Extent of SME Credit Rationing | EU 2013-14

EIF-LSE Capstone Project 2018

Wen Chen
Venu Mothkoor
Nicolas Nardecchia
Jay Patel

Coordinator (LSE) : Prof. S. Jenkins
Coordinators (EIF)*: Salome Gvetadze, Simone Signore and Elitsa Pavlova

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LSE Institute of Public Affairs
Master of Public Administration

Agenda

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- **Introduction**
  - Objectives
  - Definitions
  - Previous European credit rationing studies
- **Methods**
  - Sample
  - Model
- **Results**
  - Partial credit rationing estimates
  - Heterogeneity analysis by SME size
- **Conclusion**
  - Relevance and limitations

Introduction

We complete the following objectives as set out in the Terms of Reference.

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Review Literature

- Review equilibrium and disequilibrium credit rationing theories
- Review credit rationing empirical studies

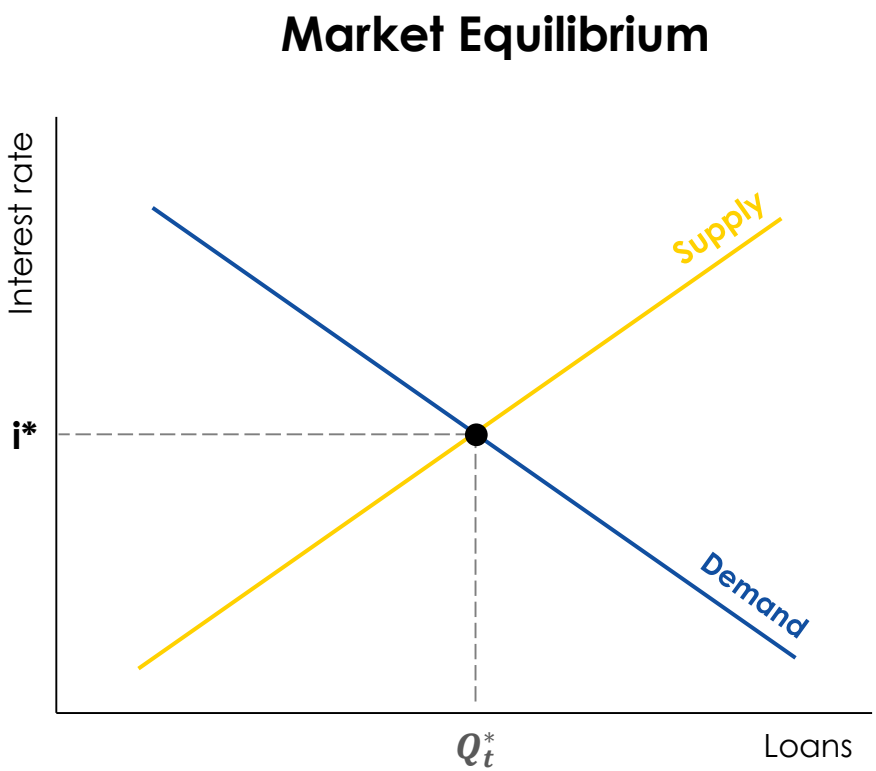
Estimate Credit Rationing

- Follow Kremp and Sevestre (2013) approach
- Use firm-level financial data for EU SMEs

Extend Kremp and Sevestre (2013)

- Compare results with 2013-14 ECB SAFE surveys
- Estimate heterogeneity of partial credit rationing by SME size

The market clears at an equilibrium interest rate



- Credit demand and supply clear at an equilbrium interest rate in each period
- Interest rates serve as an efficient allocation mechanism

