

The Real Impact of FinTech: Evidence from Mobile Payment Technology

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FinTech and the Real Economy

- Technology in providing financial services
 - Investment, lending, payment
 - ...
- Transforms consumer behavior and business practice
 - Improved convenience for consumers
 - Enhanced productivity and efficiency for business
- Exemplary role: mobile payment technology
 - China: transaction amount reaches 42 billion USD in 2018
 - Similar trend in other countries
- Reshapes the economy in multiple aspects

Mobile Payment vs. Cash

- Businesses
 - Lower the operating cost of cash-handling
 - Lower the cost of employee theft via cash
 - 2.5% of revenue (ACFE 2014; Kennedy 2014)
- Consumers
 - Removing the need to carry cash; facilitating tech adoption
 - Lowered transaction cost→increases consumer demand
- Reduced costs and boosted consumer demand can stimulate business growth
 - Especially for small businesses
 - Small businesses: >90% of firms; 35%-70% of total employment in major countries

The Role of Financial Intermediary

- More nuanced when other cashless payment methods are provided by financial intermediaries
 - E.g., credit cards
- (Small) merchants: mobile likely preferred to card
- Consumers
 - Mobile payment technology is safer
 - Credit card provides liquidity
- Banks
 - Mobile payment helps replace costly cash-based services
 - Do not want to crowd out revenue-generating credit cards
 - Endogenous response to maximize their profits

