# Markups, Productivity and the Financial Capability of Firms

C. Altomonte (Bocconi U. & Baffi-Carefin Centre)
D. Favoino (Tinbergen Institute)
T. Sonno (Bologna U. & CEP-LSE)

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# Introduction
## Motivation

(1) Financial market imperfections affect economic outcomes not only per se, but also through their interplay with firms' characteristics

[*Minetti & Zhu (2011); Gorodnichenko & Schnitzer (2013); Manova (2013); Muuls (2015); Chaney (2016); Bonfiglioli et al. (2018)*]

(2) There is a large variation in access to external finance across firms within narrow industries, even after controlling for productivity

[*Irlacher and Unger (2016)*] Graphs

(3) Size-dependent borrowing constraints or heterogeneous dependence on external finance influence the allocation of capital across firms, hence aggregate productivity

[*Gopinath et al. (2017); Larrain & Stumpner (2017)*]

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# Introduction

## The paper in a nutshell

(1) Financial frictions with monopolistically competitive firms heterogeneous in productivity and endogenous markups (Melitz and Ottaviano, 2008):

- Before producing, firms must obtain a bank loan to cover part of production costs (liquidity constraint at entry as in Chaney, 2016)
- To get the loan, firms must post the amount of collateral (tangible assets) that the bank requires (as in Manova, 2013)
- Having obtained the loan, firms enter the market and set profit maximizing prices and markups.

(2) Second source of heterogeneity to account for the differential access of firms to external finance:

- The cost of raising collateral is lower for some firms, a feature that we define as *financial capability*

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## Preview of results

- Financial capability (the relative cost advantage of each firm in raising collateral) and collateral requirements (the quantity of collateral demanded by banks) drive, together with productivity, the equilibrium expressions of firm's prices and markups
  - More financially capable firms do not translate their entire financing cost advantage into lower prices
  - Heterogeneity in access to finance can explain part of the dispersion in firms' prices and markups, on top of productivity and size
- For any given level of financial capability, the amount of collateral that banks require affects the pass-through of costs to prices in the aggregate industry equilibrium
  - Pro-competitive adjustment of industries (also) a function of credit supply: tighter access to credit contributes to incomplete pass-through

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# Introduction

## Structure of the paper

(1) Model and main proposition

(2) Test of main proposition on a representative sample of manufacturing firms during the financial crisis (CompNet & EFIGE data)

- Non-parametric measure of (unobserved) firm-specific financial capability from balance sheet data
- Firm-level measures of TFP and markups purged from potential endogeneity in access to finance

(3) Implications of financial frictions for the pass-through effect

- Structural measure of (ex-ante unobserved) firm level collateral requirements (credit constraints)

# Introduction

## Financial Capability: Identifying assumption

- Access to external finance depends on institutional characteristics of the banking system but also on some firm-level variables
  - Larger firm size is typically associated to higher (need of) loans and collateral (Rampini and Viswanathan, 2013)
  - Amount and quality of tangible assets influence the availability of collateral used as guarantee by banks (Vig, 2013; Brumm et al., 2015) Graphs
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## Financial Capability: Heterogeneity

- Tangible assets differ in terms of 'redeployability':
  - *redeployable assets* (eg. land) less firm-specific, but more easily sold and accepted as collateral (Campello and Giambona, 2012)
  - firms with higher financial capability $\tau \in [0, 1]$ obtain redeployable assets to pledge as collateral at lower costs $\Rightarrow$ firms differ in their cost of accessing finance (link with relationship lending literature)

- Then

$$\theta(\tau) = C(\widetilde{\tau}) - C(\tau)$$

measures the cost advantage (financial capability) in terms of raising collateral that a firm with ability $\tau$ will have vis-à-vis the cutoff capability firm $\widetilde{\tau}$. Note that $\delta\theta(\tau)/\delta\tau > 0$

Banks

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Banks

# Markup and financial capability

- The equilibrium markup charged by a $(c, \tau)$-firm is:

$$\mu(c, \tau) = p(c, \tau) - MC(c, \tau) = \frac{1}{2}\left[\omega c_D - c - \phi + \theta(\tau)\right] \quad (1)$$

  where $\omega = \frac{\rho}{\lambda} + 1 - \rho$ and $\phi = \frac{1-\lambda}{\lambda}\beta$ are constant parameters

- Hence the equilibrium markup $\mu(c, \tau)$ of a firm characterized by a pair $(c, \tau)$ is *ceteris paribus* an increasing function of financial capability $\tau$

# Pass-through

- Assume an exogenous increase in market size $L$
- Solving for $c_D$ (see Parameterization), and differentiating the average markup $\overline{\mu}(c, \tau)$ yields

$$\frac{\partial \overline{\mu}}{\partial L} = \frac{1}{2}\left[\frac{\omega k + \omega - k}{k+1}\frac{\partial c_D}{\partial L}\right] < 0 \tag{2}$$

- We can show that $\frac{\partial c_D}{\partial L} < 0$, i.e. an increase in market size tends to reduce the average industry markup by lowering the cost cutoff
- However $\beta$ enters in the expression of $\frac{\partial c_D}{\partial L}$: a higher $\beta$ will translate *ceteris paribus* into a lower value of the derivative
- Hence tighter credit constraints (higher collateral requirements) contribute to an incomplete passthrough

