The collateral channel: Heterogeneity within and between countries

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Motivation : The collateral channel

- With imperfect financial markets, firms's access to external finance is conditioned by the value of their collateral assets.
  - Barro (1976), Stiglitz and Weiss (1981), Hart and Moore (1994) point out that collateral pledging enhances a firm's financial capacity
- The collateral channel = the sensitivity of investment to a change in the collateral value is positive
- Leading to a "financial accelerator" effect, amplifying the impact of macroeconomic/financial shocks.
  - Bernanke and Gertler (1989), Kiyotaki and Moore (1997) : business downturns will deteriorate assets values, thus reducing debt capacity and depressing investment, which will amplify the downturn.

$\Rightarrow$ Financial frictions amplify and propagate shocks to the macroeconomy through the collateral channel

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Motivation : An heterogenous collateral channel ?

- Within country : This effect is expected to be heterogenous across firms, conditional on their size/productivity
  - More performing firms should be less financially constrained, hence react less to a shock on their collateral
  - In a granular world (Gabaix, 2011 ; Carvalho and Grassi, 2019), this has importance for the size of the financial accelerator at the aggregate level
- Across countries : Importance for the magnitude of the aggregate collateral channel across countries
  - Cross-country differences in firm performance distribution $\Leftrightarrow$ different values for the aggregate sensitivity of investment to the collateral value

$\Rightarrow$ **Our paper** : A quantification of the collateral channel both within and across (EU) countries

- Firm-level data as a straightforward way to obtain aggregate collateral channel across countries from the bottom up

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Our research question(s)

1. What is the size of the collateral channel in European countries ?
2. How far is it heterogeneous ?
   (a) Across firms within a country ?
   (b) And across European countries ?

Why should we care ? Or, our results' implications

(a) Heterogenous effects of a financial shock across firms within a country ($\approx$ the "cleansing effect of recessions")

(b) Heterogenous effects of a common financial shock in the EU – and their possible consequences for the ECB's monetary policy design

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A two-step implementation

1. Estimate the (heterogeneous) sensitivities of investment to collateral shock
   - Exploiting French firm-level data + local real estate (RE) prices
   - Collateral assets measured by the firm's real estate assets, as in Chaney, Sraer & Thesmar (2012, CST hereafter) and others
2. Provide meaningful comparisons of the size of the collateral channel for several (European) countries
   - No available firm-level data at detailed/large scale covering many European countries
   - **How to overcome this limitation ?** Combining info from CompNet database (firms performance distribution) with our French firm-level dataset
   - **From micro to macro** : Recast the aggregate value of the collateral channel at the country level from the bottom up

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Main results

Within country :

- Evidence of financial frictions, with an investment sensitivity to the collateral value = 0.2 for the average firm in France
- **Strong micro heterogeneity in size/performance**
  - Marginal effect = 0.34 below 10 employees but only = 0.1 above 50 employees
  - Same story with labor productivity, real value added or turnover distributions : a 1 to 3 range between first and last decile.
  - Similar results for other UE countries

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Between countries :

- **Substantial cross-country heterogeneity in estimated reactions to collateral shocks**
  - Between 0.16 in Switzerland and 0.25 in Czech Republic
  - EA members : from 0.18 in Finland to 0.25 in Belgium

  $\Rightarrow$ A strictly identical shock hitting RE prices (e.g., a monetary policy decision by the ECB) $\leftrightarrow$ reaction of investment 1.3-1.4 times more important in Belgium or Italy than in Finland or France.

- **A key source of this heterogeneity : importance of small firms in some countries of our sample**

Important policy implications

- Aggregate effects of collateral shocks differ across EU countries (a concern for the ECB)...
- ... Marked heterogeneous effects across firms within each EU country (a concern for national authorities)

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Related literature

- **Financial constraints on firm behavior**
  - The collateral value influences firm creation, the firm' employment growth once entered or log credit growth
    - Schmalz and al. (2017), Corradin and Popov (2015) (firm creation) ; Esrahin and Irani (2020), Schmalz and al. (2017) (employment growth) ; Basco et al. (2021) (credit growth)
- **Financial constraints and aggregate investment**
  - CST (2012), on listed US firms, Fougère, Lecat and Ray (FLR) (2019), on French data, Bahaj et al. (2017) on British firms
  - A sensitivity of the investment ratio to the corporate RE value around = 0.06-0.07 - **but focus on large firms**
- **Financial frictions and misallocations**
  - Heterogeneous financing frictions contribute to sectoral misallocation, productivity divergence and GDP losses
    - Gopinath et al. (2017), Basco et al. (2021) (Spanish data) ; Grjebine, Hericourt and Tripier (2019) (EU data) ; Chaney et al. (2020) (US)

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Outline

1. Quantify the collateral channel in France
   - Empirical methodology, data, results
2. The collateral channel across Europe
   - Empirical methodology, data, results
3. Conclusion

The collateral channel in France

French data

- Firm-level balance-sheets (INSEE)
  - FICUS (1994-2007), BRN (1993-2009), FARE (2009-2015), DADS (1993-2015) ▸ details
  - Exclusion of firms operating in the finance, insurance, real estate, construction, and mining industries

  $\Rightarrow$ 705,956 firms on average per year (222,490 firms/year over 1994-2007 ; 1,508,075 firms/year over 2009-2014)
- Real estate (house and flat) prices are provided by "Notaires de France", at the "strate" level (2000-2015)
  - Combined with CPI inflation to recast housing prices before 2000
  - By "strate"(department/city/district) : 283 strates for flat prices
- Combine both datasets to compute the market value of RE holdings
  - From RE valued at historical cost in firms balance sheets ▸ details
- A reduced IV sample for data availability limitation ▸ why ?

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Empirical methodology (1) : Baseline equation

Start from the relationship we are interested in :

$$(OLS) \qquad Inv_{it} = \rho RE\ Value_{it} + \varepsilon_{it}$$

- $Inv_{it} = \frac{I_{it}}{K_{it-1}}$: tangible investment (K expenditures) of firm i in year t, normalized by its lagged capital stock
- $RE\ Value_{it}$: (normalized) market value of the firm's real estate (RE) assets
  - $RE\ Value_{it} = \frac{RE\ Vol^h_{i0} \times P^h_{ct}}{K_{it-1}}$, with the numerator = the firms' initial real estate volume ($RE\ Vol^h_{i0}$), valued at the current local housing prices P^h_{ct}
- **Our coefficient of interest : ρ** Interpretation
  - 1 additional € of real estate collateral owned by the firm increases investment by ρ € (relative to the capital stock)
  - To have a causal interpretation of ρ, need to address the "usual suspects" (endogeneity &the ratio problem)

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Ensure a causal interpretation

1. **Endogeneity (1) : Omitted variable bias**

   $\Rightarrow$ Add firm fixed effect (μ_i) + cash flow (over K_{it-1}) CF_{it} + location-year fixed effect (λ_{ct})

2. **Endogeneity (2) : Reverse causality**

   (1) Ownership decision could be related with inv. opportunities More

   $\Rightarrow$ Control for initial characteristics of firms affecting RE ownership, interacted with the local housing price P_{ct} (X_{it})

   (2) Investment decisions might impact local RE prices (large firms)

   $\Rightarrow$ IV-strategy on P^h_{ct} based on supply-side determinants More

3. **The ratio problem**

   - Ratio as dependent variable : omitted variable and measurement error bias (Bartlett & Partnoy, 2020)+ fallacious correlation if denominator on both sides of the equation (Welch, 2021)

   $\Rightarrow$ Add $1/K_{it-1}$ as explicative variable (CST, 2020)

   - Provide numerous additional robustness checks (using log, hyperbolic sin, scale RE with $1/K_{i0}$...)

