Indirect Effects of Access to Finance

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- Lack of credit to firms believed to be a major growth barrier.
    - Credit programs to small and medium enterprises (SMEs) common.
- But we know little about *indirect effects* of credit to SMEs.
    - Direct effect: do borrowers gain?
    - Indirect effects: how are competitors and consumers affected?
- Indirect effects key to measuring broader impacts on society.
- **This project:** randomize access to a new loan product for SMEs within and across local markets in China.
- Research questions:
    1. What are the direct and indirect effects and mechanisms?
    2. What are the implied welfare effects?

Countries with Directed Lending or Credit Guarantees
for Small and Medium Enterprises

No Program Found
Program Exists

Related literature

- Well-identified studies on impact of finance.
  - Microenterprises using randomized grants: De Mel, McKenzie and Woodruff (2008).
  - Large firms using policy variation: Banerjee and Duflo (2014).
  - Microfinance: Banerjee, Karlan and Zinman (2015) overview.
- Evidence on industry and general equilibrium effects.
  - Industry equilibrium effects of R&D, subsidies, training: Bloom, Schankerman and Van Reenen (2013), Rotemberg (2017), McKenzie and Puerto (2021).
  - General equilibrium effects: Burke, Bergquist and Miguel (2018), Huber (2018), Breza and Kinnan (2021).
- **Contribution:** randomized evidence on credit's indirect effects on SMEs and consumers, mechanisms, model-based welfare evaluation.

Loan product

- In 2013 large bank introduced a new loan product to SMEs in Jiangxi.
  - Targeted to clusters of firms—typically retail and services—in specialized local "markets".
  - Savings on administering / monitoring costs for bank.
  - No collateral required.
  - Standardized application, decision in 2 weeks.
- Financial conditions:
  - Maximum loan RMB 500,000, monthly interest rate about 0.7%.
  - Pay interest every month, repay after 2 years.
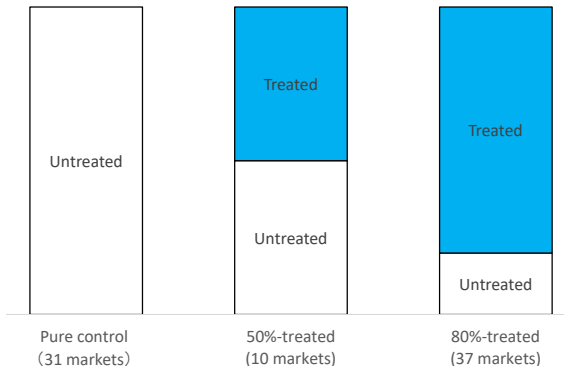
- **Treatment**: loan officer visited treated firms monthly for a year, provided information about the loan and help in applying.
- Sample: retail and service firms in 78 local markets in China.
  1. Direct effect: impact of the treatment.
  2. Indirect effect: impact of share competitors treated.

- **Surveys**: half of the firms in all markets, total sample 3,117.
    - Baseline: 2013 summer, before the intervention.
    - Midline: 2015 summer, to give time for firms to borrow and grow.
    - Endline: 2016 summer.
        - Comprehensive data on balance sheet, finances, operations.
    - Short follow-up: 2020 summer.
        - Data on location, price, service quality, customer satisfaction.