# Data & Estimations

- Firm-level data from EFIGE:
  - harmonized cross-country dataset
  - $\sim 15,000$ manufacturing firms ($\geq 10$ employees)
  - 7 countries (Austria, France, Germany, Hungary, Italy, Spain, UK)
- Firm-level balance-sheet information (tangible fixed assets, sales, number of employees) from Amadeus for the period 2002 - 2013. CompNet data for country-industry-year controls
- Non-parametric estimation of firm-level financial capability from balance sheet data
- Markups retrieved as in DeLoecker-Warzynski (2012), correcting for the potential endogeneity of $\tau$ in TFP estimates
- Sequence of estimations:

$$\tau \Rightarrow \text{TFP (clearing for } \tau) \Rightarrow \mu \Rightarrow \text{Eq. 1} \Rightarrow \beta_i \Rightarrow \text{Eq. 2}$$

Descriptives

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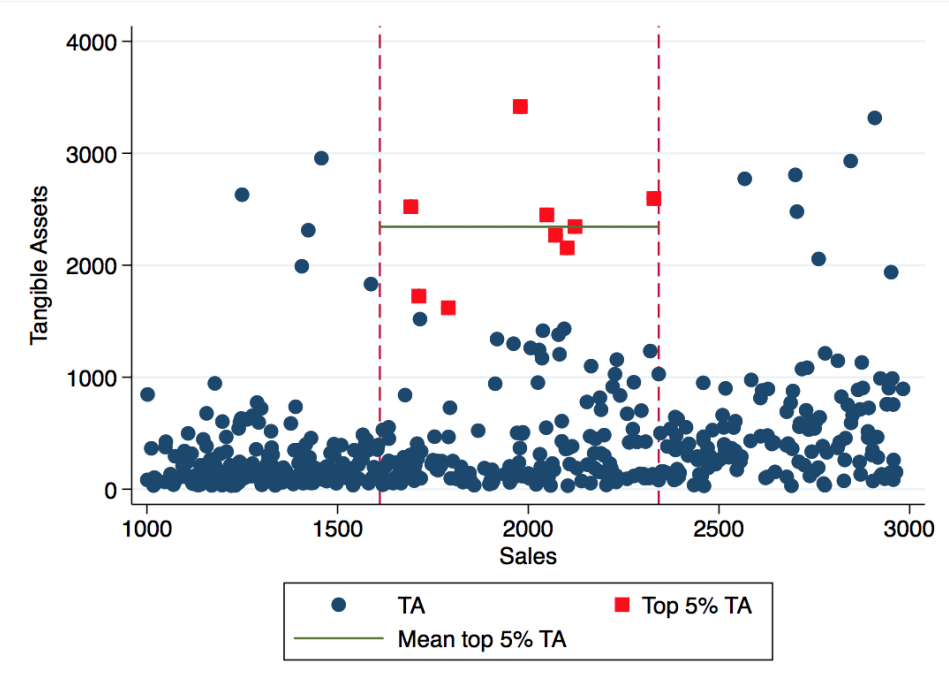
# Estimate of Financial Capability

Figure E.1: Example of $\theta(\tau)$ estimation



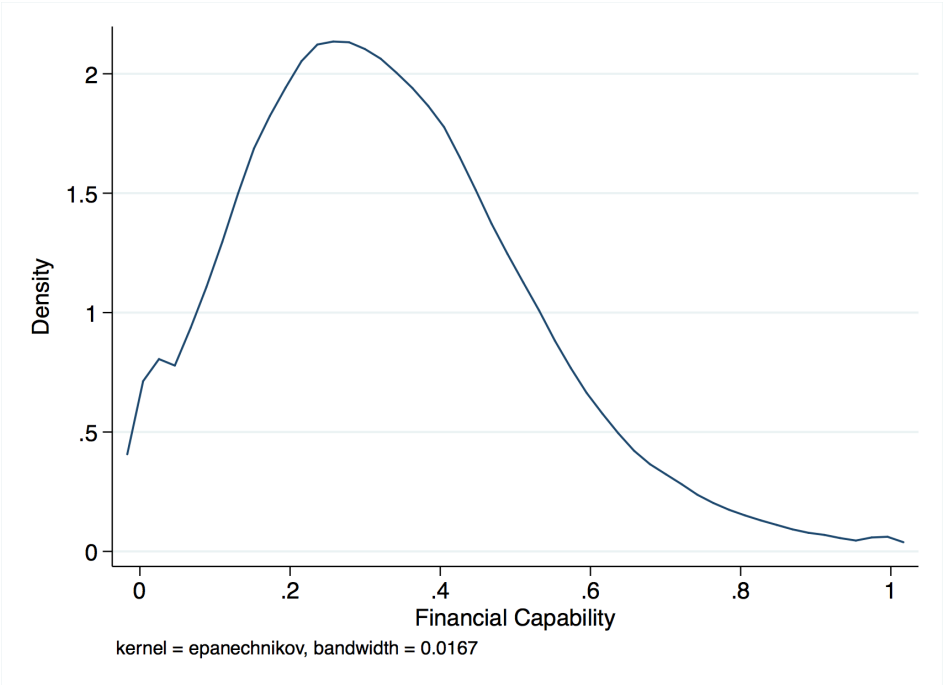

*Note*: The dashed vertical lines enclose the $4^{th}$ decile of firms by size (sales) of the French food industry. The dots represent each firm's tangible assets. The squares represent, within the $4^{th}$ decile of sales, firms in the top 5% of TA value (cutoff firms). The solid horizontal line indicates the mean value of TA for the cutoff firms.

