Bank capital structure: A story of internationalization and business model

Justine Pedrono Aurélien Violon

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Work in progress

Motivation

- Global financial crisis and Basel III : interest on bank capital structure

- Capital structure (CS) :
  - Structure of bank financing, either debt (tax benefit) or capital (cost of distress)

$$Leverage = \frac{Assets}{Equity}$$

$$\Rightarrow \textbf{Optimal leverage}$$

- Main determinants of CS : size, profit, collateral and risk
  Gropp et al. [2010]

$\Rightarrow$ But also, internationalization :
- Direct effects : Risk diversification + New costs
- Indirect effects : CS determinants conditional to internationalization

$\hookrightarrow$ International European and French banks *Baba et al. [2009], Cerutti et al. [2017]*

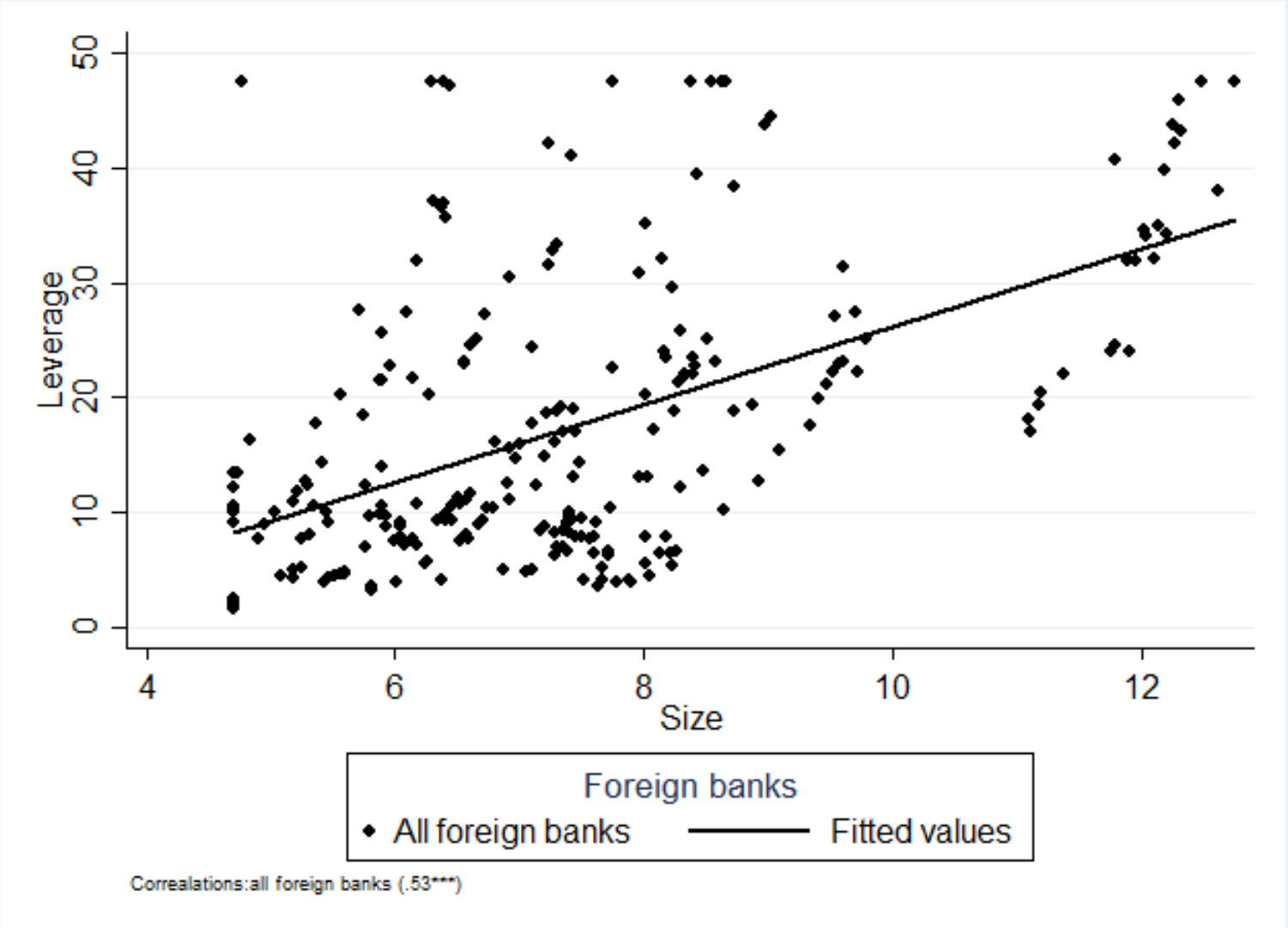

Figure: Internationalization, size and capital structure of foreign banks : data cover foreign banks located in France from 1999 to 2015. Source : ACPR, own calculations

