276.37, −4.75]	[−288.02, −33.10]
Income	98.16	106.01	75.50	38.11
	(170.03)	(150.31)	(127.77)	(106.12)
	[−290.77, 486.11]	[−230.64, 468.97]	[−219.75, 376.72]	[−175.00, 251.64]
Asset index	0.06	0.06	0.07	0.03
	(0.08)	(0.08)	(0.07)	(0.08)
	[−0.12, 0.24]	[−0.12, 0.24]	[−0.08, 0.23]	[−0.20, 0.24]
p-value consumption vs. income	[0.047]	[0.041]	[0.056]	[0.057]
Number of observations	9,246	9,246	9,246	7,754
Number of households	2,868	2,868	2,868	2,200
Time fixed effects	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes
Household characteristics × time	No	No	No	Yes
Winsorized	No	1%	5%	5%

▸ Rollout details ▸ Rollout timing

Why was it hard to save informally?

Money might be “hot” in hand or when being saved at home (Ashraf 2009)

▸ Rollout details ▸ Rollout timing

Why was it hard to save informally?

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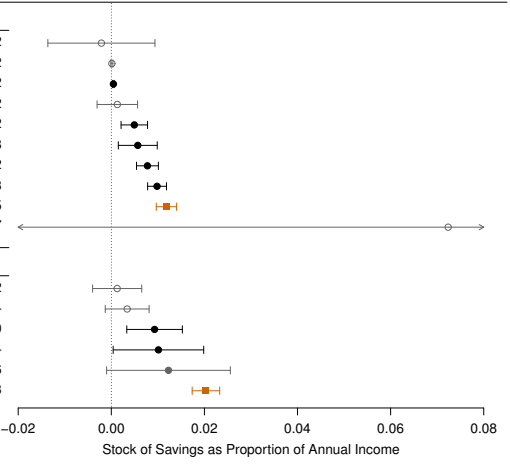
We find evidence consistent with this:

- Spending on temptation goods (alcohol, tobacco, sugar, etc.) falls by 14%, compared to 5% fall in overall consumption
- Effect of debit cards on savings concentrated among women with low baseline bargaining power

▸ Rollout details ▸ Rollout timing

Comparing effect sizes across studies

Study	Intervention	Country	Months
Panel A. Studies with Approximately One–Year Duration			
Drexler, Fischer, and Schoar (2014)	Financial education	Dominican Republic	12
Karlan and Zinman (2018)	Interest rate	Philippines	12
Kast, Meier, and Pomeranz (2018)	Savings group	Chile	12
Karlan et al. (2016)	Reminders	Philippines	9–12
Kast and Pomeranz (2014)	Account	Chile	12
Somville and Vandewalle (2018)	Payment default	India	8
Dupas and Robinson (2013)	Account or lockbox	Kenya	12
Prina (2015)	Account	Nepal	13
This paper (1 year)	Debit card	Mexico	12–15
Seshan and Yang (2014)	Financial education	India (migrants to Qatar)	13–17
Panel B. Studies with Longer Duration			
Ashraf, Karlan, and Yin (2006)	Deposit collection	Philippines	32
Dupas et al. (2018)	Account	Malawi	24
Karlan et al. (2017)	Savings group	Ghana, Malawi, Uganda	22–30
Dupas et al. (2018)	Account	Uganda	24
Schaner (2018)	Interest rate	Kenya	36
This paper (2 years)	Debit card	Mexico	20–23



Calendar of transfer dates

Oportunidades

Calendario Fijo de Retiro de Apoyos Monetarios

GOBIERNO FEDERAL SEDESOL

Entidad: **15 MEXICO**

Zona de Atención: **150303**

Municipio: **33 ECATEPEC DE MORELOS**

Localidad: **1 ECATEPEC DE MORELOS**

AGEB: [redacted] Código Postal: **55450**

Domicilio: [redacted]

Folio Titular: [redacted]

Nombre Titular: [redacted]

Identificador de Familia: [redacted]

Fase de Incorporación: **35**

Esquema de Apoyos: **Urbano 1**

Colonia: [redacted]

Estimada Titular:

Los apoyos del bimestre de corresponsabilidad	los puede retirar a partir del
Noviembre - Diciembre del 2008	Lunes 20 de Abril del 2009
Enero - Febrero del 2009	Lunes 1 de Junio del 2009
Marzo - Abril del 2009	Lunes 13 de Julio del 2009
Mayo - Junio del 2009	Lunes 14 de Septiembre del 2009
Julio - Agosto del 2009	Lunes 16 de Noviembre del 2009
Septiembre - Octubre del 2009	Lunes 11 de Enero del 2010

Bimestre de Generación de Calendario: **Corresponsabilidad Noviembre - Diciembre del 2008**

Titular beneficiaria: Usted podrá retirar sus apoyos con su Tarjeta de Débito a partir de la fecha indicada en cajeros automáticos ó establecimientos autorizados (que aceptan tarjetas VISA).

Recuerde que en cajeros automáticos podrá realizar dos operaciones (retiros ó consultas) gratuitas al bimestre, también puede utilizar su Tarjeta para comprar en establecimientos que aceptan Tarjetas de Débito VISA.

Pamphlet provided with debit card

Bienvenido al mundo de tu *Tarjeta de Débito...*

0100, PRUEBA
0100, ALPINA
Río Magdalena 115, 01090
Álvaro Obregón, DF.
0100, PRUEBA

0100010002000

L@Red de la Gente
Un mundo que crece para ti

bansefi
Banco del Ahorro Nacional y Servicios Financieros S.N.C.
4380 9910 0000 0200
11/07
LUISA ARCOS DURAN
VISA Electron

IMPORTANTE

1.- DESPRENDE tu Tarjeta de Débito.

2.- FÍRMALA en el espacio que se encuentra al reverso de tu Tarjeta de Débito donde se indica: **Firma Autorizada.**

3.- ACTÍVALA llamando al Tel.:
01 800 821 3822

4.- CONSERVA este documento. Contiene información importante que puedes utilizar en el futuro.

¡¡¡CUIDADO!!!

* Memoriza tu NIP (Número de Identificación Personal), que es tu clave secreta para hacer algunas operaciones.

* No proporciones tu NIP a nadie ni lo guardes junto con tu Tarjeta de Débito.

* **No le des tu número de Tarjeta de Débito a gente que te lo solicite sin razón.**

* Si no vas a utilizar tu tarjeta, consérvala en un lugar seguro.

* Reporta de inmediato el robo o extravío de tu Tarjeta de Débito, al Tel.:
01 800 821 3844

BANCO DEL AHORRO NACIONAL Y SERVICIOS FINANCIEROS, S. N. C., INSTITUCIÓN DE BANCA DE DESARROLLO, RÍO MAGDALENA No. 115, COL. TIZAPÁN SAN ÁNGEL, DELEG. ÁLVARO OBREGÓN, C. P. 01090, MÉXICO, D. F. CONMUTADOR 5481-3300

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Un mundo que crece para ti

USO EN CAJERO AUTOMÁTICO

Puedes realizar operaciones en cualquier cajero con logotipos RED. PLUS

1. Introduce o desliza tu Tarjeta de Débito como lo indica el cajero automático.

2. Teclea tu NIP (Número de Identificación Personal) que te ha sido entregado.

3. Selecciona la operación que deseas realizar: Retiro, Consulta de Saldo, Cambio de NIP, Venta Genérica (tiempo aire para teléfonos celulares), etc.

4. Una vez que has realizado la operación, no olvides retirar tu Tarjeta de Débito y el comprobante de la operación realizada.