Correlations

# Financial Capability

## Graph

Figure: Distribution of $\theta(\tau)$ across firms and years




*Note*: Financial capability across deciles of firms' sales in each industry. Cutoff firms are those in the top 5% of Tangible Assets value in each size/industry partition. Different combinations of firms' size ranges (quintiles, deciles, twentiles) within industries, different TA cutoff levels (1%, 5%), and different industry aggregations (2-digit or 3-digit NACE level) used as robustness

# Financial Capability

## Plausibility check

Table: Robustness of $\theta(\tau)$ across firms and years

| | (1) | (2) | (3) |
|---|---|---|---|
| Dependent variable | $\theta(\tau)_{i,t}$ | $\theta(\tau)_{i,t}$ | $\theta(\tau)_{i,t}$ |
| $\text{Loan}_{i,t}$ | 0.0408*** | | |
| | (0.00243) | | |
| Interest paid/operating $\text{revenue}_{i,t}$ | | 0.0779*** | |
| | | (0.00364) | |
| $\text{ASCL}_{i,t}$ | | | 0.0219*** |
| | | | (0.000980) |
| Obs. | 89,011 | 65,186 | 80,319 |
| R2 | 0.797 | 0.834 | 0.791 |
| Firm FE | YES | YES | YES |
| Year FE | YES | YES | YES |

*Note*: OLS estimation. Dependent variable: financial capability at the firm level (computed across deciles of sales, with firms having the top 5% of TA considered as the cutoff firms). *Loan* indicates firm's loans. *Interest paid/operating revenue* indicates the ratio between the two variables at the firm level. *ASCL* is the (inverse of the) original ASCL index of financial constraints by Mulier et al. (2016). All specifications are estimated with robust standard errors. ***,**,* = indicate significance at the 1, 5, and 10% level, respectively.

# TFP Estimation

- Financial capability $\theta(\tau)$ likely to be correlated with the (unobserved) firm-specific cost of capital. The unaccounted for input price variation typically induces a downward bias in the estimated coefficients of the production function $\Rightarrow$ (upward) biased TFP estimates
- Idiosyncratic variation in the cost of capital remains in the error term of production function / TFP estimates $\Rightarrow$ potential problem of multicollinearity between TFP and $\theta(\tau)$ when estimating Eq. 1
- Modified Woolridge (2009) algorithm including financial capability as an additional control

  [corr($TFP, \tau$)=0.0316; corr($TFP_{augmented}, \tau$)=-0.0651]
- Results hold with standard TFP and markup estimations

TFP graphs Markups estimation

# Empirical Results

## Test of Equation I - Estimation

Table: Markups, productivity and financial capability

| | (1) Within estimator | (2) Within estimator | (3) Between estimator | (4) Cross-section (OLS) |
|---|---|---|---|---|
| | all years | all years | all years | only 2008 |
| Dependent variable | $\ln(\mu)_{i,t}$ | $\ln(\mu)_{i,t}$ | $\ln(\mu)_{i,t}$ | $\ln(\mu)_{i,t}$ |
| $\ln(TFP)_{i,t}$ | 1.547*** | 1.594*** | 1.363*** | 1.462*** |
| | (0.0109) | (0.0139) | (0.0123) | (0.0191) |
| $\theta(\tau)_{i,t}$ | 0.437*** | 0.484*** | 0.205*** | 0.280*** |
| | (0.0189) | (0.0231) | (0.0237) | (0.0375) |
| $\Delta$ collateral requirement$_{c,t}$ | | -0.0152* | -0.173* | |
| | | (0.00778) | (0.101) | |
| Obs. | 53,698 | 35,525 | 32,149 | 4,548 |
| R2 | 0.807 | 0.836 | 0.726 | 0.769 |
| Number of marks | 7,873 | 7,249 | 6,544 | |
| Firm size and age controls | NO | NO | YES | YES |
| Firm FE | YES | YES | NO | NO |
| Country-Industry FE | NO | NO | YES | YES |
| Year FE | YES | YES | YES | NO |