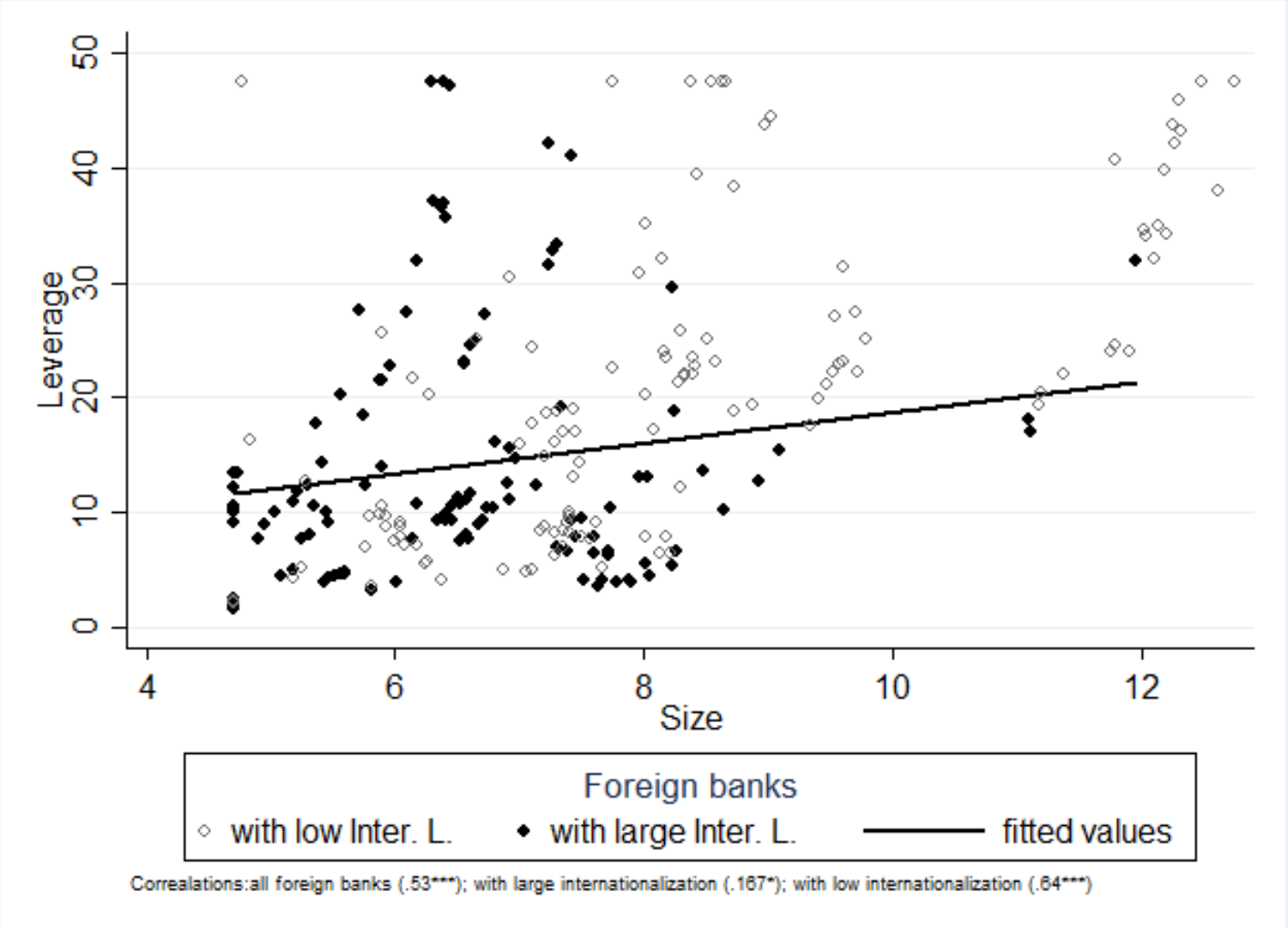

Figure: Internationalization, size and capital structure of foreign banks : data cover foreign banks located in France from 1999 to 2015. Source : ACPR, own calculations

This paper

A focus on bank capital structure with internationalization
An incentive to consider the different business models of credit institutions.

- Internationalization :
  Currency diversification = share of assets or liabilities denominated in USD
  - Direct effects are included : risk diversification and agency costs.
  - Consistent with the BIS definition of international exposures.

- Data (ACPR) :
- Credit institutions located in France between 1999 and 2015

- Main results :
  - 5 main determinants including internationalization
  - Business models and internationalization are key factors

Capital structure determinants

- **Trade-off theory** (T.O) : Kraus and Litzenberger [1973]
  - a) Being leverage : tax benefit
  - b) Being leverage : cost of distress, or cost of equity.

  $\Rightarrow$ Optimal leverage : trade-off between a) and b)

- **Pecking order theory** (P.O) : Myers and Majluf [1984]

  $\Rightarrow$ A cost hierarchy of funds available to firms

- **5 determinants** : size, profit, collateral, risk and internationalization

Theoretical predictions for simultaneous influences

- Internationalization
  - Risk diversification (+) *Lewellen [1970], Shapiro [1978, 2013]*
  - Agency and monitoring costs (−) *Lee and Kwok [1988], Burgman [1996], Reeb et al. [1998]*
- Size :
  - Bail-out implicit guarantee (+) *Gropp et al. [2010], Schich and Lindh [2012], Acharya et al. [2016]*
    - Interconnectedness (+) *Acharya et al. [2016]*
    - Public resources for national purpose (−)
- Profit :
  - A positive signal for creditors and shareholders (+)*Bradley et al. [1984]*
  - Internal finance : costless (−) *Myers and Majluf [1984]*
  - Larger profitability of MNCs (+) *Ragazzi [1973]*
  - Access to additional and or global liquidity (+) *McCauley et al. [2012]*