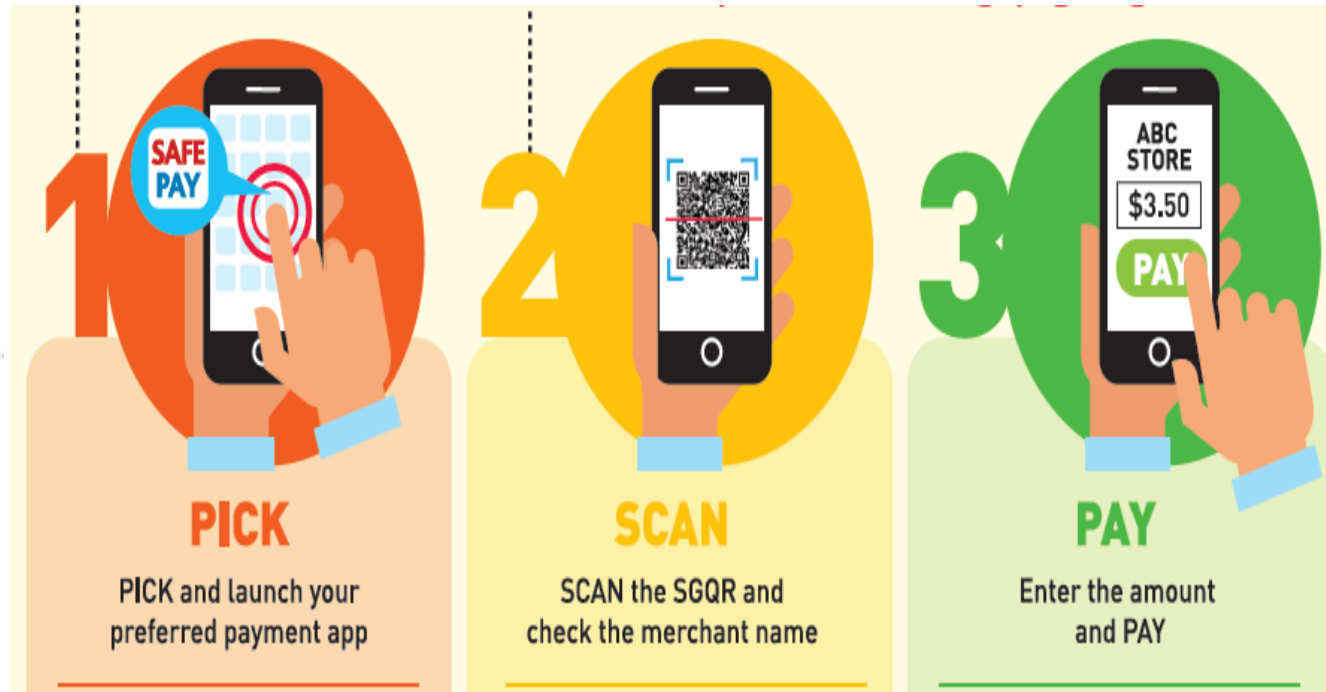
This Paper

- ***How does the introduction of mobile payment technology affect the real economy?***
 - (Small) business creation
- We use the (unexpected) introduction of new mobile payment technology in April 2017 in Singapore
- Investigate the response of multiple economic sectors
 - Merchants
 - Consumers
 - Banks
- Structural model to rationalize the responses

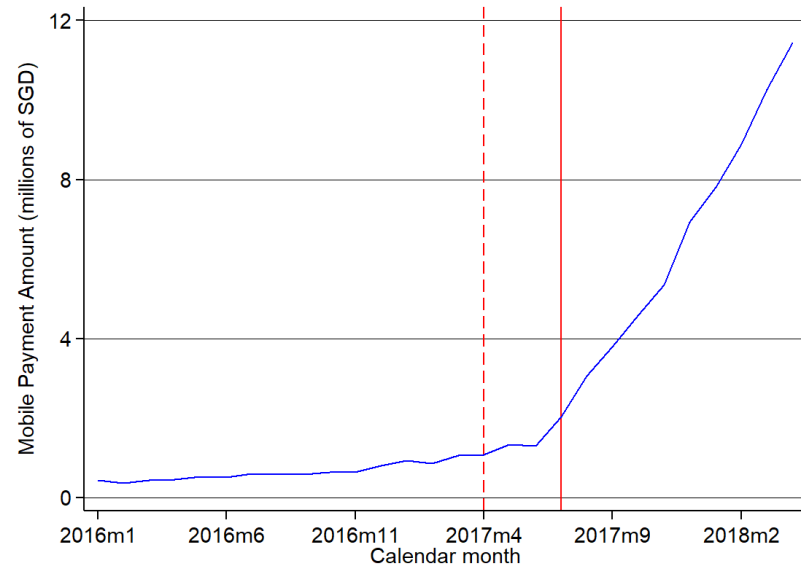
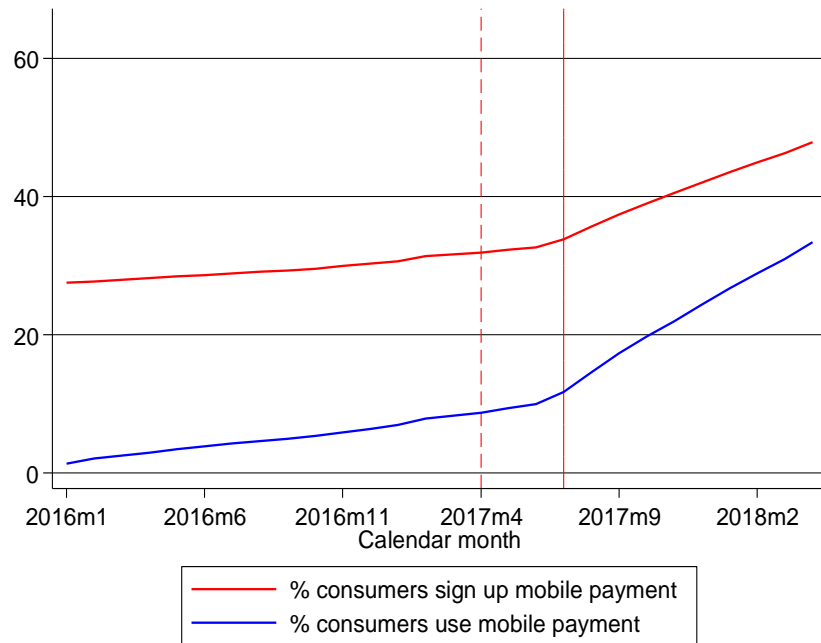
Payment System in Singapore

