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A micro-econometric analysis of the banks' loan rejection rates and the creditworthiness of the banks' corporate customers

by

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(based on joint work with Peter Askjær Drejer and Andreas Kuchler)

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Outline of the presentation

- Main research questions
- The data set
- Descriptive analysis
- Econometric analysis

Main research questions

- Why did some SME get their application for loans from commercial/savings banks rejected during the financial crisis?

  - Poor credit rating of the SME (poor economic performance and weak accounting data)?
  - Tighter credit standards in the banking sector?
  - Insufficient capitalisation of the banks?

- Did exporting SMEs have easier access to bank loans than domestic firms?

- Did micro firms face higher loan rejection rates than larger SMEs?

- Self selection: Why did some SME decide not to apply for bank loans during the crisis?

The Data Set

Firm-level answers to survey on around 2,000 Danish SMEs access to finance in 2007 and 2009/10

Firm-level employment (from employment statistics)

Summary firm-level accounting data (from reporting to Danish tax authorities)

More detailed supplementary firm-level accounting data (from accounting statistics)

Firm-level export turnover in per cent of total turnover (from foreign-trade statistics)

Firm-level information on the firms' main bank relationship (from private data vendor, EXPERIAN A/S)

Bank-level accounting information (from reporting to supervisory authorities)

Bank-firm level data set
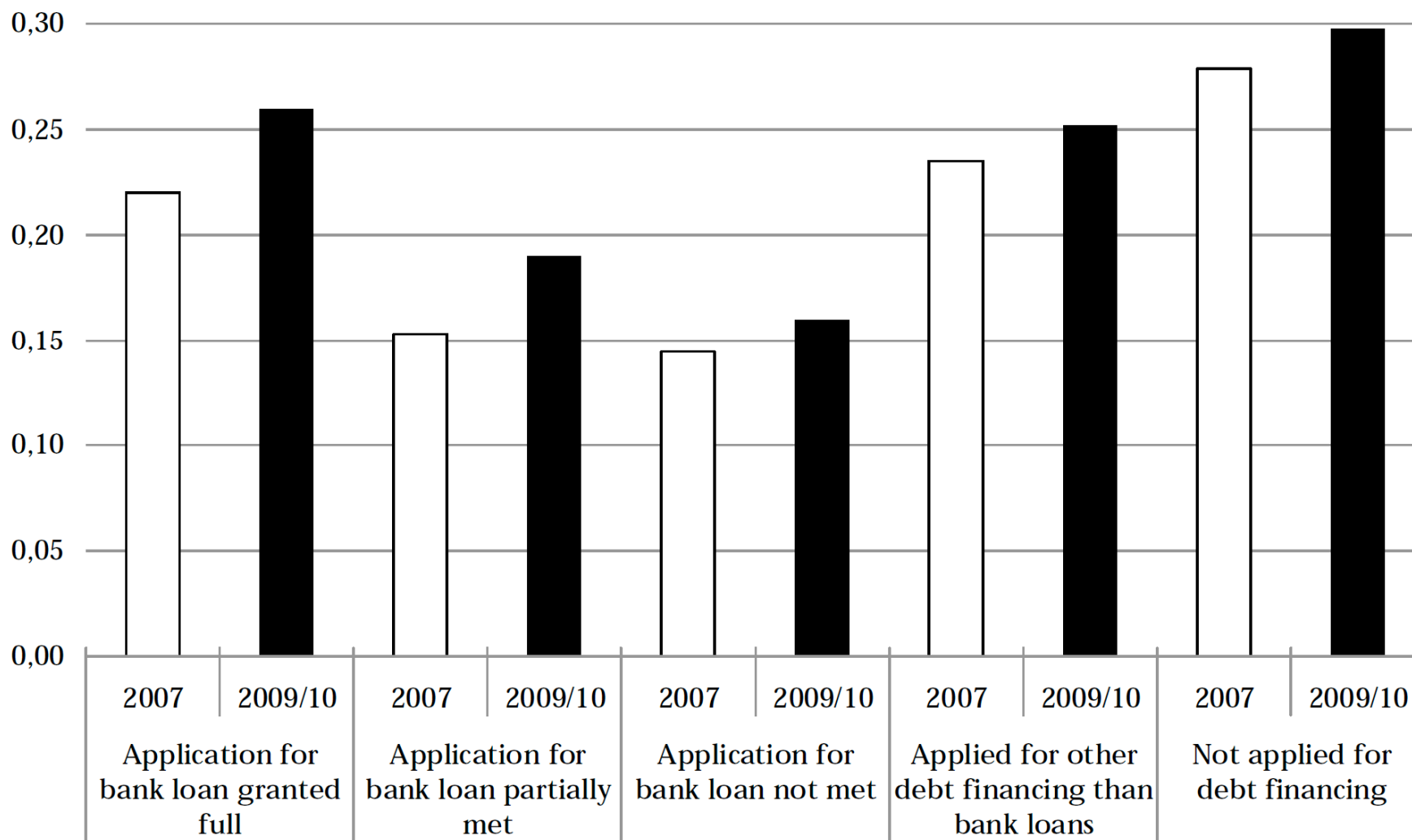
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ALLOCATION OF FIRMS IN THE ANALYSIS - BANK LOANS