COMPRA O RETIRO DE EFECTIVO EN ESTABLECIMIENTO

Puedes realizar compras en cualquier establecimiento afiliado a VISA ELECTRON.

1. Al pagar en un establecimiento con Tarjeta de Débito, no la pierdas de vista.

2. Cuando te entreguen el voucher (comprobante de pago), verifica que la cantidad impresa sea la misma de tu compra.

3. Firma tu voucher. No permitas que impriman más de un voucher.

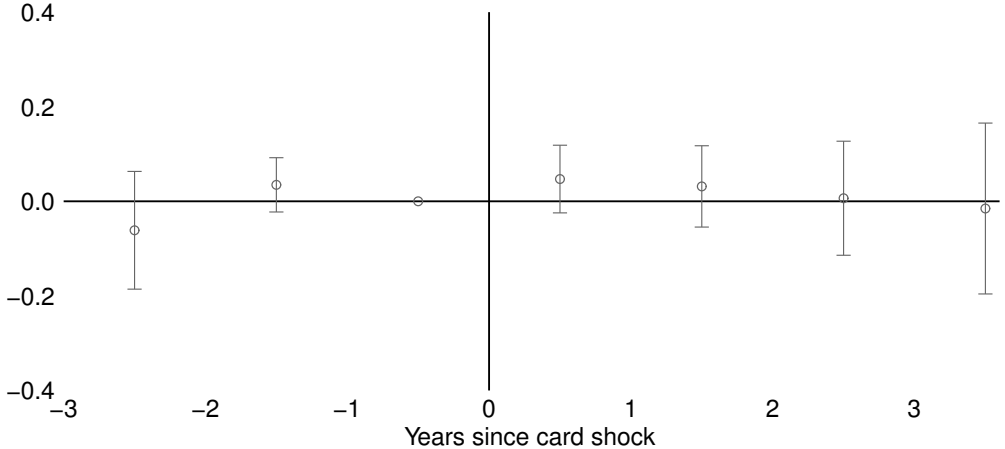
4. Conserva tus vouchers para confirmar las operaciones que has realizado con tu Tarjeta de Débito.

5. Con tu Tarjeta de Débito puedes retirar efectivo de tu cuenta en Gigante, Comercial Mexicana y WalMart. Entrega tu tarjeta al cajero (a) y solicita la cantidad que deseas retirar.

Paga con tu tarjeta y gana de **Boletazo**

No change in number of beneficiaries

$$\log \textit{Number of Beneficiaries}_{jt} = \xi_j + \delta_t + \sum_k \phi_k D^k_{jt} + \varepsilon_{jt}$$



▸ Rollout details ▸ Rollout timing ▸ Pre-trends

Rollout not correlated with observables

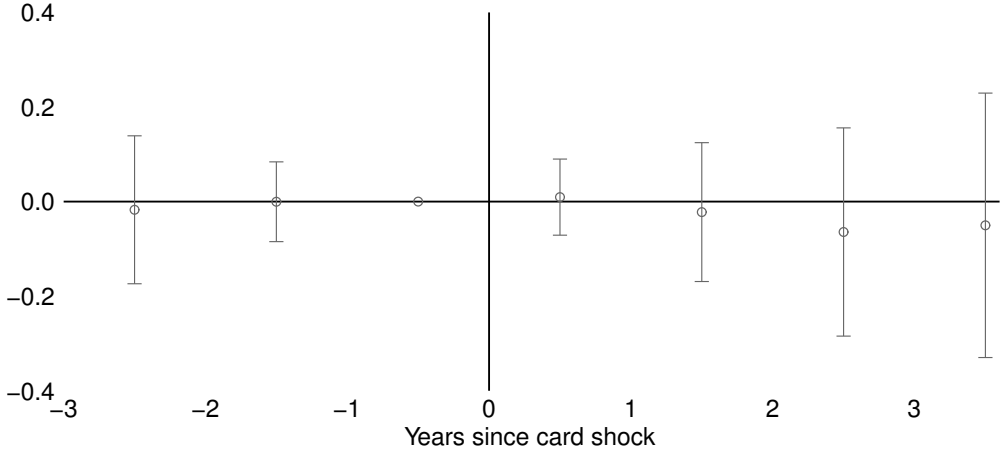
Test using discrete time hazard

Panel A: Banco de México, CNBV, population, Prospera, and electoral data Variable	(1) Mean	(2) Standard deviation	(3) Discrete time hazard
Log point-of-sale terminals	5.82	1.84	0.006 (0.007)
Δ log point-of-sale terminals	0.68	0.17	−0.012 (0.026)
Log bank accounts	9.97	3.53	0.002 (0.004)
Δ log bank accounts	2.07	4.02	0.001 (0.004)
Log commercial bank branches	2.55	1.44	0.014 (0.018)
Δ log commercial bank branches	0.65	0.97	−0.009 (0.018)
Log government bank branches	0.64	0.59	0.031 (0.019)
Δ log government bank branches	0.18	0.41	0.001 (0.016)
Log commercial bank ATMs	3.12	1.77	−0.018 (0.013)
Log government bank ATMs	0.16	0.37	−0.009 (0.022)
Log population	11.29	1.27	0.016 (0.012)
Δ log population	0.10	0.18	−0.021 (0.031)
Log Prospera beneficiaries	7.09	1.11	−0.003 (0.010)
Δ log Prospera beneficiaries	0.07	0.38	−0.000 (0.015)
% vote share PAN	29.01	15.00	0.000 (0.001)
Δ % vote share PAN	−0.51	17.49	0.001 (0.001)
Mayor = PAN (× 100)	19.31	39.55	−0.000 (0.000)
Δ mayor = PAN (× 100)	−11.97	58.17	0.000 (0.000)

Panel B: INEGI measures used to track development Variable	(1) Mean	(2) Standard deviation	(3) Discrete time hazard
% illiterate (age 15+)	6.13	3.94	0.007 (0.005)
Δ % illiterate	−0.01	0.01	−0.757 (1.116)
% not attending school (6-14)	4.23	1.94	−0.011 (0.006)
Δ % not attending school	−0.03	0.02	−0.435 (0.686)
% without primary education (15+)	40.20	10.18	−0.000 (0.003)
Δ % without primary education	0.17	0.04	0.264 (0.371)
% without health insurance	46.51	15.82	0.000 (0.001)
Δ % without health insurance	−0.05	0.08	−0.003 (0.108)
% with dirt floor	5.31	5.30	−0.000 (0.002)
Δ % with dirt floor	−0.02	0.02	0.494 (0.361)
% without toilet	5.81	3.50	−0.006 (0.004)
Δ % without toilet	−0.02	0.04	−0.024 (0.167)
% without water	6.23	9.00	0.000 (0.001)
Δ % without water	−0.04	0.05	0.088 (0.109)
% without plumbing	3.62	6.20	0.004 (0.002)
Δ % without plumbing	−0.06	0.06	0.111 (0.139)
% without electricity	4.32	2.19	0.006 (0.006)
Δ % without electricity	0.02	0.03	0.109 (0.629)
% without washing machine	33.81	14.47	0.001 (0.001)
Δ % without washing machine	−0.10	0.05	−0.017 (0.252)
% without refrigerator	17.31	10.13	−0.002 (0.001)
Δ % without refrigerator	−0.08	0.06	0.043 (0.268)

Rollout not correlated with political party

$$\mathbb{I}(Mayor_{jt} = PAN) = \xi_j + \delta_t + \sum_k \phi_k D_{jt}^k + \varepsilon_{jt}$$