i* = equilibrium interest rate
Q_t^* = equilibrium quantity of loans

There is no excess demand

The market does not clear under disequilibrium conditions

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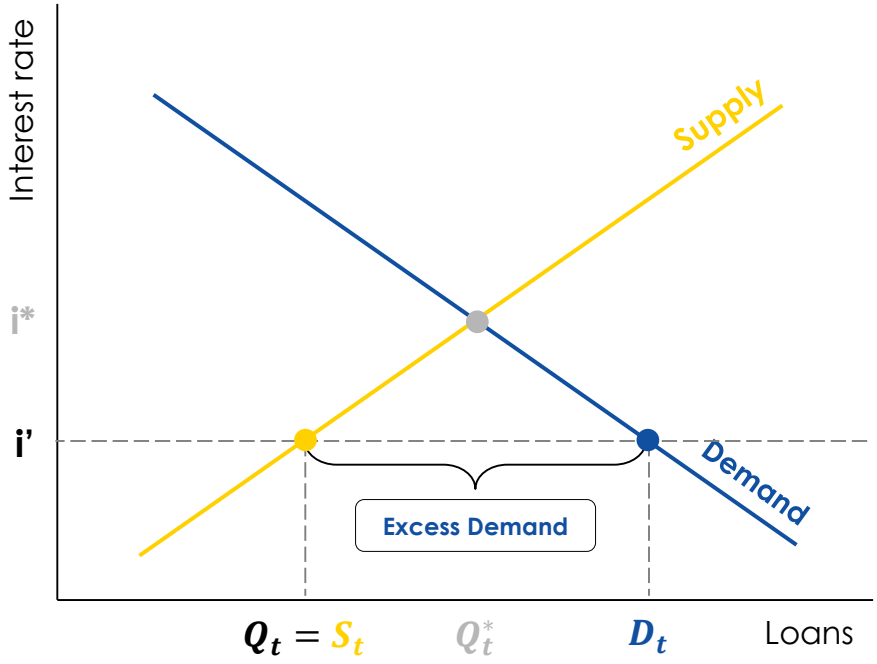
Market Disequilibrium



- Interest rates may not freely adjust
  - Rate ceiling
  - Rate stickiness

i^* = equilibrium interest rate
i' = prevailing interest rate
Q_t^* = equilibrium quantity of loans
Q_t = observed quantity of loans
S_t = supply of loans
D_t = latent demand for loans

Excess demand results as the latent demand for loans exceeds supply

Country-level credit rationing studies

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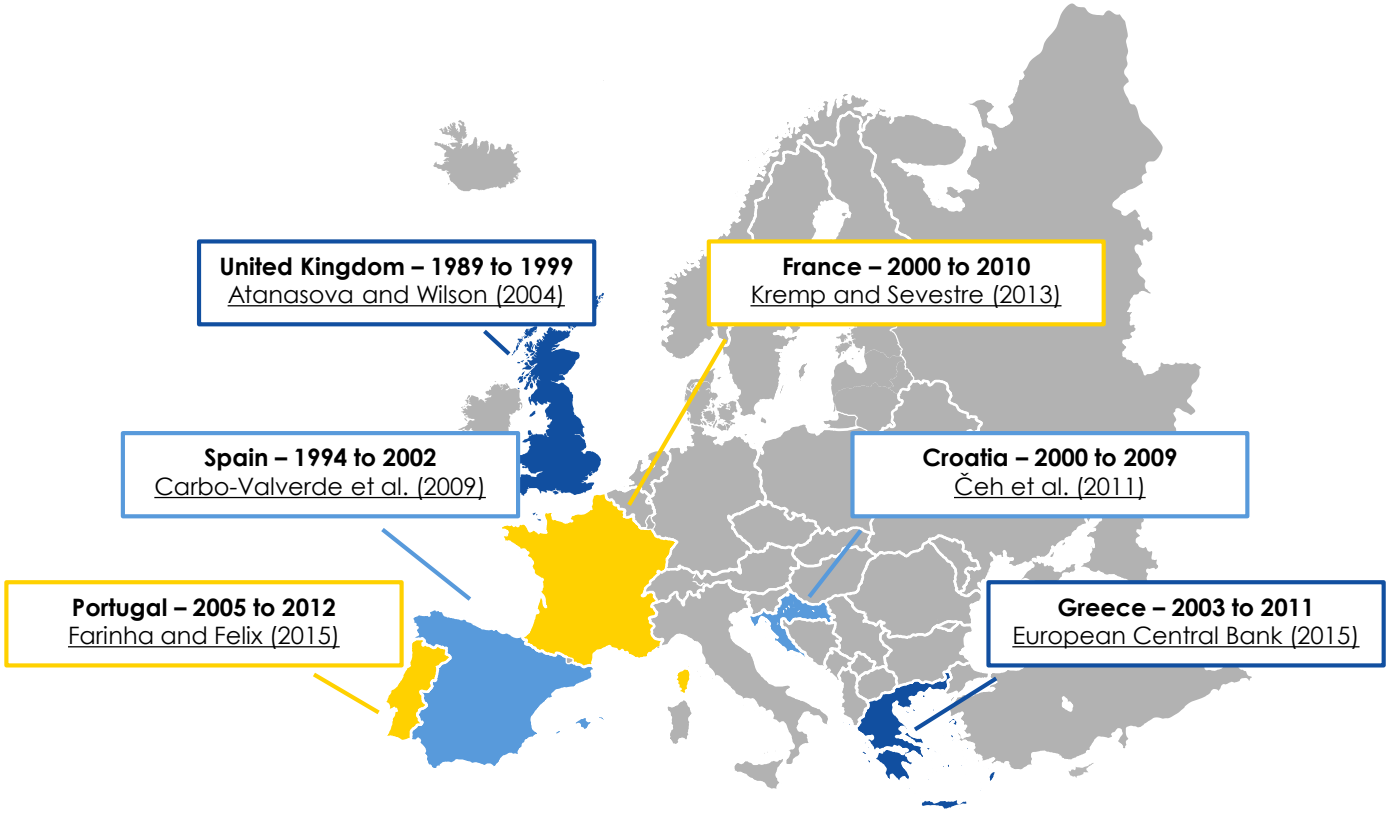
Key Findings