Figure 1.a

Per cent

2007   2009/10
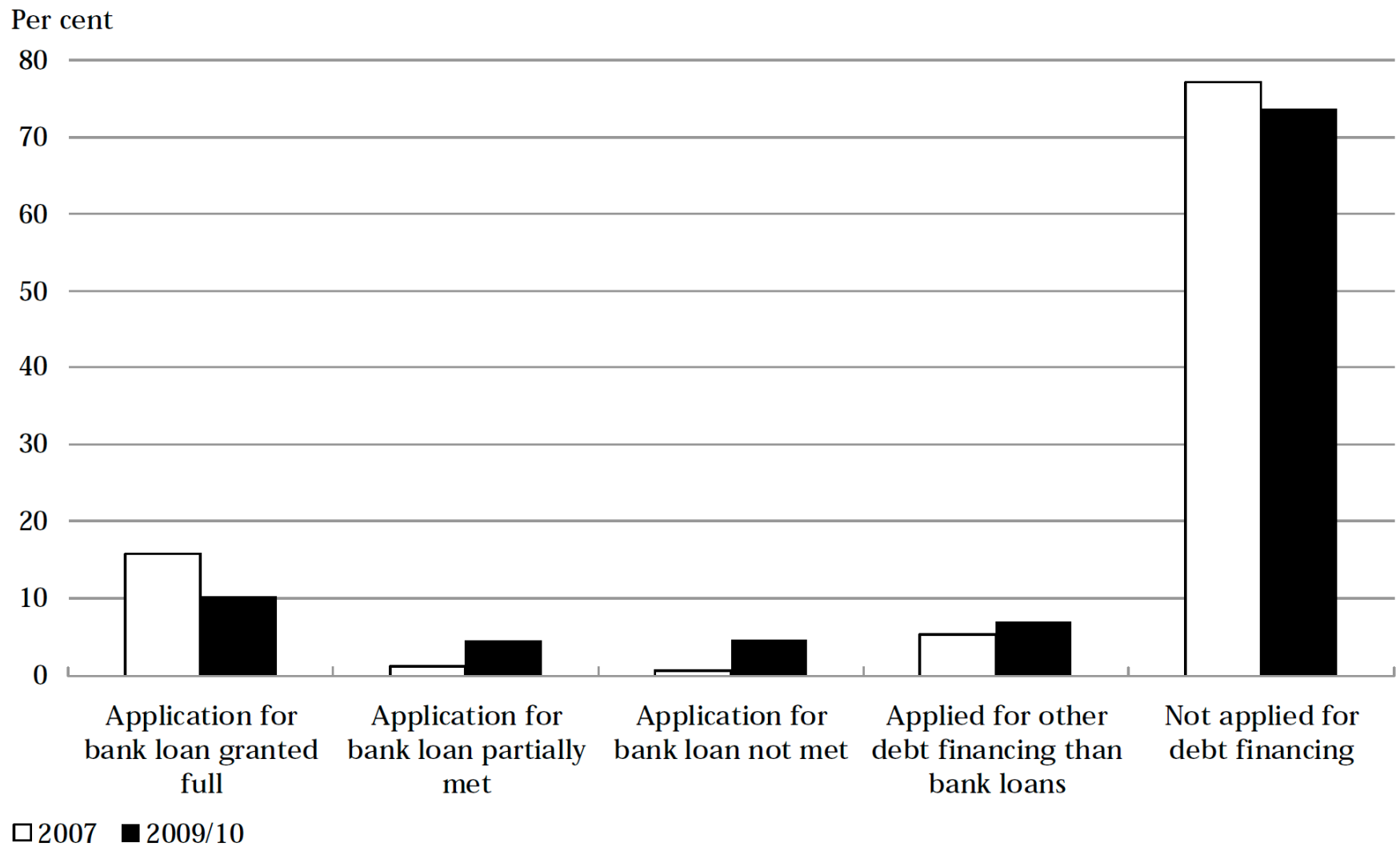
FIRMS' APPLICATIONS FOR BANK LOANS IN 2007 AND 2009/10 - MEDIAN OF SOLVENCY RATIO YEAR BEFORE APPLICATION