  $\Rightarrow$ Reduce the gap in funding resources

Theoretical predictions

- Collateral :
  - A guarantee for creditors (+) *Bradley et al. [1984]*
  - Central bank operations (−)
    - Domestic counterparty
    - Domestic currency

- Risk :
  - Uncertainty and deposits' fragility (−) *Diamond and Rajan [2000]*
  - Regulation and reserves (−) *Gropp and Heider [2010]*
  - Risk diversification (+) *Sharpe [1964], Lintner [1965], Lewellen [1970]*

- Empirically (Gropp and Heider (2010)) :
  - Size$> 0^{\dagger}$; Profit< 0 ; Collateral$> 0^{\dagger}$; Risk< 0.

† *Not significant with bank FE*

Sample and data definition

- Accounting data :
  - At the book value, consolidated data

- Internationalization :
  - At the book value, unconsolidated data
  - Aggregated currency exposures at the banking group level

  $\Rightarrow$ A proxy of asset/liability currency diversification at the group level

$\Rightarrow$ **Yearly data from 1999 to 2015 on credit institutions located in France**
73 credit institutions (53% french, 47% foreign), unbalanced panel

Business models of credit institutions

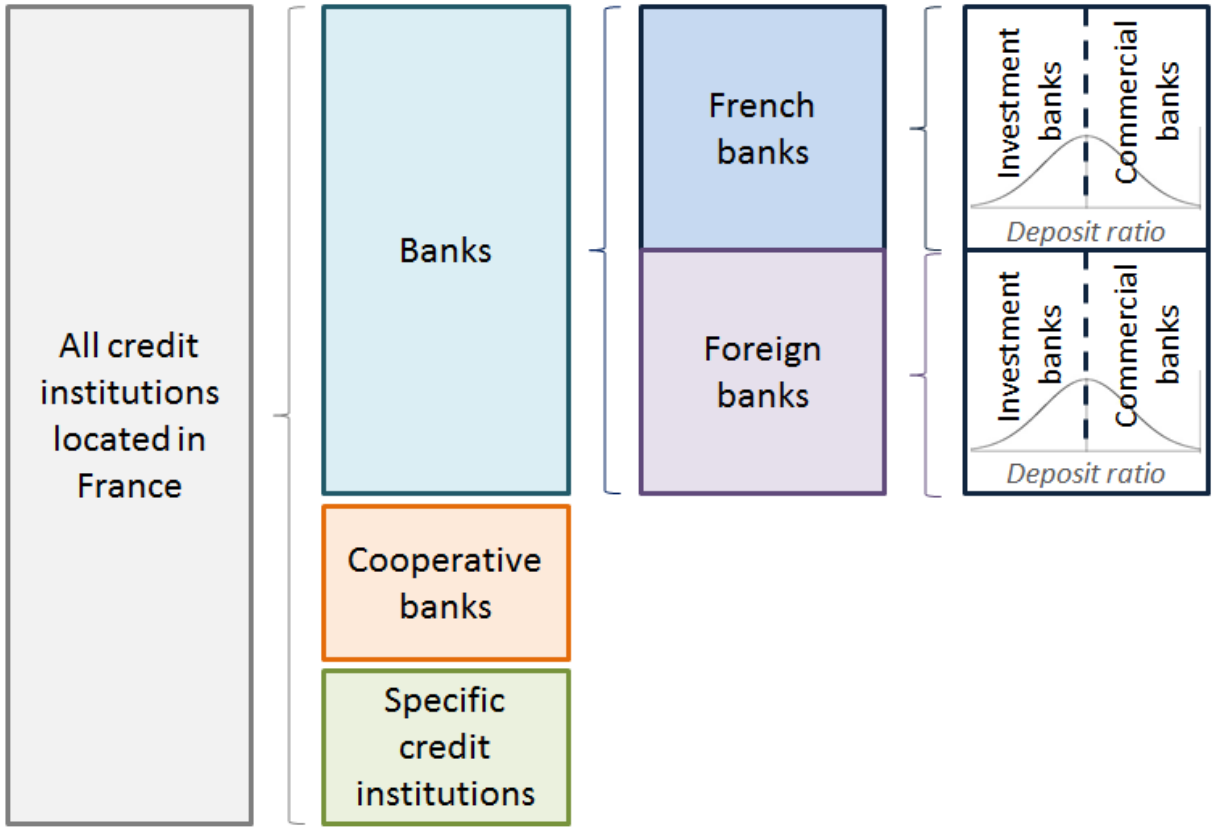

Figure: Business models

Desc. Stat.