## Summary statistics: Firm and manager characteristics

Sample: all baseline, 3,173 firms	Pure Control	Δ Treated 50% Markets	Δ Untreated 50% Markets	Δ Treated 80% Markets	Δ Untreated 80% Markets
Number of firms	1247	222	203	1214	287
Panel A: Firm Characteristics					
Firm age	6.479***	0.697	0.935	-0.310	-0.517
	(0.308)	(1.005)	(0.727)	(0.420)	(0.467)
Sector - Retail (%)	0.682***	0.047	0.027	0.004	-0.041
	(0.057)	(0.089)	(0.103)	(0.072)	(0.090)
Number of employees	8.823***	1.159	0.364	0.015	0.219
	(0.564)	(1.151)	(1.131)	(0.705)	(0.697)
Profit (10,000 RMB)	51.95***	-1.878	-2.483	-0.951	-0.272
	(6.193)	(11.62)	(9.134)	(7.747)	(8.204)
Sales (10,000 RMB)	323.7***	19.06	6.570	2.925	-7.416
	(38.30)	(79.75)	(59.83)	(53.74)	(43.40)
Panel B: Managerial Characteristics					
Gender (1=Male, 0=Female)	0.581***	-0.018	-0.009	-0.002	-0.002
	(0.031)	(0.065)	(0.061)	(0.053)	(0.059)
Age	38.36***	-0.232	0.347	-0.016	0.927
	(0.642)	(1.415)	(1.294)	(1.081)	(1.059)
Education - College	0.246***	0.011	0.025	0.031	0.029
	(0.021)	(0.036)	(0.051)	(0.028)	(0.034)
Political connection (1=Yes, 0=No)	0.148***	0.037	0.015	0.015	0.013
	(0.018)	(0.0400)	(0.031)	(0.025)	(0.027)

Sample: all baseline, 3173 firms	Pure Control	Δ Treated 50% Markets	Δ Untreated 50% Markets	Δ Treated 80% Markets	Δ Untreated 80% Markets
Number of firms	1247	222	203	1214	287
Panel A: Borrowing					
Other Bank Loan (1=Yes, 0=No)	0.253***	0.036	-0.001	-0.027	-0.030
	(0.024)	(0.049)	(0.048)	(0.033)	(0.044)
Loan Size (10,000 RMB)	30.78***	1.271	-4.008	-1.982	-5.531
	(6.737)	(14.28)	(8.919)	(11.12)	(7.769)
Monthly Interest Rate (‰)	9.158***	-0.463	0.332	0.043	0.036
	(0.133)	(0.351)	(0.289)	(0.198)	(0.294)
Panel B: Partnerships					
Number of Clients	27.37***	-0.770	1.232	1.124	2.118
	(1.011)	(1.505)	(2.287)	(1.482)	(1.829)
Number of Suppliers	6.535***	2.091	1.549	-0.244	0.124
	(0.813)	(2.245)	(1.559)	(0.908)	(1.063)
Panel C: Shutdown and Attrition					
Attrition (endline)	0.106***	-0.002	-0.002	0.001	-0.001
	(0.009)	(0.015)	(0.023)	(0.012)	(0.016)
Shutdown (endline)	0.134***	-0.026	-0.031	-0.052*	0.019
	(0.023)	(0.059)	(0.045)	(0.028)	(0.034)

- Balance remains for subset that survive to 2016 or 2020 surveys.
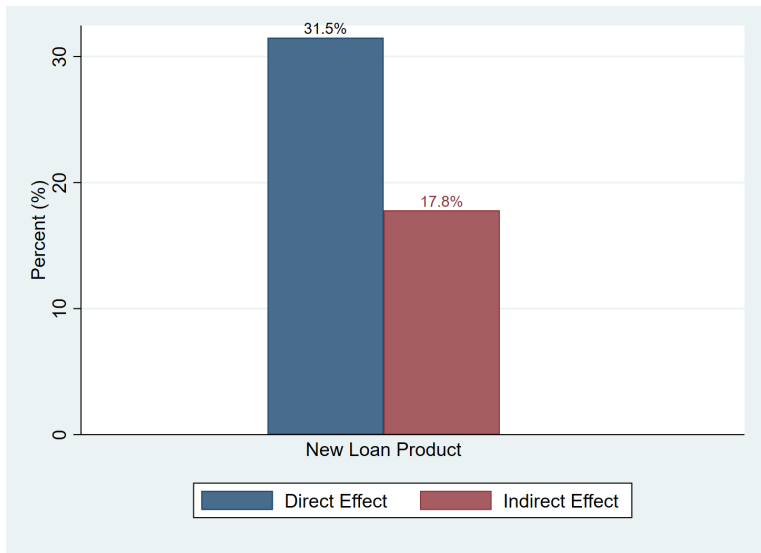
- Fact 1: Spillovers in borrowing, suggest information diffusion.