▸ Pre-trends

Benefits of POS adoption

From focus groups:

- Increased security
  - Less risk of losing revenue to robbery
  - Less risk employees skim off cash or inventory
- Convenience
  - Eliminate need to physically travel to bank to deposit sales
- Increased sales, and avoiding losing customers who adopt cards
  - One participant estimated a 15–20% increase in sales after adopting
  - Another reported losing clients as card adoption in the area increased

▸ Costs of POS adoption

Card use by new cardholders

Data: From Bansefi: all transactions made by Prospera beneficiaries

106 million transactions in 961,617 accounts

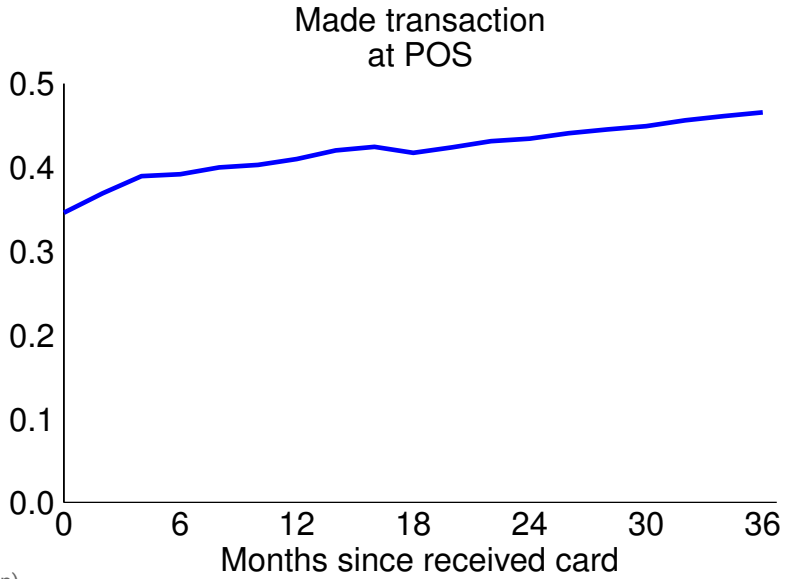
Observe all types of account transactions

- Deposits
- Withdrawals at ATMs
- Withdrawals at bank branches
- Spending on debit card

For debit card transactions, observe string of store name

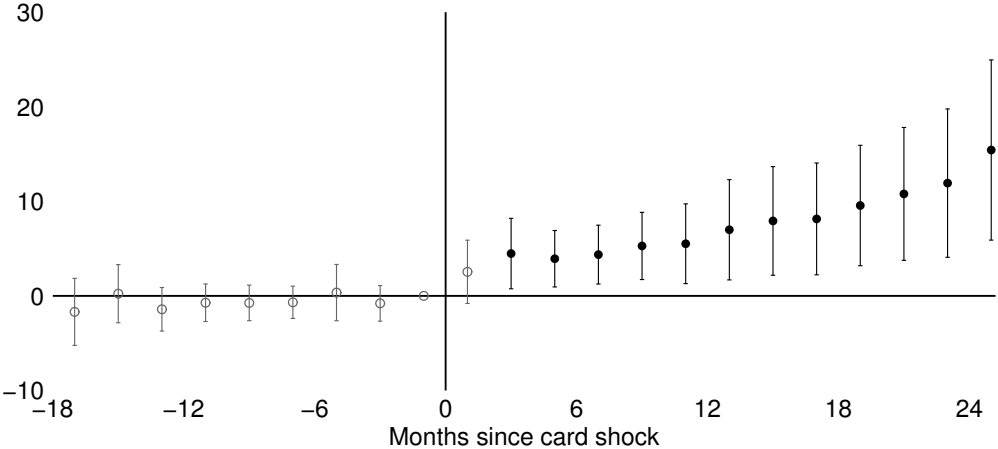
▸ Transactions at ATM/branch ▸ Distance ▸ Savings ▸ Calendar of transfer dates ▸ Pamphlet

New cardholders make purchases at POS



Corner stores increase adoption of POS

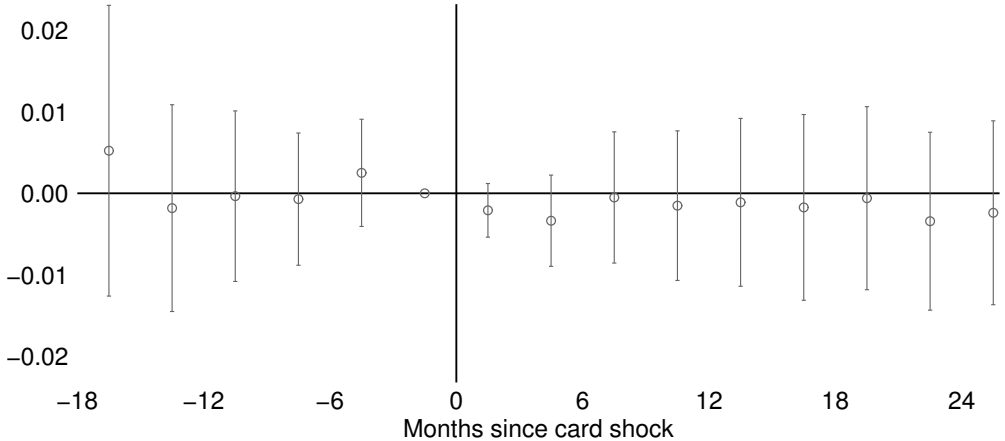
$$\textit{Number of POS}_{jt} = \xi_j + \delta_t + \sum_k \phi_k D^k_{jt} + \varepsilon_{jt}$$



▸ In logs

Banks do not appear to respond to shock

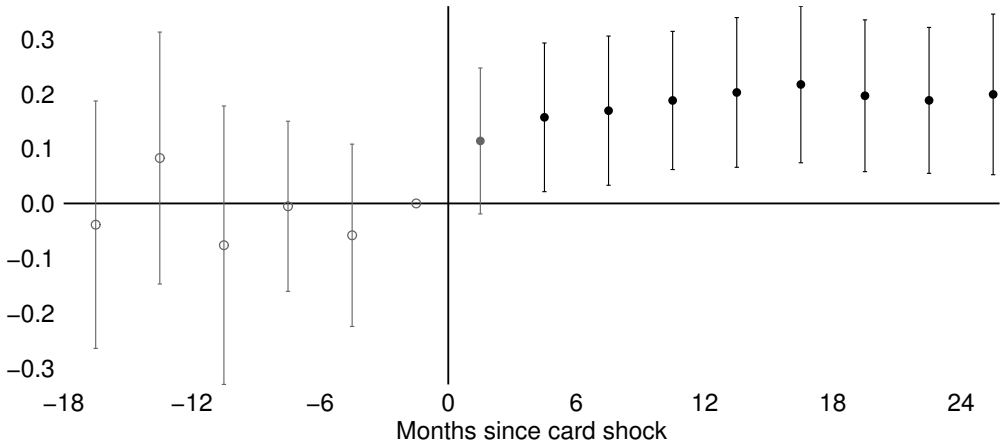
$$\log \textit{Transaction fee}_{jt} = \lambda_j + \delta_t + \sum_k \phi_k D_{jt}^k + \varepsilon_{jt}$$