- 6 country-level studies
  - 4 use firm data
  - 2 use bank data
- Each study uses different explanatory variables
- The studies take different empirical approaches



No studies consider EU-wide SME credit rationing using firm-level data

Methods

Orbis and SAFE survey data: 14,270 SMEs using five-year panel data

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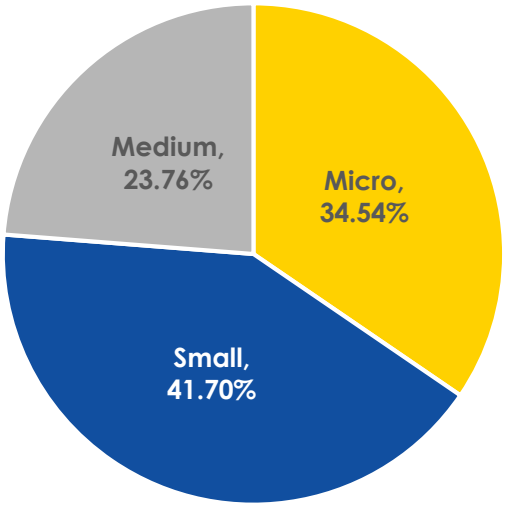
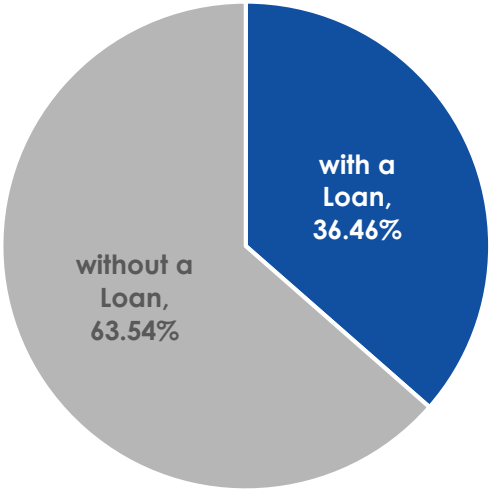
Firm Size 2013-14



Loan Information 2013-14



Other Sample Characteristics

- 24 out of 28 EU countries, ex. Cyprus, Estonia, Lithuania, and Malta
- Industries: use 7 sub-groups of NACE rev.2 classification
  - Retail, Transportation, Tourism, and Other (41.10%)
  - Manufacturing (28.54%)
  - Real Estate, Education, and Admin (14.72%)
  - Other 4 sub-groups (15.64%)

Due to data availability issues, our sample is skewed towards bigger firms

Expected direction of explanatory variables in our model

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Latent demand for loans

$$D_t = X'_{1,t}\beta_1 + u_{1,t}$$

(?) SME size

(–) Interest rate
(+) Short-term financing needs
(+) Long-term financing needs
(–) Internal resources available

