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Asset prices, collateral and bank lending: the case of Covid-19 and real estate

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Abstract

Our paper uses credit registry data for the euro area to examine how the banking system transmits asset price shocks to credit via revaluation of collateral and subsequent lending decisions. Specifically we examine banks' treatment of real estate collateral during the Covid-19 crisis. First we find evidence of significant frictions in the transmission of asset price dynamics to collateral values. Despite this we find that lending relationships reliant on real estate collateral received one third less credit following the outbreak of the pandemic and that firms experiencing downward revaluations of their collateral were significantly less likely to be given new loans. Our findings confirm that the collateral channel does create an economically significant link between real estate values and credit but suggest that the banking system's role in transmission may be more complex than traditional economic theory would imply.

JEL classification: G21; R3; C55
Key words: Real estate; collateral channel; financial accelerator ; banking; microdata

Non-technical Summary

Collateral plays a central role in how we understand the financial cycle. Put simply, rising asset prices increase collateral values, thus loosening financing constraints and increasing firms' borrowing capacity. Increased borrowing by firms in turn boosts economic activity and further increases asset prices, thus restarting the cycle by again increasing collateral values. Bernanke and Gertler (1989) show that through this "financial accelerator" mechanism, variation in collateral values can create financial cycle fluctuations even in an otherwise stable system and asset price shocks can translate into real economy shocks. In more recent years, as the use of macroprudential policies have become more widespread, the feedback loop between asset prices and credit has been seen as a central driver of systemic risk dynamics.

Our paper uses credit registry data for the euro area to examine the banking system's role in creating a link between asset price shocks and credit, focusing on banks' treatment of real estate collateral during the Covid-19 crisis. We first examine revaluation of collateral by banks over the course of the pandemic period, and then examine how banks' treatment of the collateral determined firms' access to credit. Covid-19 represents a powerful case study for examining the collateral channel as the pandemic created a large and exogenous shock in real estate markets and at the same time real estate is used as collateral for almost 40 per cent of euro area bank lending to firms.

Our credit registry data is loan-level but also provides monthly data on each piece of collateral posted. This allows us to examine monthly revaluation for almost 5 million pieces of collateral from across the euro area over the course of the Covid-19 pandemic. To our knowledge our paper is the first to study the role of banks' collateral valuation behaviour in propagating asset price shocks to credit conditions.

Our findings from this part of our analysis are surprising. Given the impact the pandemic had on real estate markets, economic theory suggests that banks would respond to the outbreak of the pandemic by revising the value of the majority of their commercial real estate collateral downward and possibly also revising upwards the value of residential real estate collateral. However, revaluation of real estate collateral by euro area banks appears to have remained largely unchanged throughout the pandemic, with the impact of these diverging commercial and residential market dynamics almost completely absent. This suggests that banks' revaluation behaviour may not be as directly linked to asset price fluctuations as we may have traditionally assumed. Moreover, we see clear national differences in revaluation behaviour which suggests that the same asset price shock could have markedly different implications for credit dynamics in different euro area countries.

Next we examine how firms' use of real estate collateral and banks' treatment of it affected lending outcomes during the crisis. Here it is particularly important that we ensure our results reflect collateral dynamics only. For example, it is possible that certain types of firm were more affected by the pandemic and that these firms also tended to use real estate as collateral. To this end, we examine firms which had relationships with multiple banks going into the pandemic and then see how lending outcomes varied depending on the use of real estate collateral in those relationships or its revaluation. In this way we are able to completely isolate the role of collateral and fully control for firm characteristics.

Due to the absence of widespread revaluation of collateral following the outbreak of the

crisis, we first see how lending outcomes differed depending on firms' use of real estate as collateral in general. We find that lending relationships which had relied on real estate collateral prior to the pandemic received significantly less credit following its outbreak than lending relationships which pledged other types of collateral - in fact, around one third less. This finding holds for both residential and commercial real estate collateral and its effect appears to be concentrated in the period following the initial outbreak of the crisis, when market uncertainty was highest and there were indeed fears of a market correction in both residential and commercial real estate markets (see for example ECB (2020)).

Next, we see if the revaluations which did take place had implications for lending outcomes. We find a clear relationship between revaluation behaviour and the likelihood of new loans being made, with negative revaluation associated with a lower likelihood of new lending and positive revaluation associated with a higher likelihood. This dynamic is amplified in cases where borrowers are highly leveraged. The sizes of these effects are also economically significant, with negative revaluation reducing the likelihood of a new loan being made by 21 per cent. Where borrowers are highly leveraged this figure increases to 42 per cent. The effect of revaluations on the size, interest rate and maturity of new lending is less clear, although we provide some evidence that downward revaluations were associated with smaller new loans.

Taken together these results confirm the capacity for real estate market dynamics to determine credit dynamics via the use of real estate as collateral, even when endogeneity is fully accounted for. They also confirm the capacity for leverage to amplify this link. Given the widespread use of real estate as collateral by firms, this underlines the importance of monitoring and understanding dynamics in commercial real estate markets by financial stability authorities. Moreover, it underlines the importance of continuing work to expand the macroprudential toolkit so that risks arising from firms' exposures to commercial real estate markets can be mitigated.

1 Introduction

Collateral plays a central role in how we understand the financial cycle. Seminal works such as Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) lay out how asset price fluctuations can drive credit dynamics via changes in collateral values. Put simply, rising asset prices increase collateral values, thus loosening financing constraints and increasing firms' borrowing capacity. Increased borrowing by firms in turn boosts economic activity and further increases asset prices, thus restarting the cycle by again increasing collateral values. Bernanke and Gertler (1989) show that through this "financial accelerator" mechanism, variation in collateral values can create financial cycle fluctuations even in an otherwise stable system and asset price shocks can translate into real economy shocks.

In more recent years, as the use of macroprudential policies have become more widespread, the feedback loop between asset prices and credit has been seen as a central driver of systemic risk dynamics. Indeed monitoring asset price developments, particularly in real estate markets, forms a central part of macroprudential policymakers risk assessment and policy calibration process. The topic has also recently returned to the academic debate. A number of prominent studies argue that it is in fact earnings-based constraints that are the main driver of US firms' access to credit, with collateral-based constraints playing a more limited role (Lian and Ma (2020), Greenwald (2020), Dreschel (forthcoming)). In contrast, Gupta et al. (2022) dispute the relevance of the collateral channel for private bank-dependent firms.

Our paper uses credit registry data for the euro area to examine the banking system's role in creating a link between asset price shocks and credit, focusing on banks' treatment of real estate collateral during the Covid-19 crisis. This is a particularly interesting case study for examining the operation of the financial accelerator via collateral constraints: 40 per cent of euro area loans to firms are collateralised by some form of real estate, with the share exceeding 70 per cent in some countries, and Covid-19 represented a large and clearly exogenous shock to real estate markets.