In a sub-sample (i...N), a bank i is identified as an investment bank if : **(Baglioni et al. [2013])**

$$\left(\frac{Deposit}{Total\ Debt}\right)_i < \left(\frac{Deposit}{Total\ Debt}\right)_{median(i...N)}$$

Specification : CS determinants

Rajan and Zingales (1995), Frank and Goyal (2004) and Gropp and Heider (2010)

$$\begin{aligned} Leverage_{i,t} = \alpha &+ \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Collateral_{i,t-1} \\ &+ \beta_4\ ln(Risk_{i,t-1}) + \beta_5\ Inter_{i,t-1} \\ &+ \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t} \end{aligned} \tag{1}$$

$$\begin{aligned} Leverage_{i,t} = \alpha &+ \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Collateral_{i,t-1} \\ &+ \beta_4\ ln(Risk_{i,t-1}) + \beta_5 Inter._{i,t-1} + \beta_6 Inter._{i,t-1} * Det_{i,t-1} \\ &+ \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t} \end{aligned} \tag{2}$$

- h_i : control for time-invariant characteristics (foreign, nationality or bank fixed effects)
- Det_i : $\{ln(Size_i);\ Profit_i;\ Collateral_i :\ ln(Risk_i)\}$
- β_6 : simultaneous influence of internationalization and other determinants of CS
- FE_t : time fixed effects
- $Controls$: $IFRS_{t-1}$; $Conso_{t-1}$; $Off\ BS_{t-1}$; $Deriv_{t-1}$ (2)
- Standard errors : clustered at the bank level

▸ Variable

CS determinants

General results

The four main determinants :

- Size : especially significant for French banks
- Profitability : mainly P.O theory except for investment banks
- Collateral : significant only for investment banks
- Risk : negative and significant for all sub-categories of banks

Internationalization :

- Overall, an asymmetry in internationalization :
  - Asset internationalization : negative **but** insignificant
  - Liability internationalization : negative **and** significant
- Considering business model :
  - Banks, investment banks and foreign investment banks
    - Negative and significant

- What about simultaneous influence ?

Table: Condiational bail-out condition for banks and commercial banks

$$Lev_{i,t} = \alpha + \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Coll_{i,t-1} + \beta_4\ ln(Risk_{i,t-1}) + \beta_5 Inter._{i,t-1} * ln(Size_{i,t-1}) + \beta_6 Inter._{i,t-1} + \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t}$$

	Banks			Commercial banks		
$ln(Size_{t-1})$	**2.50*** **	**2.56*** **	**8.11*** **	**2.25*** **	**2.32*** **	**5.54*** **
	(0.45)	(0.45)	(1.57)	(0.72)	(0.78)	(1.65)
$ln(Size_{t-1})$ *Inter. Liab.*$_{t-1}$	**-4.04** **	**-2.71***	**-4.38** **	**-5.67** **	**-4.83** **	**-4.65** **
	(1.64)	(1.54)	(2.11)	(2.15)	(1.96)	(2.11)
Inter. Liab.$_{t-1}$	20.39*	12.3	24.84*	32.18**	26.72*	27.47*
	(11.61)	(12.14)	(13.64)	(13.15)	(15.80)	(14.15)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Foreign FE	Yes	No	No	Yes	No	No
Nationality FE	No	Yes	No	No	Yes	No
Bank FE	No	No	Yes	No	No	Yes
Adjusted R^2	0.65	0.71	0.31	0.55	0.63	0.26
N	373	373	373	187	187	187

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table: Liability internationalization and profitability

$$Lev_{i,t} = \alpha + \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Coll_{i,t-1} + \beta_4\ ln(Risk_{i,t-1}) + \beta_5 Inter._{i,t-1} * Profit_{i,t-1} + \beta_6 Inter._{i,t-1} + \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t}$$

	All credit institutions					
$Profit_{t-1}$	**-1.57*** **	**-2.29*** **	**-1.71*** **	**-2.39*** **	**-0.54**	**-0.86** **
	(0.52)	(0.48)	(0.44)	(0.46)	(0.34)	(0.43)
$Inter.\ Liab._{t-1}\ Profit_{t-1}$		**3.39** **		**3.77** **		**1.24**
		(1.62)		(1.52)		(0.86)
$Inter.\ Liab._{t-1}$		-9.05**		-9.10*		-5.26
		(3.98)		(4.83)		(3.17)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Foreign FE	Yes	Yes	No	No	No	No
Nationality FE	No	No	Yes	Yes	No	No
Bank FE	No	No	No	No	Yes	Yes
Adjusted R^2	0.61	0.63	0.69	0.7	0.27	0.29
N	427	427	427	427	427	427

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table: International funding and collateral

$$Lev_{i,t} = \alpha + \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Coll_{i,t-1} + \beta_4\ ln(Risk_{i,t-1}) + \beta_5 Inter._{i,t-1} * Coll_{i,t-1} + \beta_6 Inter._{i,t-1} + \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t}$$

	Investment banks					
$Coll_{t-1}$	**16.49*** **	**20.38*** **	**13.31** **	**19.63** **	**6.57**	**14.00** **
	(5.16)	(7.03)	(5.38)	(7.22)	(6.15)	(6.44)
$Coll_{t-1}$ *Inter. Liab.*$_{t-1}$		**-46.78***		**-33.61***		**-48.20** **
		(23.35)		(19.39)		(18.61)
Inter. Liab.$_{t-1}$		-6.5		-4.54		0.05
		(5.65)		(5.21)		(3.99)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Foreign FE	Yes	Yes	No	No	No	No
Nationality FE	No	No	Yes	Yes	No	No
Bank FE	No	No	No	No	Yes	Yes
Adjusted R^2	0.74	0.78	0.77	0.79	0.34	0.39
N	186	186	186	186	186	186