▸ Adoption costs ▸ POS adoption ▸ Debit card spillovers ▸ Profits

Spillovers to other consumers' card adoption

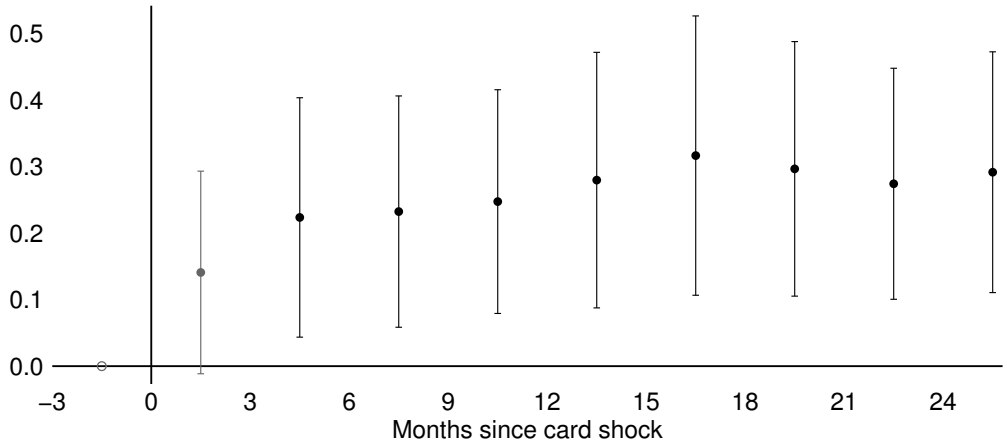
$$\log \textit{Number of Credit and Debit Cards}_{mt} = \xi_m + \delta_t + \sum_k \phi_k D^k_{mt} + \varepsilon_{mt}$$



Spillovers to other consumers' card adoption (balanced over time)

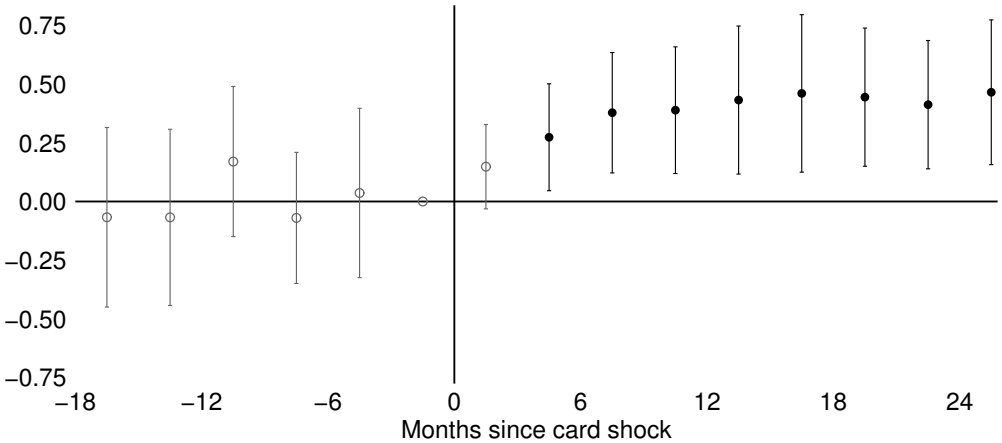
All 255 municipalities in rollout:

$$\log \textit{Number of Debit Cards}_{mt} = \xi_m + \delta_t + \sum_k \phi_k D^k_{mt} + \varepsilon_{mt}$$



Word-of-mouth learning?

Municipalities with below-median beneficiary transactions at supermarkets



Word-of-mouth learning?

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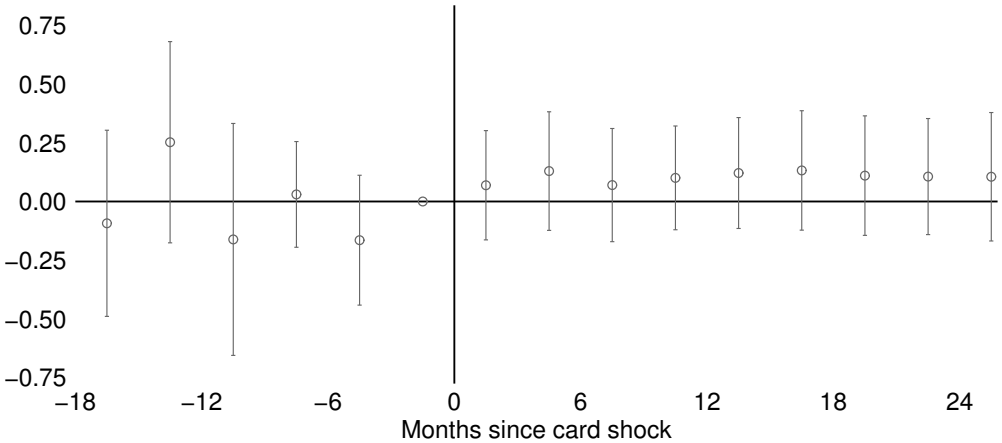
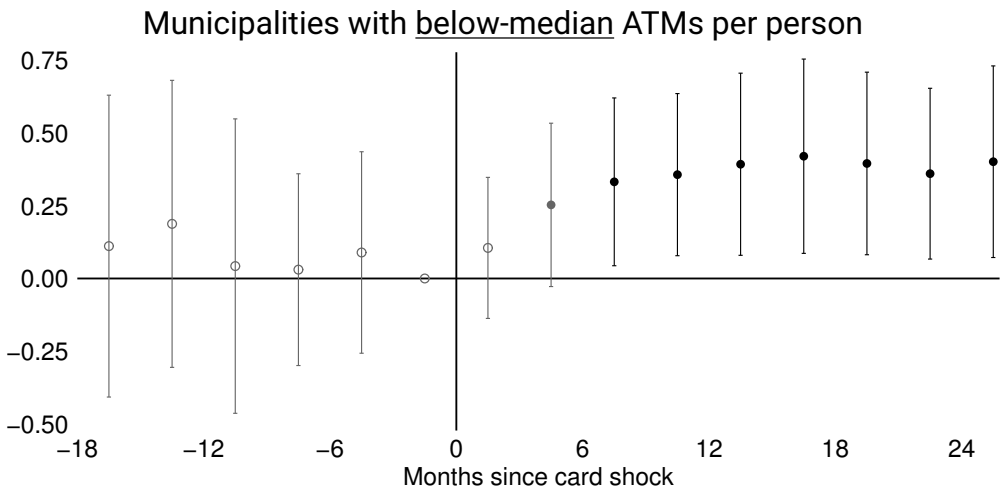
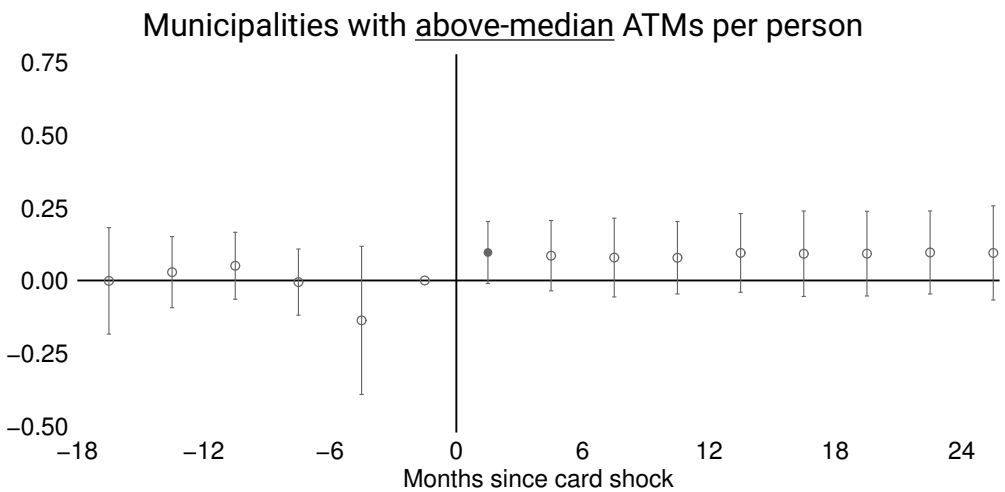