We first examine banks' revaluation of real estate collateral during the pandemic and find that this shock to asset prices had limited impact on banks' revaluation behaviour, suggesting that institutional factors may create significant frictions in this part of the financial accelerator mechanism which have previously remained unstudied. We then examine implications for lending. We show that banks lent up to a third less in lending relationships reliant on real estate collateral following the outbreak of the pandemic, despite not carrying out widespread revaluations of this collateral. Finally, we show that where revaluations *were* carried out they also significantly affected firms' credit access. Highly leveraged firms which experienced negative revaluations were 42 per cent less likely to be given a new loan. Throughout our analysis we carefully control for endogeneity by exploiting cases where borrowers have multiple banking relationships but make varying use of real estate collateral across these relationships or experience different revaluation of the collateral.

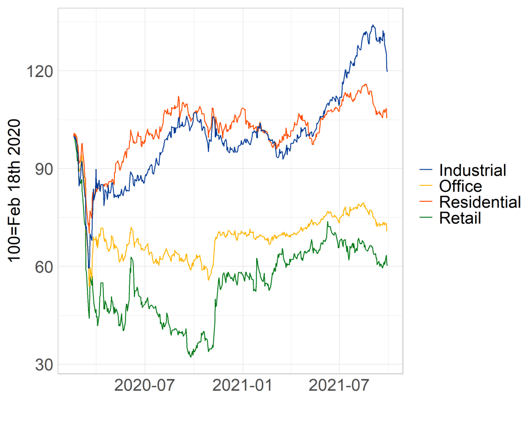
Taken together our findings suggest that the collateral channel of the financial accelerator remains alive and well. However, we also show that existing assumptions about the role of the banking system in driving this dynamic may be overly simplistic. In particular, bank revaluation behaviour deviates substantially from a simple mapping of asset price dynamics onto collateral values which may be implied by a textbook understanding of the financial accelerator model.

To our knowledge our paper is the first to study the role of banks' collateral valuation behaviour in propagating asset price shocks to credit conditions. The existing literature largely examines how investment and borrowing by firms which own real estate changes in line with changes in real estate prices (see for example Chaney et al. (2012), Gan (2007), Gupta et al. (2022) and Campello et al. (2022)). As a result, the role of the banking system remains something of a black box and the implicit assumption remains that banks map changes in market values directly onto collateral values and this is what determines firms' access to credit.

However, there are many ways in which banks' behaviour could deviate from this simple assumption and all of them would have implications for how the financial accelerator mechanism works in practice. For example, are changes in market values immediately applied to collateral values or does this occur with a lag? Do banks more readily revalue collateral when prices are rising or during a crisis? Does behaviour vary across countries? Our loan-level data set also includes information on each piece of posted collateral, ultimately allowing us to track monthly revaluation dynamics for 4.9 million pieces of real estate collateral throughout the Covid-19 pandemic. This allows us to directly study for the first time how banks treat collateral after an asset price shock.

We know that the outbreak of the Covid-19 crisis (in Europe in March 2020) had immediate and significant implications for market expectations regarding real estate values. The imposition of lockdown policies closed office buildings and shopping centres. In addition to the immediate effect on the profitability of these assets, lockdowns also raised fears that associated behavioural change, such as the shift towards e-commerce and remote working, could also threaten the longer term viability of both retail and office real estate markets. These market expectations can be illustrated using share prices for Real Estate Investment Trusts (REITs), where prices in Office and Retail segments dropped by up to 50 per cent in the days following the outbreak of the crisis and remained 30 to 40 per cent below pre-crisis levels at the end of 2021. While the initial expectations for other segments of the real estate market, including residential and industrial segments, were also negative, these segments ultimately benefited from the crisis, with prices recovering rapidly and then enjoying robust growth.

Figure 1: REIT indices show a clear impact of the outbreak of the Covid-19 crisis on euro area real estate price expectations



Source: Bloomberg

Economic theory suggests that such a shock would be followed by banks revising the value of the majority of their commercial real estate collateral downward and possibly also revising upwards the value of residential real estate collateral. Here our empirical investigation yields surprising results. Revaluation of real estate collateral by euro area banks appears to have remained largely unchanged throughout the pandemic, with the impact of these diverging commercial and residential market dynamics almost completely absent. This suggests that banks' revaluation behaviour may not be as directly linked to asset price fluctuations as may be traditionally assumed. Moreover, we see clear national differences in revaluation behaviour, with banking systems in some countries revaluing almost all of their collateral in a given year and others revaluing less than a fifth. This suggests that the same asset price shock could have markedly different implications for credit dynamics in different euro area countries. Indeed, the role of institutional characteristics in driving differences in collateral channel transmission across euro area countries has been raised before by Banerjee and Blickle (2021).

Next we examine how firms' use of real estate collateral and banks' treatment of it affected lending outcomes during the crisis. Here our data set allows us to make another valuable contribution to the existing literature. Existing work examining the capacity for changes in real estate values to affect firm credit via real estate's role as collateral highlights a number of endogeneity problems. One source of endogeneity poses particular challenges: A firm's decision to own real estate may be linked to their investment opportunities. For example, Chaney et al. (2012) flag that real estate owning firms may be more exposed to local economic shocks and so it may be firm characteristics (or firm credit demand fluctuations) which drive results, as opposed to changes in collateral values.

The granularity of our data set allows us to apply the method laid out in Khwaja and Mian (2008) whereby we compare outcomes for a given firm across its lending relationships with multiple banks. Crucially, our data allow us to examine lending outcomes for each of a firms' banking relationships and to identify differences in the use or revaluation of real estate collateral across these relationships. This means we can carry out our analysis at the bank-borrower level, unlike much of the literature which carries out analysis at the borrower level. As we are comparing outcomes for the same borrower over the same time period, we fully control for the role of firm characteristics in driving outcomes. By fully accounting for this form of endogeneity, we ensure that our results reflect the role of collateral dynamics only.

From an econometric perspective, the Covid-19 shock is also a particularly interesting case study for examining the link between collateral price shocks and lending outcomes, as the source of the shock was clearly exogenous to the real estate sector. This provides an effective treatment for an additional source of endogeneity identified in the existing literature: That firm investment may be driving real estate prices as opposed to vice versa. To our knowledge we are also the first to examine how the shock to real estate prices affected firms' access to credit during the Covid-19 crisis.

Our econometric analysis has two components. Due to the absence of widespread revaluation of collateral with the outbreak of the crisis, we first see how lending outcomes differed depending on firms' use of real estate as collateral in general. We find that lending relationships which had relied on real estate collateral prior to the pandemic received significantly less credit following its outbreak than lending relationships which pledged other types of collateral - in fact, around one third less. This finding holds for both residential and commercial real estate collateral and its effect appears to be concentrated in the period following the initial outbreak of the crisis, when market uncertainty was highest and there were indeed fears of a correction in both residential and commercial real estate markets (see for example ECB (2020)).

Next we see if the revaluations which did take place had implications for lending outcomes. We find a clear relationship between revaluation behaviour and the likelihood of new loans being made, with negative revaluation associated with a lower likelihood of new lending and positive revaluation associated with a higher likelihood. This dynamic is amplified in cases where borrowers are highly leveraged. The sizes of these effects are also economically significant, with negative revaluation reducing the likelihood of a new loan being made by 21 per cent. Where borrowers have a high loan to value ratio (LTV) this figure increases to 42 per cent. The effect of revaluations on the size, interest rate and maturity of new lending is less clear, although we provide some evidence that downward revaluations were associated with smaller new loans.