# Empirical Results

## Test of Equation I - Sensitivity

Table: Markups, productivity and financial capability - Sensitivity

| | TFP | | Financial Capability | | | |
|---|---|---|---|---|---|---|
| | Coeff | Std. Err. | Coeff | Std. Err. | Obs. | R2 |
| Baseline (within) | 1.547*** | (0.0109) | 0.437*** | (0.0189) | 53,698 | 0.807 |
| (1) Quintile of sales, top 10% TA cutoff | 1.587*** | (0.0137) | 0.390*** | (0.0212) | 35,525 | 0.835 |
| (2) Twentiles of sales, top 1% TA cutoff | 1.588*** | (0.0138) | 0.466*** | (0.0256) | 35,393 | 0.834 |
| (3) Disaggregation at Nace 3 digits - FE | 1.584*** | (0.0142) | 0.297*** | (0.0190) | 34,528 | 0.833 |
| (4) Disaggregation at Nace 3 digits - BE | 1.363*** | (0.0123) | 0.180*** | (0.0198) | 31,470 | 0.726 |
| (5) Disaggregation at Nace 3 digits - Cross Section | 1.450*** | (0.0192) | 0.223*** | (0.0300) | 4,459 | 0.769 |
| (6) Markups ACF (augmented) | 0.707*** | (0.00922) | 0.458*** | (0.0201) | 40,034 | 0.645 |
| (7) Markups Wooldridge (standard) | 1.575*** | (0.0137) | 1.283*** | (0.0260) | 35,565 | 0.825 |
| (8) Markups ACF (standard) | 1.585*** | (0.0129) | 0.655*** | (0.0231) | 39,777 | 0.836 |
| Baseline (cross-section) | 1.462*** | (0.0191) | 0.280*** | (0.0375) | 4,548 | 0.769 |
| (9) Number of Banks | 1.459*** | (0.0188) | 0.296*** | (0.0367) | 4,500 | 0.777 |
| (10) R&D Investments | 1.461*** | (0.0191) | 0.281*** | (0.0375) | 4,548 | 0.770 |
| (11) Exporter Status | 1.459*** | (0.0191) | 0.284*** | (0.0372) | 4,548 | 0.771 |
| (12) N. of Banks, R&D Inv., and Exporter | 1.457*** | (0.0188) | 0.299*** | (0.0365) | 4,500 | 0.778 |
| (13) Only unconstrained firms | 1.458*** | (0.0200) | 0.277*** | (0.0389) | 4,320 | 0.766 |

# Empirical Results

## Test of Equation I - Robustness

Table: Markups, productivity and financial capability - Robustness

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent variable | $\ln(\mu)_{i,t}$ | $\ln(\mu)_{i,t}$ | $\ln(\mu)_{i,t}$ | $\ln(\mu)_{i,t}$ |
| $\ln(TFP)_{i,t}$ | 1.547*** | 1.526*** | 1.579*** | 1.504*** |
| | (0.0109) | (0.0115) | (0.0129) | (0.00952) |
| $\theta(\tau)_{i,t}$ | 0.437*** | | | |
| | (0.0189) | | | |
| $\text{Loan}_{i,t}$ | | 0.0238*** | | |
| | | (0.00541) | | |
| Interest paid/operating $\text{revenue}_{i,t}$ | | | 0.0353*** | |
| | | | (0.00841) | |
| $\text{ASCL}_{i,t}$ | | | | 0.0359*** |
| | | | | (0.00226) |
| Obs. | 53,698 | 50,828 | 41,841 | 47,551 |
| R2 | 0.807 | 0.795 | 0.819 | 0.801 |
| Firm FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

# Empirical Results

## Test of Equation II - Prediction

- *Prediction of the model*: An increase in market size lowers markups across firms, but higher collateral requirements tend to mitigate the pro-competitive effect
- Eq. 1 augmented with a trade shock and a measure of firms' collateral requirement to identify the effect of $\beta$ on the passthrough
- Negative Trade Shock (NTS) incurred by EU countries during credit crisis of 2008/09: dummy =1 if growth of a given country-industry trade flow is in the bottom 25% of the overall growth rate distribution observed for the years 2007-2010 (BACI data).
- Proxy for firm-specific collateral requirements $\beta_i$ structurally derived from the model Plausibility check
- Model implies (+) effect of NTS (higher shock => higher markup); (-) effect of $\beta_i$ (higher costs => lower markups); (-) effect of $NTS \times \beta_i$ (effect of trade shock mitigated by collateral)

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# Empirical Results

## Test of Equation II - Estimation

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | decile of sales, top 5% TA cutoff | decile of sales, top 5% TA cutoff, Nace 3 digits | quintile of sales, top 10% TA cut-off | decile of sales, top 5% TA cutoff | decile of sales, top 5% TA cutoff |
| | Firm-specific $\beta_{i,t}$ | Firm-specific $\beta_{i,t}$ | Firm-specific $\beta_{i,t}$ | Firm-specific $\beta_{i,t}$ | $\beta_{i,t}$ above/below median |
| Dependent variable | $\ln(\mu)_{i,t}$ Wooldridge (augmented) | $\ln(\mu)_{i,t}$ Wooldridge (augmented) | $\ln(\mu)_{i,t}$ Wooldridge (augmented) | $\ln(\mu)_{i,t}$ ACF (augmented) | $\ln(\mu)_{i,t}$ Wooldridge (augmented) |
| $\ln(TFP)_{i,t}$ | 1.362*** | 1.360*** | 1.361*** | 1.205*** | 1.366*** |
| | (0.0137) | (0.0138) | (0.0132) | (0.0176) | (0.0132) |
| $\theta(\tau)_{i,t}$ | 0.222*** | 0.188*** | 0.209*** | 0.204*** | 0.224*** |
| | (0.0278) | (0.0229) | (0.0252) | (0.0300) | (0.0287) |
| $\beta_{i,t}$ | -0.585*** | -0.593*** | -0.585*** | -0.338*** | -0.143*** |
| | (0.0467) | (0.0503) | (0.0477) | (0.0552) | (0.0113) |
| $NTS_{z,ct}$ | 0.422*** | 0.415*** | 0.421*** | 0.518*** | 0.408*** |
| | (0.0793) | (0.0870) | (0.0858) | (0.0897) | (0.0741) |
| $\beta_{i,t} \times NTS_{z,ct}$ | -0.192** | -0.168* | -0.195** | -0.443*** | -0.114*** |
| | (0.0947) | (0.101) | (0.0936) | (0.101) | (0.0279) |
| Obs. | 13,126 | 12,853 | 13,126 | 12,466 | 13,126 |
| R2 | 0.757 | 0.757 | 0.757 | 0.672 | 0.754 |
| Number of marks | 5,794 | 5,681 | 5,794 | 5,516 | 5,794 |
| Firm size and age controls | YES | YES | YES | YES | YES |
| Country-Year controls | YES | YES | YES | YES | YES |
| Industry FE | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES |
| Bootstrapped (1000) SE | YES | YES | YES | YES | YES |