Control factors: Industry, country, year

Latent supply of loans

$$S_t = X'_{2,t}\beta_2 + u_{2,t}$$

(+) SME size

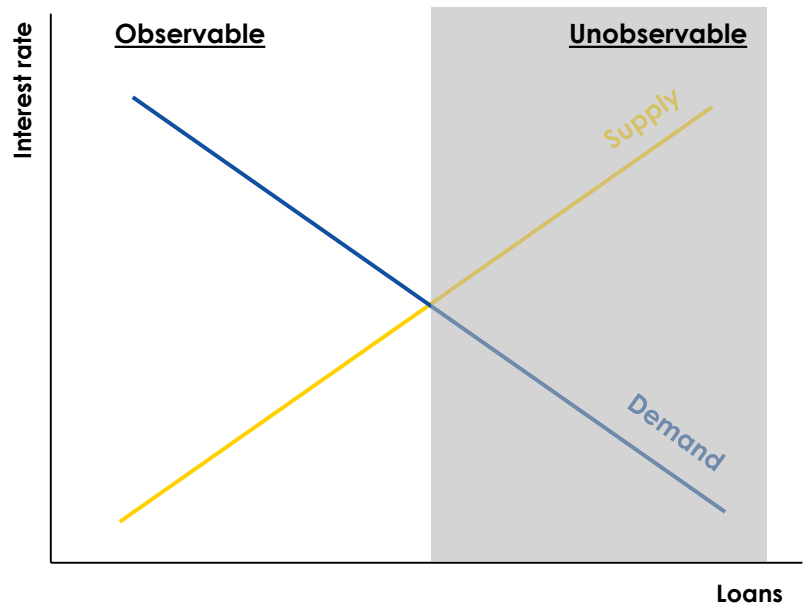
(+) Age
(+) Collateral
(+) Liquidity on hand
(–) Leverage
(+) Credit rating

Control factors: Industry, country, year

Market disequilibrium condition

Disequilibrium Condition

$$Q_t = min(D_t, S_t)$$



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Main results

Observed direction of explanatory variables in our model

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Latent demand for loans

$$D_t = X'_{1,t}\beta_1 + u_{1,t}$$

(–) Small-size (relative to Micro-size)***
(–) Medium-size (relative to Micro-size)***

(+) Interest rate***
(–) Short-term financing needs*
(+) Long-term financing needs
(–) Internal resources available***

Control factors: Industry, country, year

Latent supply of loans

$$S_t = X'_{2,t}\beta_2 + u_{2,t}$$

(–) Small-size (relative to Micro-size)***
(–) Medium-size (relative to Micro-size)***

(+) Age
(+) Collateral
(–) Liquidity on hand*
(–) Leverage***
(–) Credit rating**

Control factors: Industry, country, year

Green font indicates alignment with our hypothesis for variable direction
* Statistically significant at the 10% level
** Statistically significant at the 5% level
*** Statistically significant at the 1% level

Probability of partial credit rationing

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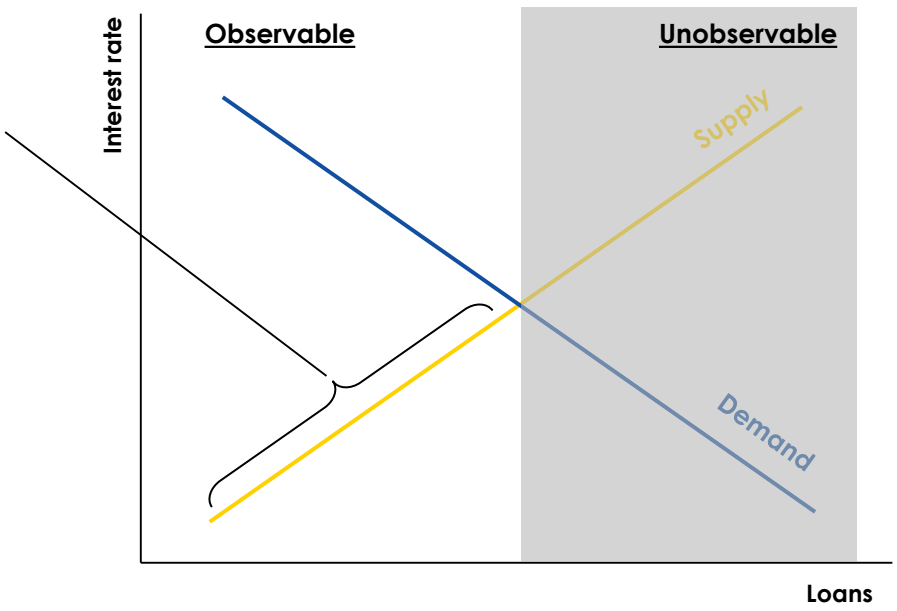
Probability of partial credit rationing

$$Pr(D_t > S_t \mid Q_t)$$

- Only firms that have a loan can experience partial credit rationing
- We do not estimate full credit rationing