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Leading to our baseline equation :

$$\text{OLS}: \quad Inv_{it} = \rho RE\ Value_{it} + \overbrace{\beta CF_{it} + \mu_i + \lambda_{ct}}^{(1)} + \overbrace{\gamma X_{it}}^{(2)} + \overbrace{\delta \frac{1}{K_{it-1}}}^{(3)} + \varepsilon_{it} \qquad (1)$$

$$\text{IV}: \quad Inv_{it} = \rho \underbrace{\widehat{REValue}_{it}}_{(2)} + \gamma \underbrace{\widehat{X}_{it}}_{(2)} + \delta \underbrace{\frac{1}{K_{it-1}}}_{(3)} + \underbrace{\beta CF_{it} + \mu_i + \lambda_{ct}}_{(1)} + \varepsilon_{it}$$

- with, under IV :

$$\widehat{REValue}_{it} = \frac{REVol_{i0}}{K_{it-1}} \widehat{P}^h_{ct}$$

$$\widehat{X}_{it} = \text{Initial controls} \times \widehat{P}^h_{ct}$$

- Recalling that
  - (1) = Omitted variable bias
  - (2) = Reverse causality bias
  - (3) = The Ratio problem

The collateral channel : The average effect

Dep. Var	(1)	(2)	(3)	(4)
	$\mathcal{I}_{i,t}$			
Estimator	OLS	OLS	OLS	IV
$REValue_{i,t}$	0.22^a	0.2^a	0.2^a	0.21^a
	(0.0041)	(0.0039)	(0.0047)	(0.0048)
$CF_{i,t}$	0.03^a	0.024^a	0.023^a	0.023^a
	(0.00026)	(0.00024)	(0.00031)	(0.0003)
$\frac{1}{K_{i,t-1}}$		0.63^a	0.63^a	0.63^a
		(0.0085)	(0.0013)	(0.0013)
# Obs.	7,998,967	7,998,967	2,483,951	2,483,951
Adj. R^2	0.19	0.21	0.21	0.21

- A 1€ increase in the firm's RE value induces a .2€ increase in the investment ratio on average
- A much larger effect than CST (2012), Bahaj et al. (2017) or FLR (2019), but... their samples restrict to much larger firms

$\Rightarrow$ Does firm size matter ?

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	(0.00026)	(0.00024)	(0.00031)	(0.0003)
$\frac{1}{K_{i,t-1}}$		0.63^a	0.63^a	0.63^a
		(0.0085)	(0.0013)	(0.0013)
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The collateral channel : Alternative specifications

Dep. var :	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\mathcal{I}_{i,t}$				$log(1+I_{i,t})$	$\mathcal{I}_{i,t}$	
$DumRE_0 \times P_{I,t}$	0.07^a						
	(0.003)						
$REValue_{i,0}$		0.025^a	0.027^a				
		(0.0009)	(0.0009)				
$asinh(RE\ Value^I_{i,t})$				0.056^a			
				(0.002)			
$\log(1+RE\ Value^I_{i,t})$					0.029^a		
					(0.0078)		
$REValue_{i,t-1}$						0.089^a	
						(0.002)	
$REValue_{i,t+1}$							**-0.13^a**
							(0.0032)
$\frac{1}{K_{i,t-1}}$		0.65^a	0.78^a	0.65^a		0.81^a	1.2^a
		(0.0088)	(0.0092)	(0.0088)		(0.016)	(0.017)
$\log(K_{i,t-1})$					-0.066^a		
					(0.0047)		
$CF_{i,t}$	0.031^a	0.024^a		0.024^a		0.023^a	0.027^a
	(0.0003)	(0.0002)		(0.0002)		(0.0003)	(0.0003)
$CF_{i,0}$			0.0007^a				
			(0.0001)				
$\log(1+CashF_{i,t})$					0.12^a		
					(0.0015)		
# Obs.	7998967	7998967	7998967	7998967	6574808	6020862	6019188
Adj. R^2	0.19	0.17	0.2	0.21	0.54	0.16	0.2

Empirical methodology (2) : Exploring firm heterogeneity

- Document the heterogenous reaction of firm's investment to changes in the collateral value
- Depending on their size/performance
- Differentiate the effect of *REValue* by bins of performance Z :

$$I_{it} = \sum_j \rho^j \, REValue_{it} \times Z_{i0}^j + \delta \frac{1}{K_{it-1}} + \beta \, CF_{it} + \gamma \, X_{it} + \mu_i + \lambda_{ct} + \varepsilon_{it}$$

- Z_{i0}^j : j^{th} quantile of firm-level performance distribution (the first year of entry), based on :
  - fixed thresholds (employment)
  - deciles (Labor productivity / Value-added / Turnover)
- Differences in $\rho^j \leftrightarrow$ Heterogeneity in the collateral channel

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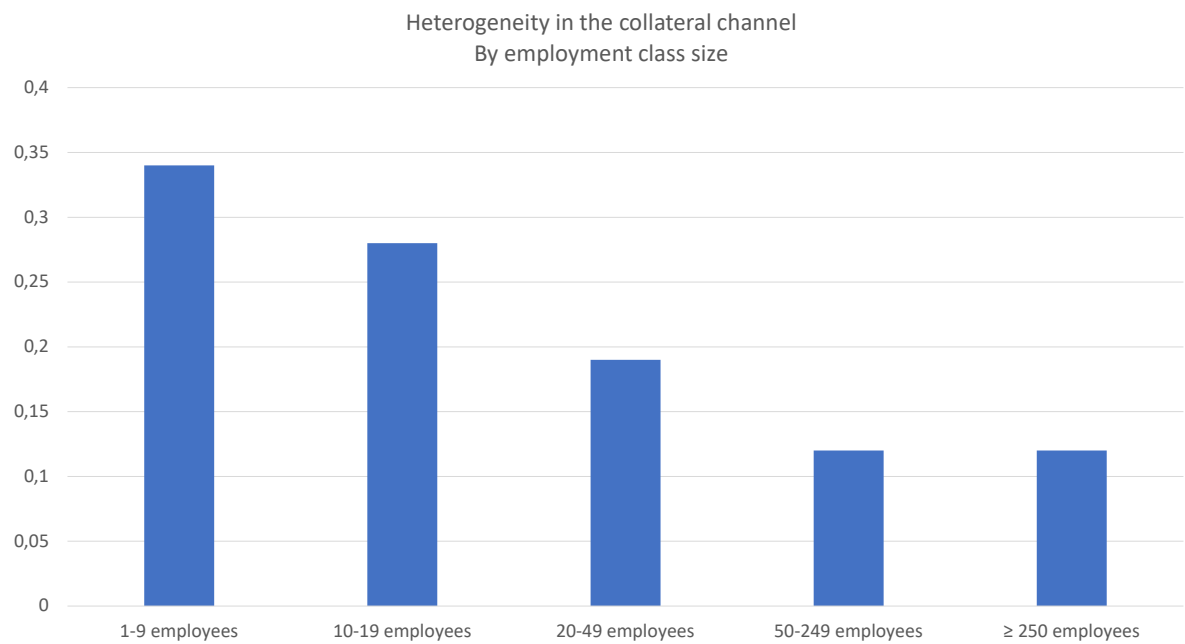
Heterogeneity of the collateral channel

Does the collateral channel depend on the firm size/performance ?