# Conclusion

- Our theoretical model predicts that
  1. conditional on productivity, a higher financial capability is associated to higher markups at the firm level
  2. higher collateral requirements attenuate the passthrough of demand shocks
- Test of the model on a representative sample of manufacturing firms covering a subset of European countries during the financial crisis
- Economic liberalization in contexts of relatively inefficient bank systems (or endogenously generating a relatively tighter access to credit by firms) are likely to deliver attenuated passthrough
- Important caveat in the design of future structural policies of economic liberalization.

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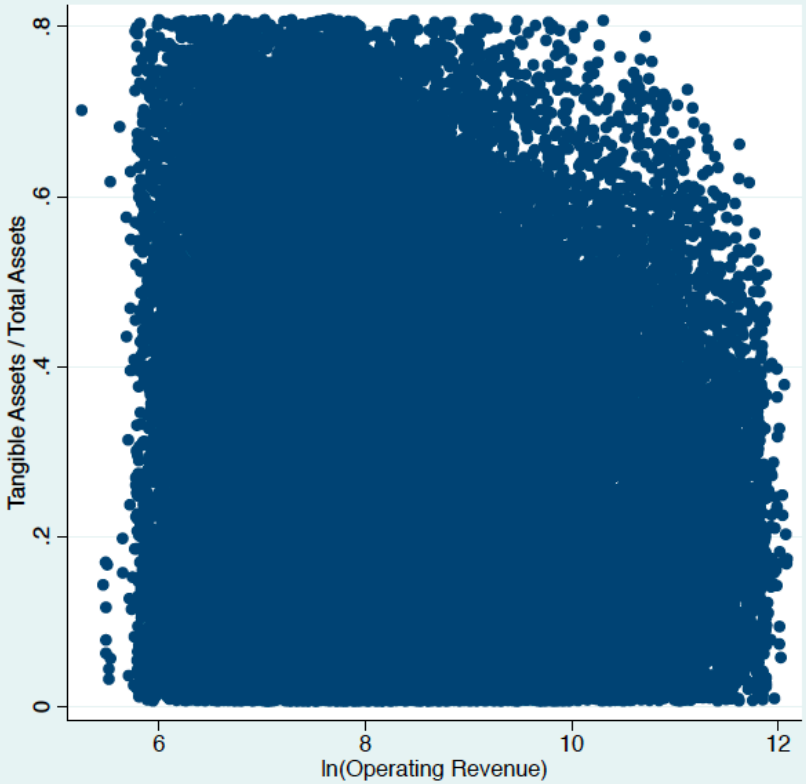
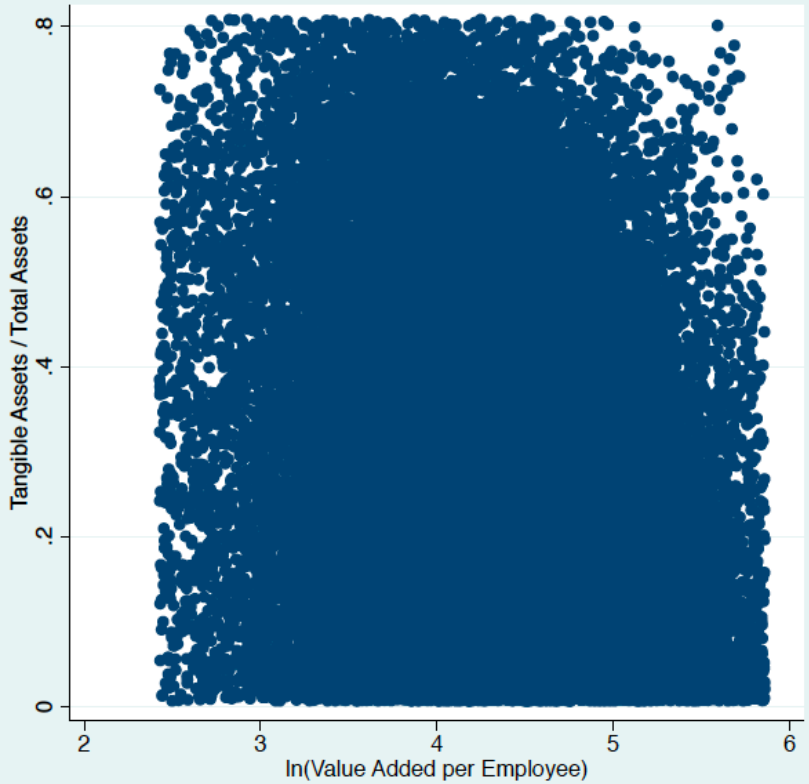
# Appendix
## Motivation I