Effects on borrowing: regression

Dep. var.:	Borrow with new loan product			Borrow from other sources	
	(1)	(2)	(3)	(4)	(5)
Treated	0.279***	0.315***		0.029	
	(0.034)	(0.034)		(0.019)	
Untreated * Share of Peers Treated		0.178***		0.013	
		(0.037)		(0.032)	
Treated * 50% market			0.302***		0.029
			(0.057)		(0.025)
Treated * 80% market			0.318***		0.028
			(0.039)		(0.021)
Untreated * 50% market			0.112*		0.005
			(0.062)		(0.028)
Untreated * 80% market			0.140***		0.007
			(0.030)		(0.029)
Constant	0.067***	0.032***	0.031***	0.294***	0.295***
	(0.014)	(0.037)	(0.030)	(0.013)	(0.013)
Observations	3173	3173	3173	2,658	2,658

- No crowding out of existing loans.
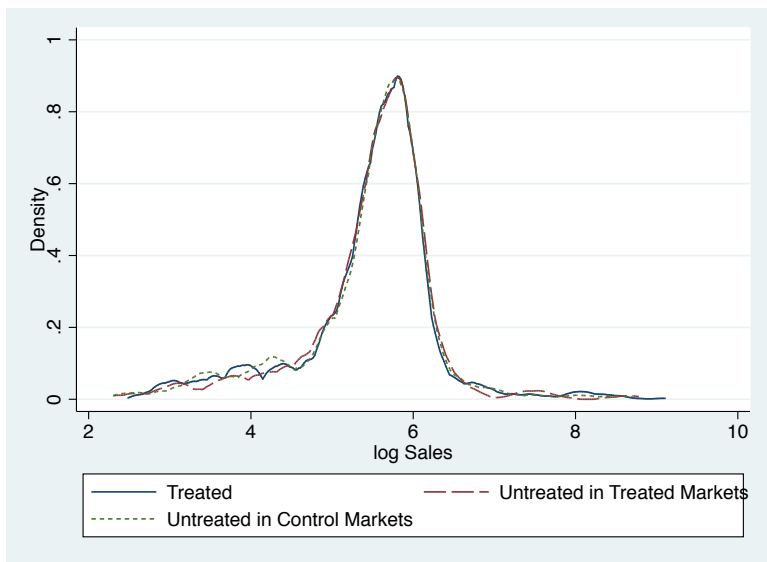
- Randomization check.
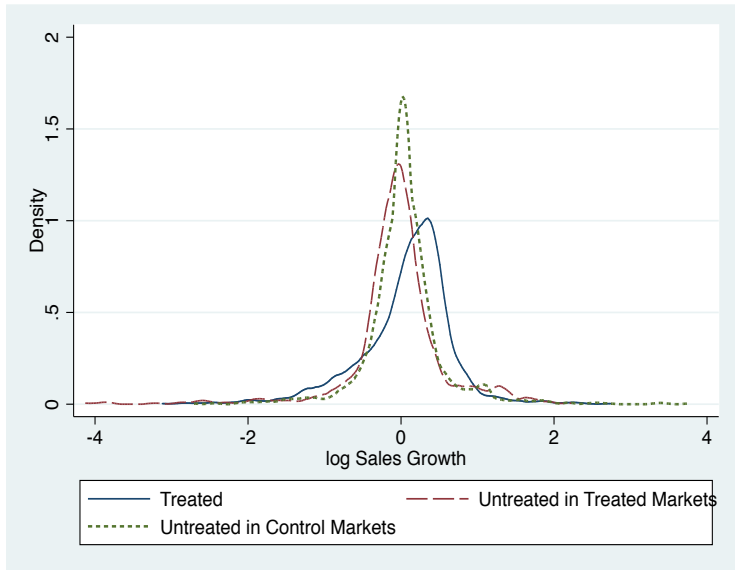
- Fact 2: Positive direct and negative indirect effects.