Orbis and SAFE survey data: 14,270 SMEs using five-year panel data

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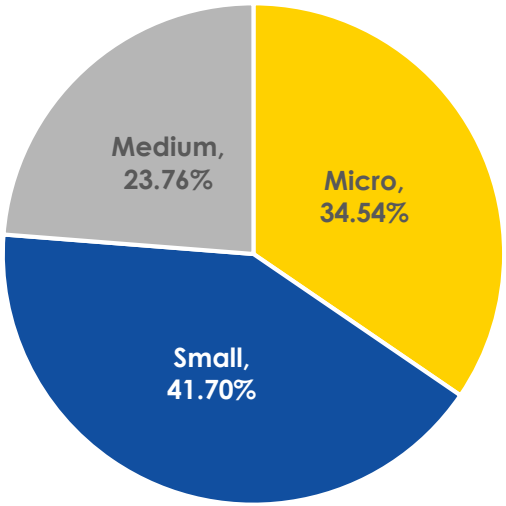
Firm Size 2013-14



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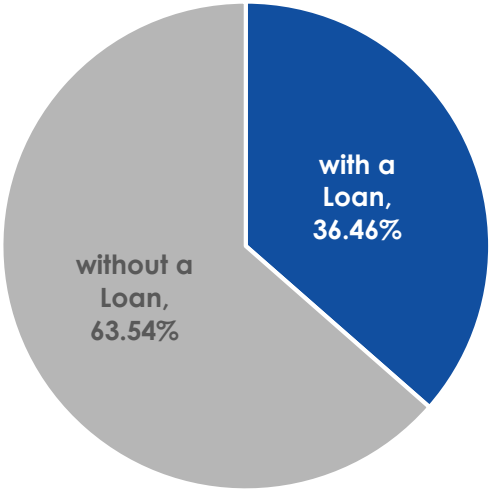

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Heterogeneity Analysis | Partial credit rationing by SME size

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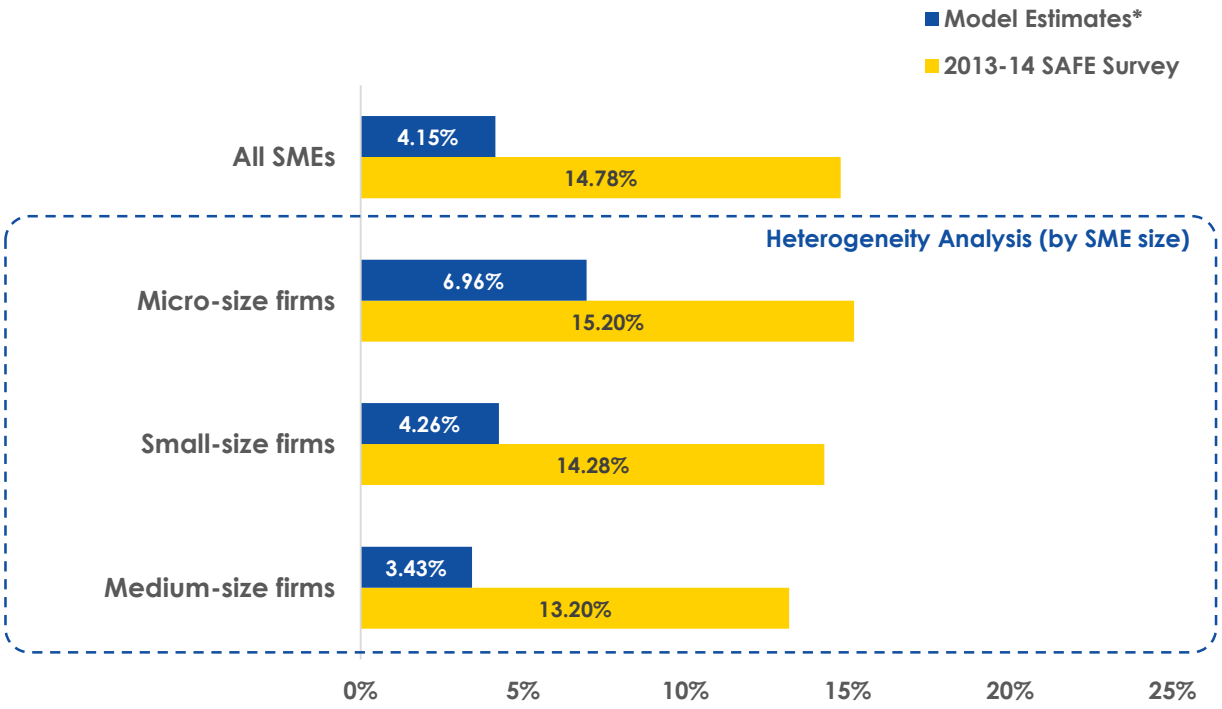
Probability that SMEs experience partial credit rationing



