

Bank credit, cash-flow and investment : a quantification exercise

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- ▶ Long standing literature on corporate financing decision and the capital structure of firms :
 - ▶ pecking order vs trade-off vs market timing theories (Myers, 1984)
- ▶ 2008 financial crisis : a large, “exogeneous” shock extensively used to identify causal effects going from financing sources to investment
 - ▶ Duchin *et al.* (2010), Cingano *et al.* (2013), Garicano & Steinweder (2016)
- ▶ However, much less work quantifying/describing the relative contribution of various funding sources to investment :
 - ▶ what does the data tell us about the way firms finance their investment ? (\neq what *cause* investment)
 - ▶ Gatchev *et al.* (2009, 2010) for the US
- ▶ Regarding the financing patterns of investment, an important dimension has been largely ignored until now :
 - ▶ the size of the investment undertaken by firms
 - ▶ small equipment/furniture vs machinery/building
- ▶ Financing mix may differ a lot along this dimension :
 - ▶ collateralisation, uncertainty, duration...

Introduction

Research questions : what we do

In this paper, we elaborate on the framework developed by Frank & Goyal (2003) and Gatchev *et al.* (2009, 2010) :

- ▶ start from an accounting identity and estimate it to quantify the contribution of various funding sources to capital expenditure :
 - ▶ use of funds = sources of funds
 - ▶ relate in a systematic way changes in the asset side and in the liability side of the balance sheet
- ▶ we enrich this setting by considering heterogeneous financing patterns along two dimensions :
 - ▶ the (relative) size of investment : below/above the median investment to assets ratio
 - ▶ the (relative) size of firms : quantiles of the distribution of sales (Covas & Den Hann, 2011)
- ▶ we quantify the contribution of bank credit and retained earnings (internal financing) :
 - ▶ for large and small investment
 - ▶ for various classes of firm size
 - ▶ when both these dimensions are considered simultaneously

Introduction

Research questions : what we find

- ▶ Bank credit is the primary sources of funding of investment :
 - ▶ for each additional euros of changes in fixed assets, a typical firm will increase its banking debt by 50 cents
- ▶ However, the use of funding sources varies significantly with both the size of the firm and the size of the investment :
 - ▶ large investment relies relatively less on bank credit and relatively more on internal financing
 - ▶ large firms tend to rely much less on bank credit
- ▶ When we interact these two dimensions :
 - ▶ the decreasing role of bank credit with firm size only observable for large investment
 - ▶ internal financing plays a much larger role for small investment (than for large investment) but for the bottom 90% of firms only

- ▶ We use the FIBEN dataset :
 - ▶ provides balance sheets of firms over a long time period : 1989-2015
- ▶ We focus on the manufacturing sector
 - ▶ we impose to have at least 5 consecutive obs.
 - ▶ we drop obs. with inconsistent data or ratios
- ▶ Importantly :
 - ▶ this dataset allows us to examine the funding patterns of small firms that fall often out of scope of studies
 - ▶ our time window covers two business cycles (if not more)
- ▶ We end up with 60,000 firms and 660,000 obs.

Decade	n	mean	p5	p10	p25	p50	p75	p90	p95
Turnover (million of euros)									
1990-1995	118,028	19.9	1.0	1.1	1.6	3.1	8.0	24.6	54.1
1995-2000	126,034	19.9	0.9	1.1	1.5	2.9	7.5	23.6	52.1
2000-2005	134,565	23.8	0.9	1.1	1.5	3.0	7.9	25.2	54.4
2005-2010	131,271	26.3	0.9	1.1	1.6	3.1	8.4	26.7	59.7
2010-2015	126,974	25.6	0.9	1.1	1.6	3.2	8.9	29.5	65.8

- ▶ Baseline accounting identity :

- ▶ $FA_{t,s} + WCA_{f,t} + Cash_{f,t} = E_{f,t} + BC_{f,t} + OD_{f,t} + TP_{f,t}$

- ▶ $\Delta FA_{t,s} + \Delta WCA_{f,t} + \Delta Cash_{f,t} = \Delta E_{f,t} + \Delta BC_{f,t} + \Delta OD_{f,t} + \Delta TP_{f,t}$