These results confirm the capacity for real estate market dynamics to determine credit dynamics via the use of real estate as collateral, even when endogeneity is fully accounted for. They also confirm the capacity for leverage to amplify this link and the economic significance of the collateral-constraint aspect of the financial accelerator channel. Given the widespread use of real estate as collateral by firms, this underlines the importance of monitoring and understanding dynamics in commercial real estate markets by financial stability authorities. Moreover, it underlines the importance of continuing work to expand the macroprudential toolkit so that risks arising from firms' exposures to commercial real estate markets can be mitigated.

Our findings also suggest that banks' treatment of collateral in the face of asset price shocks is more complex than we may have previously assumed. On one hand we show that where revaluations did occur they had the expected effects on lending outcomes. On the other hand, we find a sharp drop in lending against real estate collateral with the outbreak of the crisis combined with limited revaluation of collateral. This suggests that banks may transmit asset price shocks to lending in two distinct ways. First, by translating changes in their beliefs regarding asset prices into changes in collateral values and changing lending behaviour in line with this, i.e. the traditional "revaluation channel" as laid out in economic theory. Second, via an "uncertainty channel", whereby banks respond to heightened asset market uncertainty by restricting lending against relevant collateral but without necessarily updating their beliefs regarding the value of collateral items via formal revaluation. Of course we accept that our analysis is only a first step in examining the existence of these two channels and that further work would be needed to formalise this as economic theory.

The rest of this paper will be structured as follows; Section 2 reviews the relevant literature. Section 3 provides an overview of our credit registry data and then uses it to illustrate the use of real estate as collateral among euro area firms and the revaluation of this collateral over the course of the Covid-19 pandemic. Section 4 lays out our econometric strategy for assessing the links between collateral and lending outcomes. Section 5 provides the results of this analysis and Section 6 concludes.

2 Literature Review

Works dating back as far as Fisher (1933) identify the importance of fluctuations in collateral values for determining borrowers' access to credit. Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) in particular show that 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. Of course it follows that during periods of falling asset prices firms' access to credit is reduced, thus potentially amplifying any downturn when feedback loops develop between credit and asset prices. This "financial accelerator effect" has become central to our understanding of financial cycles.

Due to the extensive use of real estate as collateral and the central role of the asset class in past financial crises, the empirical literature on collateral-based constraints and the financial accelerator has paid close attention to how this mechanism works in relation to real estate collateral. The four papers closest to our own aim to empirically uncover the microeconomic foundation of the mechanism and do find evidence of a link between firm investment and real estate price dynamics. Chaney et al. (2012) utilise real estate price data in the US between 1993 and 2007 and estimates that for $1 increase in firms' landholdings value, the representative US public corporation raises its investment by $0.06 via collateral effects. Gupta et al. (2022) find that over the 2013-2019 period, for a 1 per cent increase in collateral values, US firms pledging real estate collateral experience 12 basis point higher growth in bank lending, and that higher real estate values boost firm capital expenditures. Campello et al. (2022) also examine dynamics in the US and confirm that higher collateral values relate to higher investment and higher debt issuance, but find that US firms over this period mostly responded to changing real estate prices by expanding unsecured borrowing. Gan (2007), conversely, investigates investment outcomes for firms which did and did not own land during the Japanese real estate crisis in the 1990s. Two further papers examine the implications of changes in real estate prices for firms' financing structure (Cvijanović (2014)) and examine how residential real estate affects firm investment when directors post their own homes as collateral (Bahaj et al. (2020)).

Our work makes a number of concrete contributions to this literature. First, this empirical literature repeatedly highlights a number of endogeneity problems. In particular, firms which own real estate may be different from other firms and where the decision to own real estate is correlated with investment opportunities this may bias results. Chaney et al. (2012) flags that firms which own real estate may be more exposed to local economic shocks and so the estimated effect of real estate price changes on investment may reflect the effect of varying collateral values but also the impact of economic shocks on factors such as firm credit demand (see also Cvijanović (2014), Gupta et al. (2022), Campello et al. (2022) and Bahaj et al. (2020)). In our case, it is very likely that the Covid-19 pandemic affected commercial real estate prices and the profitability of firms which own these assets simultaneously.[1] Existing work takes steps towards addressing this issue by controlling for firm characteristics, comparing outcomes before and after the purchase of real estate, and restricting their sample to the trading sector - which may be less exposed to local demand

[1] For example, the closure of shopping centres reduced the profitability of those assets, pushing down both their price and the profitability of firms which owned them. This in turn likely affected the firms' credit demand and banks' willingness to lend to them. Thus it is of central importance that we can differentiate between changes in lending behaviour driven by firms' credit demand or banks' beliefs regarding firms' probability of default and those solely driven by changes in collateral values.

shocks. However, Chaney et al. (2012) acknowledges unobservable characteristics and/or time varying characteristics may also drive this endogeneity, so these methods will not be able to fully address it.

Much of the analysis in the existing literature is carried out at the firm-level but the granularity of our data allows us to examine lending dynamics at the bank-borrower level. Moreover, we are able to identify variation in the use and revaluation of real estate collateral across a borrowers' various banking relationships. This means that we can apply the method laid out in Khwaja and Mian (2008) where outcomes for the same borrower across its various banking relationships are compared. Thus we can very effectively remove this crucial source of endogeneity by controlling for all observable and unobservable firm characteristics. The econometric specification will be discussed further in Section 4 but, in short, this method is implemented by carrying out analysis at the bank-borrower level for a specific time period and introducing borrower fixed effects.[2] A number of papers in the literature do use firm fixed effects in their specifications but as their analysis is carried out at the firm-level this fixed effect allows them to look at outcomes for the same firm across time as opposed to for the same firm following a specific shock across its various banking relationships. Again, as Chaney et al. (2012) acknowledges, sources of endogeneity may be time-varying and so this does not fully address the endogeneity problem at hand.

As our data also includes information on the industry, location and size of firms we are able to double check our results using the method laid out in Degryse et al. (2019) and in this way also ensure that results are not driven solely by firms which borrow from multiple banks, a recognised limitation to the Khwaja and Mian (2008) method. Gupta et al. (2022) and Campello et al. (2022) also apply variations on this method but, again, it should be noted that this method relies on observable firm characteristics and so will not account for endogeneity arising from unobservable characteristics.

Moreover, while these empirical papers and the theoretical literature provide crucial insights into the implications of asset price fluctuations for firm investment, they largely ignore the role of the banking system in translating asset price changes into changes in collateral values (via revaluation) and then into lending outcomes. Our credit registry data set contains loan-level data but also collateral-level data, allowing us to track the values of individual collateral items on a monthly basis over the course of the Covid-19 pandemic. Thus we can examine, to our knowledge for the first time, how banks revalue assets in response to a large, exogenous market shock and so also shine a light on how bank behaviour can affect how an asset price shock is ultimately translated to firms' access to credit.