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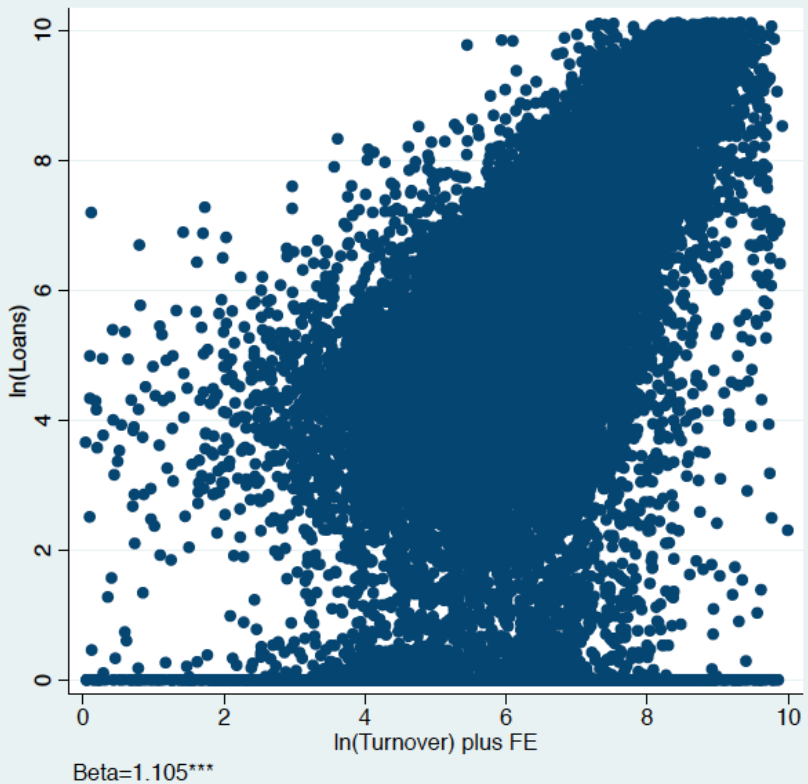
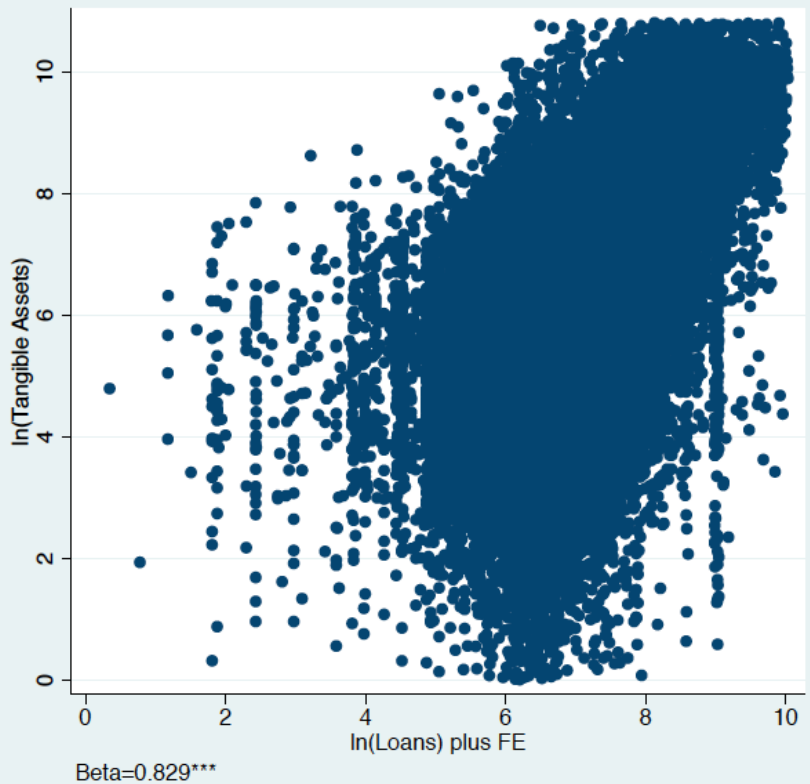
# Appendix
## Motivation II

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# Appendix
## Intuition of financial capability cutoff

- The implications of heterogeneity in financial capability can be seen considering the case of all firms having the same financial expertise $\bar{\tau}$
- Since they have the same fixed entry cost $f_E$ they would end up with the same cost to produce the required amount of tangible asset per unit of output $C(\bar{\tau})$
- In this case, the total cost of producing tangible assets for any firm $\overline{TC}(c) = C(\bar{\tau})q(c)$ will just be a function of the firm's size, i.e. ultimately of its marginal costs
- Even introducing a financial sector in our framework, without heterogeneity in financial capability productivity will remain the only endogenous variable needed to characterize the entire equilibrium of the industry

Back to Financial Sector

- Firms borrow from a perfectly competitive banking sector in order to finance a share $\rho$ of production costs $cq(c)$
- Banks require a minimum amount of collateral as generated by the (financially capable) cutoff firm $\widetilde{\tau}$
- Collateral is a sector-specific share $\beta$ of tangible assets, and there is an exogenous probability $\lambda$ of repayment R
- The participation constraint of a bank is thus:

$$\underbrace{-\rho cq(c,\tau)}_{\text{loan}} + \lambda \underbrace{R(c,\tau)}_{\text{repayment}} + (1-\lambda)\underbrace{\beta f_E q(c,\tau)}_{\text{collateral}} \geq 0$$