- **A collateral channel strongly decreasing with the employment size**



- A clear, decreasing pattern also pointed :
  - with labor productivity, value-added and turnover ▸ See
  - On the sub-sample of listed firms ▸ See
  - Weighting observations by asset, $1/K$, total employment ▸ See

Analysis on French data : Main take-aways

- Evidence of a strong collateral channel in France
- **Marked non-linearity** in the effects of a shock on the collateral on firm's investment,
- **Depending on its performance/size**

$\Rightarrow$ The more productive/the larger the firm, the lower the financial constraints (3 to 1 gap btw small and large firms, decreasing pattern in-between)

$\Rightarrow$ **Next step** : Use our French firm dataset as laboratory to estimate the financial accelerator across Europe

Analysis on French data : Main take-aways

- Evidence of a strong collateral channel in France
- **Marked non-linearity** in the effects of a shock on the collateral on firm's investment,
- **Depending on its performance/size**

$\Rightarrow$ The more productive/the larger the firm, the lower the financial constraints (3 to 1 gap btw small and large firms, decreasing pattern in-between)

$\Rightarrow$ **Next step** : Use our French firm dataset as laboratory to estimate the financial accelerator across Europe

The collateral channel across countries

Empirical Methodology (2) : A bottom-up approach

- An aggregate measure of the collateral channel for country k

$$\frac{\partial I_t^k}{\partial RE\ Value_t^k} = \sum_j \widehat{\rho}_j^k \omega_j^k,$$

With

- $\widehat{\rho}_j^k$: previously estimated investment sensitivities by bin of perf
- $\omega_j^k = \frac{RE\ Vol_j^k}{RE\ Vol_T^k}$: the share of capital stock (as a proxy for real estate) of all firms belonging to the j^{th} bin of *the performance indicator*

- Particularly relevant for EU countries
  - For which we do not dispose of detailed firm-level data
  - But for which we can obtain information on employment, real VA... and capital stock - conditional on various performance variables

$\Rightarrow$ Exploit information from CompNet database ▸ Method ▸ Compnet data

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- Which countries ?
- Keep countries comparable with France regarding : More
  - Predominance of bank loans over capital market financing
  - Weight of bank finance for the corporate sector
  - Comparable real estate holdings behavior

$\Rightarrow$ 9 EU countries (+ France) : BEL, DNK, ESP, FIN, GER (>20 empl.), ITA, NLD, PRT, SWE

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Shares of capital stock by employment category

Employment size class	1-9	10-19	20-49	50-249	$\geq$250
Belgium	0.53	0.08	0.08	0.12	0.19
Czech Republic	0.59	0.03	0.04	0.10	0.24
Denmark	0.28	0.06	0.10	0.22	0.33
Finland	0.21	0.04	0.07	0.14	0.54
France	0.25	0.04	0.06	0.13	0.51
Italy	0.50	0.08	0.08	0.12	0.21
Netherlands	0.48	0.05	0.07	0.12	0.28
Portugal	0.33	0.06	0.10	0.20	0.31
Spain	0.44	0.06	0.07	0.13	0.29
Sweden	0.30	0.04	0.06	0.13	0.47
Switzerland	0.10	0.07	0.11	0.18	0.55
United Kingdom	0.16	0.06	0.07	0.17	0.53

Notes : Authors' computations, based on CompNet 9^{th} version database.

- Finland, France, Sweden, Switzerland or UK : biggest firms represent $>$ 50% of the total K stock...
- ... Belgium, Czech Republic, Italy, Netherlands and Spain : small firms tend to account for a much bigger share of K stock

Next step : Implications for the collateral channel at the aggregate level ?