Our work is also relevant to the recent literature on earnings-based constraints on firm borrowings. In recent years a number of high-profile studies have argued that this mechanism may work largely via earnings-based constraints as opposed to collateral-based constraints. Lian and Ma (2020) examine rules imposed by lenders on US firms and find that the majority of these covenants relate to the firms' earning as opposed to their collateral, with banks imposing limits on the ratio between a firms debt and EBITDA for example. It is then found that the debt of US firms, particularly those more bound by these constraints, is indeed very sensitive to variation in earnings and typically not responsive to variations

[2] Gan (2007) does carry out analysis at the bank-borrower level but does not compare outcomes for a given firm across various banking relationships, possibly because data is not available to identify variation in the extent of real estate collateral use across these relationships. A number of other referenced papers use granular loan or contract-level data but ultimately carry out analysis at the borrower-level.

in real estate values. Similarly Greenwald (2020) and Dreschel (forthcoming) find large effects from earnings based constraints. While the end goal of our analysis is not to compare the relative strength of earnings and collateral based constraints, our findings of an economically significant impact of use of real estate collateral during Covid-19 suggest that collateral based constraints remain an important component of corporate bank borrowing dynamics. This is in line with Gupta et al. (2022) who argue in their recent paper that the collateral channel is most relevant for private bank-dependent firms and that omission of small bank-dependent borrowers from the analysis by Lian and Ma (2020) misses the set of firms for which this channel is most relevant.

Finally, to our knowledge we also are the first to directly examine how the shock to real estate prices affected firms' access to credit during the Covid-19 crisis.[3] Indeed this was identified as a key potential feedback loop from the early stages of the pandemic but formal empirical examination has not been provided until now (see for example IMF (2020)). From an econometric perspective, the Covid-19 shock is also a particularly interesting case study for examining the link between collateral price shocks and lending outcomes, as the source of the shock was clearly exogenous to the real estate sector. This provides an effective treatment for an additional source of endogeneity identified in the existing literature: That firm investment may be driving real estate prices as opposed to vice versa.[4] One drawback of examining this channel during the Covid-19 pandemic is that a number of very significant government support measures were in place to cushion the pandemic's impact on key macroeconomic variables such as employment. As a result we limit our analysis to implications for bank lending, where we are able to identify and control for these programmes, and do not attempt to estimate implications for macroeconomic variables such as employment or GDP, where we are unable to control for key programmes such as employment support schemes.

By showing how the use of real estate as collateral affects firms' lending outcomes, our work also provides useful insights for the wider literature on real estate dynamics and firm credit (see for example Peek and Rosengren (2000) and Kaas et al. (2016)) and on the role of real estate price dynamics in contributing to wider boom-bust cycles (see for example Mian and Sufi (2011), Berger et al. (2018), Cerutti et al. (2017) and Carroll et al. (2011)). Our detailed examination of banks' treatment of collateral values during a period of asset price fluctuations and implications for lending outcomes also provides useful insights into the wider literature on collateral's role in determining firms' access to credit (see Stiglitz and Weiss (1981), Hart and Moore (1994)) and the cost of credit (see Luck and Santos (2019), John et al. (2003)). Our use of collateral-level data also allows us to expand on the insights provided by Cerqueiro et al. (2016), Cerqueiro et al. (2020) and Degryse et al. (2021) who each examine how banks' lending behaviour changed following the introduction of regulatory or legal reforms which would impact banks' collateral treatment.

Finally, while we primarily examine the topic from a financial stability perspective, our analysis also has clear implications for the collateral channel of monetary policy.

[3] Gupta et al. (2022) use their estimates based on pre-Covid data to produce simple estimates of how the collateral channel may have affected macroeconomic variables during Covid-19, although they accept that these estimates will not account for the very significant government support schemes over the course of the pandemic.

[4] To deal with this Chaney et al. (2012), Bahaj et al. (2020), Gupta et al. (2022) and Campello et al. (2022) and Cvijanović (2014) use instrumental variables methods. Gan (2007) notes that the Japanese real estate crisis studied in her paper is a large enough shock to be exogenous from the actions of any given firm.

3 Real Estate Collateral Use and Revaluation During the Covid-19 Pandemic

3.1 Data set

Our paper utilises AnaCredit, an analytical credit registry containing detailed monthly information on all individual bank loans to firms in the euro area above the value of €25,000.[5]. We use monthly reporting from the beginning of 2019 to the end of 2021 to cover the most intense period of the Covid-19 pandemic. It should be noted that AnaCredit does not include data on lending to households and so our analysis focuses only on lending to firms. Throughout our analysis we exclude overdrafts, credit card debt, deposits other than reverse repurchase agreements, trade receivables, finance leases, and loans with an initial maturity of less than 2 years.

Data are provided at the loan-level and include detailed information on characteristics of loans, borrowers, and lenders. Most importantly, monthly data is also provided for each piece of collateral posted, including its initial value, revaluation dates, and the type of collateral. This allows us to directly examine the treatment of over 4.9 million pieces of real estate collateral, held by 2,582 banks, and posted by 1.9 million borrowers across all 19 euro area countries.

The richness of our data set also allows us to include a range of variables at the bank, borrower, and bank-borrower level in our econometric specifications. At the borrower-level, sector is controlled for with a dummy variable as per the NACE code classifications[6]. Information on the borrower's balance sheet and profitability is also used to compare firms which do and do not use real estate collateral. At bank-borrower level, we include the aggregate LTV, a dummy for domestic vs cross-border relationship, and a dummy taking the value of 1 if any of the loans of the borrower in a given bank had been under moratoria during the Covid-19 period. ank-calculated probability of default for each borrower is also used as a control variable.

In addition, we complement AnaCredit with supervisory data on banks' CET1 ratios and aggregate NPL ratios. These are particularly important control variables throughout our analysis due to the the possibility that banks which accepted a lot of real estate collateral prior to Covid-19 were also less resilient banks and so lent less once the pandemic broke out. Similarly, we are able to control for the use of real estate as collateral and its revaluation at the bank-level. Table 10 in Appendix A provides an overview of the construction of our data set.

[5]Further information on the AnaCredit project is available here. More detailed documentation on the regulations around the collection and processing of AnaCredit is available here

[6]NACE sectors are identified via first-level sections. The sectors controlled for are Manufacturing, Construction, Trade, Transport, Accommodation, and Real Estate, with all other sectors classified as Other.

3.2 Real Estate as Collateral

We begin by examining the extent of real estate's use as collateral for non-financial corporation (NFC) lending across the euro area, as this is crucial to understanding the economic significance of fluctuations in its value. Over recent years, data gaps have been a major barrier in understanding the financial system's exposures to commercial real estate. Quite basic information was not readily available for euro area economies, such as comprehensive measures of banking system exposure to commercial real estate markets via the use of real estate as collateral, loans for commercial real estate purposes, and loans to real estate related firms. AnaCredit provides unprecedented insight into euro area banks' commercial real estate exposures and allows for the closure of a number of crucial data gaps.

