

## Determinants of the credit cycle: a flow analysis of the extensive margin

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The views expressed herein are those of the author and do not necessarily reflect those of the Bank of Italy or the European Central Bank.

## Motivation

- Bank credit booms often sow the seeds of subsequent credit crunches (e.g. Schularick-Taylor 2012; Dell’Ariccia et al. 2012; Baron-Xiong, 2017): macroprudential tools when “there are signs that credit has grown to excessive levels” (BIS 2010)
- Borrowers on a loan can increase the amount of principal credit approved on the loan (**intensive margin**), borrow from new lenders (**extensive margin**), or both
- Implications for creditworthiness of known vs. unknown clients and for search frictions
- Yet little is known about the relative importance of these margins and **the determinants of the net creation of borrowers**

## What We Do

1. Decompose changes in aggregate bank credit along the intensive and extensive margin
2. Show key determinants of credit expansions: the extensive margin and the net creation of borrowers
3. Apply a flow approach to assess the contribution of borrowers entering (inflows) and exiting (outflows) the bank credit market
4. Show borrower inflows are procyclical, more volatile than borrower outflows, and explain most of the fluctuations in the net creation of borrowers
5. Show search frictions (prob. of matching a new bank) account for the bulk of volatility in borrower inflows

Motivation  
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**Data**  
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Intensive and Extensive Margins  
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Flow Approach  
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Results  
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Concluding Remarks  
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# Data

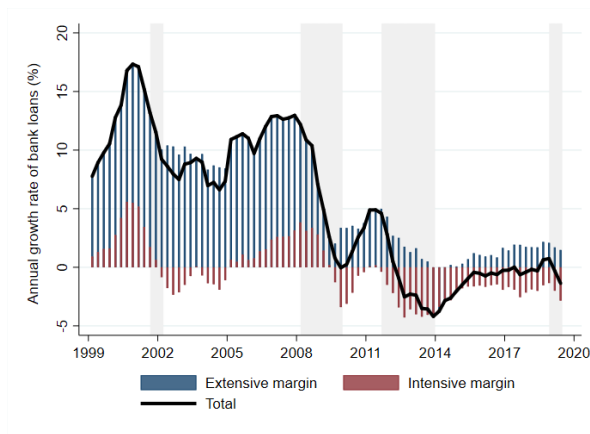
## Data

- January 1997-June 2019
- 5.6 million Households (HHs) and 2.4 million Non-Financial Corporations (NFCs) borrowing from at least a bank
- Credit volumes reported to the Italian Central Credit Register for individual HHs and NFCs
  - credit granted or drawn  $\geq$ €75,000 (lowered in January 2009 to €30,000)
  - term loans, credit lines, loan backed by account-receivables, and bad loans (“sofferenze”)
- Information on loan applications
  - from new potential clients
  - The Bank of Italy collects information on customers’ borrowings from the intermediaries and notifies them of the risk position of each customer vis-à-vis the banking system

## Intensive and Extensive Margins

## Intensive vs. extensive margin

$$\frac{\Delta L_t}{L_{t-1}} = \underbrace{\sum_{f \in \mathcal{F}} \sum_{b \in \mathcal{B}} \frac{I_{fbt}^I - I_{fbt-1}^I}{L_{t-1}}}_{\text{Intensive margin}} + \underbrace{\sum_{f \in \mathcal{F}} \sum_{b \in \mathcal{B}} \frac{I_{fbt}^C - I_{fbt-1}^D}{L_{t-1}}}_{\text{Extensive margin}}, \quad (1)$$



**borrower-bank relations** active in  $t$  and in  $t - 1$  are included in the intensive margin, the remaining ones are in the extensive margin

## Intensive and extensive contributions to credit expansion

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	bank-borrower	borrower
Intensive margin	17.6	40.4
Extensive margin	82.4	59.6

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*Notes:* The extensive and intensive margin are calculated according to eq. (1). In column “bank-borrower” *bank-borrower relations* active in  $t$  and  $t - 1$  are included in the intensive margin, while the remaining ones are in the extensive margin. In column “borrower” *borrowers* active in  $t$  and  $t - 1$  are included in the intensive margin, while the remaining ones are in the extensive margin. The average contribution of each margin to aggregate credit growth is calculated when both margins are positive.