Figure 2.a

FIRMS' APPLICATIONS FOR BANK LOANS IN 2007 AND 2009/10 - MEDIAN OF CHANGE IN SOLVENCY RATIO 2 YEARS PRIOR TO APPLICATION   Figure 3

2007	2009/10	2007	2009/10	2007	2009/10	2007	2009/10	2007	2009/10
Application for bank loan granted full		Application for bank loan partially met		Application for bank loan not met		Applied for other debt financing than bank loans		Not applied for debt financing	
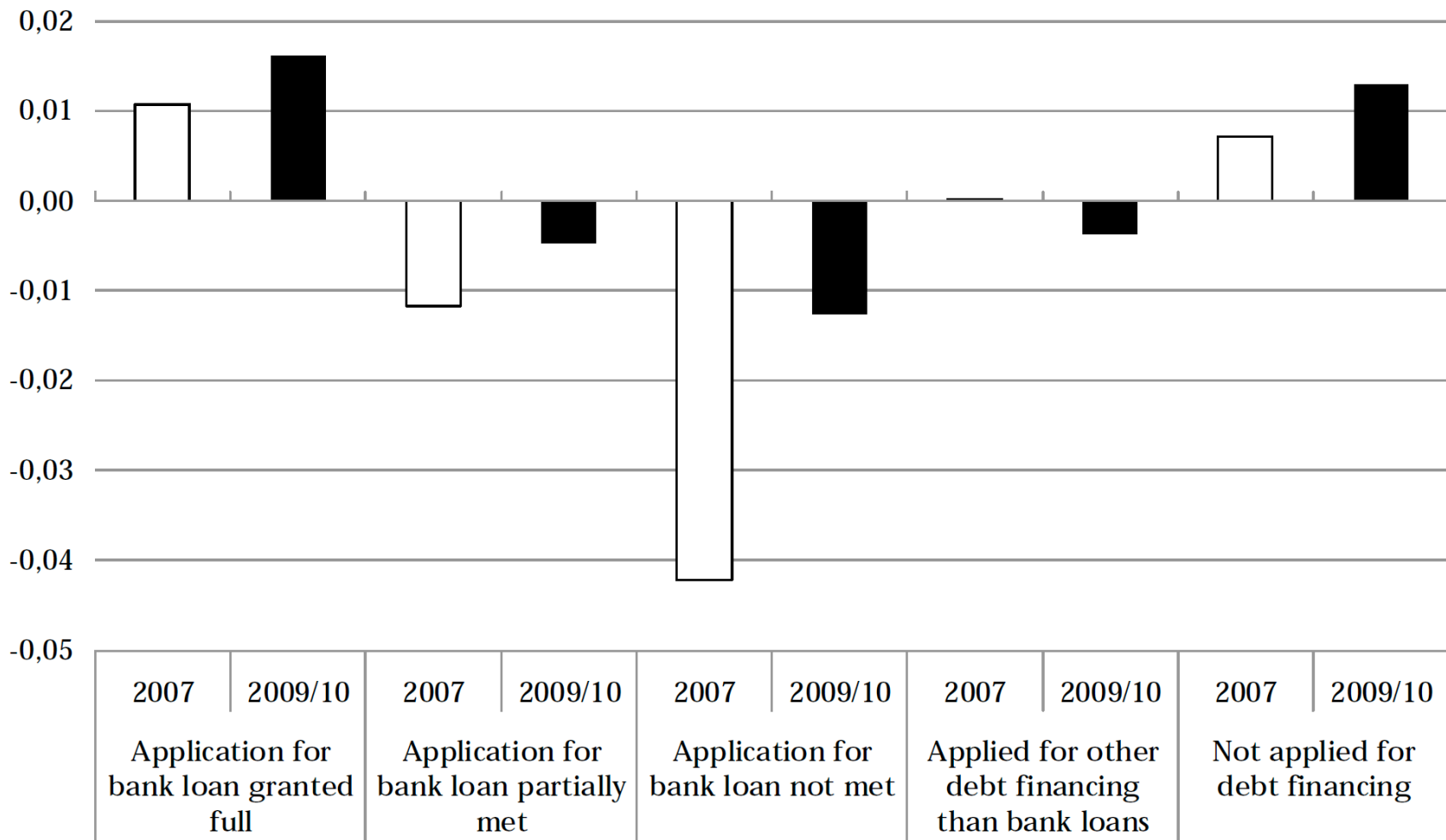
OUTCOME OF FIRMS' APPLICATIONS FOR BANK LOANS - DISTRIBUTED BY THE
SOLVENCY RATIO OF THE FIRMS   Figure 4

