EUROPEAN CENTRAL BANK

EUROSYSTEM

Asset prices, collateral and bank lending

The case of Covid-19 and Real Estate

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Housekeeping

The views expressed are those of the authors and are not necessarily those held by the European Central Bank

We examine how the banking system transmits asset price shocks to credit, via revaluation of collateral and subsequent lending decisions

- We examine banks' treatment of real estate collateral during the Covid-19 crisis and then examine how the use of real estate collateral and its revaluation affects banks' lending behaviour during this crisis

- We use credit registry data for the euro area (AnaCredit) which provides loan-level data on euro area bank lending to firms (NFCs) but also collateral-level data, including almost 5 million pieces of real estate collateral

- We make three key contributions to the literature:
  1. We examine how banks' revaluation behaviour contributes to the financial accelerator for the first time and find evidence of significant frictions in the transmission of asset price dynamics to collateral values
  2. We confirm an economically significant link between real estate price shocks and lending behaviour – confirming the significance of the collateral channel
  3. We do this having fully addressed endogeneity problems which remained unresolved in the pre-existing literature

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1. Motivation
2. Literature
3. Data
4. Collateral revaluations during Covid-19
5. Did banks avoid lending to real estate collateral reliant firms during Covid-19?
6. How did revaluations affect lending behaviour?

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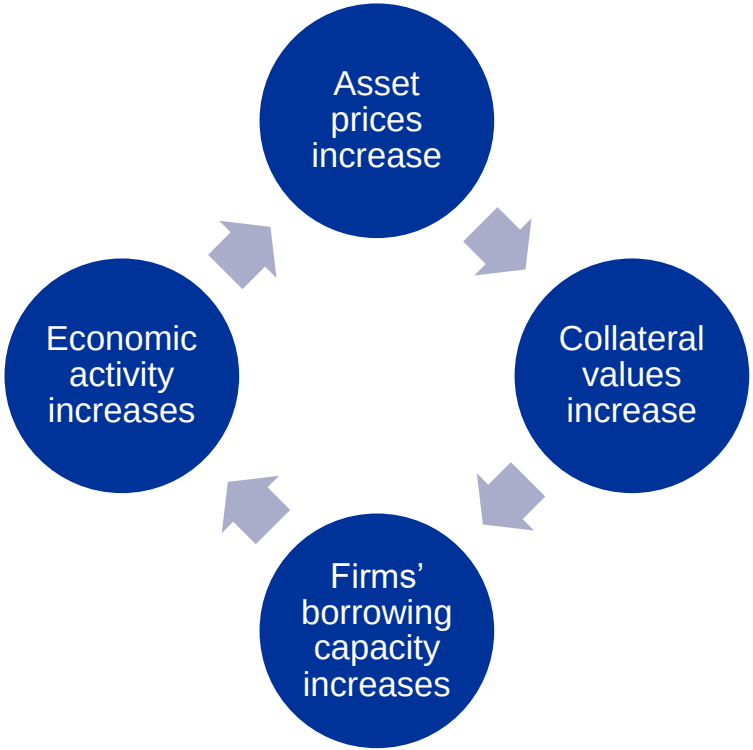
Why do we care about collateral values?

Collateral plays a central role in our understanding of how financial cycles work

e.g. Bernanke and Gertler (1989) “financial accelerator”

Also central role in transmission of monetary policy via “collateral channel”

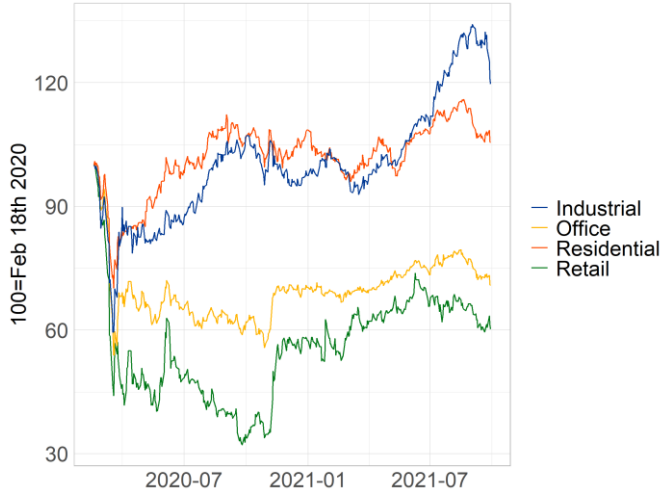


Covid-19 was a large, exogenous shock to real estate markets and real estate is widely used as collateral on NFC lending