- As many developed economy, Singapore is...
 - Cash-dominant society, with credit cards as a popular alternative
 - Cash usage accounts for **43%** of total monthly spending
 - Credit card accounts for **16%** of total monthly spending
- April 2017: Introduction of QR code by a large bank
- July 2017: Allowing for inter-bank transfer on phones
- Pay/receive entirely on phones, by scanning/displaying QR codes or inputting the recipients' phone number
- Can pay both consumers and merchants
- straightforward, efficient, and secure

Illustration of the Technology



Post-shock Mobile Payment Use



Based on the transaction records of a large, random sample of consumers from a leading bank in Singapore

- By 2018, 56.6% (49.1%) consumers in sample signed up (used) mobile payment
- By 2018, total amount of mobile payment from our bank : ~ **770 million SGD**

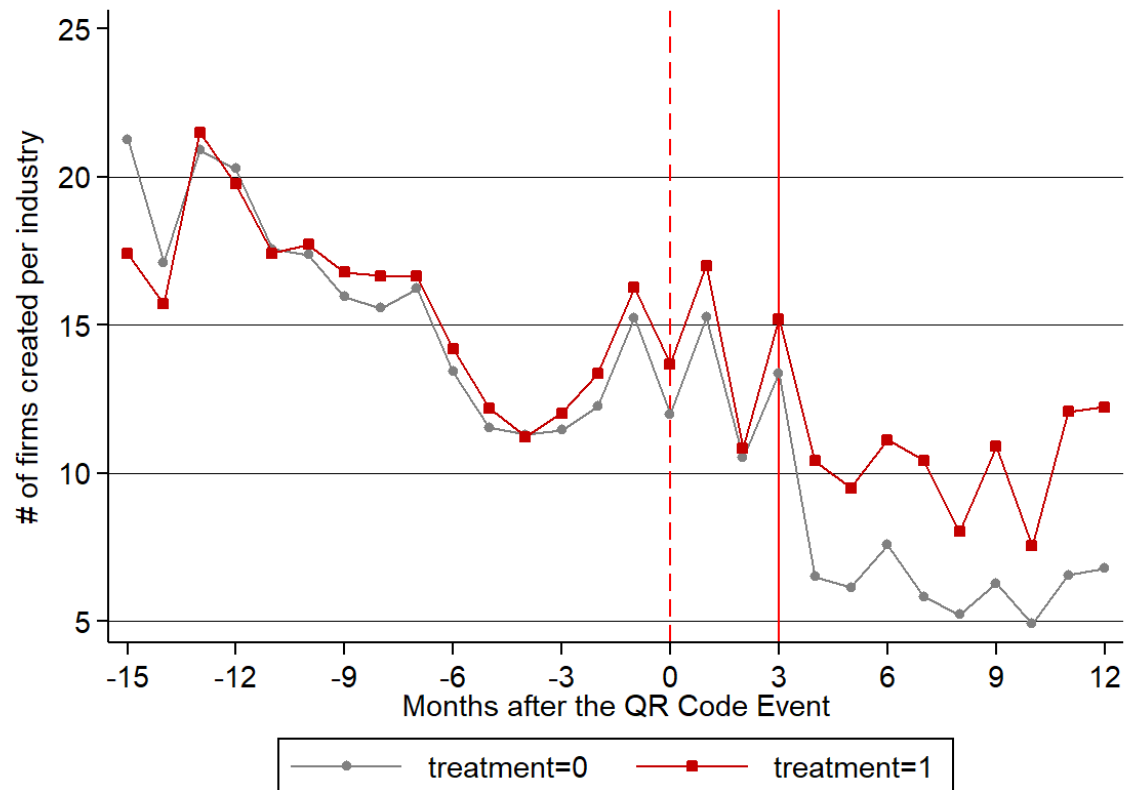
Preview of Findings

- After the introduction of mobile payment technology, affected industries show higher growth rate of business creation by 8.9%,
 - Effect entirely driven by small businesses
 - Effect stronger among industries facing higher cost of cash handling
- Consumers:
 - mobile payment increased
 - ATM cash withdrawal decreased
 - Total spending increased
- Bank:
 - Closure of ATM machines
 - Mobile payment users experience increase in credit limit
 - Consistent with bank's endogenous response

Data

- Business creation
 - ACRA (Accounting and Corporate Regulatory Authority)
 - Registry data of the universe of firms in Singapore
 - Firm name, industry, registry date, location, legal entity type
- Financial data from the largest bank in Singapore (DBS)
 - 5 million retail customers ~ 82% of the country's population
 - Random sample of 250K consumers from 2016-2018
 - Disaggregated transaction records of mobile payment, bank account and debit/credit card
 - Consumer characteristics: e.g., age, gender, occupation
 - Population of ATM transactions
 - Location, transaction amount and time

Raw Data: # Business Creation



Regression Result

	(1)	(2)	(3)
	Dependent Var. = Log(1+# of new businesses)		
	Full sample	Non-company	Company
Treated*Post	0.089*** (0.034)	0.123*** (0.038)	-0.065 (0.058)
