

# Relationship Lending and Firm innovativeness: New Empirical Evidence

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**Motivation:** *financial factors are the main obstacle inhibiting innovation*  
(Community Innovation Survey)

**Aim:** to examine the effects of relationship lending on firm innovativeness  
identifying two phases of the innovative process, the discovery and  
introduction phases.

# Methodology

From an econometric perspective, proceeding in 2 steps (Mohnen et al. (2006)):

**(1) propensity to innovate equation** - firms are either innovative or not

↔ the discovery phase

**(2) intensity to innovate equation** - the extent to which firms are innovative (% new products in total sales)

↔ the introduction phase

# Literature Review

**Macro - bank-based versus market-based system** (Tadesse(2007), Carlin and Mayer(2003), Levine(2002))

**Micro - two somehow separated strands**

- econometric methods for innovation surveys (for a review Hall and Mairesse (2006))
- bank-firm relationship (Alessandrini et al.(2008), Ughetto(2006))

In-between, Benfratello et al.(2007), Herrera and Minetti(2007), Atassanov et al.(2005), Hyytinen and Toivanen(2005)

# Relationship lending and Innovation

**Determinants of relationship lending (Elsas (2005)): number of banks, main bank's share, and length.**

Why relationship lending affects innovation?

- nature of selected projects (Boot (2000))
- quality and effectiveness of internal inputs
- hold-up problem (von Thadden(1995)) and soft-budget constraint problem (Dewatripont and Roland (2000))

As there are conflicting predictions, the empirical investigation account for firm heterogeneity (small vs large, high-tech vs low-tech)

# Relationship lending and Innovation in Italy

Relationship lending has always be a channel to finance investments

- stock-market and specialized players play a marginal role
- later-stage investments
- internal funds are still the main source

# Data description

The most recent waves, the 8th and 9th - of the comprehensive survey on Italian manufacturing firms carried by Mediocredito-Capitalia every three years.

**Period covered: 1998-2003**

Firms are either innovative or not in 1998-2000 or 2001-2003  
Average in 1998-2000/2001-2003 for R&D, Fixed capital, number of employees

# Summary statistics: 2001-2003

	<b>MAIN BANK SHARE</b>	<b>MAIN BANK # YEARS</b>	<b>TOTAL # BANKS</b>
LARGE & LT	30.3299	20.0506	7.0150
LARGE & HT	32.1561	18.0048	6.8789
SMALL & LT	35.3025	16.8680	4.1788
SMALL & HT	34.0666	17.0709	4.1107

LT: Low-tech according to NACE classification

HT: High-tech according to NACE classification

SMALL: Less than 50 employees



# Econometric Models

- **Tobit type II (cross-section)**: to control for selectivity problems

▶ tobit cross

▶ CH3 & EFN

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# Econometric Models

- **Tobit type II (cross-section)**: to control for selectivity problems
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  - ▶ CH3 & EFN
- **Conditional logit (panel)**: to control also for fixed effects in the discovery phase
  - ▶ clogit
- **Tobit type II (panel)**: to control also for fixed effects also in the introduction phase (Rochina Barrachina (1999), Raymond et al(2007))
  - ▶ rochina

# Results and Conclusions

**Banks do not carry out a sophisticated intervention at the development stage of the innovation for small firms.**

- A higher share of the main lending bank has a positive impact on the capacity of small firms to translate innovation into a greater percentage of new products in total sales.
- No significant effects in the discovery phase.

**Small firms in more concentrated banking markets are associated with a lower capacity to innovate.**

# Results and Conclusions

**For firms in high-tech sector the main bank turned out to play an important role even in discovery phase.**

- The share of the main bank proved to be a significant variable also in the first phase of the innovative process.
- For high-tech firms longer relationship with the main bank can have positive effects.

# COMPETITION & EXTERNAL FINANCIAL NEED

## Controlling for

- *technological demand for external finance (EFN)* (Hyytinen and Toivanen (2005), Demirguc-Kunt and Maksimovic(2002, 1998))
- *banking competition and concentration (CH3)*(Petersen and Rajan (1995), Boot and Thakor(2000), Degryse and Ongena (2007))

## **EFN and concentration have a negative effect on firm innovative capacity**

▶ table

Firms that are more in need of external finance might find difficult to finance innovation

Less concentrated market might foster innovation (Spagnolo(2004))

▶ back

# Relationship lending in the discovery phase

## Small firms

Relationship lending variables turned out to be significant at 5% level. Bank share is again the most significant. For small banks, it is not possible to reject the hypothesis the overall effects is zero.

▶ table

## High-tech firms

For high tech firms, at 10% significantly different from zero. The length of the relationship is positive and individually significant at 10% level. For low-tech firms longer relationship might have negative effects.

▶ table

# Relationship lending in the introduction phase

## Small firms

The share of the main bank is positive and significant.

The banking concentration index is negative and significant [▶ table](#)

## High-tech firms

Relationship lending variables turned out to be jointly significant at 10% level.