Figure 2 shows the share of NFC loans in each euro area country collateralised by some form of real estate [7]. At the euro area level, 37% of NFC loans use real estate as collateral and in some countries the share exceeds 70%, suggesting that shocks to real estate values do have the potential to have economically meaningful implications for credit dynamics. Figure 2a breaks this down by each type of real estate collateral identified by AnaCredit, namely commercial real estate used for income generating purposes, residential real estate used for income generating purposes, and commercial real estate used for firms' own commercial activities. At the euro area level each account for about a third of real estate collateralised loans. Unfortunately AnaCredit does not allow us to differentiate between different types of commercial real estate assets, such as shopping centres and office blocks.

At this point it should be noted that while the types of collateral we examine include real estate used for both commercial and residential purchases, all real estate examined is owned by firms as opposed to households. Thus in line with most formal definitions (see ESRB (2019)), all real estate examined can be considered commercial real estate (CRE). For the remainder of this paper, we will use the phases *real estate* and *CRE* interchangeably.

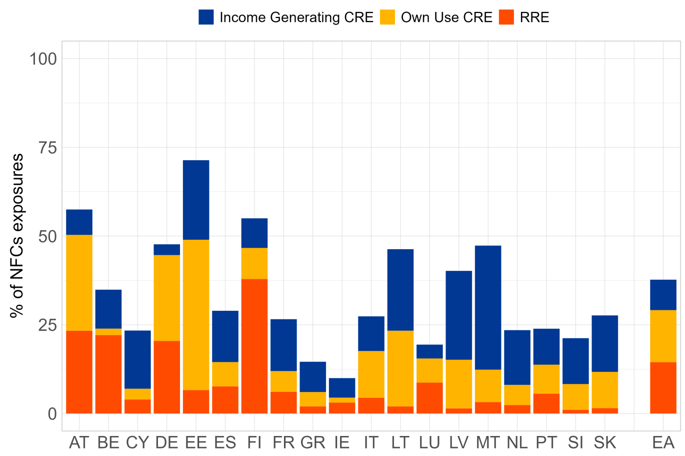
Figure 2b breaks down all real estate collateralised loans by their purpose, with any loan taken out for commercial real estate purchase, residential real estate purchase, or construction flagged as a "real estate purposed" loan. Here we can see that real estate is widely used as collateral in both real estate lending and lending for other purposes.[8] Similarly, Figure 2c shows that real estate is used as collateral by borrowers from the real estate sector but 37% of CRE-collateralised loans are to firms not active in real estate or construction sectors. Taken together, these charts suggest that fluctuations in real estate prices could therefore create an accelerator effect within real estate markets by creating a very direct feedback loop between real estate values and real estate credit, and could also have implications for lending to wider economic activity.

[7]This analysis uses the aforementioned filters on lending types and only considers collateralised loans. Therefore this does not cover all NFC lending.

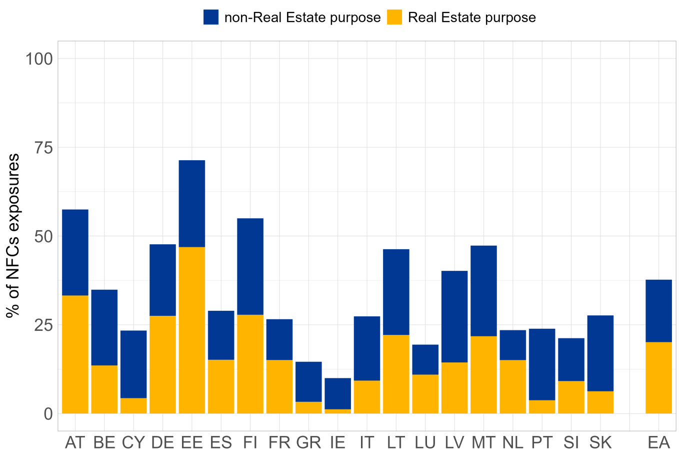
[8]The capacity to identify real estate purposed lending also opens possibilities to examine dynamics in lending to real estate activities over the course of the Covid-19 crisis. For further examination of this see Ryan et al. (2022)

Figure 2: Commercial Real Estate Exposures in the EA, December 2021
Share of NFC loans collateralised by real estate

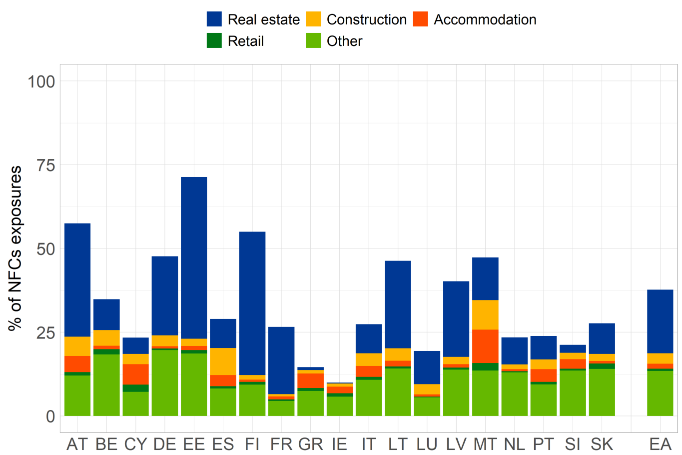
(a) Collateral Type



(b) Loan Purpose



(c) Borrower Sector



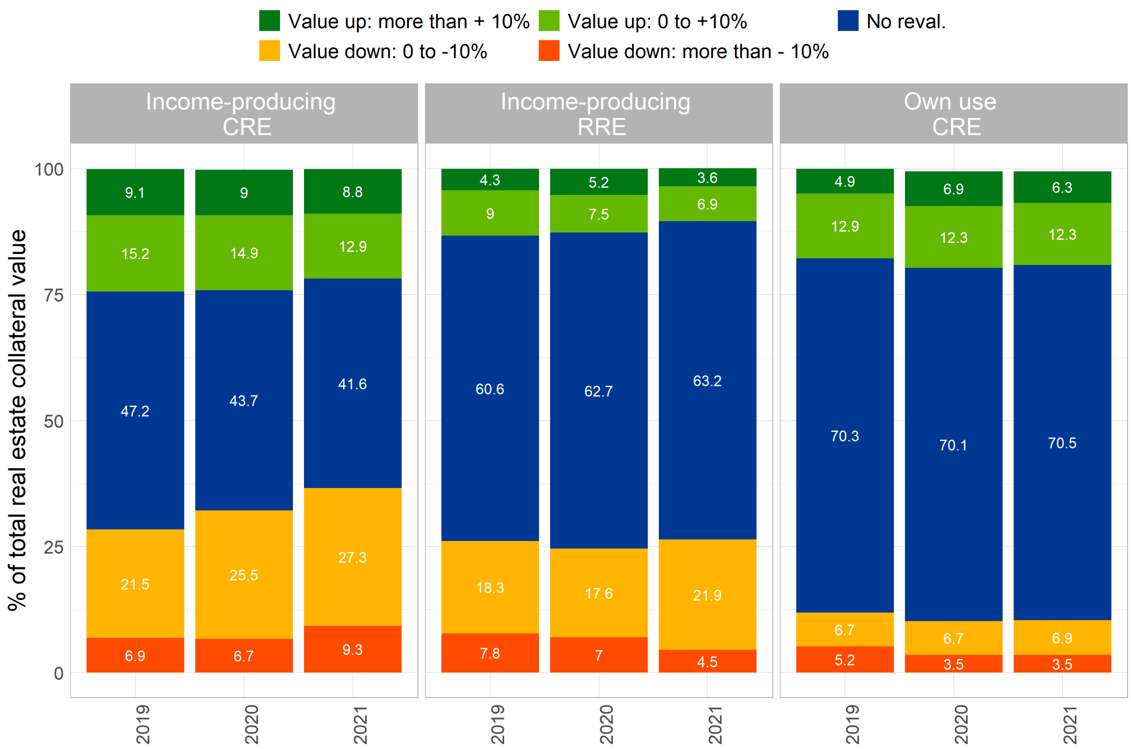
Note: CRE stands for commercial real estate and RRE for residential real estate.