Fixed effects	Industry, year-month, Industry-division×year		
Observations	9,226	9,226	9,226
Adj R^2	0.898	0.861	0.836

- Mobile payment increased the number of business created by 156 per month
 - Parallel trend holds: no effect in the months before
 - No effect in tourist areas: less domestic consumer→less shocked
 - Persistent effect
 - Stronger effect in the less wealthy areas: promote inclusive growth

Delineating Economic Channels

- For merchants:
 - **Lowers the cost of handling cash**
- For consumers:
 - Lowers the transaction cost and improves convenience
 - Facilitates adoption
 - Increases demand
- For banks:
 - Endogenous response to maximize profits
 - Cut cost
 - Maintain its revenue generating business line (e.g., cc)

Cash Cost of Merchants

- Retail & food industries facing differential levels of cash-handling cost (Arango and Taylor, 2008)

	(1)	(2)
	Log(1+# of non-company new businesses)	
	High cash-transaction cost industries	Low cash-transaction cost industries
Treated*Post	0.437*** (0.128)	0.113 (0.071)
Fixed effects	Industry, year-month, Industry-division×year	
Observations	6,856	7,256
Adj R^2	0.859	0.855

Diff: p=0.026

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Mobile Payment Response

	(1)
	Log(1+ mobile payment)
Treated*Post	0.254***
	(0.006)
Observations	2,696,557
Adj R^2	0.382

- Treatment: consumers ex ante more receptive to mobile payment (i.e., signed up for mobile wallet before shock)
- Bank's aggregate \uparrow in mobile payment: **SGD 4.5 million** per month

Cash Usage Response

	(1) Log(1+Cash withdrawal)	(2) Log(1+ATM cash withdrawal)	(3) Log(1+OTC cash withdrawal)
Treated*Post	-0.027*** (0.008)	-0.029*** (0.008)	0.002 (0.003)
Observations	2,696,557	2,696,557	2,696,557
Adj R^2	0.641	0.500	0.162

- Significant decrease in cash, which is entirely driven by ATM cash withdrawal

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Spending Response

	(1)	(2)	(3)	(4)	(5)
	Log(1+Total spending)	Log(1+mobile payment)	Log(1+credit card spending)	Log(1+debit card spending)	Log(1+bill payment)
Treated*Post	0.042*** (0.005)	0.254*** (0.006)	0.033*** (0.007)	0.012* (0.007)	-0.002 (0.007)
Observations	2,696,557	2,696,557	2,696,557	2,696,557	2,696,557
Adj R^2	0.608	0.382	0.686	0.611	0.754