2007

□ Application for bank loan granted full   ■ Application for bank loan partially met
▨ Application for bank loan not met

2009/10

□ Application for bank loan granted full   ■ Application for bank loan partially met
▨ Application for bank loan not met
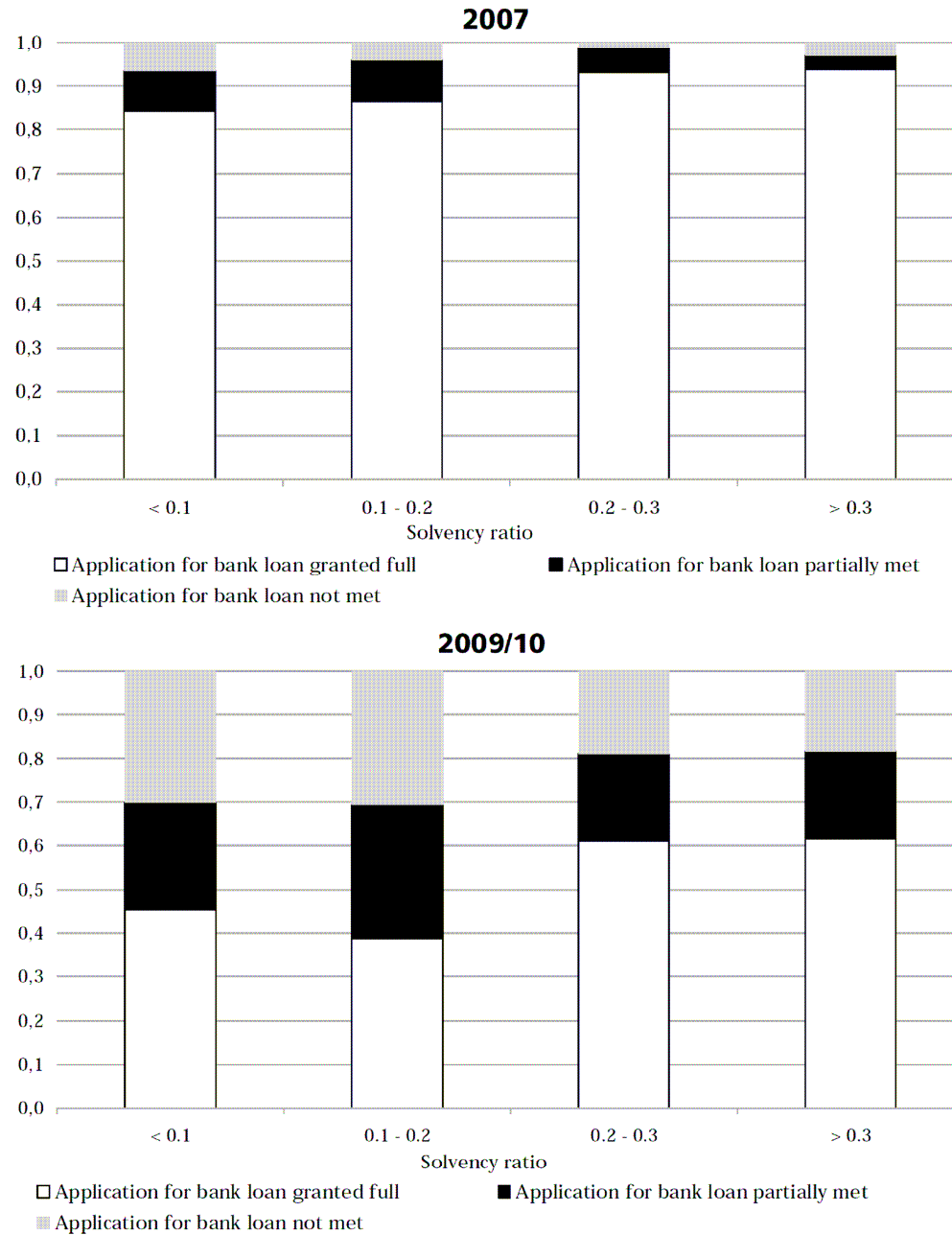
Other findings (charts shown in the paper)