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table: Asset internationalization and risk

$$Lev_{i,t} = \alpha + \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Coll_{i,t-1} + \beta_4\ ln(Risk_{i,t-1})$$
$$+\beta_5 Inter._{i,t-1} * ln(Risk_{i,t-1}) + \beta_6 Inter._{i,t-1} + \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t}$$

	Banks					
$ln(Risk_{t-1})$	**-8.22*** **	**-10.57*** **	**-5.87*** **	**-8.22*** **	**-3.38**	**-4.64***
	(1.73)	(1.62)	(1.58)	(1.61)	(2.36)	(2.68)
$Inter.\ Asset_{t-1}\ ln(Risk_{t-1})$		**9.48**		**10.91***		**10.05** **
		(6.15)		(5.59)		(4.67)
$Inter.\ Asset_{t-1}$		-0.24		1.38		-1.58
		(5.19)		(7.60)		(7.04)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Foreign FE	Yes	Yes	No	No	No	No
Nationality FE	No	No	Yes	Yes	No	No
Bank FE	No	No	No	No	Yes	Yes
Adjusted R^2	0.62	0.64	0.7	0.71	0.26	0.3
N 373	373	373	373	373	373	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

▸ Additional results

Takeaway

CS determinants

CS determinants :	Positive	Negative
Size (T.O)	Gropp and Heider [2010]† **Pedrono and Violon(2018)**	
Profitability (P.O)		Gropp and Heider [2010] **Pedrono and Violon(2018)**
Collateral (T.O)	Gropp and Heider [2010]† **Pedrono and Violon(2018)**	
Risk(T.O)		Gropp and Heider [2010] **Pedrono and Violon(2018)**
Intern. (T.O)		**Pedrono and Violon(2018)**

† Not significant with bank FE

Takeaway

Simultaneous influence

Intern. and determinants	Positive	Negative
Size		**Pedrono and Violon(2018)**
Profit	**Pedrono and Violon(2018)**	
Collateral		**Pedrono and Violon(2018)**
Risk	**Pedrono and Violon(2018)**	

Conclusion

⇒ Capital structure relevancy

- ▷ **Observed** time-invariant specific factors
  - → Bank business model
  - → Bank nationality
- ▷ **Observed** time-variant determinants :
  - → Size, profit, collateral, risk and internationalization

⇒ Internationalization : key to identify CS determinants

- → For both cross-section and individual heterogeneity
- → Challenging main determinants

⇒ Next steps :

- ▷ Interpretation
- ▷ Quantify results
- ▷ Robustness checks
  - → IV with lags
  - → Alternative measures of investment banks

Definition of Variables

Leverage	$\frac{Assets}{Equity}$
Size	*Asset*
Profit.	$\frac{Net\ income}{Asset} * 100$
Collateral	$\frac{Collateral}{Asset}$
Risk	$\frac{RWA}{Total\ Asset}$
Inter A.	$\frac{Assets\ denominated\ in\ USD}{TotalAssets}$
Inter L.	$\frac{Liabilities\ denominated\ in\ USD}{TotalAssets}$
Off BS	$\frac{Credit\ substitutes\ in\ off-balance\ sheet}{Total\ Assets}$
Deriv	$\frac{Derivatives\ linked\ to\ an\ underlying\ FX\ risk}{Total\ Assets}$