- ▶ We could net out working capital assets and trade payables :

- ▶ $\Delta NWC_{f,t} = \Delta WCA_{f,t} - \Delta TP_{f,t}$

- ▶ We also re-express changes in equity as the sum of equity issuance and retained earnings :

- ▶ $\Delta E_{f,t} = \Delta E_{f,t}^{raw} + (\pi_{f,t} - Dividends_{f,t}) = \Delta E_{f,t}^{raw} + RE_{f,t}$

- ▶ After rearranging we get our main equality:

$$\Delta FA_{t,s} = \Delta E_{f,t}^{raw} + RE_{f,t} + \Delta BC_{f,t} + \Delta OD_{f,t} - \Delta NWC_{f,t} - \Delta Cash_{f,t}$$

- ▶ We estimate the following equations :

- ▶
$$Y_{f,t}^k = \alpha + \beta_k \cdot \frac{\Delta FA_{f,t}^+}{TA_{f,t-1}} + Controls_{f,t} + \sum FE_{f,t} + \epsilon_{f,t}$$

- ▶ where :

- ▶ $Y_{f,t}^k$ denotes one of the possible funding sources (bank credit, retained earnings...) scaled by total assets
- ▶ $FE_{f,t}$ denote a set of year, industry, firm, firm age, firm size fixed effects

- ▶ In this setting, the coefficient β_k can be interpreted as the contribution of funding source k to the financing of investment expenses :

- ▶ when fixed assets change by 1% of total assets, bank credit changes by $\beta_{f,t}^{BC}$ % of total assets

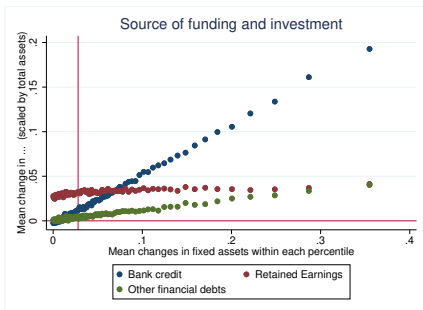
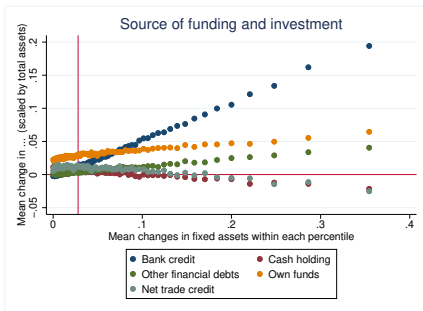
- ▶ The following relation between estimated coefficients must hold :

- ▶
$$\sum_k \beta_k = 1$$

- ▶ We focus on the positive change in fixed assets i.e. we disregard disinvestment patterns

Graphical evidence

Investment and funding sources



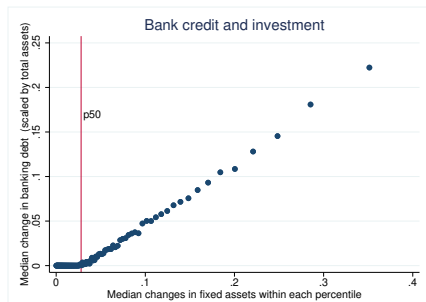
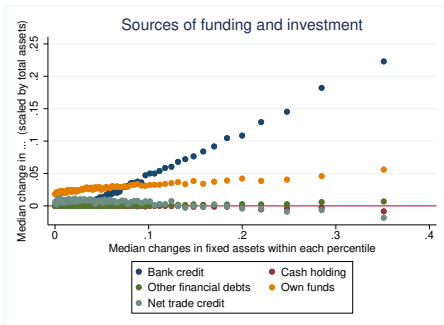
Baseline Regressions

	Change in ... / TA						
	Bank credit	Other debts	Retained Earnings	Cash Holding	net Trade Credit	Equity (net of RE)	Residual Liabilities
Change in fixed assets / TA	0.477*** (0.003)	0.114*** (0.003)	0.069*** (0.002)	-0.061*** (0.003)	-0.146*** (0.004)	0.039*** (0.001)	0.095*** (0.002)
Observations	256,798	256,798	256,798	256,798	255,981	253,164	256,798
Adjusted R-squared	0.373	0.090	0.408	0.238	0.061	0.125	0.060
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level