## Correlation between extensive margin and its components

	bank-borrower	borrower
net mean loan to new borrowers	0.17	-0.27
net change in the number of borrowers	0.92	0.94

*Notes:* All series are divided by their corresponding standard deviation. The extensive margin is calculated according to eq. (1). In column “bank-borrower” *bank-borrower relations* active in  $t$  and  $t-1$  are included in the intensive margin, while the remaining ones are in the extensive margin. In column “borrower” *borrowers* active in  $t$  and  $t-1$  are included in the intensive margin, while the remaining ones are in the extensive margin. The net mean loan to new borrowers is difference between the mean loans to new borrowers (relationships) and the mean loans to exiting borrowers (relationship severances). The net change in the number of borrower is the difference between the number of new borrowers (relationships) and the number of exiting borrowers (relationship severances).

⇒ henceforth focus on the net change in the number of borrowers

## Flow Approach

## Baseline Definitions

- Borrower.** HHs and NFCs that have at least one credit relationship with a bank.
- Applicant.** HHs and NFCs that submit at least one loan application to a new bank *and* do not have any credit relationship with a bank at the reporting date.
- Inactive.** HHs and NFCs that are neither borrowers nor applicants during the period but are classified as applicants or borrowers in the previous *or* next six months.

	<i>Looking for a loan from a new bank?</i>	
	Yes	No
<i>Borrowing?</i>		
Yes	<b>Borrower</b>	Borrower
No	Applicant	Inactive

⇒ Henceforth, entry and exits are vis-à-vis **the bank credit market**

## Transition Matrix

	Status in next period		
	<i>Borrower</i>	<i>Applicant</i>	<i>Inactive</i>
Status in current period			
<i>Borrower</i>	BB	BA	BI
<i>Applicant</i>	AB	AA	AI
<i>Inactive</i>	IB	IA	II

*Notes:* The letter *B* stands for Borrower, *A* stands for Applicant and *I* for Inactive in the credit market.

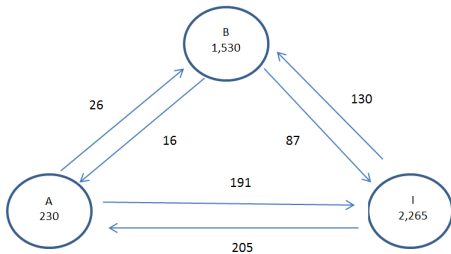
The **net creation of borrowers**  $\Delta_6 B_{t+6}$  can be decomposed into the difference between borrower inflows and borrower outflows:

$$\Delta_6 B_{t+6} = \underbrace{AB_{t+6} + IB_{t+6}}_{\text{borrower inflows}} - \underbrace{(BA_{t+6} + BI_{t+6})}_{\text{borrower outflows}}, \quad (2)$$