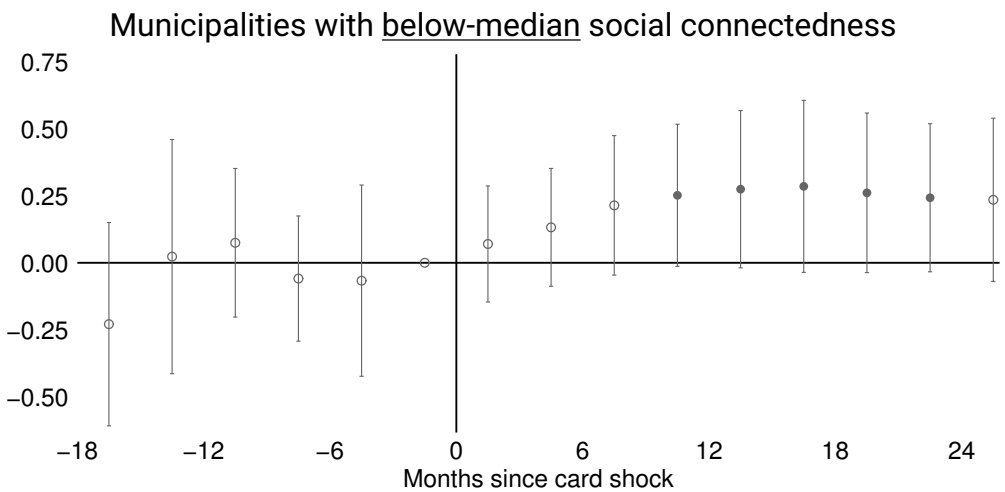
By ATM density



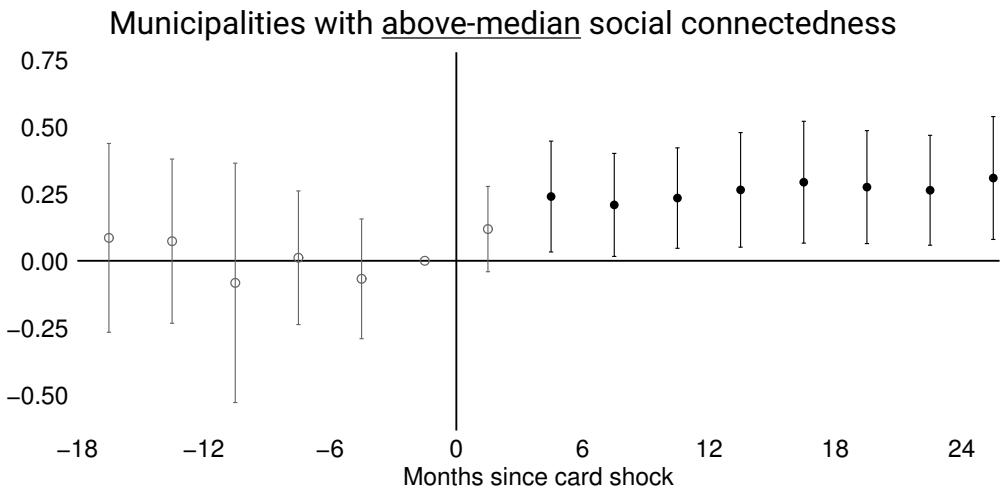
By ATM density



By social connectedness



By social connectedness



Prices

Data: High-frequency store by product by week price data, 2002–2014

- Microdata used to construct Mexico's Consumer Price Index
- $\sim$10 million price quotes
- Product codes are barcode-equivalent (e.g., 600ml Coca-Cola bottle)
- Restrict to food, drink, tobacco categories

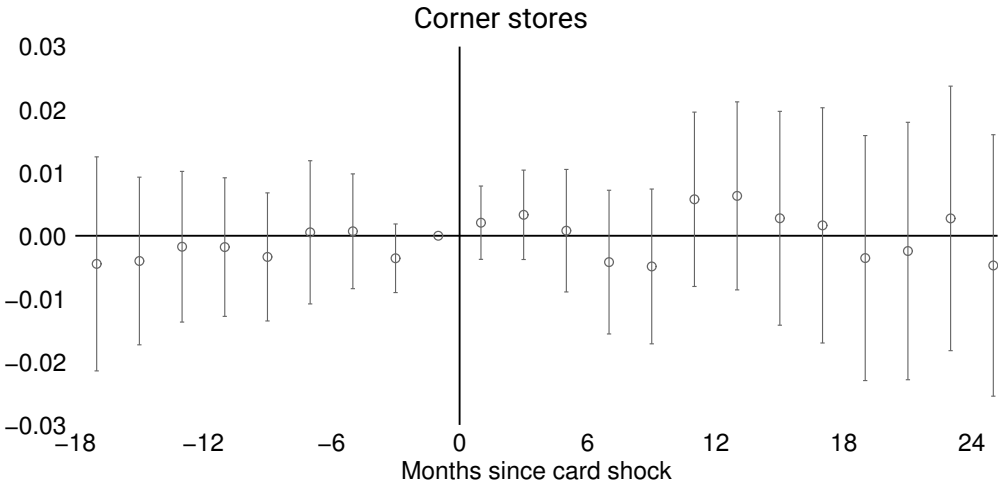
Specification: Event study difference-in-differences

$$\log Price_{gst} = \eta_{gs} + \delta_t + \sum_k \phi_k D^k_{m(s)t} + \varepsilon_{gst}$$

- η_{gs} are barcode-level-good by store fixed effects
- $D^k_{m(s)t} = 1$ if municipality m received the card shock k periods ago
- As before, aggregated to 2-month periods

No price effect

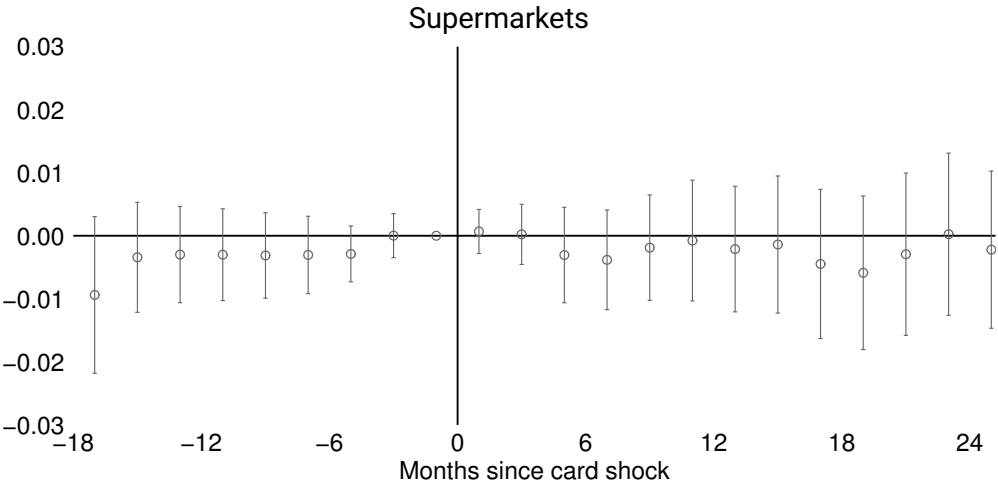
$$\log Price_{gst} = \eta_{gs} + \delta_t + \sum_k \phi_k D^k_{m(s)t} + \varepsilon_{gst}$$