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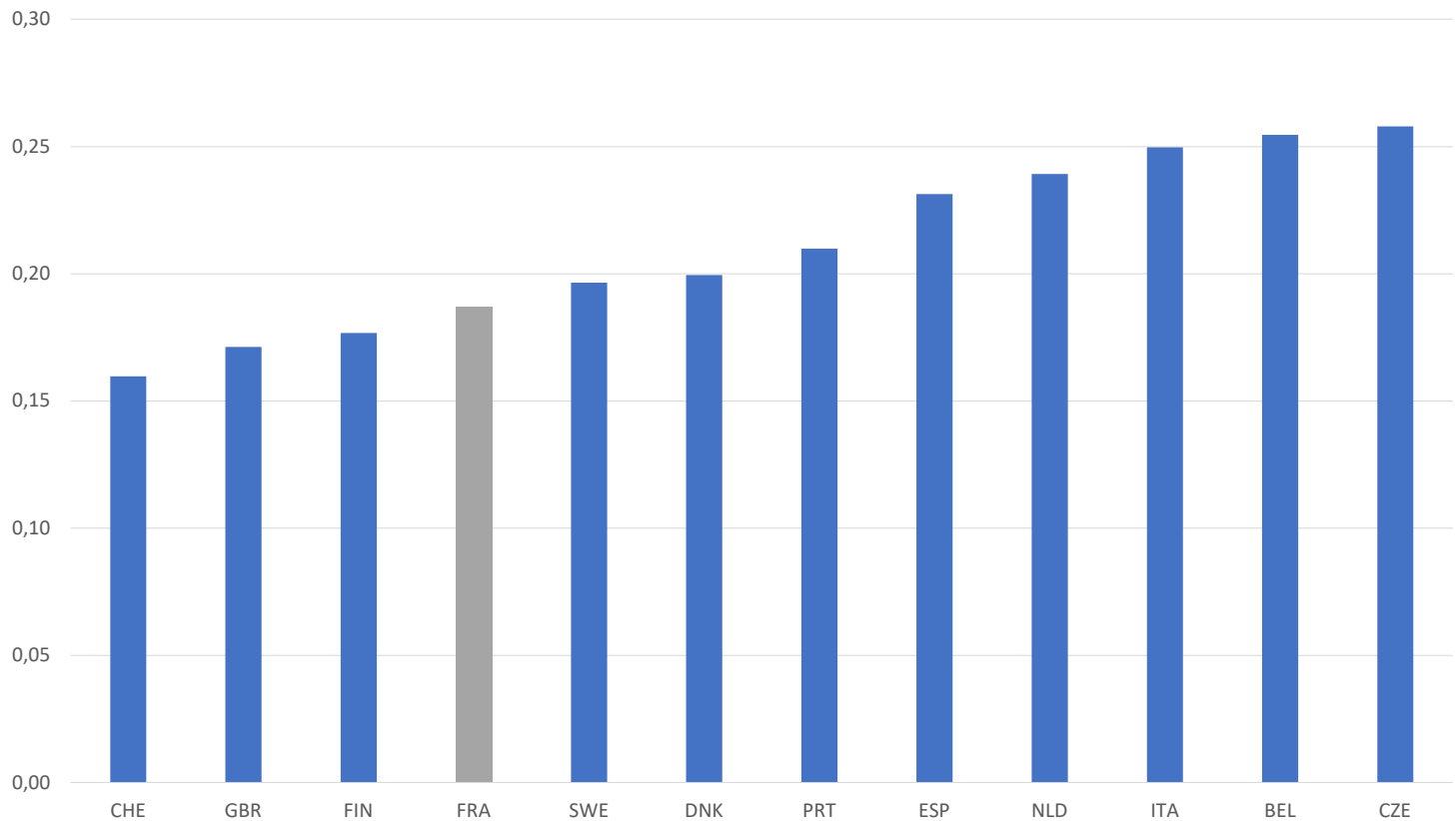
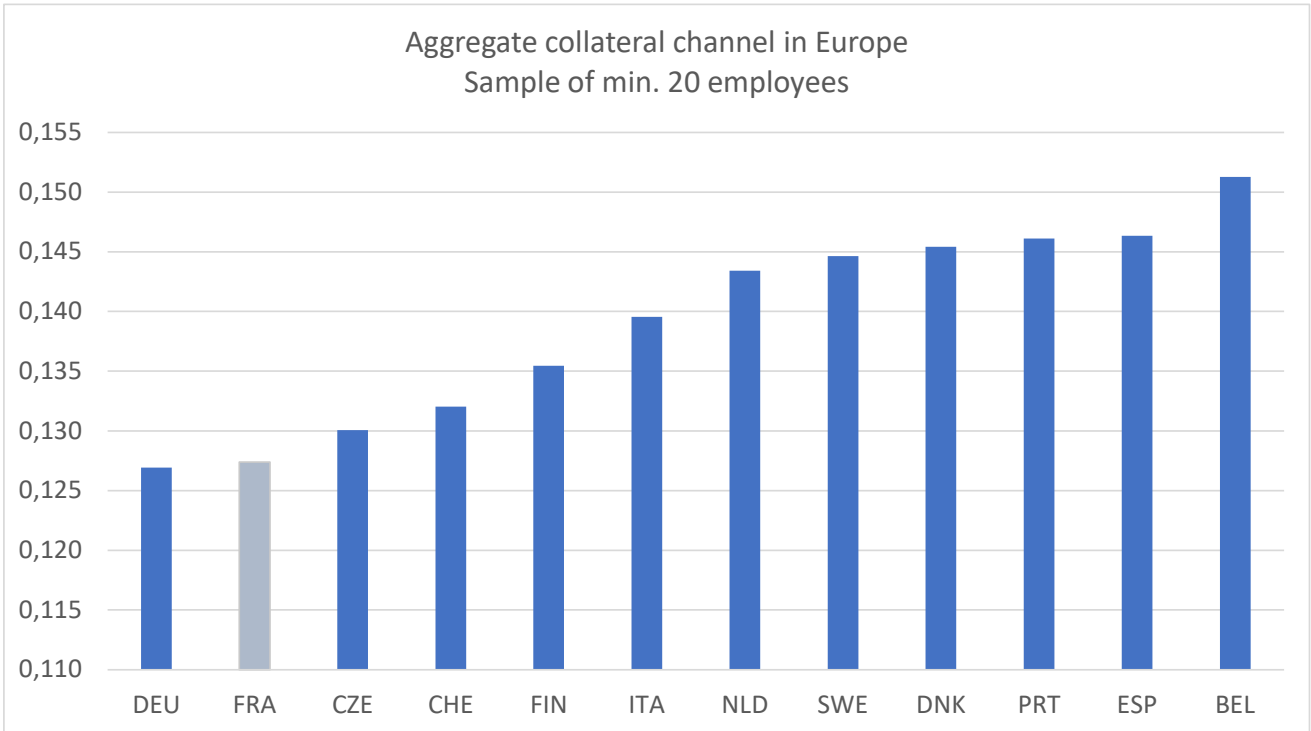
Next step : Implications for the collateral channel at the aggregate level ?

Estimates of country-level collateral channels



⇒ **A collateral channel significantly different across countries**

Estimates of country-level collateral channels ($\geq$ 20 empl.)



$\Rightarrow$ **Importance of small firms in determining the size of the aggregate collateral channel**

Estimates of country-level collateral channels

- Qualitatively similar stories (▸ Comparisons) when performance is proxied by :
  - ▸ Real value Added
  - ▸ Labor productivity

Conclusion

Two main contributions

- Within-country : The heterogenous size of the collateral channel depending on the firm's performance/size
  - Marked heterogenous effects across firms within country
- Between-country : Quantify the size of the aggregate collateral across Europe
  - Significant differences across European countries concerning aggregate reactions to collateral shock

Implications

- Heterogeneous effects of a common financial shock in the EU (e.g, "cleansing effect of recessions")
- Consequences for the ECB's monetary policy design

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Thank you !

Appendix

Databases

- Firm-level balance-sheets (INSEE) : *Fichier complet unifié de Suse* (FICUS, 1994-2007), *Bénéfices Réels Normaux* (BRN, 1993-2009), *Fichier approché des résultats d'Esane* (FARE, 2009-2015), *Déclaration Annuelle de Données Sociales* (DADS, 1993-2015)
- We combine these various datasets to maximize coverage and data availability
  - Investment (dependent variable) : reported in FICUS and FARE, but not in BRN - unavailable in 2008
  - Location (city) of firms : reported only in DADS
  - Some variables simultaneously reported in FICUS and BRN (1994-2007) and in FARE and BRN (2009)
    - Value-Added and firm's age : use FARE information in 2009 (more firms covered)
    - Number of employees : use DADS info if missing in BRN/FICUS/FARE
    - Other variables : keep BRN and replace with info from FICUS/FARE is missing in BRN

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More on RE value calculation : The method

Challenge : We need the market value of real estate assets of each firm in t : "land and buildings" in the balance sheets...

... but they are valued at historical cost.

Consequently, we need (as in CST, 2012) :

1. to calculate for each firm the average age of those assets (to infer when they have been bought)
2. to compute their current market value (move from $RE\ Vol_{ic0}$ to $RE\ Value_{it}$) based on historical housing price series

(1) Year of acquisition : The rationale

Age of the property	=	(a)	The proportion of the property claimed as depreciation	×	(b)	Depreciable life

- Uncover (a) and (b) from firms accounting data
- Discard firms with only land as land does not depreciate ($\simeq$ 3% of firms with RE holdings)

▸ Back

More on RE value calculation : (1) Age of RE assets

(a) RE depreciation

- BRN main source of information : detailed info on real estate assets depreciations ("*amortissement sur constructions*")
- FARE only provides tangible assets depreciations ("*amortissement et provisions sur immobilisations corporelles*"), without distinguishing between real estate and equipments...
  - 1994-2009 : RE assets depreciations provided by BRN
  - 2010-2015 (or if info missing in BRN), rebuild based on FARE as follows :

$$\text{RE depreciations} = \frac{\text{RE assets}}{\text{All tangible assets}} \times \text{Tangible assets depreciations}$$