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Descriptive statistics

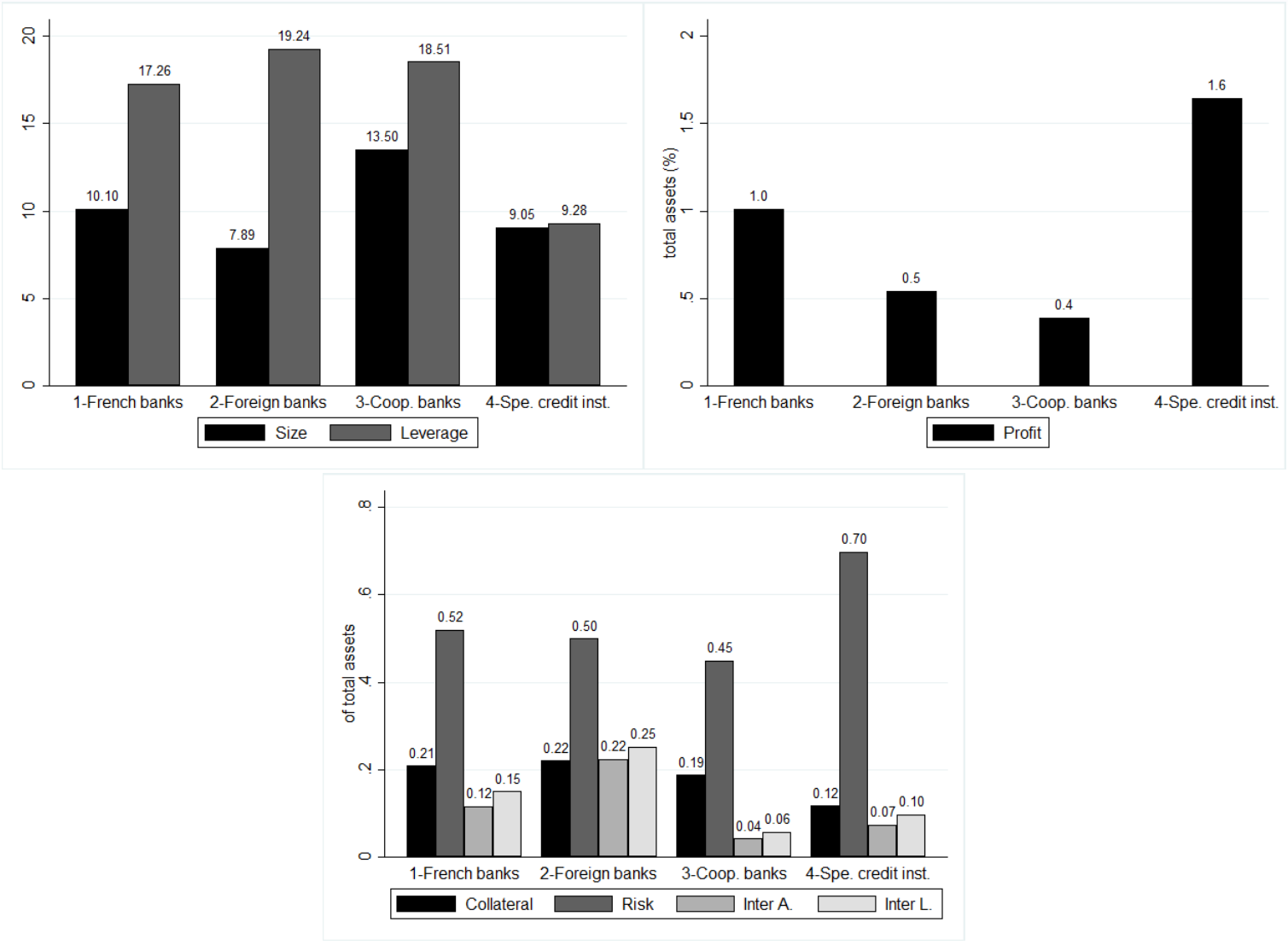

Figure: Credit institutions characteristics : data cover credit institutions located in France from 1999 to 2015. Source : ACPR, own calculations.