Companies which got their applications for bank loans totally or partly rejected were characterised by:
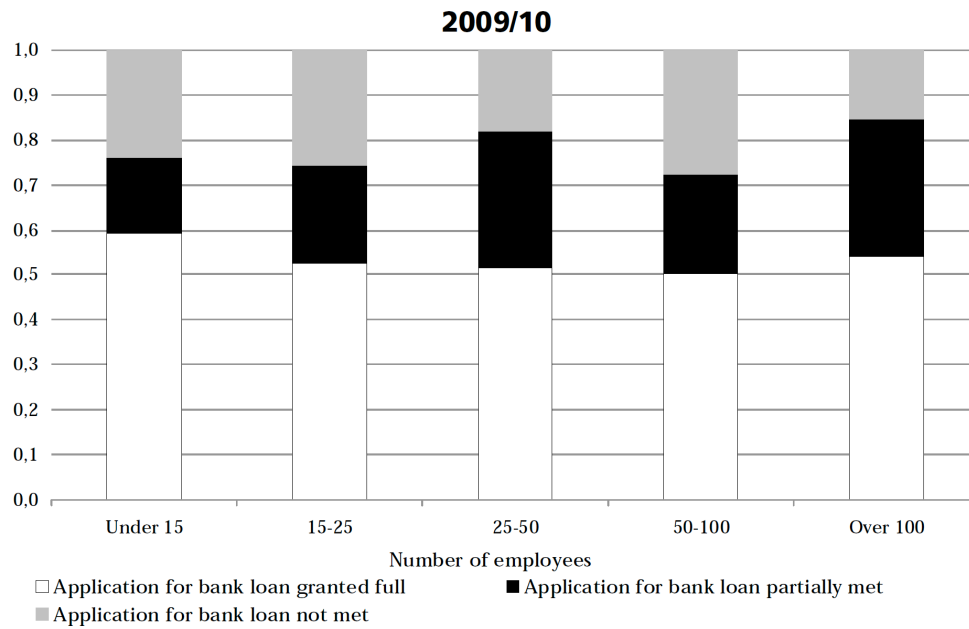
- lower profit ratios
- higher short-term debt ratios
- lower median degree of liquidity
- higher implied interest costs on gross debt

than the other firms.

OUTCOME OF FIRMS' APPLICATIONS FOR BANK LOANS - DISTRIBUTED BY THE NUMBER OF EMPLOYEES AT THE FIRM

Figure 12

2007

□ Application for bank loan granted full   ■ Application for bank loan partially met
■ Application for bank loan not met

2009/10

□ Application for bank loan granted full   ■ Application for bank loan partially met
■ Application for bank loan not met
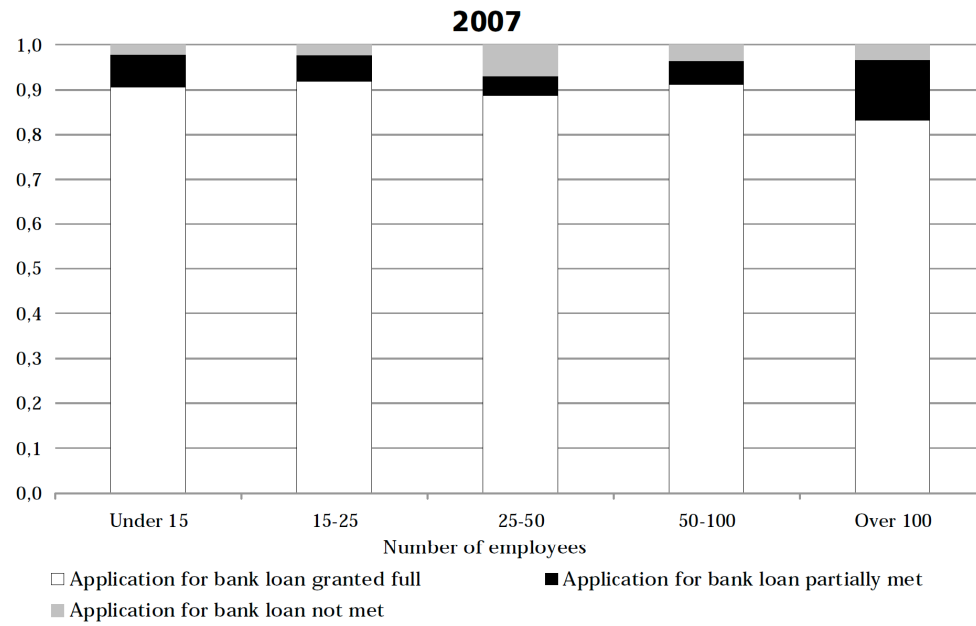
OUTCOME OF FIRMS' APPLICATIONS FOR BANK LOANS - DISTRIBUTED BY
EXPORT SHARE   Figure 13

2007

Export share

□ Application for bank loan granted full   ■ Application for bank loan partially met
▨ Application for bank loan not met

2009-10

Export share

□ Application for bank loan granted full   ■ Application for bank loan partially met
▨ Application for bank loan not met