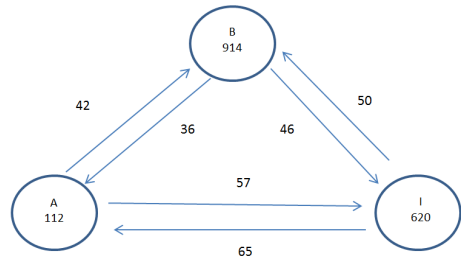
# Results

# Gross Flows and Stocks (Thousands)

## Households

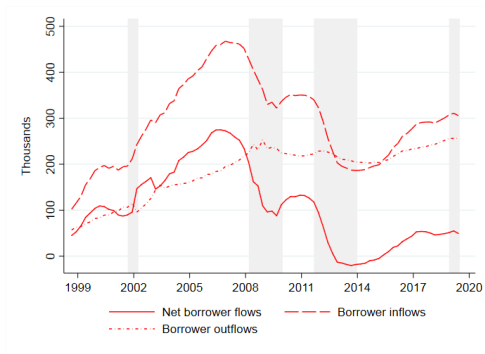


## Non-Financial Corporations

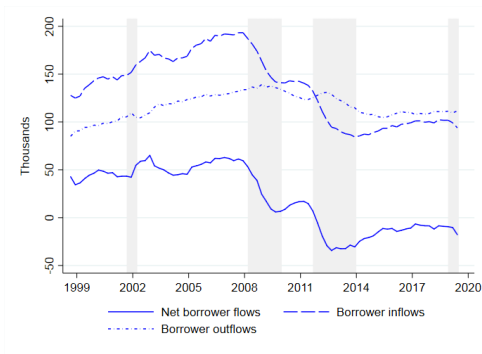


# Gross Borrower Flows (Annual Changes)

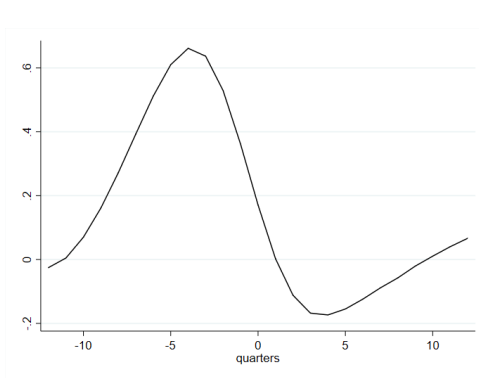
## HH Borrowers



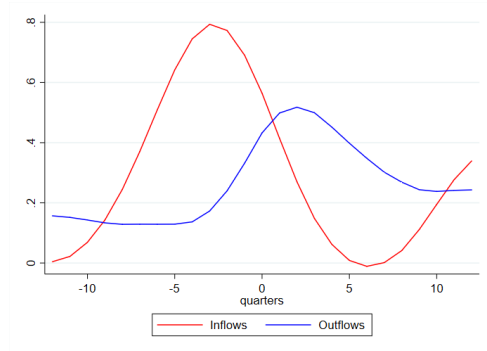
## NFC Borrowers



# Cross-correlations



(a) Correlation between  $\widehat{GDP}_t$  and  $\widehat{borrowers}_{t+i}$



(b) Correlation between  $\widehat{GDP}_t$  and  $\widehat{borrower\ inflows}_{t+i}$  and between  $\widehat{GDP}_t$  and  $\widehat{borrower\ outflows}_{t+i}$

Notes: Correlation is between the cyclical component of each series.  $Inflows = AB + IB$  and  $Outflows = BA + BI$



## Standard deviation

GDP	1.93	
Net creation of borrowers $b$	2.83	
<i>-borrower inflows</i>	15.85	
<i>-borrower outflows</i>	8.40	
	<b>HH</b>	<b>NFC</b>
Net creation of borrowers $b$	10.66	3.85
<i>-borrower inflows</i>	19.79	11.29
<i>-borrower outflows</i>	11.72	6.06

*Notes:* Numbers are in percentage. All series are annual growth rates. Inflows= $AB + IB$  and Outflows= $BA + BI$ .

## Decomposition of the net creation of borrowers

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### HH sector

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$\beta^{\bar{A}\bar{B}+\bar{I}\bar{B}}$	borrower inflows	0.96
$\beta^{\bar{B}\bar{A}+\bar{B}\bar{I}}$	borrower outflows	0.04

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### NFC sector

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$\beta^{\bar{B}\bar{A}+\bar{B}\bar{I}}$	borrower inflows	0.89
$\beta^{\bar{B}\bar{A}+\bar{B}\bar{I}}$	borrower outflows	0.11

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*Notes:* The third column of the row labeled “ $\beta^j$ ” reports the OLS estimated coefficient from running a regression of the variable  $\hat{j}$  against the cyclical component of the annual growth rate of borrowers, i.e.  $Cov(\hat{j}, \hat{b})/Var(\hat{b})$  with  $j \in \{\bar{B}\bar{A} + \bar{B}\bar{I}, \bar{A}\bar{B} + \bar{I}\bar{B}\}$ .

## Where do fluctuations in borrower inflows originate from?

$$(\widehat{AB + IB})_{t+4} = \widehat{f}_{t+4} + (\widehat{A + I})_t, \tag{3}$$

where

- $f = \frac{AB+IB}{A+I}$  is the new bank matching probability: **search frictions**
- $A + I$  denotes unknown potential borrowers in the market: **competition**

### Decomposition of borrower inflows

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#### HH sector

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$\beta^f$	loan finding probability	0.68
$\beta^{A+I}$	non borrowers	0.29

#### NFC sector

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$\beta^f$	loan finding probability	0.73
$\beta^{A+I}$	non borrowers	0.25

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## Concluding Remarks

- New evidence on the role of the extensive margin in shaping the pattern of aggregate credit dynamics
- Three new facts:
  1. cyclical fluctuation in the net creation new borrowers is largely driven by gross inflows of borrowers
  2. gross inflows of borrowers are procyclical, highly volatile and tend to lead the business cycle
  3. gross inflows of borrowers are twice as volatile as gross outflows and their volatility is mainly explained by changing in the probability of finding a loan
- Monitoring/manipulating the inflows of new borrowers may be key for macroprudential authority (smoothing credit cycle) but also for monetary policy (smoothing business cycle)