- Then, get the share of RE asset claimed as depreciation :

$$\text{Share of depreciated RE} = \frac{\text{Accumulated depreciation of buildings}}{\text{Gross book value of buildings}}$$

▸ Back

(b) Depreciable life ("*durée d'amortissement*")

- Following Nelson, Potter, and Wilde (2000), = building cost/annual depreciation
- 36 years on average over all firms-years

To finally get the year of acquisition

- The average age of buildings for each firm : Share of depreciated capital $\times$ depreciable life
- Year of acquisition = current year - age of buildings

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More on RE value calculation (2)

From historical cost to the market value

- Need to inflate the historical cost since the year of acquisition - with strate-level, residential real estate inflation
- Need to know the location of these assets.
  - DADS : information on the location (city) of real estate assets at the SIREN level (headquarter).
  - Merge with housing prices from "Notaires" by strate-year
- Get the current market value
  - For the properties declared at historical cost the first year t_1 of entry in the database (say, $RE^{hist}_{it_1}$), with year of acquisition 0

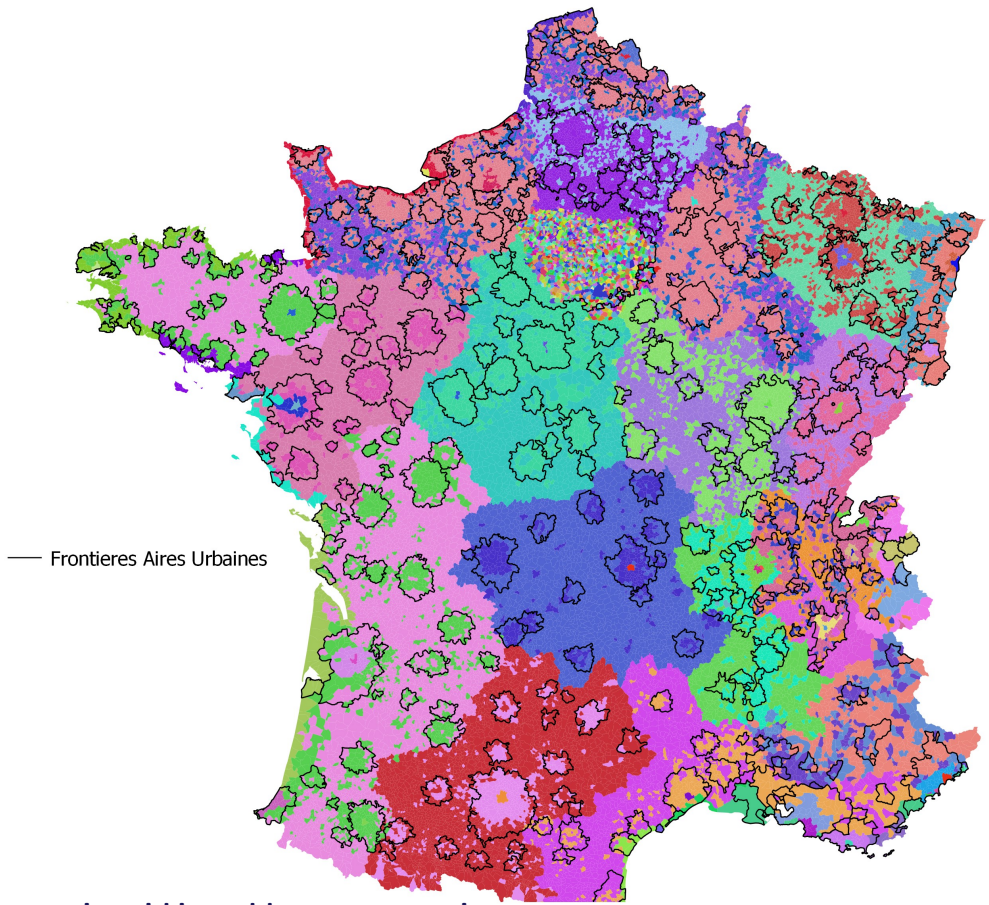
$$RE\ Value_{it} = \underbrace{\frac{RE^{hist}_{it_1}}{P^h_{c0}}}_{RE\ Vol_{ic0}} P^h_{ct}$$

Back

More on *strates* and *aires urbaines*

For the IV sample

- Data on the housing supply elasticity at the level of urban area ("*aire urbaine*")
- Not all "strates" involve "aire urbaine"



$\Rightarrow$ The IV sample is restricted to firms in "strates" sufficiently "urbanized"

- 230,074 firms per year on average (76,214 over 1994-2007 ; 483,577 over 2009-2014)

$\Rightarrow$ A potential selection bias

  - Check the consistency of estimates between the "large" (OLS) and the "reduced" (IV) sample

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Interpreting the baseline equation

- **A reduced-form equation**
  - Can be derived from a simple investment model under collateral constraint (Chaney et al. WP)
  - The estimated coefficient $\widehat{\rho}$: A composite measure of *i°)* the fraction of firms facing financing constraints, *ii°)* the severity of financing constraints, *iii°)* the fraction of the value of real estate assets that can be used as collateral.

  $\Rightarrow$ The higher $\widehat{\rho}$, the stronger the collateral channel – and the more stringent the financial constraints

- $\widehat{\rho}$ measures how a firm's investment responds to each additional €1 of real estate *owned by the firm* (not to real estate shocks overall independently of owning real estate)

▸ Back to main slide

Endogeneity concern (1)

(1) The ownership decision could be related with investment opportunities

- RE prices may be correlated with local demand shocks and land-holding firms may be more sensitive to local demand shocks (overestimate ρ)

$\Rightarrow$ Control for initial characteristics of firms affecting RE ownership, interacted with the local housing price P_{ct} (X_{it})

- Initial controls : Quintiles of firms' age, assets, ROA and sector
- Rather than P_{ct} alone that would (only) capture the overall impact of the housing business cycle on investment

Back

Endogeneity concern (2)

- Investment decisions might impact local real estate prices (especially for large firms)
  - Fight a reverse causality bias (overestimate ρ)

$\Rightarrow$ $\widehat{P}^h_{ct}$ = identified by a first-stage estimate, based on interacting

- local housing elasticity : measures the constraints on land supply (local level)
- the housing loan interest rate (macro level)

- Leading to our baseline equation with IV :

$$Inv_{it} = \rho \underbrace{\frac{RE\ Vol_{i0}}{K_{it-1}} \widehat{P}^h_{ct}}_{\widehat{REValue}_{it}} + \gamma \underbrace{\widehat{P}^h_{ct} \times \text{Initial controls}}_{\widehat{X}_{it}} + \beta CF_{it} + \mu_i + \lambda_{ct} + \varepsilon_{it}$$

  - Fight also a bias with unclear direction, related to various measurement issues (e.g., flat/house prices capture only imperfectly corportate/commercial RE price cycles)

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More on the heterogeneity of the collateral channel