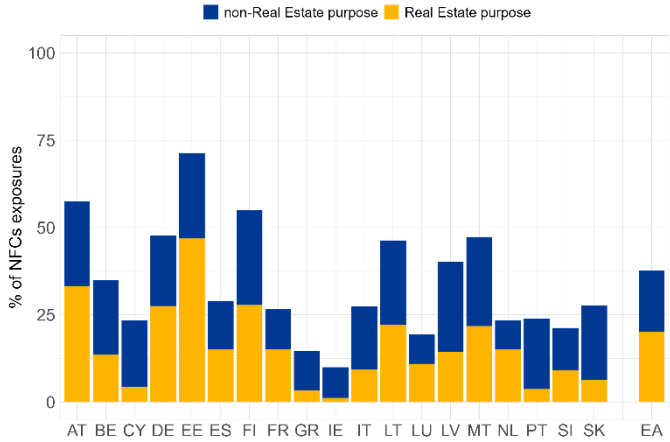
- Pandemic had negative impact on Retail and Office markets while Residential real estate price growth accelerated

- Approximately 37% of euro area NFC loans are collateralized by real estate - collateral channel suggests that shocks to real estate prices could have implications for credit to real estate markets (amplify initial shock) and wider NFC credit conditions (amplify wider financial cycle)

REIT price dynamics during Covid-19



Real Estate is widely used as collateral – including on lending for non-real-estate-purposed lending



Source: Left: Bloomberg Right: ECB calculations based on AnaCredit. Data as of end December 2021.

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Existing literature

- ***Collateral channel of financial/business cycles***
  - **Bernanke and Gertler (1989), Kiyotaki and Moore (1997)** - Fluctuations in asset prices can create fluctuations in real economic activity when these assets are used as collateral and so their rising prices loosen firms' borrowing constraints
  - **Lian and Ma (QJE; 2021), Greenwald (2019) and Drechsel (2022)** – Examine covenants in US corporate loans and argue that actually earnings based constraints are more common than collateral based constraints – **argue that traditional collateral channel plays only a minor role – our results support the economically significant role of the collateral channel (in euro area, during crisis)**

- ***Real estate and the collateral channel – empirical analysis***
  - ***Chaney at al (AER; 2012)*** – rising real estate prices in the US raises firm investment
  - ***Gan (JFE; 2007)*** - negative real estate price shock in Japan in the 1990s reduced firm investment rate

Granularity of our data allows us to address endogeneity problem present in existing literature on collateral constraints