1. Experimental design and data.
2. Conceptual framework.
3. Results.
4. Conclusion.

Conceptual framework: business stealing

- Monopolistically competitive firms are organized in local markets.
- Utility over differentiated goods i in markets m

$$H + \left[\int Q_m^{1-1/\theta} dm \right] \text{ with } Q_m = \left[\int_{i \in m} (h_i Q_i)^{1-1/\sigma} di \right]^{\frac{\sigma}{\sigma-1}}$$

where h_i is product quality and $\sigma > \theta$.
- Firms produce with labor and differ in productivity: $Q_i = \omega_i L_i$.
  - Numeraire H produced perfectly competitively.
- Treatment increases quality-adjusted productivity $h_i \omega_i$ by e^γ.
- Introduced randomly to share S_m of firms in market m.
- **Proposition.** To a first-order approximation, effect on revenue of i

$$\Delta \log R_i \approx (\sigma - 1)\gamma \cdot T_i - (\sigma - \theta)\gamma \cdot S_m.$$

Estimating equation

- Basic specification:

$$y_i^t = \beta \cdot Post^t \times Treatment_i$$
$$+ \delta \cdot Post^t \times Share\ Competitors\ Treated_i$$
$$+ \kappa \cdot Post^t + Firm\ f.\ e. + \varepsilon_i^t$$

- *Post* is indicator for the midline or endline survey, firm fixed effects remove time-invariant heterogeneity.
  - Cluster standard errors by market.
- Interpretation of coefficients:
  - β represents direct effect of treatment;
  - δ represents indirect effect of competitors' treatment.

Main outcomes

Dep. var.:	log Sales	Profit (10,000 RMB)	log Number of Employees	log Wage Bill	Fixed Assets (10,000 RMB)	log Material Cost	Shutdown
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post*Treated	0.099***	12.64***	0.075**	0.101***	5.468	0.077*	-0.028***
	(0.035)	(3.099)	(0.029)	(0.029)	(4.537)	(0.041)	(0.010)
Post*Share Competitors Treated	-0.086**	-9.478*	-0.066*	-0.069*	-3.013	-0.050	0.001
	(0.041)	(4.802)	(0.038)	(0.037)	(4.558)	(0.047)	(0.018)
Firm FE and Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,612	8,612	8,612	8,602	8,612	8,605	8,847

- Large direct and indirect effects on main outcomes.

Dep. var.:	log Number of Clients	Renovation	New Product	Quality of Labor	Supplier Change	Stocking Period (unit: month)	Inventory Management
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post*Treated	0.083**	0.243***	0.231***	0.097***	0.114***	0.597***	0.132***
	(0.032)	(0.020)	(0.018)	(0.025)	(0.025)	(0.086)	(0.022)
Post*Share	-0.071**	-0.049	-0.047**	-0.026	0.027	-0.034	0.019
Competitors Treated	(0.034)	(0.030)	(0.019)	(0.030)	(0.032)	(0.112)	(0.027)
Firm FE and Post	Yes	Yes	Yes	No	No	No	No
Observations	8,612	8,612	8,612	2,781	2,781	2,781	2,781

- Reallocation of clients to treated firms.
- Treatment improves measures of
    - Quality: renovation, new product, labor quality;
    - Cost: supplier, stocking period, inventory management.
- Small indirect effects: net gains at market level.

Consumer experience

Dep. var.:	log Price	Advice from Sellers	Service Quality	Shopping Environment	Value for Money	Overall Satisfaction
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.052*	0.238***	0.753***	0.991***	0.574***	0.836***
	(0.027)	(0.035)	(0.0950)	(0.0969)	(0.081)	(0.060)
Share Competitors Treated	-0.007	-0.098**	-0.175	-0.345***	-0.211**	-0.231**
	(0.037)	(0.046)	(0.120)	(0.128)	(0.087)	(0.095)
Observations	2,781	1,804	1,804	1,804	1,804	1,804

- Improved consumer experience both in price and quality dimensions.
  - Small indirect effects: net gains at market level.
- **Suggested mechanism**: firms invest to improve "quality/price ratio", leading to reallocation of demand.