* Among SMEs that applied for a loan

Key Findings

- On average, the probability of partial credit rationing for EU SMEs in our sample is 4.15%
- The probability of partial credit rationing is highest for micro-size firms, followed by small- and medium size-firms. This is consistent with SAFE survey results
- Our sample is not representative of EU SMEs after dropping firms with missing Orbis data; our results likely underestimate partial credit rationing

Self-reported SAFE results suggest greater extent of rationing than model estimates

Conclusion

Understanding the nature of credit rationing is key to inform policy

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The model can be used to determine:

- Extent of credit rationing at an aggregate level
- Differential probabilities of credit rationing for subgroupings including, but not limited to, by firm size and country group

Limitations:

- Non-bank SME financing options not evaluated
- Bank characteristics
  - Individual lending capacity of banks
  - Market power of a bank in local markets
- Availability of EU-wide data
- Technical challenges

Appendix

Appendix Items

- Other European credit rationing studies (detail)
- Demand-side variable details
- Supply-side variable details
- Altman and Sabato (2007) Z-score
- Sample 1 | Summary statistics
- References
- Acknowledgements

Country-level credit rationing studies

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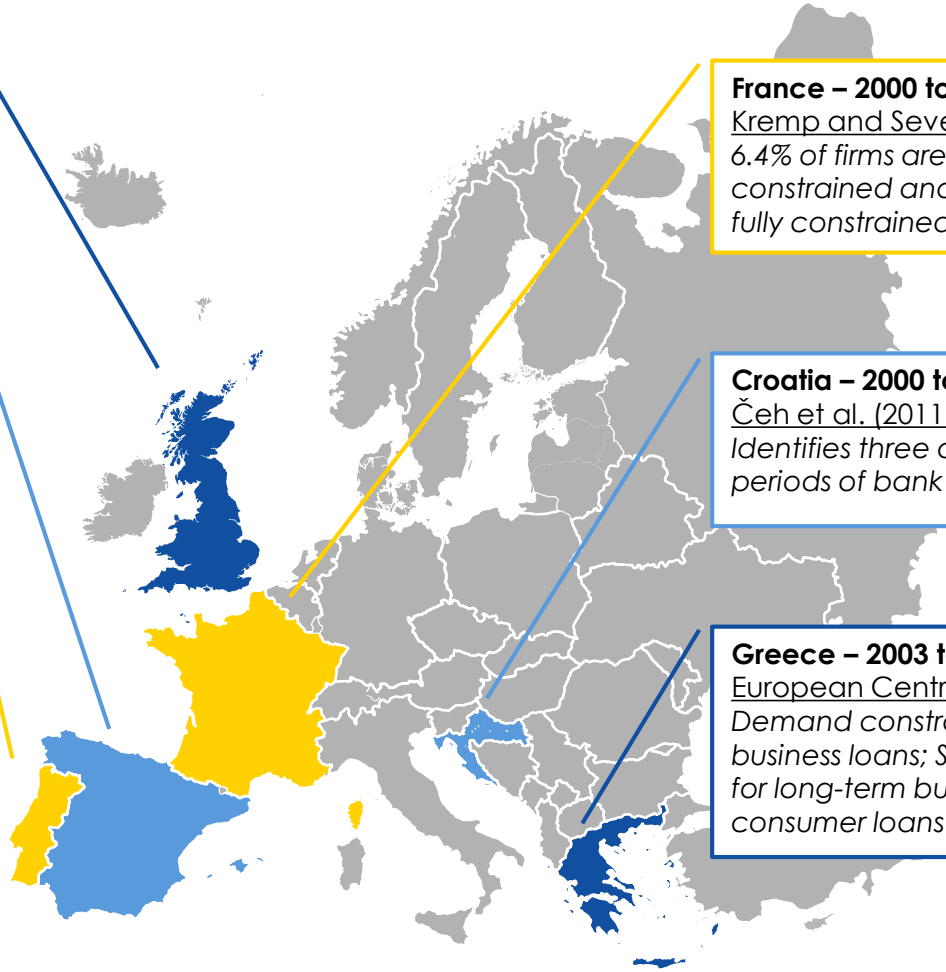
United Kingdom – 1989 to 1999
Atanasova and Wilson (2004)
42.7% of the firms are constrained