(1) Exploring various performance variables

Back

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var	$\mathcal{I}_{it}$					
$\text{REValue}_{it} \times$ Deciles of :	Real labor prod		Real VA		Real turnover	
$\leq P10$	0.52^a		0.26^a		0.31^a	
	(0.013)		(0.0092)		(0.011)	
$P10 - P20$	0.31^a		0.38^a		0.32^a	
	(0.011)		(0.013)		(0.01)	
$P20 - P30$	0.25^a		0.3^a		0.29^a	
	(0.01)		(0.0077)		(0.0078)	
$P30 - P40$	0.21^a		0.24^a		0.23^a	
	(0.01)		(0.0072)		(0.0068)	
$P40 - P50$	0.21^a		0.18^a		0.21^a	
	(0.0096)		(0.0053)		(0.0065)	
$P50 - P60$	0.17^a		0.14^a		0.18^a	
	(0.009)		(0.0043)		(0.005)	
$P60 - P70$	0.16^a		0.14^a		0.14^a	
	(0.0091)		(0.0044)		(0.0042)	
$P70 - P80$	0.18^a		0.12^a		0.13^a	
	(0.0094)		(0.0036)		(0.004)	
$P80 - P90$	0.16^a		0.11^a		0.11^a	
	(0.0094)		(0.0035)		(0.0036)	
$> P90$	0.19^a		0.073^a		0.077^a	
	(0.0097)		(0.0027)		(0.0024)	
REValue_{it}		0.3^a		0.2^a		0.2^a
		(0.0064)		(0.0039)		(0.0039)
CF_{it}	0.025^a	0.025^a	0.024^a	0.024^a	0.024^a	0.024^a
	(0.00029)	(0.00029)	(0.00025)	(0.00025)	(0.00024)	(0.00024)
$\frac{1}{K_{it-1}}$	0.76^a	0.76^a	0.63^a	0.63^a	0.63^a	0.63^a
	(0.014)	(0.014)	(0.0086)	(0.0087)	(0.0084)	(0.0085)
# Obs.	4,121,206	4,121,206	7,579,499	7,579,499	7,998,938	7,998,938
Adj. R^2	0.19	0.19	0.21	0.21	0.21	0.21

(2) Sample of firms with 20 employees or more

Back

Bin of :		Real VA	Real Iprod	Employment
$\leq P10$		$.21^a$	$.33^a$	$.23^a$
$P10 - P20$		$.19^a$	$.23^a$	$.26^a$
$P20 - P30$		$.16^a$	$.16^a$	$.2^a$
$P30 - P40$		$.15^a$	$.12^a$	$.21^a$
$P40 - P50$		$.13^a$	$.12^a$	$.18^a$
$P50 - P60$		$.13^a$	$.088^a$	$.2^a$
$P60 - P70$		$.15^a$	$.13^a$	$.15^a$
$P70 - P80$		$.15^a$	$.11^a$	$.13^a$
$P80 - P90$		$.093^a$	$.082^a$	$.12^a$
$> P90$		$.057^a$	$.087^a$	$.12^a$
$REVal_t/K_{t-1}$	$.12^a$			
CF_t	$.027^a$	$.029^a$	$.029^a$	$.029^a$
$1/K_{t-1}$	1.1^a	1.2^a	1.2^a	1.2^a
Obs.	848,166	319,709	353,109	353,109
Adj. R^2	.25	.26	.26	.26

Standard errors in parentheses, clustered at the strate-year level.

$^c : p < 0.1$, $^b : p < 0.05$, $^a : p < 0.01$

Firm and strate-year FE always included.

Initial controls (ROA, age, asset, sector) $\times P_t$ always included.

(3) Focus on listed firms

Back

Dep. Var	(1)	(2)	(3) $\mathcal{I}_{i,t}$	(4)	(5)
$REValue_{i,t}$	0.093^a	0.067^a	0.12^a	0.18^a	0.17^a
	(0.03)	(0.022)	(0.043)	(0.053)	(0.053)
$CF_{i,t}$	0.007^b	0.004^c	0.003	0.004	0.002
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
$\frac{1}{K_{i,t-1}}$		75^a	89^a		73^b
		(16)	(30)		(29)
$P_{l,t}$		-0.001			
		(0.001)			
Initial controls (ROA, age, asset)$\times P_{l,t}$	No	No	Yes	Yes	Yes
Initial controls (sector)$\times P_{l,t}$	No	No	No	Yes	Yes
Location-year FE	Yes	No	Yes	Yes	Yes
Year FE	No	Yes	No	No	No
# Obs.	2,227	2,962	1,981	1,981	1,981
Adj. R^2	0.3	0.29	0.32	0.33	0.34

(4) Weighting observations by : Asset, Employment, $1/K$

Back

Weight by :		Asset	Employment	$1/K$
$REVal_i t/K_{it-1}$	0.2^a	0.12^a	0.15^a	0.3^a
$1/K_{it-1}$	0.63^a	1.2^a	1.4^a	
$CF_i t$	0.024^a	0.021^a	0.025^a	0.017^a
Obs.	7998967	7967121	5956409	7998967
Adj. R^2	0.21	0.18	0.22	0.43

Standard errors in parentheses, clustered at the strate-year level.

Firm and strate-year FE always included.

Initial controls (ROA, asset, age, sector) $\times P_t$ always included.

$^c : p < 0.1$, $^b : p < 0.05$, $^a : p < 0.01$

More on the Bottom-up approach

(1) Quantify the heterogenous size of the collateral channel in the EU countries

Along the labor productivity/VA/employment distribution

(a) Requires the thresholds values by bin j of the perf. variable Z_j^k for each EU country k

- Obtained from CompNet data

(b) Estimate the semi-elasticity $\widehat{\rho}_j^k$ for each bin j/country k

- Using the thresholds values (from CompNet, for each country k) applied to our French firm dataset

(2) Obtain the aggregate financial accelerator in EU countries

(a) Using the share of total capital by bin of performance (ω_j^k) as weighting scheme (from Compnet)

(b) To finally obtain ρ_k as $\sum_j \omega_j^k \widehat{\rho}_j^k$

Back

Compnet data

- Logic of the Compnet database
  - Indicators computed with firm-level data by national data providers, aggregated and harmonized to allow cross-country comparability.
  - Only moments of those data are provided : percentiles, mean, std...
- From the Compnet joint distribution dataset, extract
  - The thresholds values associated with each bin j of the performance variable considered $\{Z_j^k\}$, for each country k
  - The capital stock (as proxy for real estate) by bin of performance, hence their share in the total : $\{\omega_j^k\}$
- Country selection
  - Real labor prod. distribution, use the CompNet 9th vintage

  $\Rightarrow$ 7 countries (+ France) : BEL, DNK, ESP, ITA, NLD, PRT, SWE
  - Real value added and employment, use the Compnet 9th vintage

  $\Rightarrow$ 10 countries (+ France) : BEL, DNK, ESP, ITA, NLD, PRT, SWE, CZE, FIN, CHE
  - Germany only for the +20 employees sample

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More on Compnet data : Country selection

Back

1. Predominance of bank loans over market financing in the EU :
   - Allen and Gale (2001), Allen et al. (2004), ESBG (2016)
2. For the corporate sector in particular (end 1990s)
   - Reliance on non-marketable financing instruments shared by many EA countries (ECB, 2020)
   - Ratio of bank loans to corporate sector (in % GDP) : France 37.2% $<$ EU average (45.2%) or Germany, Italy and Spain (Ehrmann et al., 2001)
3. Comparable real estate holdings/behavior
   - Banerjee & Blickle (EER 2021) : 2004-2012, stronger relationship between regional house price growth and small firm activity in Sweden, Spain, Portugal, and Italy, compared to France and UK.
   - ECB (2015) : need for collateral reported by 80% of small firms in Spain, 60% in Italy, 44% in France.
   - In France, Spain and Italy, 62% of firms $<$ 50 employees need collateral to acquire financing. Half report using personal assets, including their own house, as collateral (versus only 5% of larger firms).
   - In 2019 : Home ownership rate in France $=$ or $<$ all countries investigated