Outline from here

VARIABLES	Borrow with new loan product	
	Treated	Untreated
	(1)	(2)
Share Local Competitors Treated	-0.023	-0.023
	(0.039)	(0.043)
Share Local Non-competitors Treated	0.039	0.100**
	(0.057)	(0.049)
Share Non-local Competitors Treated	0.005	0.112**
	(0.095)	(0.056)
Share Non-local Non-competitors Treated	-0.045	0.061
	(0.146)	(0.076)
Observations	1256	1525

- Spillover only to untreated.
- Information diffusion from "similar" firms who are not direct competitors.
- Highlights sender incentives in technology adoption.

VARIABLES	All Sample			Treated and Pure Control		
	log Sales	Profit (10,000 RMB)	log Number of Employees	log Sales	Profit (10,000 RMB)	log Number of Employees
	(1)	(2)	(3)	(4)	(5)	(6)
Post*Treated	0.089**	11.60***	0.079**	0.098	-2.024	0.041
	(0.041)	(2.776)	(0.031)	(0.188)	(10.96)	(0.057)
Post*Share Local Competitors Treated	-0.099*	-11.49**	-0.053	-0.021	-3.065	0.020
	(0.054)	(5.173)	(0.038)	(0.069)	(4.019)	(0.041)
Post*Share Local Non-competitors Treated	0.156***	13.41***	0.056**	0.132**	16.68***	0.015
	(0.046)	(4.416)	(0.027)	(0.053)	(5.291)	(0.024)
Post*Share Non-Local Competitors Treated	-0.065	-9.798	-0.022	0.009	-6.108	-0.0002
	(0.045)	(12.10)	(0.047)	(0.111)	(16.41)	(0.070)
Post*Share Non-Local Non-competitors Treated	0.094	8.412	-0.018	0.035	10.94	-0.042
	-0.062	(15.83)	(-0.047)	(0.249)	(18.67)	(-0.062)
Firm FE and Post	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,220	8,220	8,220	6,967	6,967	6,967

- Positive indirect effect from local non-competitors may be:
  1. Information diffusion induced borrowing,
  2. Demand diffusion from "shopping around."
- Preserved for groups where diffusion shut down, suggesting latter.
- Demand externality may drive agglomeration of retail.

Dep. var.:	log Market Revenue	Market Profits	Shutdown Rate	Renovation Rate	Product Intro Rate	Quality of Labor	log Price	Customer Satisfaction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post*Share Market Treated	0.058	53.41	-0.072**	0.162***	0.146***	0.043	-0.043*	1.020***
	(0.037)	(130.1)	(0.027)	(0.030)	(0.020)	(0.032)	(0.025)	(0.265)
Market FE and Post	Yes	Yes	Yes	Yes	Yes	No	No	No
Observations	234	234	234	234	234	78	78	78

- Insignificant effects on sales and profit.
- Market-wide gains in survival, quality, price, and customer satisfaction.

- Four types of indirect effects:
    - Information diffusion.
    - Business stealing.
    - Consumer gains.
    - Demand diffusion.
- Core mechanism: loan enables improvements in quality/price ratio, generating consumer gains and reallocating demand.
- Impacts concentrated on consumer rather than producer surplus.

1. Experimental design and data.
2. Conceptual framework.
3. Results.
   1. Main effects.
   2. Intermediate outcomes and mechanisms.
   3. Geography and competition.
   4. Welfare evaluation.
4. Conclusion.

- Include both diffusion and business stealing using IV approach:

$$treatment \xrightarrow{1} borrowing \xrightarrow{2} outcomes$$

  diffusion acts at stage 1, business stealing at stage 2.

- Model-implied second stage equation:

$$y_i = \zeta \cdot B_i + \xi \cdot Z_i + \varepsilon_i$$

  where B_i is borrowing and Z_i share of competitors who borrow.