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Descriptive statistics

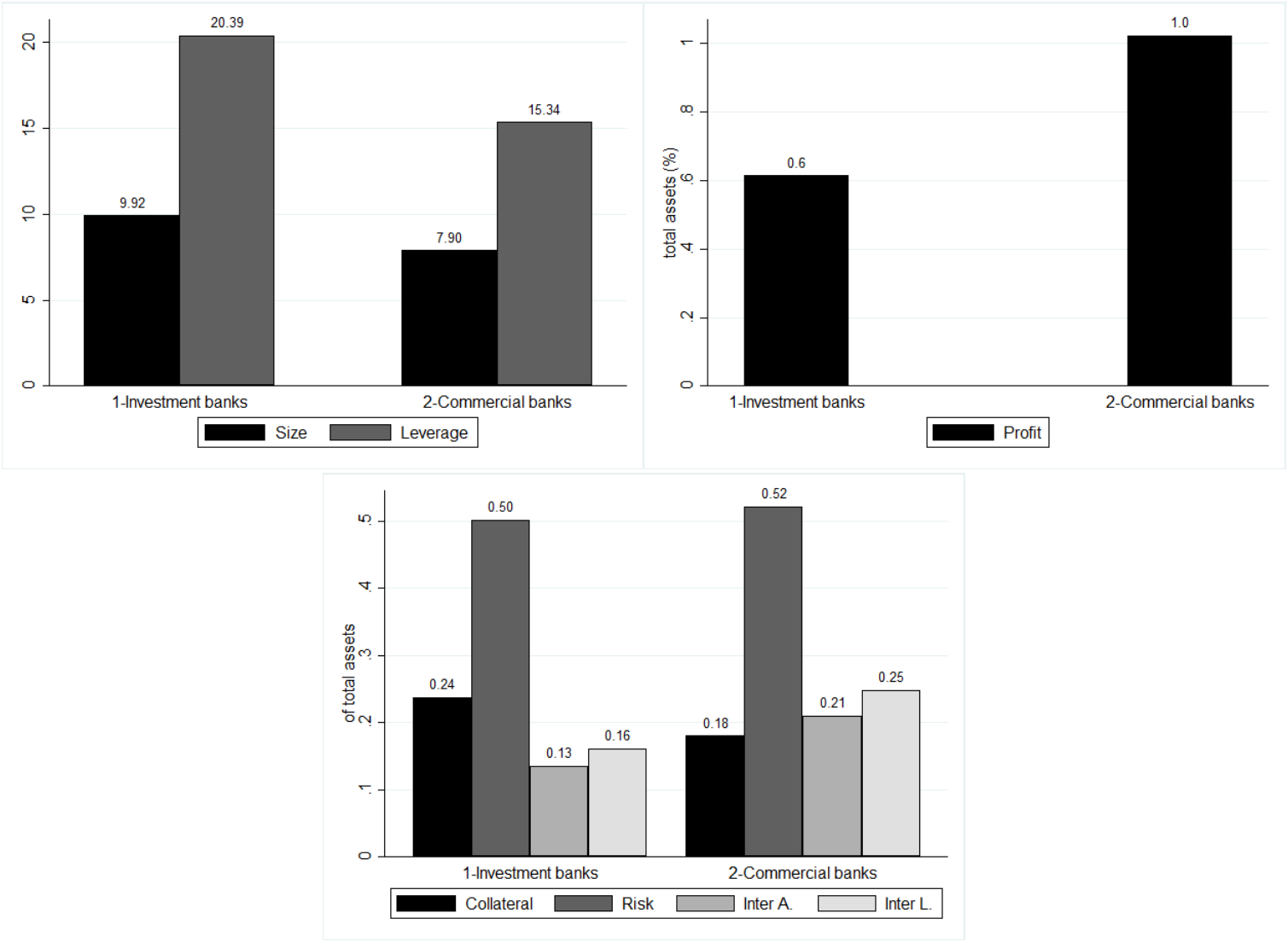

Figure: Credit institutions characteristics : data cover credit institutions located in France from 1999 to 2015. Source : ACPR, own calculations.

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Desc stat

Table: Summary statistics.

Variable	Mean	Std. Dev.	Min.	Max.	N
Lev	15.63	11.48	1.64	47.5	537
ln(*Size*)	8.59	2.78	4.7	14.21	537
Profit	0.9	1.35	-0.85	6.60	537
Coll	0.19	0.19	0	0.66	537
Risk	0.54	0.26	0.16	1.23	537
$Inter.\ Asset_{All}$	0.22	0.23	0	0.78	537
Inter. Asset	0.17	0.2	0	0.70	537
$Inter.\ Liab_{All}$	0.27	0.26	0	0.97	537
Inter. Liab	0.2	0.22	0	0.88	537
Resid Asset $(n - FR)$	0.43	0.28	0	0.94	537
Resid Liab. $(n - FR)$	0.45	0.33	0	0.99	537

All credit institutions located in France (1999-2015). Source : ACPR, own calculations.

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Desc stat

Table: Distribution of Asset Internationalization (*Inter. Asset*)

	Q1	Q2	Q3	Q4
N	135	134	134	135
Inter. Asset	0.003	0.045	0.157	0.478
Inter. Liab	0.011	0.072	0.211	0.511
Resid $(n - FR)$	0.226	0.265	0.485	0.732
Lev	13.436	18.492	17.183	13.630
ln(*Size*)	8.664	9.740	9.280	6.699
Profit	1.121	0.906	0.993	0.590
Coll	0.155	0.255	0.264	0.101
Risk	0.647	0.486	0.519	0.517
Off BS	0.362	0.201	0.233	0.259
Deriv	0.227	0.0957	0.18979	0.138

These summary statistics are for the complete sample over the period 1999-2015. This table presents variable averages for each quartile of currency diversification