Spain – 1994 to 2002
Carbo-Valverde et al. (2009)
33.93% of firms are financially constrained

Portugal – 2005 to 2012
Farinha and Felix (2015)
15% of firms are partially constrained and 32% firms are fully constrained



France – 2000 to 2010
Kremp and Sevestre (2013)
6.4% of firms are partially constrained and 4.6% of firms are fully constrained

Croatia – 2000 to 2009
Čeh et al. (2011)
Identifies three distinct sub-periods of bank credit activity

Greece – 2003 to 2011
European Central Bank (2015)
Demand constraints for short-term business loans; Supply constraints for long-term business loans, consumer loans and mortgages

Demand-side financial indicator variables

Interest rate	$\frac{Financial\ Expenses}{Loans + Long\ term\ debt_1}$
Long-term financing needs	$\frac{Tangible\ Fixed\ Assets}{Total\ Assets}$
Short-term financing needs	$\frac{Working\ Capital}{Total\ Assets}$
Internal resources available	$\frac{Cashflow_2}{Total\ Assets}$

1. We use Noncurrent Liabilities when Loans + Long Term Debt data are not available
2. We use EBITDA when Cashflow data are not available

Supply-side financial indicator variables

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Physical non-cash collateral	$\frac{Tangible\ Fixed\ Assets + Inventory\ Stock}{Total\ Assets}$
Liquidity on hand	$\frac{Net\ Current\ Assets}{Total\ Assets}$
Leverage	$\frac{Loans + Long\ Term\ Debt_1}{Cashflow_2}$
Credit rating	*Altman Z-score*$_3$ *Categories* Relatively Safe Zone | Z-score $> \bar{x} + 1\sigma$ Relatively Grey Zone | $\bar{x}$ - 1σ $<$ Z-score $< \bar{x} + 1\sigma$ Relatively Distressed Zone | Z-score $< \bar{x}$ - 1σ
Age category	*SAFE (2013-14) Size Categories* $<$ 2 yrs. | 2-5 yrs. | 5-10 yrs. | $>$ 10 yrs.

1. We use Noncurrent Liabilities when Loans + Long Term Debt data are not available
2. We use EBITDA when Cashflow data are not available
3. Z-score based on Altman and Sabato (2007) model

Altman and Sabato (2007) Z-score model

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Source

Altman, E. and Sabato, G. (2007). Modelling Credit Risk for SMEs: Evidence from the U.S. Market. Abacus, 43(3), pp.332-357.

Sample

Financial data for 2,010 SMEs from the United States between 1994 and 2002

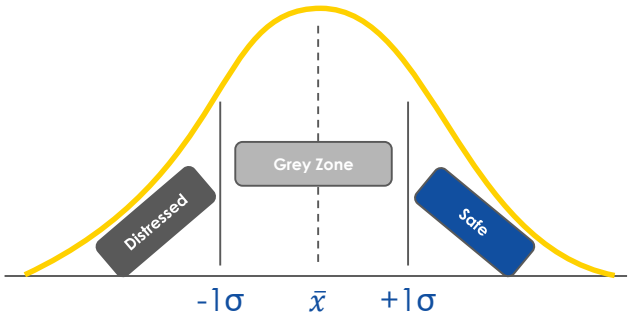
Rationale

Sample consists of SMEs from a well-diversified economy, which may serve as a valid proxy for the EU economy

Adapted Model

Log[PD / (1-PD)]=
+ 53.48
- 4.09 * Log[(1-Cashflow) / Total Assets]
- 1.13 * Log[Current Liabilities / Equity Book Value]
- 4.32 * Log[(1-Retained Earnings) / Total Assets]
+ 1.84 * Log[(Balance Sheet Cash / Total Assets]
+ 1.97 * Log[Cashflow / Financial Expenses]