- ▶ Bank credit is the primary source of financing for investment :
 - ▶ a change in FA corresponding to 1% of total assets is associated to a change in bank credit corresponding to 0.5% of total assets
- ▶ The contribution of other funding sources is much smaller, albeit not negligible
 - ▶ we can check that the estimated coefficients sum to 1
- ▶ These results and their interpretation remain the same if we also consider negative changes in FA
- ▶ However, these average contributions may mask heterogeneous patterns of financing :
 - ▶ we now consider how the contribution of each funding sources varies along with :
 - ▶ the relative size of investment (above/below the median investment to assets ratio)
 - ▶ the relative size of firms (p25, p50, p75, p90 & p95)
 - ▶ we now focus on bank credit and retained earnings

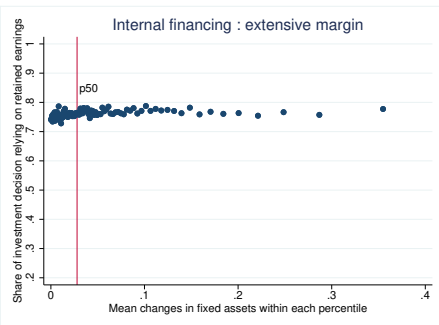
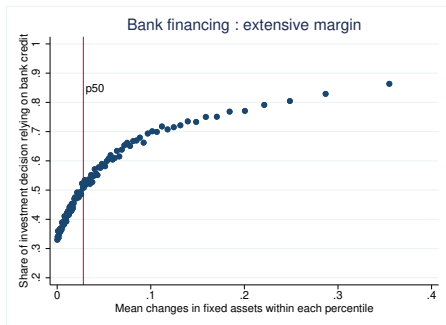
Graphical evidence

Source of funds and the size of investment



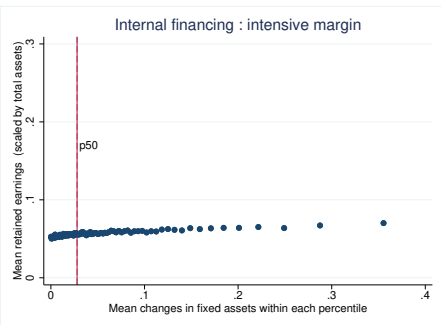
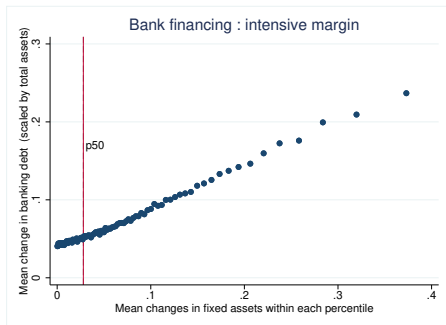
Bank credit, retained earnings and the size of investment

Extensive margin



Bank credit , retained earnings and the size of investment

Intensive margin



- ▶ A visual inspection indicates that :
 - ▶ the propensity to use bank credit is strongly increasing with the (relative) size of investment
 - ▶ in contrast, large and small investment tends to use bank credit at the same frequency
- ▶ At the intensive margins, the graph are not very conclusive
- ▶ Nonetheless, after a closer examination we could suspect that the contribution of bank credit (and retained earnings) may differ with the size of investment
- ▶ As a result, we move to the regressions to answer to this question :
 - ▶ does the financing of investment with bank credit and retained earnings vary along with the size of investment ?