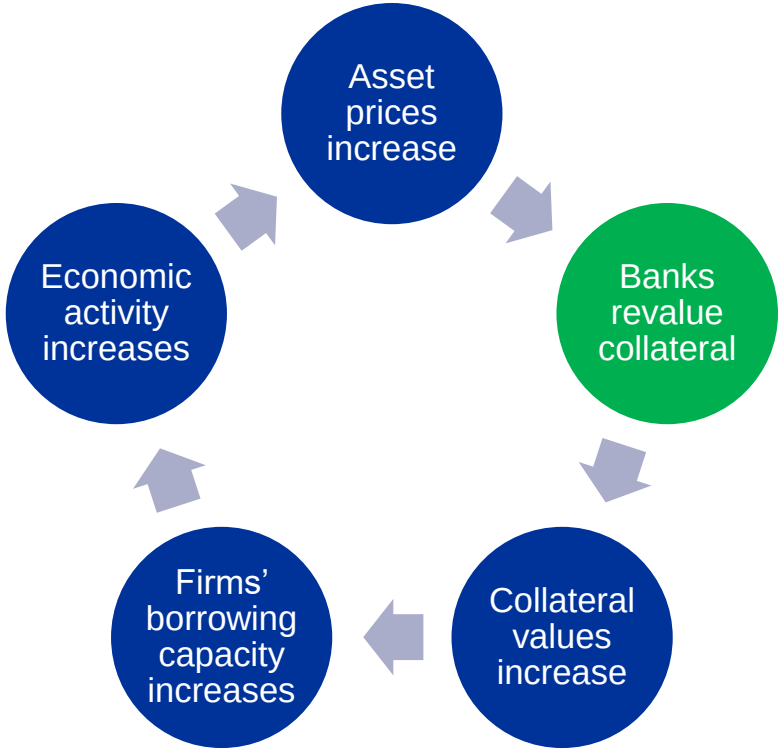
- Critical source of endogeneity that these papers cannot fully address – the decision to hold real estate and firms' investment opportunities are likely highly correlated
  - Chaney et al (2012) suggest that real estate owning firms may be more exposed to local economic shocks

"We do not have a proper set of instruments to deal with [this] source of endogeneity. We make two attempts at gauging the severity of the bias it may cause" *Chaney at al (AER: 2012)*

- We carry out most of our analysis at the bank-borrower-level. This allows us to follow method laid out in **Khwaja and Mian (2008)** which compares outcomes across a given borrowers' banking relationships
  - Implement via borrower or time-borrower fixed effects with data at bank-borrower-level
  - **This means we fully control for the role of firm characteristics in driving our results**
  - Double check using industry-location-size FE laid out in **Degryse et al (2019)**

Revaluation behaviour is a crucial but unstudied component of the financial accelerator mechanism

- Our data set allows us to track the value of individual pieces of collateral over time (during a crisis caused by a large exogenous shock)
- To our knowledge ours is the first paper to examine actual revaluation behaviour by the banking system
- By studying this behaviour and then examining its relationship with lending we provide novel insights into a crucial but previously unstudied component of the financial accelerator mechanism



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AnaCredit

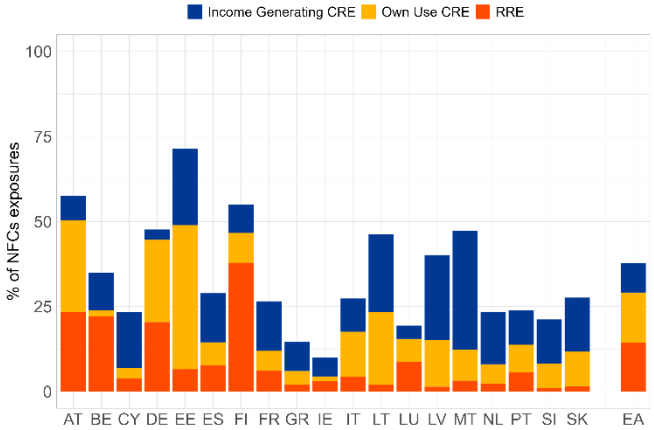
- AnaCredit is an analytical credit register containing information on all commercial bank lending in the euro area above €25,000

- Data is both loan and collateral level - provides details including valuations, revaluation dates, debtor information, and asset types.

Real Estate Collateral Item
1. Commercial Real Estate (CRE) used for *income generating purposes*
2. Commercial Real Estate (CRE) used for a *firm's own commercial activities,* i.e. offices and commercial premises
3. Residential Real Estate (RRE) owned by NFCs

- *Data coverage:* January 2019 – December 2021
  - Non-Financial Corporations loans
  - Longer term loan types (no overdrafts, credit card debt)
  - Collateral value of at least €10,000

NFC exposure by types of real estate collateral



Source: ECB calculations based on AnaCredit. Data as of end December 2021.