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Desc stat

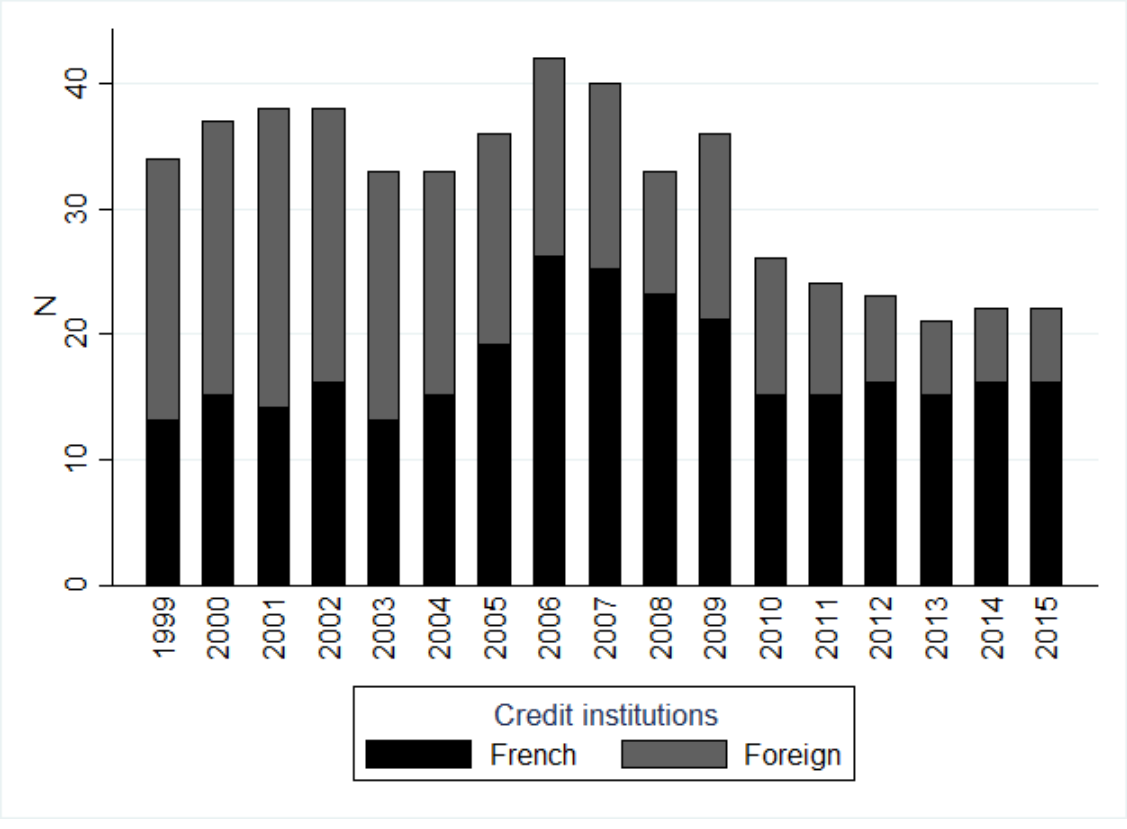

Figure: Credit institutions characteristics : data cover credit institutions located in France from 1999 to 2015. Source : ACPR, own calculations.

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Additional results :

- Utility of collateral :
  - Depend on international funding :
    Foreign currency + foreign counterparty

Results

- Valuation effect and systematic risk :
  - Systematic risk : not increased by FX rate exposure

Results

- Risk and liability internationalization
  - Diversification in liquidity risk

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Table: Currency dimension of collateral

$$Lev_{i,t} = \alpha + \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Coll_{i,t-1} + \beta_4\ ln(Risk_{i,t-1}) + \beta_5 Inter._{i,t-1} * Coll_{i,t-1} + \beta_6 Inter._{i,t-1} + \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t}$$

	Investment banks								
$Coll_{t-1}$	19.69**	19.13***	9.94	20.32***	18.25**	12.56**	21.44**	15.21*	7.85
	(7.15)	(6.32)	(6.41)	(5.42)	(6.59)	(5.96)	(8.00)	(8.25)	(7.35)
$Coll_{t-1}$ $Inter.\ Liab.\ (EA)_{t-1}$	-29.49	-32.82	-48.57						
	(36.03)	(39.07)	(31.50)						
$Coll_{t-1}$ $Inter.\ Liab.\ (n-EA)_{t-1}$				-72.03**	-42.78*	-63.72**			
				(27.42)	(23.00)	(23.83)			
$Coll_{t-1}$ $Resid\ Liab.\ (n-FR)_{t-1}$							-11.06	-0.84	-1.73
							(14.21)	(11.95)	(9.48)
$Inter.\ Liab.\ (EA)_{t-1}$	-2.26	6.64	-5.02						
	(7.81)	(9.65)	(6.84)						
$Inter.\ Liab.\ (n-EA)_{t-1}$				-4.38	-5.31	4.25			
				(6.65)	(6.71)	(6.88)			
$Resid\ Liab.\ (n-FR)_{t-1}$							1.59	2.85	7.62
							(2.68)	(3.63)	(5.06)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Foreign FE	Yes	No	No	Yes	No	No	Yes	No	No
Nationality FE	No	Yes	No	No	Yes	No	No	Yes	No
Bank FE	No	No	Yes	No	No	Yes	No	No	Yes
Adjusted R^2	0.73	0.78	0.36	0.78	0.8	0.36	0.73	0.77	0.33
N	177	177	177	177	177	177	178	178	178

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

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Table: Valuation effect and risk

$$Lev_{i,t} = \alpha + \beta_1\ ln(Size_{i,t-1}) + \beta_2\ Profit_{i,t-1} + \beta_3\ Coll_{i,t-1} + \beta_4\ ln(Risk_{i,t-1}) + \beta_5 Inter._{i,t-1} * ln(Risk_{i,t-1}) + \beta_6 Inter._{i,t-1} + \delta\ Controls_{i,t-1} + \gamma FE_t + h_i + u_{i,t}$$

	Banks								
$ln(Risk_{t-1})$	-8.22***	-10.02***	-4.94*	-5.87***	-7.55***	-4.08	-3.38	-4.08	-2.41
	(1.73)	(1.94)	(2.55)	(1.58)	(1.86)	(2.78)	(2.36)	(2.46)	(2.74)
$ln(Risk_{t-1})$ $Inter.Asset.(EA)_{t-1}$		25.46**			28.13***			16.26*	
		(11.03)			(10.59)			(8.85)	
$ln(Risk_{t-1})$ $Resid\ Asset\ (n-FR)_{t-1}$			-7.73			-4.31			-2.49
			(6.02)			(6.75)			(4.12)
$Inter.Asset.(EA)_{t-1}$		10.13			16.8			7.27	
		(10.24)			(10.81)			(8.90)	
$Resid\ Asset\ (n-FR)_{t-1}$			-7.59*			-3.98			2.41
			(4.14)			(3.82)			(3.65)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Foreign FE	Yes	Yes	Yes	No	No	No	No	No	No
Nationality FE	No	No	No	Yes	Yes	Yes	No	No	No
Bank FE	No	No	No	No	No	No	Yes	Yes	Yes
Adjusted R^2	0.62	0.63	0.63	0.7	0.71	0.7	0.26	0.28	0.27
N	373	373	373	373	373	373	373	373	373

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

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