- In a perfectly competitive banking sector this constraint holds with equality, and thus one can retrieve $R(c,\tau)$

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- To work out the aggregate implications for the economy, we have to fully characterize the industry equilibrium (i.e. solve for $c_D$) taking into account both (independent) sources of heterogeneity $(c, \tau)$
- We assume $c$ to follow an Inverse Pareto distribution with $k \geq 1$ over $[0, c_M]$, while $\tau$ follows a Uniform distribution in [0,1]
- We also need to specify the functional form of $\epsilon(\tau)$, i.e. the price advantage enjoyed by the $\tau$ firm. We assume that $\epsilon(\tau) = \tau - a$, with $a \in [0, 1]$
- The latter implies that the financial capability cutoff is $\widetilde{\tau} = a$
- The free-entry equilibrium condition then yields:

$$\pi^e = \int_0^{c_D} \int_a^1 \frac{L}{4\gamma} \left[\omega c_D - c - \phi + \theta(\tau)\right]^2 \; dF(\tau) \; dG(c) = f_E$$

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# Appendix

## Details of $\frac{\partial c_D}{\partial L} < 0$

By applying Dini's implicit function theorem, we obtain:

$$\frac{\partial c_D}{\partial L} = -\frac{\partial \pi^e(L, c_D(L))/\partial L}{\partial \pi^e(L, c_D(L))/\partial c_D}$$

We can show that $\frac{\partial \pi^e(L, c_D(L))}{\partial L} > 0$ and that $\frac{\partial \pi^e(\beta, c_D(\beta))}{\partial c_D}$ is always positive in correspondence of positive values of the expected profits.

Hence, we have that $\frac{\partial c_D}{\partial L} < 0$

Looking at how collateral requirements $\beta$ affect the above derivative, by comparing the two partial derivatives of $\pi^e$ it can be easily shown that a higher $\beta$ will increase both the numerator and the denominator of $\frac{\partial c_D}{\partial L}$, with the effect being however larger on the denominator. As a result a higher $\beta$ will translate *ceteris paribus* into a lower value of $\frac{\partial c_D}{\partial L}$.

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Table D.1: Descriptive statistics

| | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Tangible fixed assets | 139,119 | 1,800 | 4,551 | 1 | 50,224 |
| Sales | 115,151 | 10,197 | 23,940 | 185 | 250,391 |
| Number of employees | 102,841 | 65 | 112 | 10 | 1,063 |
| $\theta(\tau)$ | 104,590 | 0.330 | 0.189 | 0 | 1 |
| Loan | 101,147 | 0.590 | 0.381 | 0 | 1 |
| Interest paid / operating revenue | 68,983 | 0.381 | 0.370 | 0 | 1 |
| ASCL | 90,158 | 1.844 | 1.029 | 0 | 4 |
| $\Delta$ collateral requirement | 93,912 | 0.102 | 0.158 | 0 | 1 |
| Employees (categorical) | 191,503 | 2.019 | 0.890 | 1 | 4 |
| ln($Age$) | 191,425 | 3.399 | 0.705 | 1 | 6 |
| $\beta_i$ | 47,536 | 0.492 | 0.142 | 0 | 1 |
| NTS | 57,352 | 0.250 | 0.433 | 0 | 1 |
| Number of banks | 14,571 | 2.99 | 2.02 | 1 | 14 |
| Investments in R&D | 14,759 | 0.60 | 0.49 | 0 | 1 |

Back to Data

- Firm-level markups and productivity estimated as in De Loecker and Warzynski (2012), through both the Wooldridge (2009) and Ackerberg, Caves and Fraser (2009) procedures

Table: Markup estimates: median values and standard deviations

| Estimation method | Median | St. dev. |
|---|---|---|
| Wooldridge (standard) | 1.2063 | 0.7543 |
| Wooldridge (augmented) | 1.2152 | 0.7066 |
| ACF (standard) | 1.0668 | 0.4016 |
| ACF (augmented) | 1.0886 | 0.6267 |

*Note*: Standard estimation follows Woolrdridge (2009) and Ackerberg, Caves and Frazer (2015). The augmented estimation introduces financial capability $\theta(\tau)$ in the control function.

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Figure: Productivity kernel graphs