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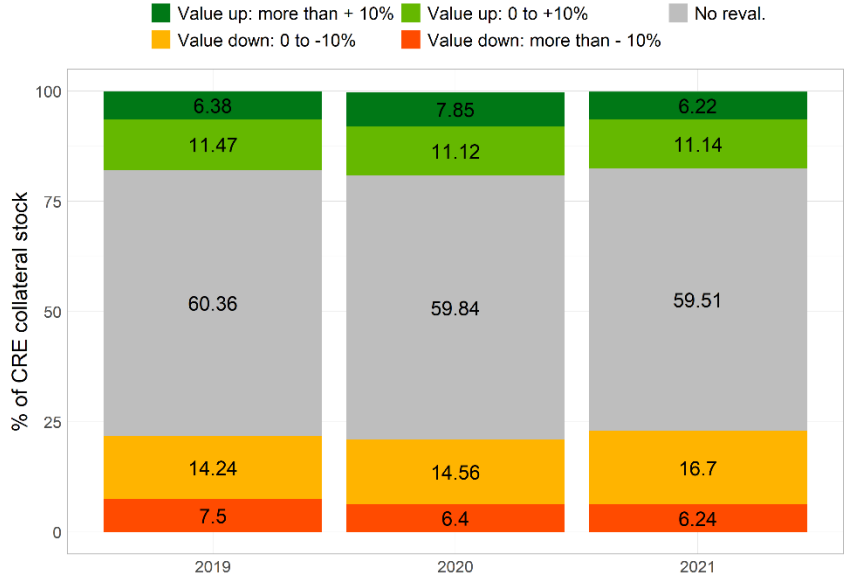
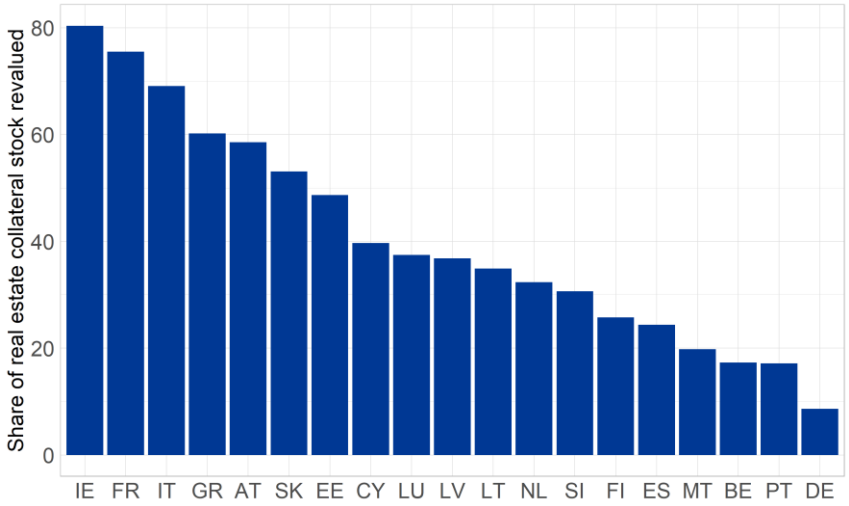
Banks' revaluations of real estate collateral are limited in many countries and Covid-19 pandemic appears to have had limited impact on banks' revaluation behaviour

Collateral revaluation patterns did not change substantially with the outbreak of the pandemic



In many countries a very low share of collateral is revalued at all (2020 data)



Source: ECB calculations based on AnaCredit.
Note: Revaluation size is based on change in value of each piece of collateral over the year. Collateral items appearing in at least 8 months are included. Own use CRE refers to collateral which is the borrower's own offices or commercial premises (typ_prtctn = 9).