$\Rightarrow$ Elasticities using French data probably a lower bound for the other countries

Table – Share of capital by decile of real labor productivity

	$\leq P10$	P10-20	P20-30	P30-40	P40-50	P50-60	P60-70	P70-80	P80-90	$> P90$
Belgium	0.015	0.017	0.021	0.027	0.037	0.049	0.068	0.099	0.183	0.485
Czech Republic	0.026	0.019	0.022	0.026	0.030	0.036	0.052	0.083	0.136	0.571
Denmark	0.025	0.030	0.034	0.037	0.046	0.056	0.070	0.090	0.120	0.492
Finland	0.023	0.029	0.035	0.049	0.062	0.078	0.098	0.113	0.149	0.363
Italy	0.032	0.036	0.042	0.051	0.062	0.075	0.093	0.122	0.174	0.313
Netherlands	0.039	0.059	0.062	0.074	0.087	0.098	0.102	0.108	0.131	0.239
Portugal	0.030	0.034	0.035	0.038	0.045	0.058	0.081	0.113	0.173	0.393
Spain	0.045	0.034	0.034	0.040	0.046	0.054	0.071	0.100	0.141	0.435
Sweden	0.017	0.024	0.029	0.039	0.042	0.050	0.063	0.092	0.176	0.469

Notes : Authors' calculation, from Compnet joint distribution dataset (9^{th} version).

Heterogeneity across firms, based on real labor productivity performances

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Country :	BEL	DNK	ITA	NLD	PRT	ESP	SWE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
REValue × Real Labor Prod. Decile							
$\leq P10$	0.45^a	0.69^a	0.6^a	0.51^a	0.71^a	0.61^a	0.58^a
	(0.011)	(0.019)	(0.016)	(0.013)	(0.022)	(0.016)	(0.015)
$P10 - P20$	0.21^a	0.42^a	0.35^a	0.24^a	0.57^a	0.36^a	0.29^a
	(0.0081)	(0.016)	(0.013)	(0.0078)	(0.021)	(0.013)	(0.0094)
$P20 - P30$	0.21^a	0.31^a	0.26^a	0.21^a	0.41^a	0.26^a	0.23^a
	(0.009)	(0.01)	(0.011)	(0.0081)	(0.02)	(0.011)	(0.0094)
$P30 - P40$	0.18^a	0.24^a	0.25^a	0.17^a	0.37^a	0.25^a	0.21^a
	(0.0095)	(0.009)	(0.012)	(0.0083)	(0.019)	(0.012)	(0.0098)
$P40 - P50$	0.16^a	0.22^a	0.21^a	0.17^a	0.33^a	0.21^a	0.21^a
	(0.01)	(0.0095)	(0.011)	(0.0094)	(0.016)	(0.011)	(0.01)
$P50 - P60$	0.18^a	0.21^a	0.21^a	0.17^a	0.26^a	0.21^a	0.18^a
	(0.011)	(0.0099)	(0.011)	(0.01)	(0.013)	(0.011)	(0.0096)
$P60 - P70$	0.16^a	0.17^a	0.21^a	0.18^a	0.25^a	0.2^a	0.16^a
	(0.011)	(0.0093)	(0.0099)	(0.013)	(0.012)	(0.0096)	(0.0097)
$P70 - P80$	0.18^a	0.16^a	0.18^a	0.18^a	0.22^a	0.17^a	0.18^a
	(0.013)	(0.0094)	(0.0086)	(0.013)	(0.0088)	(0.0086)	(0.0092)
$P80 - P90$	0.2^a	0.18^a	0.17^a	0.22^a	0.2^a	0.17^a	0.17^a
	(0.015)	(0.0087)	(0.0073)	(0.017)	(0.0067)	(0.0073)	(0.01)
$> P90$	0.24^a	0.2^a	0.2^a	0.26^a	0.18^a	0.2^a	0.22^a
	(0.017)	(0.0084)	(0.0078)	(0.024)	(0.0056)	(0.0081)	(0.011)
CF_{it}	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
$1/K_{i,t-1}$	0.88^a	0.88^a	0.88^a	0.88^a	0.88^a	0.88^a	0.88^a
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Obs.	4021988	4021988	4021988	4021988	4021988	4021988	4021988
Adj. R^2	0.19	0.19	0.19	0.19	0.19	0.19	0.19

Table – Share of capital by decile of real value added

	$\leq P10$	P10-20	P20-30	P30-40	P40-50	P50-60	P60-70	P70-80	P80-90	$> P90$
Belgium	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.07	0.12	0.62
Czech Republic	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.06	0.13	0.62
Denmark	0.02	0.02	0.02	0.03	0.04	0.04	0.06	0.07	0.12	0.58
Finland	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.06	0.80
Italy	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.11	0.58
Netherlands	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.09	0.61
Spain	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.10	0.56
Sweden	0.01	0.01	0.02	0.02	0.03	0.03	0.05	0.06	0.10	0.68
Switzerland	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.06	0.09	0.73

Notes : Authors' calculation, from Compnet joint distribution dataset (9^{th} version).