Small vs large investment financing

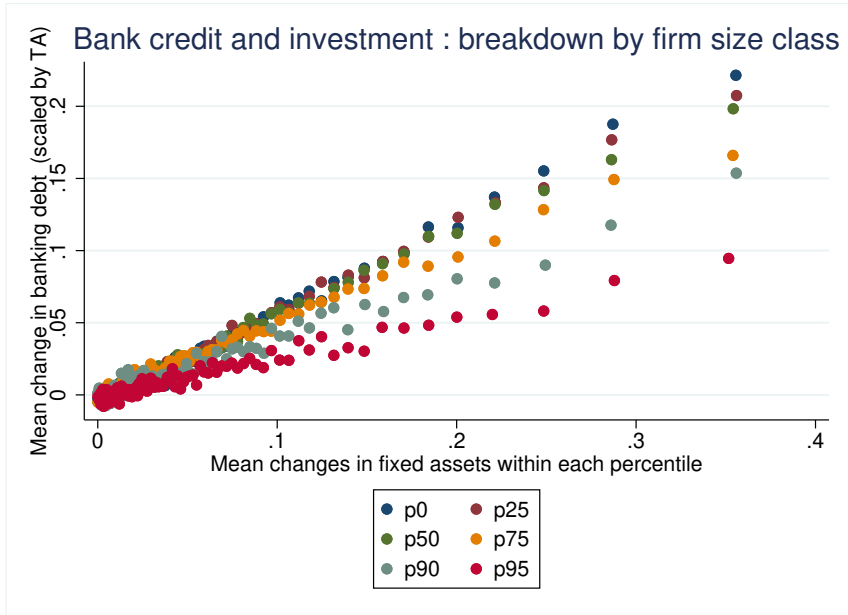
Intensive margins only

	All Investment		Small Investment		Large Investment	
Change in fixed assets / TA	0.452*** (0.003)	0.070*** (0.002)				
Small Change in fixed assets / TA			0.319*** (0.033)	0.160*** (0.019)		
Large Change in fixed assets / TA					0.486*** (0.005)	0.071*** (0.003)
Observations	126,728	190,844	38,599	84,467	69,611	86,433
Adjusted R-squared	0.514	0.391	0.376	0.403	0.511	0.386
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level

- ▶ The financing of large and small investment (in relative terms) differs significantly one from another
 - ▶ Small investment :
 - ▶ the primary source of funding remains bank credit (0.32) ...
 - ▶ but the role of internal financing in the form of retained earnings is all but marginal (0.16)
 - ▶ Large investment :
 - ▶ the contribution of bank credit to capital expenditure is very large (almost half of the funding mix) ...
 - ▶ while internal financing is much smaller (0.07)
- ▶ These results underlines the importance to consider the relative size of capital expenditure when questioning the financing patterns:
 - ▶ office equipment and machinery are not funded in the same way !

Bank financing and firm size

How does the funding mix of firms evolve with their relative size ?



Firm size and investment size

Intensive margins only

	All Investment		Small Investment		Large Investment	
	Change in Bank credit	Retained earnings	Change in Bank credit	Retained earnings	Change in Bank credit	Retained earnings
Change in fixed assets / TA * [p0-p25]	0.492*** (0.007)	0.075*** (0.004)	0.218** (0.105)	0.171*** (0.058)	0.515*** (0.009)	0.082*** (0.006)
Change in fixed assets / TA * [p25-p50]	0.481*** (0.006)	0.073*** (0.004)	0.281*** (0.078)	0.198*** (0.046)	0.505*** (0.008)	0.072*** (0.005)
Change in fixed assets / TA * [p50-p75]	0.481*** (0.006)	0.063*** (0.003)	0.376*** (0.064)	0.224*** (0.037)	0.525*** (0.008)	0.063*** (0.005)
Change in fixed assets / TA * [p75-p90]	0.428*** (0.008)	0.073*** (0.004)	0.338*** (0.072)	0.146*** (0.039)	0.459*** (0.011)	0.074*** (0.006)
Change in fixed assets / TA * [p90-p95]	0.383*** (0.013)	0.068*** (0.007)	0.177* (0.101)	-0.009 (0.056)	0.421*** (0.017)	0.061*** (0.009)
Change in fixed assets / TA * [p95-p100]	0.277*** (0.012)	0.072*** (0.006)	0.412*** (0.089)	0.065 (0.052)	0.312*** (0.016)	0.078*** (0.009)
Observations	126,728	190,844	38,599	84,467	69,611	86,433
Adjusted R-squared	0.517	0.391	0.376	0.403	0.514	0.386
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level