[▶ table](#)

[▶ back](#)



# ADDING FINANCIAL VARIABLES

	Intensity Eq(2)	Propensity Eq(1)
Main bank share	-0.0020	-0.0008
Main bank relationship	0.0191	0.0054
Number of banks	0.0697*	0.0398**
Financial instruments	1.2566*	0.5794*
Main bank share*SMALL	0.0125*	0.0040
Main bank relationship*SMALL	-0.0361**	-0.0059
Number banks*SMALL	-0.0073	-0.0061
Financial instruments*SMALL	-2.0090**	-0.2981
sale growth <sub>t-1</sub>		0.2957*
$\rho$		0.9320***
N	564	1221

Traditional regressors are **included** (R&D per employee, Fixed capital investment per employee, Patents..) [close](#)

# BASE TOBIT MODEL

	<b>Intensity</b>	<b>Propensity</b>
	Eq(2)	Eq(1)
<b>R&amp;D Amount</b>	0.2304***	0.1498***
<b>Investment</b>	-0.0063	0.0107*
<b>Young</b>	-2.7988***	-0.4416
<b>Age</b>	-0.0067	0.0008
<b>M&amp;As</b>	0.7726**	0.2562*
<b>International competition</b>	0.3367	0.1512
<b>Patents bought</b>	0.1880	0.2385
<b>Patents sold</b>	-2.0342**	-0.7128*
<b>International agreements</b>	0.4820	0.3210
<b>Public incentives</b>	0.6415***	0.3312***
<b>Listed</b>	2.6064***	1.3997***
<b>Size</b>	0.0009	0.0020***
<b>High tech</b>	0.2677	0.2019**
<b>sale growth<sub>t-1</sub></b>		0.2583
<b>Constant</b>	-9.4778***	-3.6785***
$\rho$	0.9110***	
<b>N</b>	564	1221

close

# COMPETITION & EXTERNAL FINANCIAL NEED

	Eq(2)	Eq(1)	Eq(2)	Eq(1)
<b>Main bank share</b>	0.0096**	0.0031**	0.0096**	0.0030*
<b>Main bank relationship</b>	-0.0114	0.0012	-0.0113	0.0013
<b>Number of banks</b>	0.0765**	0.0381**	0.0755**	0.0392**
<b>Financial instruments</b>	-0.4733	0.3551	-0.4365	0.3745
<b>CH3</b>	-0.2952	-0.7331	14.9524	7.3773**
<b>EFN</b>			11.4127	7.1867*
<b>CH3xEFN</b>			-29.9252*	-15.7572**
$\rho$		0.9388***		0.9260***
N	564	1221	564	1221

▶ close

# Conditional logit small firms

	(1)	(2)
<b>Amount R&amp;D</b>	0.1482	
<b>Fixed investments</b>	-0.0067	
<b>R&amp;D dummy</b>		1.3156***
<b>Investment dummy</b>		1.5329***
<b>Main bank share</b>	0.0472**	0.0164
<b>Main bank relationship</b>	-0.0147	-0.0134
<b>Number of banks</b>	0.0693	0.0616
<b>Financial instruments</b>	1.9148**	1.5368**
<b>Number banks*SMALL</b>	0.0525	0.0200
<b>Bank share*SMALL</b>	-0.0476***	-0.0221*
<b>Bank relationship*SMALL</b>	0.0137	-0.0027
<b>Financial instruments*SMALL</b>	-1.2445	-0.6435
<b>Age</b>	0.2276	0.5265***
<b>Size</b>	0.0009	-0.0075
<b>CH3</b>	1.0227	1.6642
<b>N</b>	644	868

# Conditional logit high-tech firms

	(1)	(2)
<b>Amount R&amp;D</b>	0.1575	
<b>Fixed investment</b>	-0.0068	
<b>R&amp;D dummy</b>		1.2724***
<b>Investment dummy</b>		1.5405***
<b>Main bank share</b>	-0.0024	-0.0113**
<b>Main bank relationship</b>	-0.0057	-0.0206*
<b>Number of banks</b>	0.1135	0.1103
<b>Financial instruments</b>	0.9304	1.0857**
<b>Bank share*HT</b>	0.0108	0.0228**
<b>Bank Relationship*HT</b>	0.0228	0.0250
<b>Number of banks*HT</b>	0.0851	-0.1732
<b>Financial instruments*HT</b>	-0.7965	-1.1040
<b>Age</b>	0.2177	0.5496***
<b>Size</b>	0.0055	-0.0003
<b>CH3</b>	0.9832	2.7103
<b>N</b>	644	868

# Tobit II for high-tech firms

$\Delta$ Investment	0.3476***
$\Delta$ R&D amount	-0.0679
$\Delta$ Main bank share	0.0126
$\Delta$ Main bank relationship	0.0392
$\Delta$ Number of banks	0.1674
$\Delta$ Financial instruments	2.1110**
$\Delta$ Size	-0.0045*
$\Delta$ Patents bought	0.9969***
$\Delta$ Patents sold	0.4620
$\Delta$ Incentives	-0.1260
$\Delta$ M&As	-0.3255
$\Delta$ CH3	-5.5178
$\Delta$ AGE	-1.458
lambda2	1.9641
lambda1	0.5501

# Tobit II for small firms

$\Delta$ Investment	0.3478***
$\Delta$ R&D amount	-0.0048
$\Delta$ Main bank share	0.0067***
$\Delta$ Main bank relationship	0.0234
$\Delta$ Number of banks	0.0489
$\Delta$ Size	-0.0195***
$\Delta$ Patents bought	1.0835***
$\Delta$ Incentive	-0.2245
$\Delta$ Financial instruments	1.3811***
$\Delta$ M&As	-0.6469**
$\Delta$ CH3	-12.4702**
$\Delta$ AGE	-1.6164***
lambda2	0.7392*
lambda1	0.8507