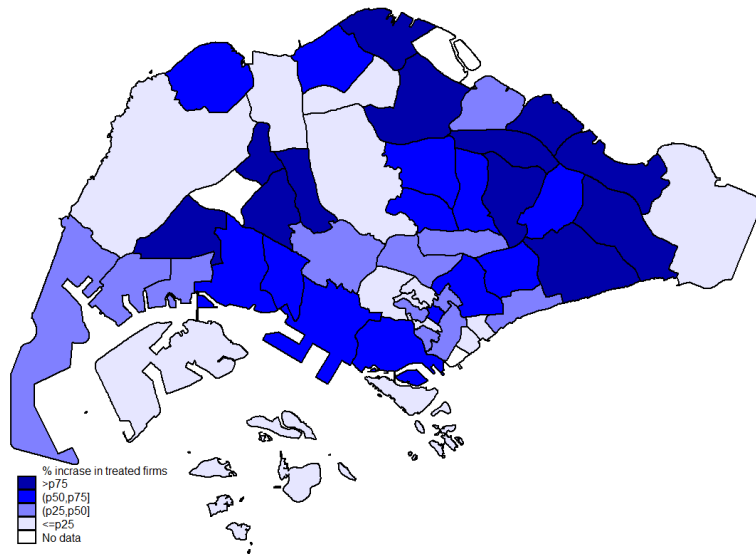
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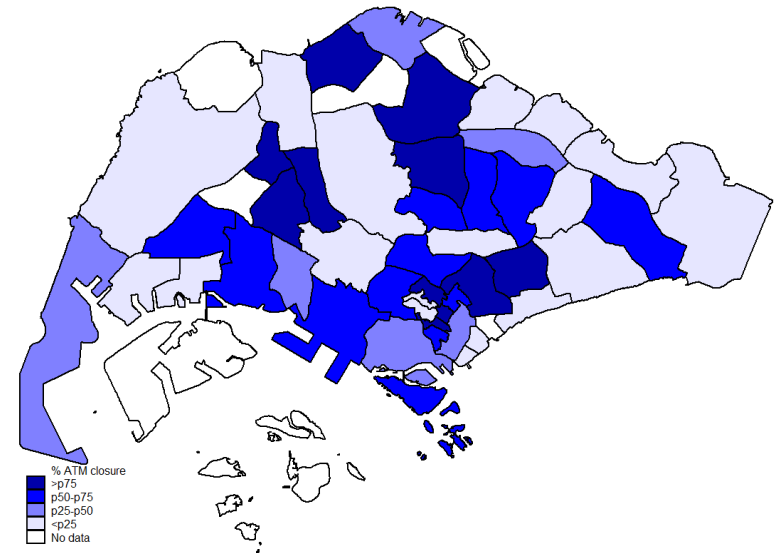
Firm Creation and ATM Closure

- Acceleration of ATM closure after QR-payment introduction
 - 11.9 ATM closure per month during the pre-event period
 - 16.6 ATM closure per month after the event

Firm Creation



ATM Closure



- One std increase in the growth rate of small business creation can explain 0.33 std of the increase of monthly ATM closure rate ($p < 0.05$)

Delineating Economic Channels

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 - **Maintain its revenue generating business line (e.g., cc)**

Credit Response

	(1) Having credit card	(2) # of credit cards	(3) Log(credit limit)
Treated*Post	0.016*** (0.001)	0.093*** (0.003)	0.047*** (0.002)
Observations	6,623,455	4,169,090	4,169,090
Adj R^2	0.934	0.965	0.940

- Consistent with the bank increasing credit provision to mobile payment users
- Consistent with the large credit card spending increase
 - Credit cards remain unpopular for small merchants: increase in consumer demands not fully accrued to small merchants
- Same pattern in the aggregate: salient jump in credit provision after the shock