Figure 14

2007

Group 1   Group 2-4   Unknown group

☐ Application for bank loan granted full   ■ Application for bank loan partially met
▨ Application for bank loan not met

2009/10

Group 1   Group 2-4   Unknown group

☐ Application for bank loan granted full   ■ Application for bank loan partially met
▨ Application for bank loan not met

Loan impairment charge ratio 2009 for banks in:
Group 1: 1.5 per cent
Group 2: 5.6 per cent
Group 3: 4.2 per cent

FIRMS' APPLICATIONS FOR DEBT FINANCING IN 2009/10
- MEDIAN OF SOLVENCY RATIO YEAR BEFORE APPLICATION   Figure 15
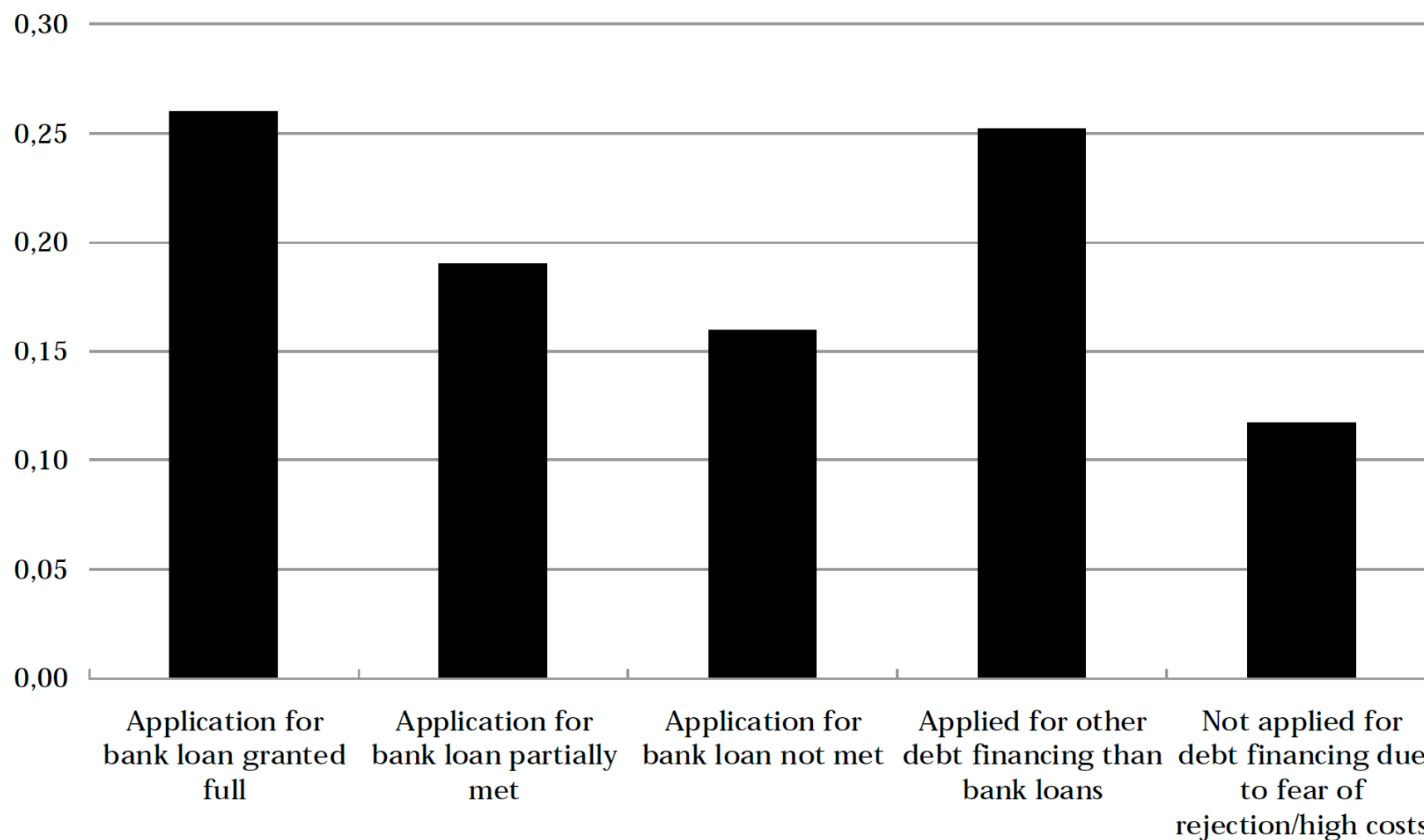
FIRMS' APPLICATIONS FOR DEBT FINANCING IN 2009/10
- MEDIAN OF CHANGE IN SOLVENCY RATIO 2 YEARS PRIOR TO APPLICATION   Figure 16
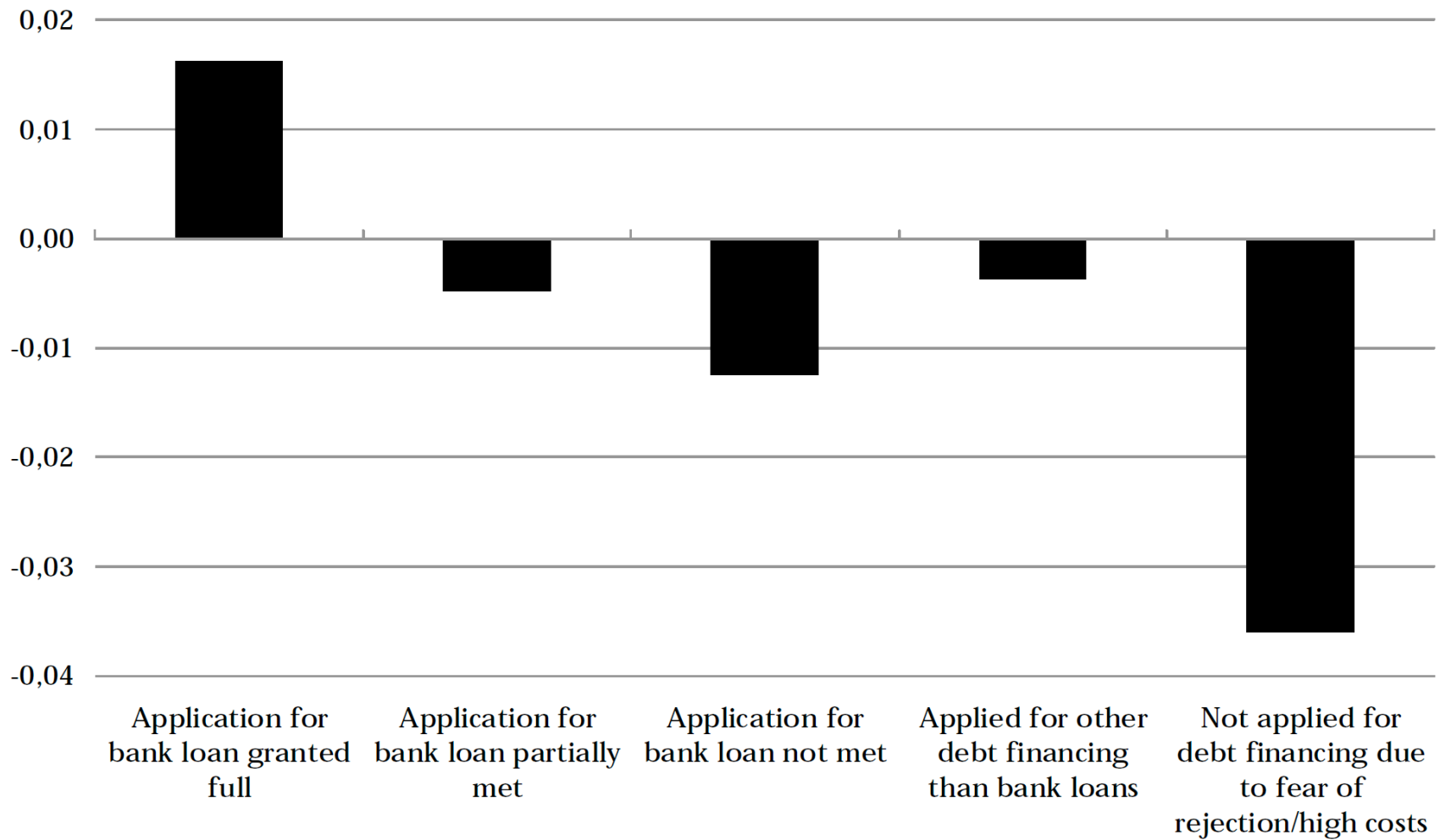
Other findings (charts shown in the paper)