▸ Adoption ▸ Consumption ▸ Profits

No price effect

$$\log Price_{gst} = \eta_{gs} + \delta_t + \sum_k \phi_k D^k_{m(s)t} + \varepsilon_{gst}$$

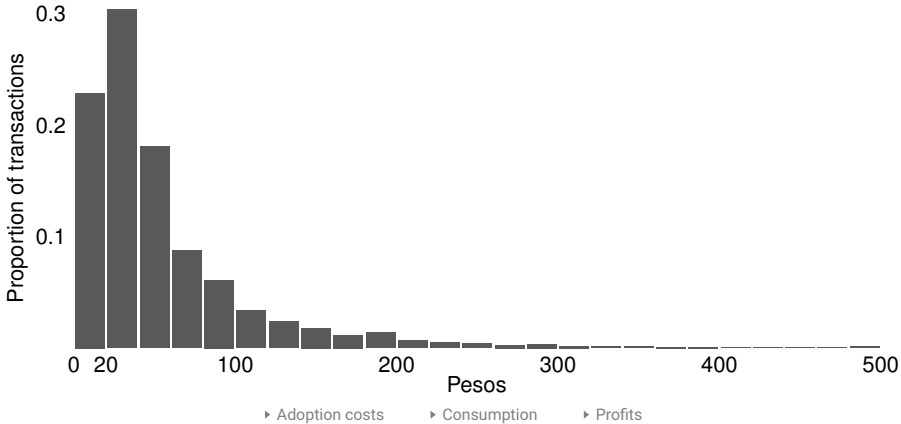


▸ Adoption ▸ Consumption ▸ Profits

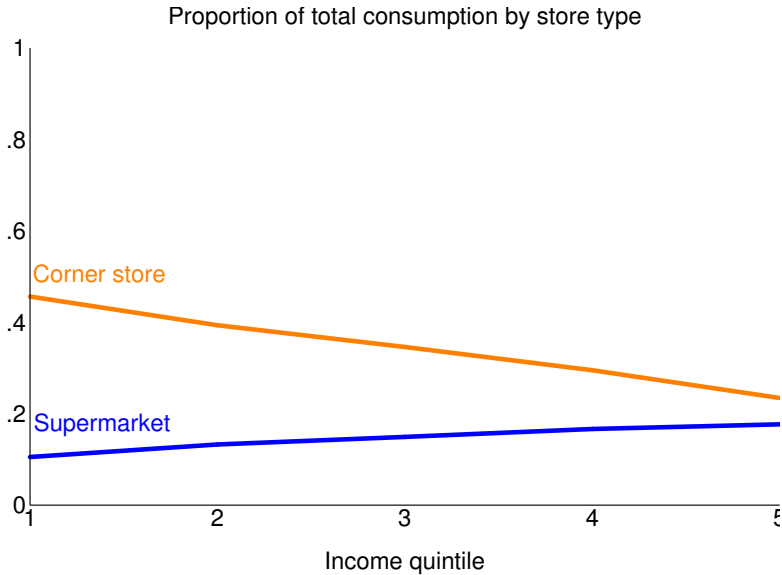
Transaction sizes

Data: universe of transactions at corner stores (by all cardholders)

Result: $>$20% less than US$2, $>$50% less than US$4



Consumption shares by store type (control)



Consumption across stores

$$\log Spending^{s}_{it} = \lambda_{j(i)} + \delta_t + \gamma D_{j(i)t} + \varepsilon_{it}$$

$$\log Spending^{s}_{it} = \xi_{j(i)Card(i)} + \psi_{Card(i)t} + \delta_t + \gamma D_{j(i)t} + \omega D_{j(i)t} \times \mathbb{I}(Card)_{it} + \varepsilon_{it}$$

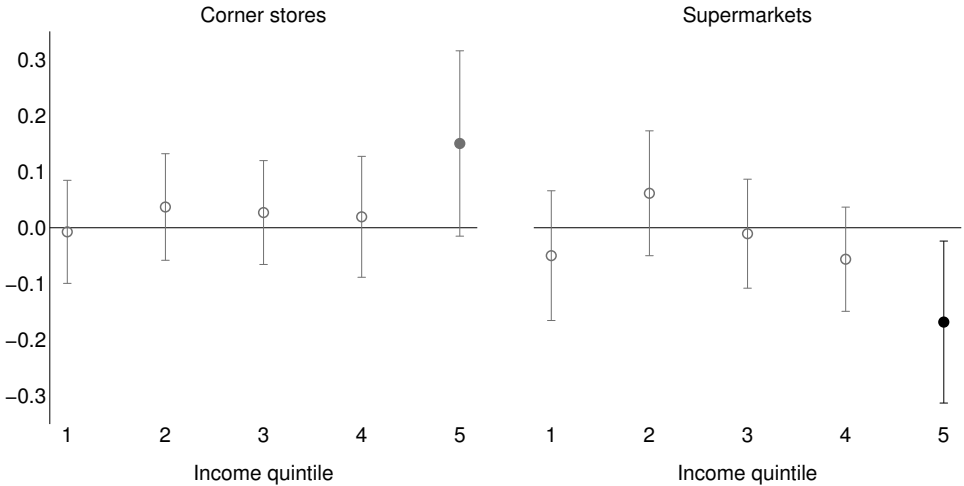
$$\log Spending^{s}_{it} = \xi_{j(i)Ben(i)} + \psi_{Ben(i)t} + \delta_t + \gamma D_{j(i)t} + \omega D_{j(i)t} \times \mathbb{I}(Ben)_{it} + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable: log spending at…								
	Corner stores			Supermarkets			Total		
Diff-in-diff	0.067	0.051	0.076	−0.018	0.003	−0.016	0.029	0.029	0.041
	(0.032)	(0.033)	(0.033)	(0.043)	(0.050)	(0.045)	(0.030)	(0.033)	(0.030)
Diff-in-diff × has credit card		0.061			−0.058			−0.012	
		(0.040)			(0.062)			(0.040)	
Diff-in-diff × Prospera beneficiary			−0.127			−0.030			−0.161
			(0.060)			(0.133)			(0.063)
P-value DID + (DID × interaction)		[0.009]	[0.423]		[0.250]	[0.732]		[0.581]	[0.073]
Number of households	49,810	49,810	49,810	49,810	49,810	49,810	49,810	49,810	49,810
Number of localities	220	220	220	220	220	220	220	220	220
Locality fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality by card/beneficiary fixed effects		Yes	Yes		Yes	Yes		Yes	Yes
Card/beneficiary by time fixed effects		Yes	Yes		Yes	Yes		Yes	Yes

▸ Consumption ▸ Profits

Consumption across stores: quantity of food (kg and liters)

$$\log Quantity^{s}_{it} = \lambda_{j(i)} + \theta_{q(i)t} + \gamma D_{j(i)t} + \sum_{q=2}^{5} \psi_q \mathbb{I}(quintile = q)_{it} \times D_{j(i)t} + \varepsilon_{it}$$