Performance of Businesses

- Use change in income and spending of the self-employed from our bank data to assess the business performance aspect

	(1)	(2)
	<u>Log(1+Bank account inflow)</u>	<u>Log(1+Total spending)</u>
Self-employed*Post	0.069*** (0.016)	0.030*** (0.012)
Observations	3,803,186	3,803,186
Adj R^2	0.720	0.608

Model Ingredients

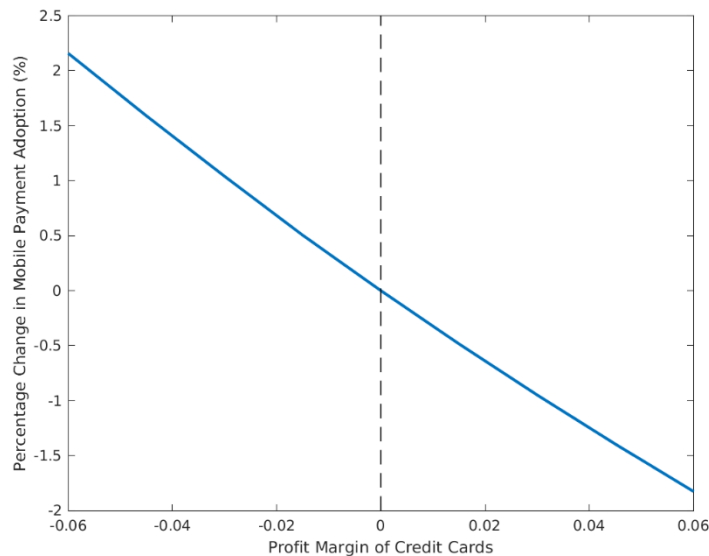
- Consumers
 - Utility depends on preference which differs by payment method
 - Utility of cash depends on the number of ATMs, utility of card depends on banks' credit supply
 - Choose a payment method (cash, mobile, card, or no transaction)
- Merchants
 - Different payment instrument implies different net profit
 - Merchants make entry decisions based on the expected profit
- Banks
 - Different profit margins for each payment method
 - Incur costs for providing ATMs and credit supply
 - Choose the number of ATMs and credit supply to maximize profits

Estimation and Prediction

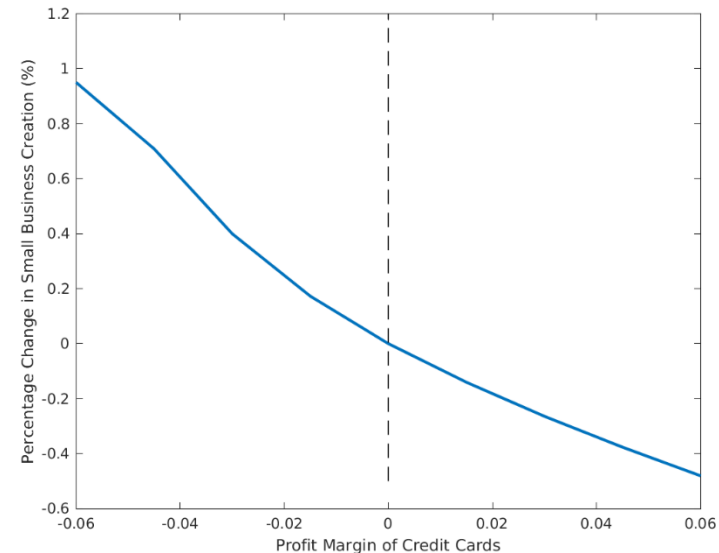
- Use empirical moments of business entry, transactions of different payment methods, ATM and credit supply over time
- Estimate structural parameters that rationalize the empirical responses by consumers, merchants, and banks
 - Consumer preferences
 - Preference for mobile payment increases after the shock → mobile payment increased & cash withdrawal decreased (substitution)
 - Net Profit of each payment method for merchants
 - Higher net profit of mobile payment than cash → more small business entries after the shock
 - Profit margin of each payment method for banks
 - Low margin of cash and high margin of credit cards → closure of ATMs and increase in credit supply
- Predicted magnitude of total spending increases by 4.2%.
 - Convenient spending stimulates demand
 - More entries from small merchants