Firms which did not apply for debt financing due to fear of rejection or high interest rates were characterised by:

- lower profit ratios
- higher short-term debt ratios
- lower median degree of liquidity
- higher implied interest costs on gross debt

than the other firms that applied for bank loans or debt financing.

Econometric Analysis

- Formal econometric analysis of the impact of firm characteristics on the probability of having an application for a bank loan accepted.

- Probit model:

  P(loan application accepted$_i$) = f(firm characteristics$_i$)

- Take into account that firms, which do apply for bank loans, are not a random sample of all firms (selection model).

- Include key performance indicators of the firm's principal bank connection to test whether loan acceptance rates can be explained mostly by firm or bank characteristics.

RESULTS: BIVARIATE PROBIT MODELS WITH SAMPLE SELECTION   Table 3

	2007		2009-2010		2007		2009-2010	
	Coef.	M.E.	Coef,	M.E.	Coef.	M.E.	Coef.	M.E.

PROBABILITY OF ACCEPTANCE OF BANK LOAN APPLICATION

	2007		2009-2010		2007		2009-2010	
Solvency ratio	*0.766	0.106	**0.453	0.135	0.214	0.022	*0.797	0.186
Profit ratio	-0.009	-0.001	**0.897	0.268	-0.018	-0.002	**1.534	0.357
Implied interest costs					-0.103	-0.011	-1.986	-0.463
Liquidity ratio (broad)					6.035	0.618	**1.830	0.426
Short-term debt ratio........					-0.906	-0.093	0.337	0.079
Constant	***1.253		***0.614		**1.474		0.491	

SELECTION EQUATION

	2007		2009-2010		2007		2009-2010	
Solvency ratio	***-0.214		***-0.346		**-0.693		***-1.005	
Profit ratio	0.002		*-0.138		0.001		*-0.209	
Implied interest costs					*1.863		0.314	
Liquidity ratio (broad)					***-2.123		***-1.302	
Short-term debt ratio........					*-0.497		**-0.630	
LN(No. of employees)........	-0.060		-0.074		-0.048		0.027	
LN(Total assets)	**0.081		**0.077		0.070		0.048	
Applied for loan (other source)...................	***1.155		***1.083		***1.058		***0.865	
Constant	***-1.631		***-1.044		**-1.072		-0.671	
ρ	-0.095		***-0.511		0.040		**-0.688	
Observations	1,917		1,996		927		1,035	

Note: Coef. = Coefficient estimate; M.E. = Marginal Effect of a unit change in the explanatory variable on the probability of having the application for a bank loan accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. The selection equation models the probability that a company applied for a bank loan. ρ is not directly estimated in the ML-estimatiion; the significance test reported is a test for atanh(ρ) = 0. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

RESULTS: IMPACT OF BANK AND FIRM CHARACTERISTICS ON OUTCOME OF LOAN
APPLICATIONS   Table 4

	2007		2009-2010	
	Coef.	M.E.	Coef.	M.E.
PROBABILITY OF ACCEPTANCE OF BANK LOAN APPLICATION				
Solvency ratio	1.263	0.059	***1.789	0.424
Profit ratio	-0.039	-0.002	**1.758	0.416
Implied interest costs	-4.588	-0.215	0.583	0.138
Liquidity ratio (broad)	6.233	0.293	**2.555	0.605
Short-term debt ratio.....................................	-0.769	-0.036	0.616	0.146
Bank: Group 1	0.517	0.033	-0.036	0.009
Bank: Loan impairment charge ratio	0.001	0.000	*-0.054	-0.013
Bank: Solvency ratio.....................................	9.685	0.455	-0.405	-0.096
Constant	0.056		0.037	
SELECTION EQUATION				
Solvency ratio	*-0.751		***-1.037	
Profit ratio	0.001		-0.354	
Implied interest costs	1.742		-0.914	
Liquidity ratio (broad)	***-2.362		***-2.091	
Short-term debt ratio.....................................	-0.286		-0.406	
Bank: Group 1	-0.090		**-0.324	
Bank: Loan impairment charge ratio	0.266		0.009	
Bank: Solvency ratio.....................................	-5.786		*-2.774	
LN(No. of employees)	-0.015		-0.038	
LN(Total assets)	0.057		0.052	
Applied for loan (other source)	***0.983		***0.923	
Constant	-0.378		0.070	
ρ	-0.201		**-0.670	
Observations	695		713	

Note: Coef. = Coefficient estimate; M.E. = Marginal Effect of a unit change in the explanatory variable on the probability of having the
application for a bank loan accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. The
selection equation models the probability that a company applied for a bank loan. ρ is not directly estimated in the ML-
estimatiion; the significance test reported is a test for atanh(ρ) = 0. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Main research questions - summary of findings

- Why did some SME get their application for loans from commercial/savings banks rejected during the financial crisis?
    - Poor credit rating of the SME (poor economic performance and weak accounting data)? YES
    - Tighter credit standards in the banking sector? YES
    - Insufficient capitalisation of the banks? NO
- Did exporting SMEs have easier access to bank loans than domestic firms? NO
- Did micro firms face higher loan rejection rates than larger SMEs? NO
- Self selection: Why did some SME decide not to apply for bank loans during the crisis? Poor credit rating