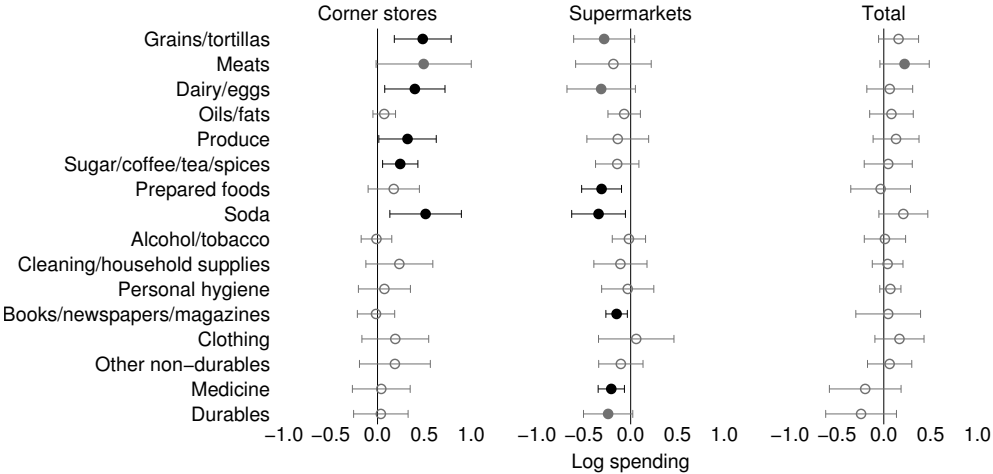


▸ Consumption

Consumption across stores: by product category

$$\log Spending_{it}^{gs} = \lambda_{j(i)} + \theta_{q(i)t} + \gamma D_{j(i)t} + \sum_{q=2}^{5} \psi_q \mathbb{I}(quintile = q)_{it} \times D_{j(i)t} + \varepsilon_{it}$$

Results for richest quintile



Consumption across stores: by product category (food)

$$\log Spending^{s}_{it} = \lambda_{j(i)} + \theta_{q(i)t} + \gamma D_{j(i)t} + \sum_{q=2}^{5} \psi_q \mathbb{I}(quintile = q)_{it} \times D_{j(i)t} + \varepsilon_{it}$$

	(1) Grains/ tortillas	(2) Meats	(3) Dairy/ eggs	(4) Oils/ fats	(5) Produce	(6) Sugar/ coffee/tea/ spices	(7) Prepared foods	(8) Soda	(9) Alcohol/ tobacco
Panel A: Corner stores									
Quintile 1	−0.051	0.145	0.292	−0.015	0.307	0.329	−0.031	−0.060	0.089
	(0.096)	(0.175)	(0.154)	(0.101)	(0.137)	(0.145)	(0.149)	(0.141)	(0.057)
Quintile 2	0.033	0.080	0.068	0.159	0.052	0.055	−0.243	0.180	0.070
	(0.099)	(0.167)	(0.130)	(0.078)	(0.120)	(0.115)	(0.145)	(0.136)	(0.071)
Quintile 3	−0.025	0.003	0.140	0.097	0.221	0.135	−0.056	0.191	0.128
	(0.109)	(0.160)	(0.132)	(0.073)	(0.133)	(0.124)	(0.129)	(0.129)	(0.079)
Quintile 4	0.144	0.167	0.162	0.013	0.130	0.019	−0.060	0.234	−0.053
	(0.103)	(0.145)	(0.124)	(0.074)	(0.145)	(0.102)	(0.150)	(0.131)	(0.079)
Quintile 5	0.483	0.493	0.399	0.072	0.321	0.243	0.173	0.514	−0.011
	(0.154)	(0.258)	(0.163)	(0.061)	(0.156)	(0.096)	(0.139)	(0.194)	(0.083)
Baseline mean	5.772	4.289	4.765	0.740	3.660	1.683	2.501	4.332	0.580
Number of observations	49,810	49,810	49,810	49,810	49,810	49,810	49,810	49,810	49,810
Number of localities	220	220	220	220	220	220	220	220	220
Locality fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quintile × time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

▸ Consumption

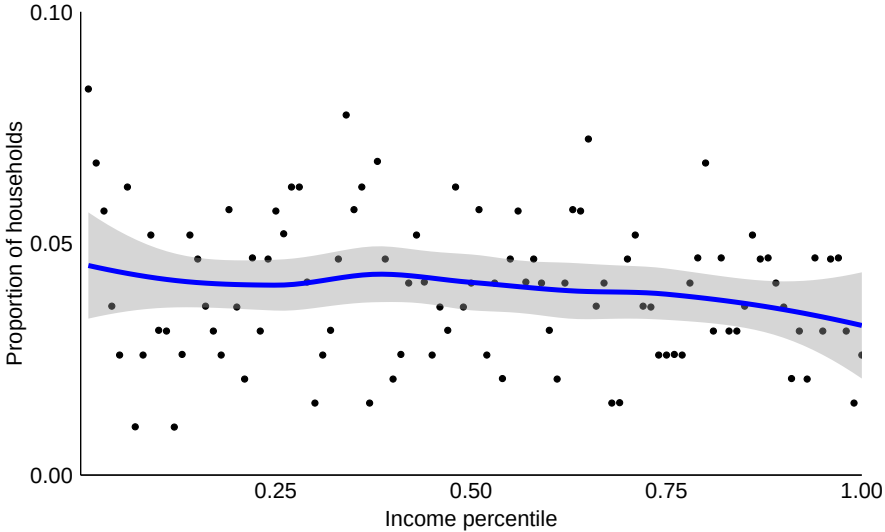
Consumption across stores: by product category (food)

$$\log Spending_{it}^{s} = \lambda_{j(i)} + \theta_{q(i)t} + \gamma D_{j(i)t} + \sum_{q=2}^{5} \psi_q \mathbb{I}(quintile = q)_{it} \times D_{j(i)t} + \varepsilon_{it}$$

	(1) Grains/ tortillas	(2) Meats	(3) Dairy/ eggs	(4) Oils/ fats	(5) Produce	(6) Sugar/ coffee/tea/ spices	(7) Prepared foods	(8) Soda	(9) Alcohol/ tobacco
Panel B: Supermarkets									
Quintile 1	−0.024	−0.013	−0.092	0.018	−0.069	0.011	0.004	−0.096	0.039
	(0.142)	(0.122)	(0.121)	(0.079)	(0.138)	(0.099)	(0.069)	(0.089)	(0.036)
Quintile 2	0.210	0.151	0.161	0.121	0.086	0.250	−0.024	0.009	−0.007
	(0.151)	(0.128)	(0.132)	(0.068)	(0.143)	(0.120)	(0.073)	(0.093)	(0.038)
Quintile 3	−0.034	0.121	−0.070	0.076	−0.004	0.207	−0.022	−0.004	0.095
	(0.125)	(0.123)	(0.121)	(0.073)	(0.111)	(0.113)	(0.071)	(0.087)	(0.054)
Quintile 4	−0.030	0.057	−0.167	−0.087	−0.049	−0.048	0.013	−0.125	−0.092
	(0.113)	(0.141)	(0.108)	(0.071)	(0.124)	(0.092)	(0.088)	(0.095)	(0.054)
Quintile 5	−0.283	−0.184	−0.315	−0.069	−0.138	−0.144	−0.311	−0.343	−0.019
	(0.165)	(0.205)	(0.185)	(0.088)	(0.167)	(0.117)	(0.108)	(0.145)	(0.090)
Baseline mean	2.065	2.122	2.042	0.542	1.895	0.956	0.634	1.311	0.242
Number of observations	49,810	49,810	49,810	49,810	49,810	49,810	49,810	49,810	49,810
Number of localities	220	220	220	220	220	220	220	220	220
Locality fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quintile × time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