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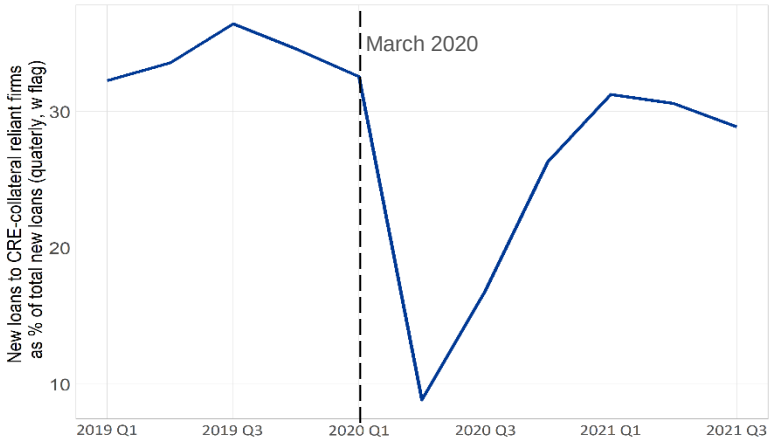
Were firms which relied on real estate collateral granted less credit following the stress in real estate markets?

$$new\ loans_{i,j} = \beta_0 + \alpha_i + \beta_1 * Pre\ Covid\ real\ est.collateral\ depend_{i,j} + \Gamma * X_{i,j} + \Phi * Z_j + \varepsilon$$

- α_i - borrower fixed-effects
- $X_{i,j}$ - bank-borrower control variables
- Z_j - bank control variables
- Standard errors clustered for banks and borrowers

Conservative specification aims to isolate effect of real estate collateral reliance on credit availability to remove endogeneity and credit demand effects

New loans to firms which relied on real estate collateral pre-2020 as % of total quarterly new loans



Note: *Approx 2 million observations. Only loans to pre-existing bank-borrower relationships are considered.*

Source: ECB calculations based on AnaCredit.

We use borrower fixed effects in the diff-in-diff model to see that banks avoided lending to firms who were reliant on real estate collateral

- β_1 - the mean difference in ratio of new lending in the first 6 months of pandemic to pre-pandemic stock of loans between the group of real estate-reliant (treated) and non-real estate-reliant (control group) companies
- Carefully control for an overlap between owning an using real estate collateral, and relying on income stream from real estate

Dependent Variable:	New loans to pre-covid stock of loans				
Model: Borrower fixed-effects, without gov-guaranteed loans	(All borrowers) (All CRE) ()	(All borrowers) (CRE subsectors) ()	(All borrowers) (All CRE) (CRE-prps control)	(No CRE-prps) (All CRE) ()	(No RE-sectors) (All CRE) ()
Variables					
CRE reliance dummy	-0.0355***		-0.0317***	-0.0486***	-0.0461***
	(0.0057)		(0.0056)	(0.0100)	(0.0073)
CRE inc. gen. reliance dummy		-0.0448***			
		(0.0074)			
RRE reliance dummy		-0.0398***			
		(0.0059)			
CRE own use reliance dummy		-0.0389***			
		(0.0056)			
Borrower LTV	-5.06×10^{-5}	-5.34×10^{-5}	-5.13×10^{-5}	-6.06×10^{-5}	-5.04×10^{-5}
	(4.62×10^{-5})	(4.62×10^{-5})	(4.63×10^{-5})	(5.1×10^{-5})	(4.8×10^{-5})
Cross-border dummy	-0.0272**	-0.0283**	-0.0284**	-0.0279	-0.0344**
	(0.0117)	(0.0117)	(0.0117)	(0.0193)	(0.0164)
Bank NPL ratio	0.0743	0.0715	0.0753	0.0556	0.0801
	(0.0726)	(0.0722)	(0.0743)	(0.0713)	(0.0766)
Bank CET1 ratio	-0.0114	-0.0138	-0.0079	0.0113	-0.0181
	(0.0398)	(0.0398)	(0.0408)	(0.0508)	(0.0559)
Moratorium dummy	-0.0385***	-0.0379***	-0.0385***	-0.0536***	-0.0442***
	(0.0100)	(0.0100)	(0.0102)	(0.0131)	(0.0118)
CRE purpose share dummy			-0.0210***		
			(0.0059)		
Fixed-effects					
dbtr_id	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	1,727,594	1,727,594	1,727,594	1,231,899	1,087,219
R^2	0.79557	0.79565	0.79564	0.81029	0.77760
Within R^2	0.00269	0.00309	0.00305	0.00369	0.00326