Euro area aggregates mask substantial country heterogeneity across each of these measures, with the composition of real estate assets, loan purpose, and sectors involved varying substantially. Should there be differences in revaluation or lending behaviours for each type of CRE asset, as would be expected with the price divergence within the real estate market, this would then suggest that national transmission of these market dynamics may also be different.

3.3 Revaluations During Covid-19

The Covid-19 pandemic triggered widespread changes to social behaviours, with factors such as lockdowns and remote work resulting in changes in demand in the property market. Most types of commercial real estate including office, retail and hospitality markets were negatively impacted by falling occupancy rates and corresponding reductions in price growth expectations, as seen in Figure 1. Despite fears of a residential market correction at the start of the crisis (see for example ECB (2020)), residential real estate and some commercial real estate types, such as industrial buildings, ultimately benefited from the crisis and saw increased demand and rising prices.

Figure 3: Revaluations by Year and Collateral type



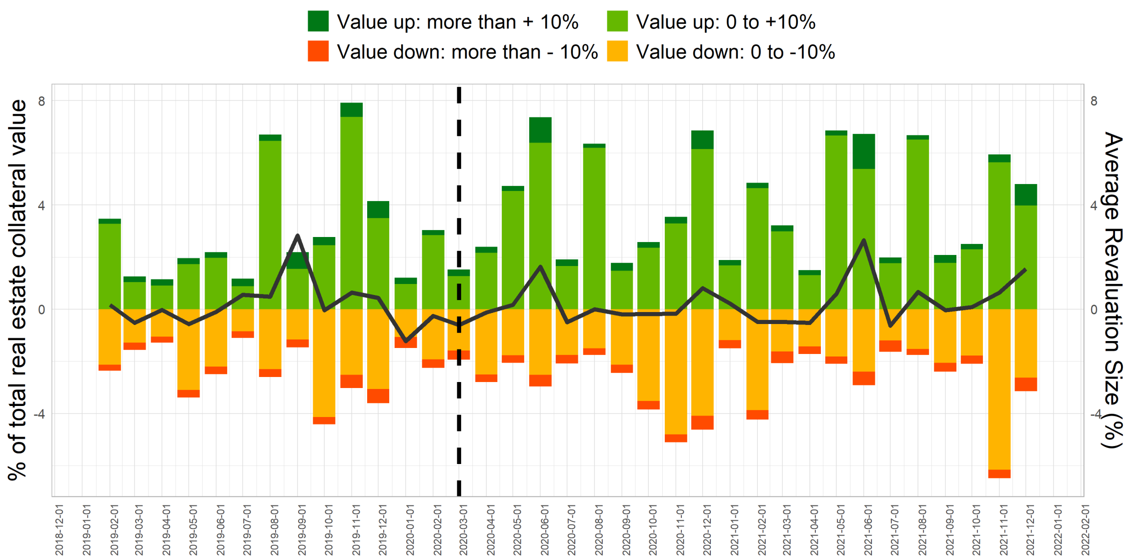
Note: Revaluations for the year are calculated as a change of value from the beginning of the year or the earliest entry, to the end of the year or the latest entry. Revaluation size is calculated as the proportional change from the initial value for a given collateral item in the year. CRE stands for commercial real estate and RRE for residential real estate.

This shock provides a natural experiment in which we can assess the response of banks to a genuinely exogenous shock to real estate collateral values. Economic theory suggests that banks would respond to falling real estate prices by applying haircuts and downward revaluation to assets which were negatively affected, while potentially increasing the positively affected real estate values in line with price growth. Overall, a significant downward shock to the value of banks' commercial real estate collateral portfolios would be expected or, at the very least, a decrease in upward revaluations and increase in downward revaluations during the pandemic years, as compared to 2019.

As AnaCredit contains monthly data on the value of all collateral items, the exact timing and size of every revaluation of each piece of collateral can be identified. First, Figure 3 summarises this information by comparing aggregate revaluation dynamics in 2019, 2020 and 2021 for each type of real estate collateral. In 2019, 39.7% of the total real estate collateral stock was revalued, compared to 40.1% in 2020 and 40.5% in 2021. While we do see some increase in the share of income producing commercial real estate experiencing downward revaluations during the pandemic period, these slight differences do not align with what we would expect given wider dynamics in real estate markets. The continuous downward revaluations of residential assets is also surprising given that in 2020 there was positive average growth in residential real estate prices across all euro area markets. We check that results are not being driven by a number of large banks and find that bank size did not appear to be a central driver of the share of collateral revalued (see Appendix B).

Next, to understand dynamics at a higher frequency and to see, for example, if annual dynamics are hiding spikes in revaluations at key points in the pandemic, Figure 4 shows the proportion of the total real estate collateral stock held by euro area banks that was revalued in a given month, including the direction of the valuation. Again, we do not see a sudden wave of downward revaluations with the onset of the pandemic and overall the impact of the pandemic is not clearly visible in monthly revaluation patterns. [9]

Figure 4: Monthly Revaluation Patterns - Seasonality and Covid-19 Effects



Note: The left axis relates to the bar chart for the proportion of the collateral stock that was revalued in a given month in each revaluation category. The right axis relates to the line graph showing the average revaluation size to indicate if revaluations were on average positive or negative in a given month.

[9] We also briefly examine how regularly collateral was revalued and find that while a substantial share of collateral was never revalued, another segment of the collateral stock was revalued regularly. Of the collateral that did get revalued, almost a third was revalued five times or more and most was revalued more than once over the period studied (see Appendix B).

Taken together, these results present a significant divergence from economic theory and suggest that implicit assumptions that banks simply map changes in asset values to collateral values may be overly simplistic. That said, there are a number of factors which could explain this deviation. At a high-level, carrying out revaluations may be a costly process, disincentivising regular updating of collateral values and weakening the link between asset market fluctuations and collateral values. From a regulatory perspective, the Capital Requirements Regulation [10] states that banks are required to monitor the value of real estate assets posted against loans every 1- 3 years, depending on the property type and that revaluation should be conducted more frequently in the case of significant market events. In this sense our finding that approximately a third of total collateral values were changed each year is broadly in line with regulatory requirements in the euro area. Banks may also avoid applying downward revaluations where this will increase the official loss given default on exposures and so increase provisioning requirements associated with these exposures. On the other hand, the downward revaluations seen on residential real estate assets could reflect standard haircuts applied to ageing buildings.