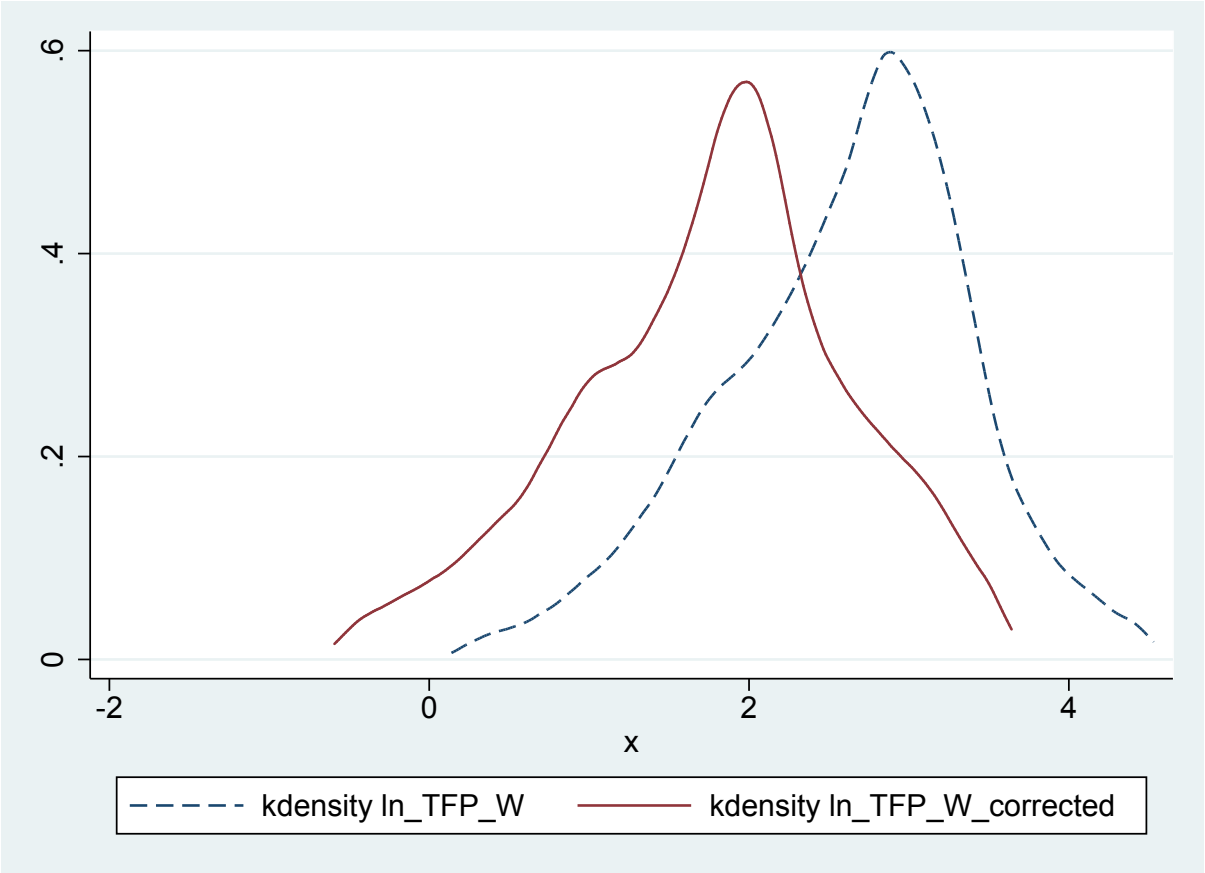


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Table F.1: Plausibility check of $\beta_{i,t}$

| | (1) | (2) | (3) |
|---|---|---|---|
| Dependent variable | $\beta_{i,t}$ | $\beta_{i,t}$ | $\beta_{i,t}$ |
| $WW_{i,t}$ | 0.0440*** | | |
| | (0.00167) | | |
| $HP_{i,t}$ | | 0.0233*** | |
| | | (0.00189) | |
| $\ln(sales)_{i,t}$ | | | -0.0492*** |
| | | | (0.00553) |
| Obs. | 43,805 | 46,912 | 47,079 |
| R2 | 0.760 | 0.999 | 0.074 |
| Firm FE | YES | YES | YES |
| Year FE | YES | YES | YES |
| Robust SE | YES | YES | YES |

*Note*: Dependent variables: ; $WW_{i,t}$ indicates the Whited and Wu index of credit constraints (2006);$HP_{i,t}$ is the Hadlock and Pierce index of credit constraints (2010); $\ln(sales)_{i,t}$ is log of firms' sales. ***,**,* = indicate significance at the 1%, 5%, and 10% level, respectively.

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## Table D.3: Correlations of right-hand side variables

| | $\theta(\tau)_{i,t}$ | $\ln(TFP)_{i,t}$ Wooldridge not corrected | $\ln(TFP)_{i,t}$ Wooldridge corrected | $\beta_{i,t}$ | Value added per employee$_{i,t}$ | Total asset$_{i,t}$ |
|---|---|---|---|---|---|---|
| $\theta(\tau)_{i,t}$ | 1 | | | | | |
| $\ln(TFP)_{i,t}$ Wooldridge (standard) | 0.0316 | 1 | | | | |
| $\ln(TFP)_{i,t}$ Wooldridge (augmented) | -0.0651 | 0.4674 | 1 | | | |
| $\beta_{i,t}$ | -0.0086 | -0.0001 | 0.013 | 1 | | |
| Value added per employee$_{i,t}$ | 0.0307 | 0.3215 | 0.265 | -0.0464 | 1 | |
| Total asset$_{i,t}$ | -0.2342 | 0.1099 | 0.1488 | -0.0191 | 0.2871 | 1 |

*Notes*: $\theta(\tau)$ is financial capability estimated as in section 3.1; $\ln(TFP)_{i,t}$ is total factor productivity estimated as in Wooldridge(2009) both in the standard and the augmented version as discussed in section 3.2; $\beta_i$ is the firm-specific proxy for collateral requirements, estimated as discussed in section 5.

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