Counterfactual: Credit Card Margin

Mobile Payment Adoption



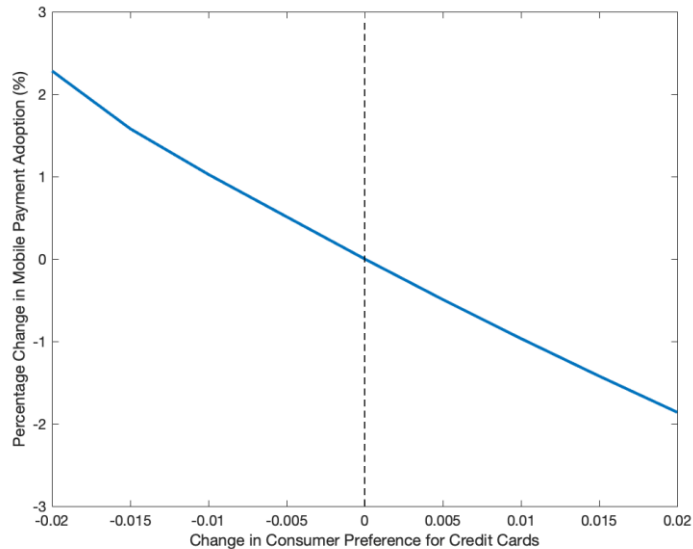
Small Business Creation



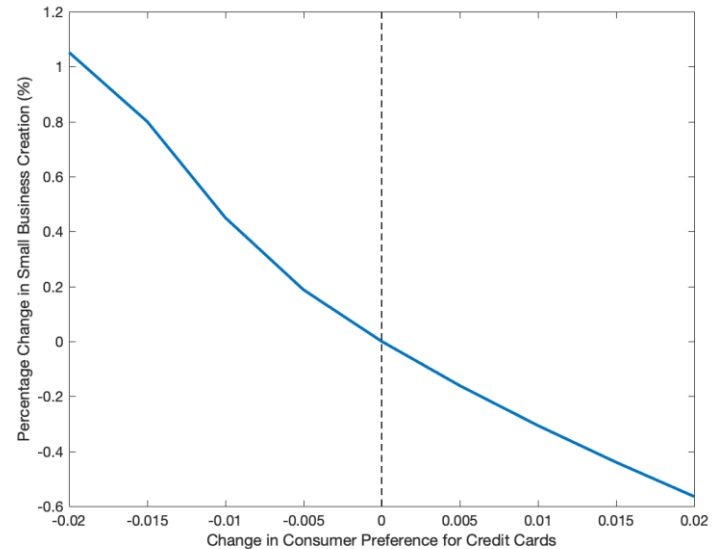
- Perturb the bank's profit margin for credit cards
 - The adoption in mobile payment and creation in small business decrease as the profit margin of credit cards increases
- Highlight the role of financial intermediaries on the impact of mobile payment

Counterfactual: Credit Card Preference

Mobile Payment Adoption



Small Business Creation



- Perturb consumer preference for credit cards
 - The adoption in mobile payment and creation in small business decrease as the preference for credit cards increases
- Consistent with the evidence as casually observed in the US
 - The impact of mobile payment hinges on the profitability and prevalence of other (cashless) payment methods

Concluding Remarks

- The introduction of the mobile payment technology reshapes economic activities in multiple sectors
- Stimulates small business creation, through
 - Lower (small) merchants' transaction cost
 - Improve consumers' convenience
 - Facilitating adoption
 - Boosting demand
- Banks' response to maintain its credit card business
 - Dampens the effect on small business