Of course from a systemic risk perspective, the finding that collateral values may not be updated in line with market values may weaken the link between asset price dynamics and credit dynamics, but this also comes with its own risks. For example, where downward revaluations are not applied, the official value of held collateral may significantly differ from losses which can be recovered in the case of default. In this way, the absence of significant revaluation activity following the shock of the Covid-19 pandemic may have implications for financial sector resilience and our understanding of risk build-up in certain segments of the economy.

Further examination also reveals significant cross-country heterogeneity in collateral revaluation behaviours. In particular, the share of collateral revalued at all varies substantially across countries. Figure 5a shows that the proportion of the real estate collateral stock revalued in a given country in 2020 ranges from 11% in Germany to 80% in Ireland, with these shares stable at the country-level across years. Examining the share of collateral revalued at bank-level underscored these national patterns, with the majority of banks in each country revaluing either a high or low share of collateral in line with national trends (we illustrate this in **Appendix B**).

To understand if national price dynamics are contributing to this cross country heterogeneity we compare national market price dynamics to changes in revaluation behaviour. Figure (5b) shows a comparison of residential market price growth with yearly changes in revaluation sizes for residential collateral items.[11] Again, the lack of correlation between national asset price dynamics and revaluation dynamics is striking and suggests that price dynamics are not one of the primary drivers of country level trends.

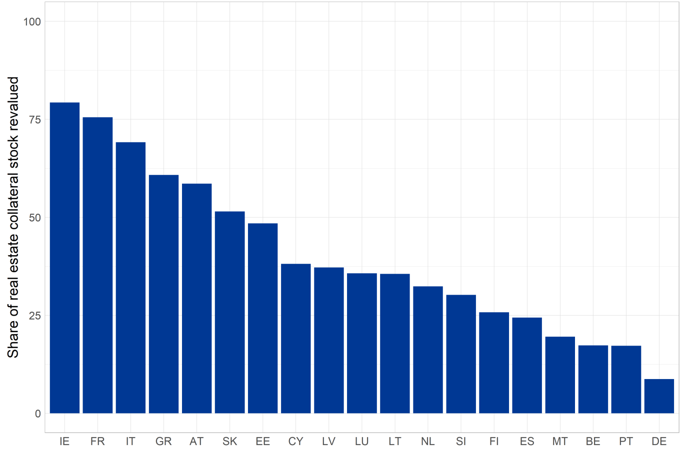
The fact that a large share of collateral was not revalued over the course of the pandemic does raises the question: Which collateral items were and were not revalued? While this is not the main focus of our paper, we use a probit model to investigate the loan, borrower, and collateral characteristics that impacted the likelihood of a collateral asset being revalued by a bank in a given month. In particular, we want to check if the low share

[10] Further information on Article 208 of the Capital Requirements Regulation is available here.

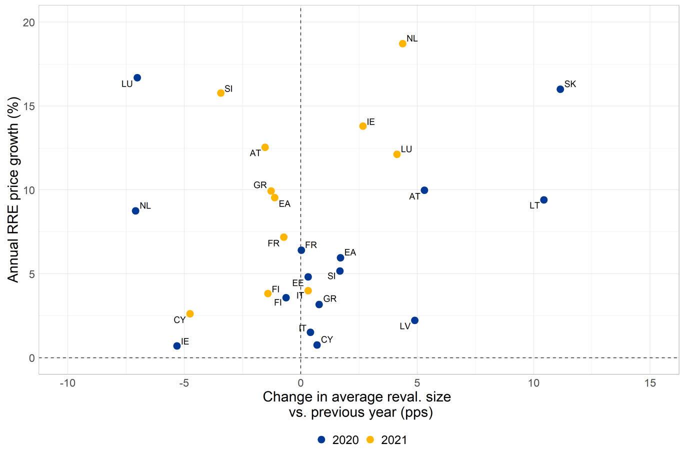
[11] We focus on the residential market for this part of our analysis as price dynamics across different segments of commercial real estate markets (e.g. office, retail and industrial) varied widely over the period examined but we are unable to differentiate between these types of commercial real estate collateral.

Figure 5: Country heterogeneity in revaluation behaviour

(a) Total 2020 Real Estate Collateral Stock revalued by country



(b) Correlation between collateral revaluation and price dynamics



Note: Figure b examines RRE price changes and asset revaluations only due to the limited data availability on CRE price dynamics in some countries.

of collateral being revalued is driven by Covid-19 policies, such as loan moratoria, which may have disincentivised revaluation. At the euro area level, we find that loans associated with moratoria policies were actually more likely to be revalued, so this is not driving our surprising results. However, we also find that most relationships which hold at the euro area are very different across individual countries, suggesting that banks' selection of which collateral to revalue may also be driven by national factors. One relationship which remains consistent across types of collateral and countries is that collateral associated with NPLs is more likely to be revalued. Further details on this analysis can be found in Appendix D.

Again a range of institutional factors could explain these cross country differences. For example, the low share of collateral revalued annually by German banks may reflect the approach taken to real estate collateral valuation in Germany which aims to produce a long term sustainable value as opposed to a mark-to-market approach. This longer term value may need less frequent updating. Of course diverging national patterns in revaluation behaviour raise the possibility that a similar shock to asset values may have heterogeneous transmission paths across euro area countries. Indeed we can see this in Figure 5b. This has implications how the financial accelerator may operate but may also have implications for the collateral channel of monetary policy.

4 Implications for lending - Empirical Strategy

Of course the primary reason we care about banks' treatment of real estate collateral is to understand its implications for lending and, by extension, real economic activity. We investigate this in two ways. First, we examine whether banks avoided lending to firms which relied heavily on real estate collateral following the outbreak of the Covid-19 pandemic, even though banks did not engage in widespread downward revaluations of real estate collateral. Then, narrowing our focus to banks' real estate-collateralised loan portfolios, we examine whether or not the revaluations that *did* take place had implications for firms' access to credit.

4.1 Impact of Real Estate Collateral Reliance on Credit

To answer our first question we use the difference-in-differences econometric approach shown in Equation 1:

$$newloans_{i,j} = \beta_0 + \beta_1 * CREdepend_{i,j} + \Gamma * X_i j + \Phi * Z_j + \alpha_i + \varepsilon \qquad (1)$$

Our dependent variable $newloans_{i,j}$ looks at new lending from bank j to borrower i in the first 6 months of the Covid-19 period, March 2020 - August 2020. We use two versions of the LHS variable. The first one is the ratio of new loans in the Covid-19 period to the pre-Covid-19 stock of loans. The second is the ratio of new loans in the Covid-19 period to the pre-Covid-19 (January 2019 - February 2020) new loans. We collapse the data into pre-Covid-19 and post-Covid-19 and divide the post-Covid-19 by the pre-Covid-19, and hence we get one observation per borrower-bank relationship which can be interpreted as dynamics of new lending. Such approach of ignoring the time-series information is a solution to serial correlation proposed by Bertrand et al. (2004) and applied by Couaillier et al. (2022). We chose to focus on the first 6 months of the Covid-19 pandemic as it seemed to be the most acute phase. Pre-pandemic the monthly ratio of lending to real estate-reliant companies and non-real estate-reliant companies seems to have been stable (see Figure 7b). This confirms that the "parallel trend assumption", which needs to hold for the difference-in-differences to be valid according to Bertrand et al. (2004) and Imbens and Wooldridge (2009), holds.