Heterogeneity across firms, based on real value-added performances

Country :	BEL	CZE	DNK	FIN	ITA	NLD	ESP	SWE	CHE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
REValue × Real Value-Added Decile									
$\leq P10$	0.53^a	0.53^a	0.49^a	0.53^a	0.6^a	0.43^a	0.59^a	0.42^a	0.4^a
	(0.013)	(0.017)	(0.011)	(0.013)	(0.016)	(0.0097)	(0.016)	(0.0095)	(0.0088)
$P10 - P20$	0.27^a	0.66^a	0.19^a	0.28^a	0.42^a	0.18^a	0.51^a	0.18^a	0.16^a
	(0.0098)	(0.02)	(0.0078)	(0.011)	(0.012)	(0.0063)	(0.015)	(0.0067)	(0.0057)
$P20 - P30$	0.17^a	0.47^a	0.18^a	0.18^a	0.28^a	0.15^a	0.29^a	0.15^a	0.16^a
	(0.0073)	(0.014)	(0.008)	(0.0085)	(0.011)	(0.0062)	(0.012)	(0.0059)	(0.0056)
$P30 - P40$	0.19^a	0.28^a	0.17^a	0.19^a	0.17^a	0.16^a	0.25^a	0.17^a	0.15^a
	(0.0076)	(0.011)	(0.0071)	(0.0091)	(0.008)	(0.0061)	(0.011)	(0.006)	(0.0058)
$P40 - P50$	0.15^a	0.22^a	0.16^a	0.17^a	0.18^a	0.15^a	0.17^a	0.14^a	0.13^a
	(0.0059)	(0.01)	(0.0066)	(0.0077)	(0.0079)	(0.0062)	(0.0085)	(0.0054)	(0.0047)
$P50 - P60$	0.16^a	0.17^a	0.17^a	0.15^a	0.16^a	0.13^a	0.18^a	0.13^a	0.12^a
	(0.0055)	(0.0079)	(0.0063)	(0.0064)	(0.0072)	(0.005)	(0.0081)	(0.0045)	(0.0045)
$P60 - P70$	0.14^a	0.18^a	0.14^a	0.17^a	0.16^a	0.13^a	0.16^a	0.12^a	0.11^a
	(0.0043)	(0.0076)	(0.0052)	(0.0058)	(0.0059)	(0.005)	(0.0072)	(0.0044)	(0.0039)
$P70 - P80$	0.12^a	0.16^a	0.13^a	0.14^a	0.15^a	0.11^a	0.16^a	0.096^a	0.089^a
	(0.0034)	(0.0058)	(0.0043)	(0.0048)	(0.0042)	(0.0045)	(0.0056)	(0.0035)	(0.0032)
$P80 - P90$	0.092^a	0.15^a	0.1^a	0.13^a	0.13^a	0.095^a	0.15^a	0.086^a	0.076^a
	(0.0027)	(0.0039)	(0.0031)	(0.0034)	(0.005)	(0.0035)	(0.0043)	(0.0029)	(0.0028)
$> P90$	0.063^a	0.095^a	0.074^a	0.079^a	0.088^a	0.073^a	0.095^a	0.062^a	0.058^a
	(0.0022)	(0.0018)	(0.0019)	(0.0018)	(0.0018)	(0.002)	(0.0018)	(0.0024)	(0.0028)
CF_{it}	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a	0.025^a
	(0.00027)	(0.00027)	(0.00027)	(0.00027)	(0.00027)	(0.00027)	(0.00027)	(0.00027)	(0.00027)
$1/K_{i,t-1}$	0.85^a	0.85^a	0.85^a	0.85^a	0.85^a	0.85^a	0.85^a	0.85^a	0.85^a
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Obs.	5859905	5859905	5859905	5859905	5859905	5859905	5859905	5859905	5859905
Adj. R^2	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21

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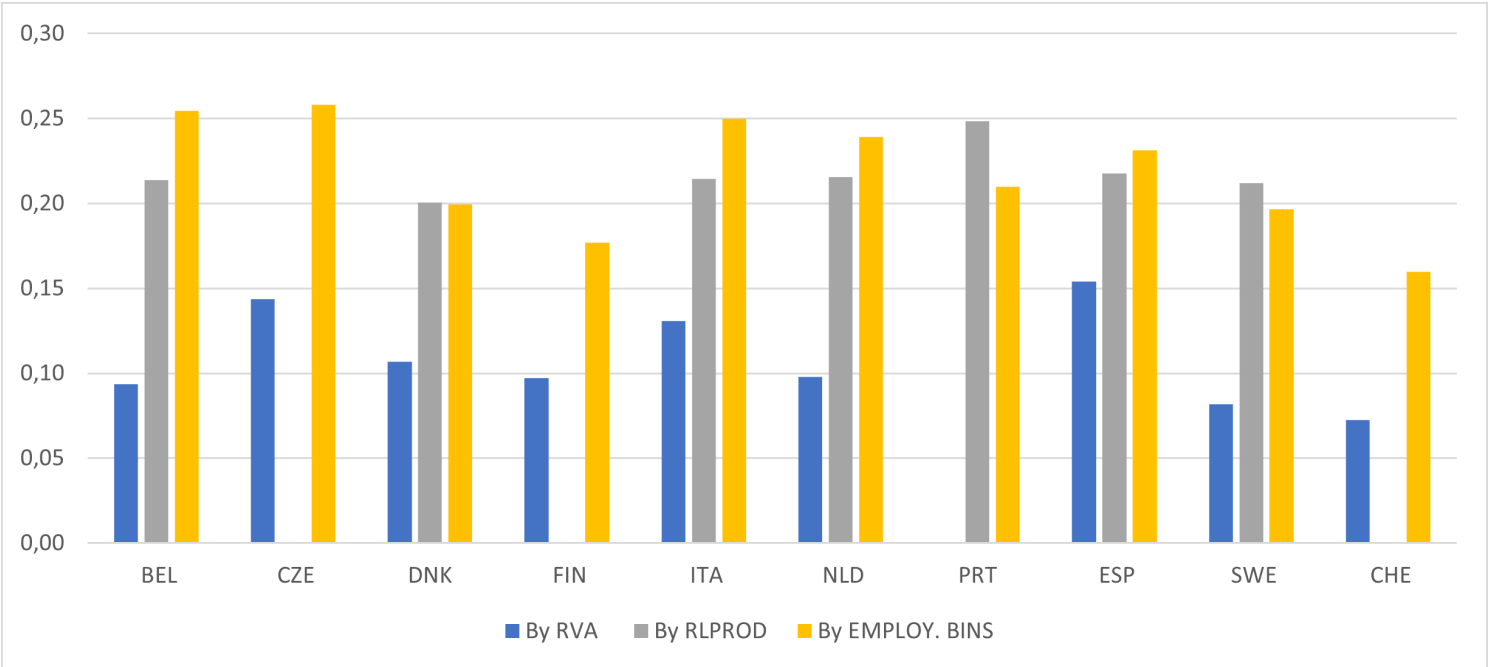
Figure – Estimates of the heterogeneous collateral channel - Various size and performance proxies



Notes : RVA = Real Value-Added ; RLPROD = Real Labor Productivity. EMPLOY. BINS = the underlying heterogeneity regressions are based on the five employment categories used for the main estimates, and presented in the main text. Missing bars indicate corresponding estimation is not available. BEL = Belgium ; CZE = Czech Republic ; DNK = Denmark ; FIN = Finland ; ITA = Italy ; NLD = Netherlands ; PRT = Portugal ; ESP = Spain ; SWE = Sweden ; CHE = Switzerland.

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Sanity check : Comparing the results based on BFF vs Compnet thresholds (real labor prod. distribution)

Thresholds	BFF (1)	Compnet (2)
$REVal_{isc,t} \times$ Labor prod. decile :		
$\leq P10$	0.58^a	0.51^a
$P10 - P20$	0.34^a	0.26^a
$P20 - P30$	0.26^a	0.21^a
$P30 - P40$	0.22^a	0.2^a
$P40 - P50$	0.22^a	0.2^a
$P50 - P60$	0.2^a	0.18^a
$P60 - P70$	0.15^a	0.16^a
$P70 - P80$	0.2^a	0.17^a
$P80 - P90$	0.16^a	0.18^a
$> P90$	0.21^a	0.22^a
$CF_{isc,t}$	0.025^a	0.025^a
	(0.0003)	(0.0003)
$\frac{1}{K_{t-1}}$	0.88^a	0.88^a
	(0.016)	(0.016)
# Obs.	4,021,988	4,021,988
Adj. R^2	0.19	0.19

Notes : All estimations include initial controls (ROA, Age, Asset, Industry) $\times$ the price of real estate $P_{c,t}$, as well as firm- and strate-year-fixed effects. Standard errors in parentheses, clustered at the strate-year level. ^{c}, ^{b}, ^{a} denote, respectively, significance at the 10%, 5%, and 1% levels.

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