Relative Credit Rating Method



Sample 1 | Summary Statistics

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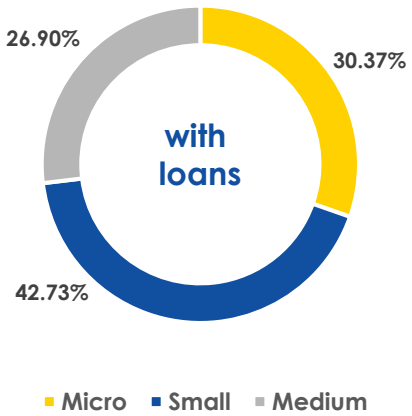
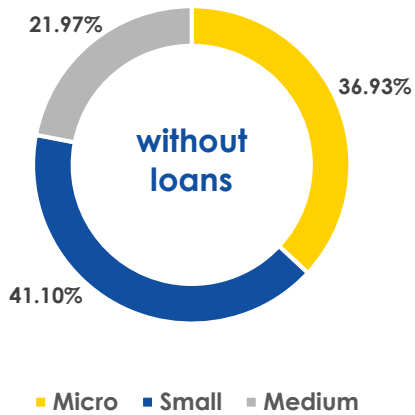
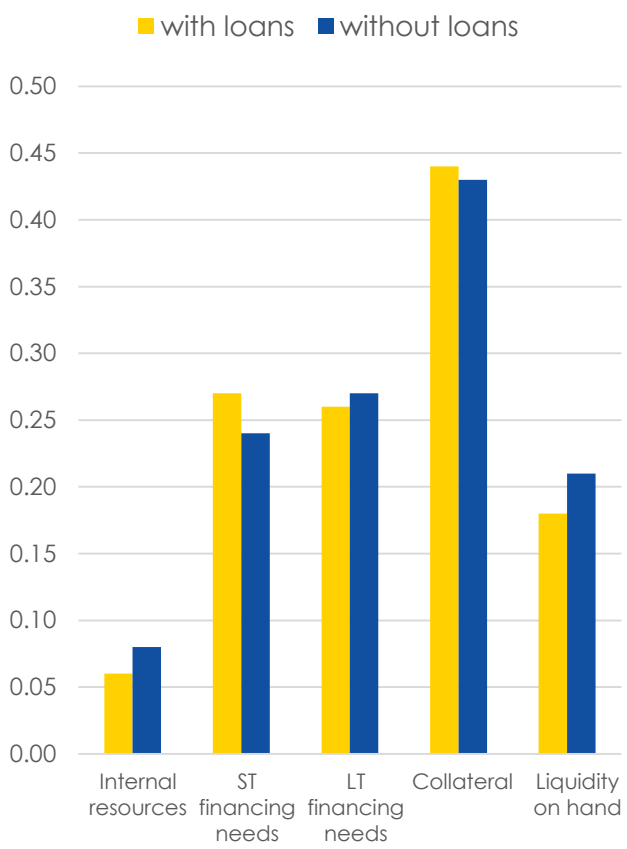
Firm size proportions



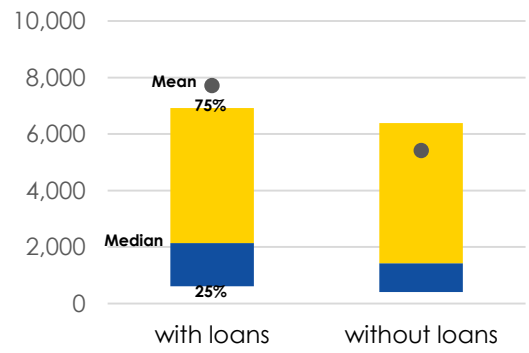


Main variable averages (over total assets)

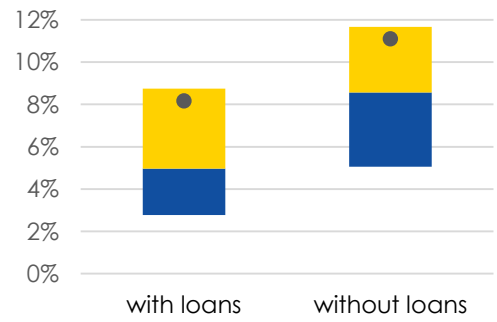


25th, 50th, 75th percentiles and mean

Total Assets (th euros)



Interest Rate (observed / imputed)



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