Two-way (crdtr_id & dbtr_id) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

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How did revaluations affect bank lending decisions?

$$new\ loan_{i,j,t} = \beta_0 + \alpha_i + \beta_1 coll.reval.occurred_{i,j,t} + \beta_2 coll.reval.nature_{i,j,t} + \beta_3 coll.reval.nature_{i,j,t} * high\ LTV_{i,j,pre-Covid} + \Gamma * X_{i,j,t} + \Phi * Z_{j,pre-Covid} + \varepsilon$$

Link revaluations at bank-borrower-level to contemporaneous new lending

- Real Estate collateralized loans only, monthly Feb 2020-Aug. 2021
- **Extensive margin:** Probits examine effect of revaluation on probability a loan is made

Very conservative specification aims to really isolate effect of revaluation on credit availability

- α_i - borrower fixed-effects – removes endogeneity and credit demand effects
- $X_{i,j,t}$ - bank-borrower control variables – new collateral posted, number of loans pre-Covid, average interest rate etc.
- Z_j - bank control variables – pre-Covid NPL and CET1 ratios
- Control for revaluation occurring at all – aims to capture procedural relationship between revaluation and lending

Revaluations and the likelihood of a new loan being made

- Borrowers receiving a negative revaluation were less likely to get a new loan (aprox – 21%)
- Effect concentrated among highly leveraged borrowers (aprox – 42%)
- Leverage plays lesser role for upward revaluations
- Size of revaluation also matters

Dependent Variable:	Loan made			
Model:	(1)	(2)	(3)	(4)
Variables				
Reval. dummy	0.2160***	0.2175***	0.1104***	0.1615***
	(0.0288)	(0.0288)	(0.0304)	(0.0217)
Neg. reval. dummy	-0.1051***	-0.0635		
	(0.0402)	(0.0448)		
New coll. posted dummy	2.391***	2.391***	2.392***	2.392***
	(0.0222)	(0.0222)	(0.0222)	(0.0222)
Avg. num new loans 2 years pre-Covid	0.0260***	0.0261***	0.0261***	0.0260***
	(0.0075)	(0.0075)	(0.0075)	(0.0075)
Num. pre-Covid loans	0.0019*	0.0019*	0.0019*	0.0019*
	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Bank CET1 ratio (pre-Covid)	0.0728	0.0669	0.0690	0.0750
	(0.1088)	(0.1092)	(0.1094)	(0.1090)
Bank NPL ratio (pre-Covid)	0.3591	0.3680	0.3594	0.3785
	(0.4496)	(0.4495)	(0.4499)	(0.4500)
LTV > 75% dummy		0.0374*	0.0295	
		(0.0193)	(0.0193)	
Neg. reval. dummy × LTV > 75% dummy		-0.1693***		
		(0.0639)		
Pos. reval. dummy			0.0995**	
			(0.0435)	
Pos. reval. dummy × LTV > 75% dummy			0.0276	
			(0.0659)	
Reval. size (%)				0.3575**
				(0.1648)
Fixed-effects				
Borrower	Yes	Yes	Yes	Yes
Fit statistics				
Observations	267,701	267,701	267,701	267,701
Squared Correlation	0.28652	0.28658	0.28662	0.28651
Pseudo R^2	0.34263	0.34273	0.34266	0.34262
BIC	142,531.7	142,547.3	142,554.1	142,533.0

Clustered (Bank-borrower) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Our findings

1 **Real estate is an important form of collateral for euro area banks' NFC lending**

- Price shock from Covid-19 may impact resilience of loan portfolios
- Price shock may also affect lending via the collateral channel/ financial accelerator

2 **Revaluation behaviour more complex than economic theory would imply**

- Limited downward revaluations of commercial real estate collateral despite market correction
- Clear national differences in revaluation behaviour

3 **However, we do find evidence of implications of the shock for firms' access to credit during Covid**

- Banks appeared to avoid lending to real estate collateral reliant firms during the pandemic
- For collateral that has been revalued – downward revaluations are associated with lower credit provision