Firm size and investment size

- ▶ Strong, and not surprising, evidence that the funding mix largely differs along with the relative size of the firms :
 - ▶ the larger the firm, the more balanced its funding mix
 - ▶ the smallest firms overly rely on bank credit
- ▶ In contrast, the contribution of retained earnings tends to be largely uniform across firm size
- ▶ Even more interesting is the fact that firm size and investment size interact together when it comes to financing patterns :
 - ▶ no clear pattern emerges in the way firms of different size use bank credit for small investment
 - ▶ while internal financing play a significant role for small investment of small firms, this contribution drop to zero for the very largest firms (top 10%)
 - ▶ bank credit is less and less important to the funding of large investment as we consider larger firms
 - ▶ conversely, the contribution of retained earnings to large investment is small but uniform across firm size class

- ▶ We elaborate on the work of Gatchev *et al.* (2009/10) to study the contribution of bank credit to capital expenditure
 - ▶ we confirm the predominant role played by bank credit in the case of French firms
 - ▶ other funding sources are more marginal and more equally distributed on average
- ▶ We also identify two important sources of heterogeneity : firm size and investment size
 - ▶ small investment rely relatively more on internal financing and relatively less on bank credit than large investment
 - ▶ the contribution of bank credit tends to decrease monotonically with firm size
- ▶ When we combine these two dimensions, we observe that :
 - ▶ the decreasing role of bank credit with firm size is observable for large investment only
 - ▶ internal financing play a larger role for small investment but for the bottom 90% of firms only

Thank you for your attention

Appendix : Baseline Regressions

Positive and negative changes in fixed assets

	Change in ... / TA						
	Bank credit	Other debts	Retained Earnings	Cash Holding	net Trade Credit	Equity (net of RE)	Residual Liabilities
Change in fixed assets / TA	0.506*** (0.002)	0.093*** (0.002)	0.102*** (0.001)	-0.090*** (0.002)	-0.104*** (0.002)	0.035*** (0.001)	0.072*** (0.001)
Observations	657,849	657,849	657,849	657,849	656,310	650,540	657,849
Adjusted R-squared	0.287	0.054	0.391	0.231	0.050	0.137	0.041
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level

Appendix : Small vs large investment financing

Intensive and extensive margins

	All Investment		Small Investment		Large Investment	
Change in fixed assets / TA	0.477*** (0.003)	0.069*** (0.002)				
Small Change in fixed assets / TA			0.533*** (0.024)	0.121*** (0.021)		
Large Change in fixed assets / TA					0.478*** (0.004)	0.067*** (0.003)
Observations	256,798	256,798	118,145	118,145	118,502	118,502
Adjusted R-squared	0.373	0.408	0.145	0.456	0.419	0.407
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level

Appendix : Firm size and investment size

Intensive and extensive margins

	All Investment		Small Investment		Large Investment	
	Change in Bank credit	Retained earnings	Change in Bank credit	Retained earnings	Change in Bank credit	Retained earnings
Change in fixed assets / TA * p0-p25]	0.338*** (0.007)	0.078*** (0.005)	0.552*** (0.064)	0.267*** (0.061)	0.535*** (0.009)	0.074*** (0.007)
Change in fixed assets / TA * p25-p50]	0.526*** (0.006)	0.075*** (0.004)	0.586*** (0.051)	0.203*** (0.048)	0.517*** (0.008)	0.075*** (0.006)
Change in fixed assets / TA * p50-p75]	0.502*** (0.006)	0.070*** (0.004)	0.513*** (0.046)	0.208*** (0.039)	0.516*** (0.008)	0.069*** (0.005)
Change in fixed assets / TA * p75-p90]	0.449*** (0.007)	0.066*** (0.005)	0.579*** (0.052)	-0.012 (0.044)	0.450*** (0.010)	0.062*** (0.007)
Change in fixed assets / TA * p90-p95]	0.380*** (0.012)	0.059*** (0.008)	0.459*** (0.080)	0.018 (0.062)	0.392*** (0.016)	0.055*** (0.010)
Change in fixed assets / TA * p95-p100]	0.274*** (0.010)	0.046*** (0.007)	0.436*** (0.070)	-0.087 (0.061)	0.266*** (0.013)	0.051*** (0.009)
Observations	256,798	256,798	118,145	118,145	118,502	118,502
Adjusted R-squared	0.377	0.408	0.145	0.457	0.423	0.407
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm level	Firm level	Firm level	Firm level	Firm level	Firm level