▸ Consumption

Corner store owners evenly distributed by income



Corner store churn

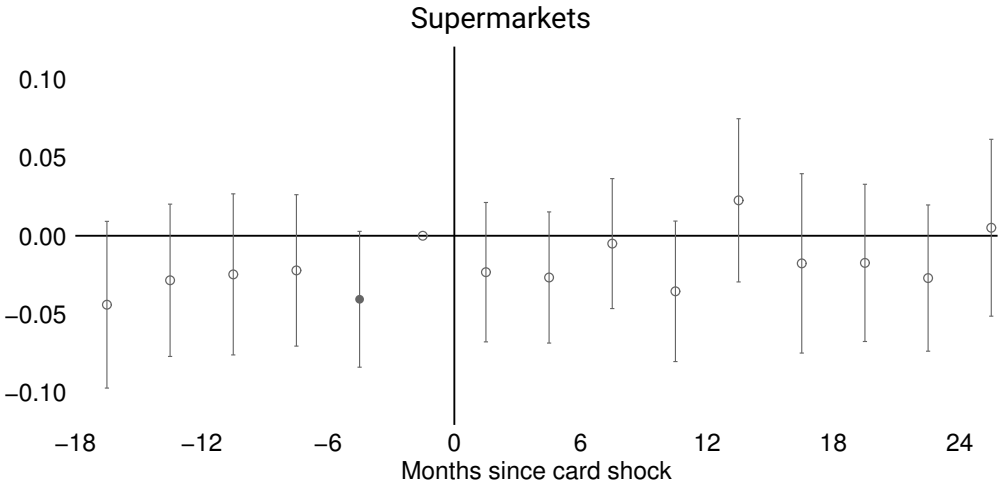
$$y_{jt} = \lambda_j + \delta_t + \beta D_{jt} + \varepsilon_{jt}$$

	(1)	(2)	(3)	(4)
	Only 2008 stores		All stores	
	Number of Corner Stores	Log Number of Corner Stores	Number of Corner Stores	Log Number of Corner Stores
	−3.056***	−0.048	0.076	0.006
	(1.171)	(0.040)	(0.642)	(0.056)
Number of localities	250	250	250	250
Locality fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes

▸ Profits

No wage effect

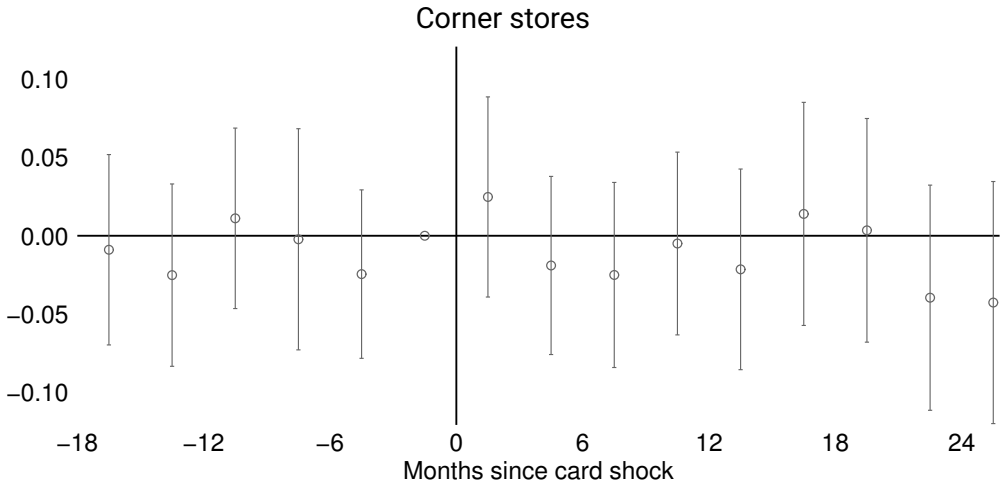
$$\log Wage_{it} = \lambda_{m(i)} + \delta_t + \sum_k \phi_k D^k_{m(i)t} + \varepsilon_{it}$$



▸ Profits

No wage effect

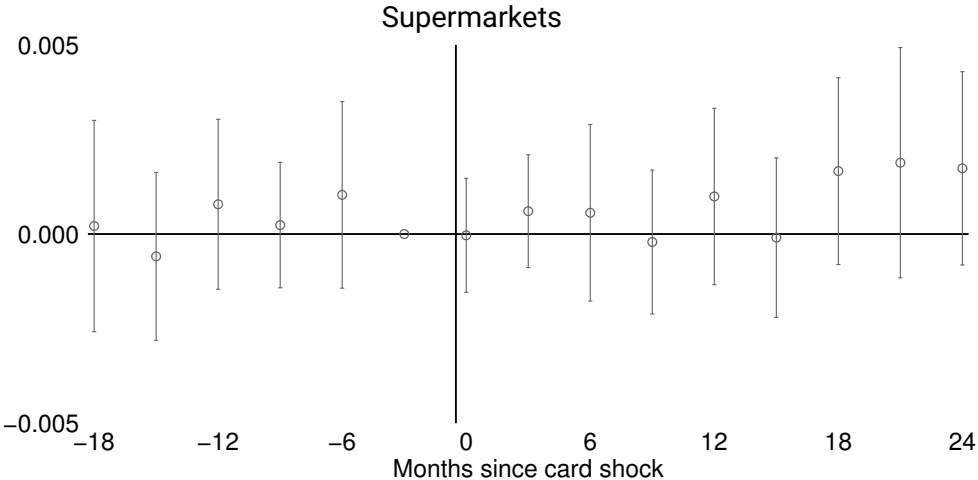
$$\log Wage_{it} = \lambda_{m(i)} + \delta_t + \sum_k \phi_k D^k_{m(i)t} + \varepsilon_{it}$$



▸ Profits

No effect on probability fired

$$Fired_{it} = \lambda_{m(i)} + \delta_t + \sum_k \phi_k D^k_{m(i)t} + \varepsilon_{it}$$



▸ Profits

Consumer gains from supply-side POS adoption

$-\theta_k/\alpha_k$ is price-equivalent value of no stores $\rightarrow$ all stores with POS:

$$-\frac{\theta_k}{\alpha_k} = \frac{d \log \phi_{akst} / d\overline{POS}_{z(a)st}}{d \log \phi_{akst} / d \log P_{ast}} = \frac{d \log P_{ast}}{d\overline{POS}_{z(a)st}}$$

$-(\theta_k/\alpha_k)\Delta POS_{ks}$ is value to consumers of supply-side response to shock

- ΔPOS_{ks} is observed change in adoption in response to shock

Next: plug in $-\frac{\theta_k}{\alpha_k}\Delta POS_{ks}$ for $d \log P_s$ in standard consumer surplus formula

Consumer gains from supply-side POS adoption

First-order approximation of compensating variation:

$$CV = e(P^0, U^0) - e(P^1, U^0)$$

First-order Taylor expansion of $e(P^0, U^0)$ around P^1:

$$\approx \left[e(P^1, U^0) + \sum_s \frac{\partial e(P^1, U^0)}{\partial P_s} (P_s^0 - P_s^1) \right] - e(P^1, U^0)$$

Shephard's lemma and duality:

$$\approx -\sum_s x_s^1 (P_s^1 - P_s^0) \approx -\sum_s P_s^1 x_s^1 \left(\frac{P_s^1 - P_s^0}{P_s^1} \right) \approx \sum_s P_s^1 x_s^1 \left(\frac{\theta}{\alpha} \Delta POS_s \right)$$

Proportional Δconsumer surplus $\approx \sum_s \phi_s^1 \, (\theta/\alpha) \, \Delta POS_s$