- First stage: instrument with randomly assigned T_i and S_i.
  - Untreated borrow 11 months later $\rightarrow$ include them in B_i, Z_i only at endline.
- Ignore demand diffusion and heterogeneity by geography.
  - Incorporating demand diffusion has small effect on results.

Direct and indirect effects of borrowing

Dep. var.:	First stage		IV		
	Borrow (1=Yes, 0=No)	Share Competitors Borrow	log Sales	Profit	log Number of Employees
	(1)	(2)	(3)	(4)	(5)
Post*Treated	0.273***	0.009			
	(0.030)	(0.006)			
Post*Share Competitors Treated	0.091***	0.357***			
	(0.021)	(0.033)			
Borrow			0.318**	40.41***	0.239***
			(0.127)	(9.698)	(0.07)
Share Competitors Borrow			-0.288**	-33.09**	-0.22***
			(0.134)	(12.978)	(0.082)
F-statistics	51.5	58.85			
Firm FE and Post	Yes	Yes	Yes	Yes	Yes
Observations	8612	8612	8612	8612	8612

- Qualitative results similar to reduced-form estimates.
- Can be combined with the model for welfare evaluation.

Model-predicted welfare effects

- **Gain in consumer surplus**: model predicts is proportional to

$$\frac{\zeta_R}{\sigma - 1} \cdot \text{Revenue of treated}$$

  where ζ_R is IV revenue direct effect coefficient.
- Extent of reallocation normalized by elasticity of substitution.
  - Measures cost savings from reduction in quality-adjusted price.
- For a given σ can be computed from estimates.
  - Atkin et al (2016) report 4.4, Dolfen et al (2019) 4.3-6.1 for retail elasticity of substitution; we use $\sigma = 6$.
- **Gain in producer surplus**: net increase in profits in the market, inferred from IV profit coefficients.

Welfare effect estimates

Welfare gain per firm in market	Treat all firms		Treat 50% of firms	
	Share of Profit (%)	USD	Share of Profit (%)	USD
Producer Surplus	4.1	3,566	2.0	1,778
	(4.4)	(3,904)	(2.2)	(1,952)
	[-5, 12]	[-4,263, 10,752]	[-2, 6]	[-2,131, 5,376]
Consumer Surplus	12.7	11,139	6.3	5,565
	(4.6)	(4,022)	(2.3)	(2,011)
	[4, 22]	[3,929, 19,614]	[2, 11]	[1,965, 9,807]
Spillover			2.4	2,087
			(1.3)	(1,144)
			[0, 6]	[316, 4,918]
Total	16.7	14,696	10.7	9,430
	(7.3)	(6,415)	(4.9)	(4,281)
	[3, 32]	[2,724, 28,054]	[2, 21]	[1,508, 18,296]

- Large gains in consumer surplus.
  - The direct effect of the treatment is large, meaning that consumers value the improved services resulting from the treatment.

Return on capital

Private Return (%)	74.2
	(12.9)
	[46, 98]
Business Stealing (pp)	-56.3
	(23.4)
	[-104, -13]
Consumer Surplus (pp)	41.9
	(13.6)
	[16, 70]
Social Return (%)	59.8
	(21.8)
	[11, 98]

- Compute return to capital by normalizing with loan amount.

  Soc return = Priv return + Business stealing + Consumer surplus.

- Private return between Banerjee-Duflo's 105%, De Mel et al's 60%.
- Social return different but still large.
- Ignoring consumer surplus would lead to wrong welfare conclusion.

1. Experimental design and data.
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Conclusion

- We examined impact of access to finance on SMEs.
- Large positive direct effects.
    - Mechanism: lower price and higher quality.
- Large indirect effects:
    - Positive information diffusion to similar non-rival firms.
    - Negative business-stealing from competitors.
    - Positive price-adjusted quality gains to consumers.
    - Positive demand externality to local non-competitors.
- Model-based account of direct and indirect effects on firms and consumers implies sizeable welfare gains.
    - Ignoring some indirect effects could lead to different conclusion.