Our treatment is the Covid-19 pandemic, which is an exogenous unexpected shock that negatively affected the real estate collateral pledged to obtain bank lending, but didn't affect equally negatively other types of collateral. As such, we consider that the assumption of the difference-in-differences of the exogenous assignment of the treatment holds. Even though high levels of revaluation were not seen, we expected that banks may have responded to the uncertainty and indications of CRE price correction in the period by reducing their lending to those borrowers who relied on real estate collateral.

Our treatment group ($CREdepend_{i,j}$) contains lending relationships between borrower i and bank j in which the borrower relied on real estate as collateral in the pre-Covid-19 period. $CREdepend_{i,j}$ is based on the ratio of real estate collateral pledged to all collateral pledged pre-Covid-19, with the cut-off point at 75th percentile. In practical terms this identifies relationships which were entirely real estate-collateral reliant, compared to those which were partially reliant or where no real estate collateral was used. As our data set contains observations for each bank a firm has a loan from, the flag indicates if the firm is real estate collateral reliant in that relationship. As such, a debtor may not be real estate reliant in all relationships. 19% of the our sample were *Always CRE Reliant*, with an additional 3% being reliant on real estate in one of their banking relationships but not all. Figure 6 compares some key characteristics of borrowers across their CRE-collateral reliance status. In general, borrowers who utilised real estate as their primary form of collateral before the pandemic were slightly richer, more highly leveraged and, correspondingly, more highly collateralised than other borrowers.

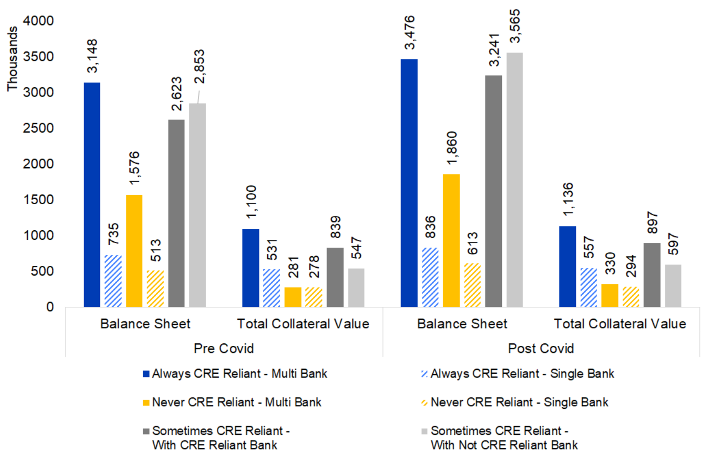
However, we see that these real estate reliant borrowers received a lower volume of lending after the pandemic (Figure 7a). Given their strong position pre-Covid-19, this suggests that the holding of real estate assets as collateral was a factor in this change. Later analysis will disentangle the endogeneity present in this simple analysis to isolate the effect of holding real estate collateral from other related factors, such as the firm's commercial activities. Figure 7b shows the share of all monthly new loans that were taken out by firms from the bank relationships flagged as being real estate reliant pre-pandemic. A sharp decrease in the share is seen in March 2020 following the onset of the pandemic. This trend supports our theory that banks retreated from lending to those firms who were reliant on real estate assets as a form of collateral due to the expectation of price deterioration in real estate markets. [12]

Within the difference-in-differences approach, β_1 is our coefficient of interest - it captures if the mean ratio of lending after the pandemic outbreak to the pre-pandemic stock was different between the group of CRE-reliant and non-CRE-reliant companies. We expect this coefficient to be negative - which would mean that the borrowing by real estate collateral reliant companies was negatively affected when real estate collateral was negatively affected. Our use of pre-pandemic real estate collateral reliance is motivated by the very high likelihood that both banks and firms would want to shift away from real estate collateral once the pandemic broke out. Therefore, had we based our division into treatment and control groups on the shares of real estate collateral held during the pandemic, this could have distorted our findings and also resulted in a breach of the exogenous assignment of the treatment assumption.

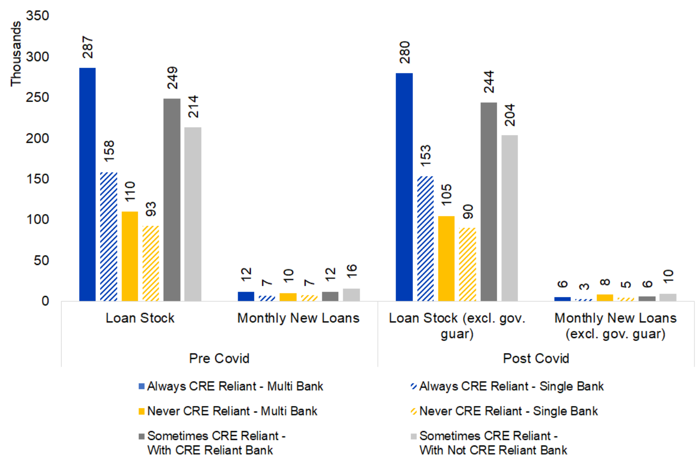
[12] Though it is not tested further in this paper, some wealth effects following the Covid-19 period are also suggested by this borrower comparison. Non-CRE Reliant firms saw their Balance Sheet increase by an average of 20% post Covid-19; the average for CRE-reliant firms was +14%. A full table of the comparison between firm types is available in Appendix C. In general, those firms that had mixed reliance between real estate and non-real estate assets were those with much larger median asset holdings, as would be expected for a firm with multiple banking relationships.

Figure 6: Comparison of Borrower Types - Banking Relationships and Real Estate Collateral Reliance

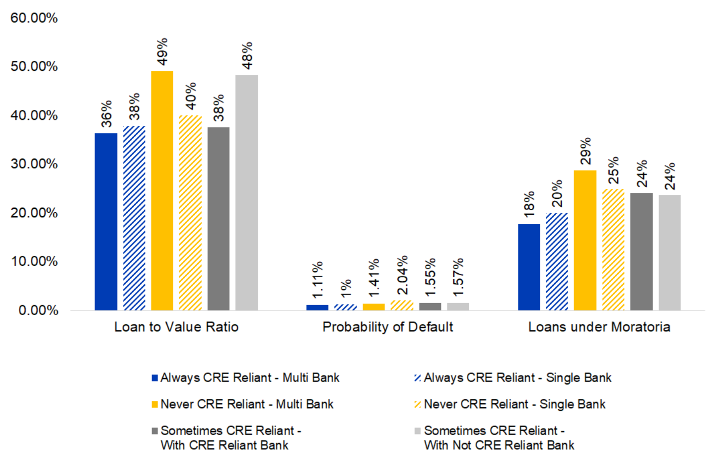
(a) Financial Position



(b) Borrowing Behaviour



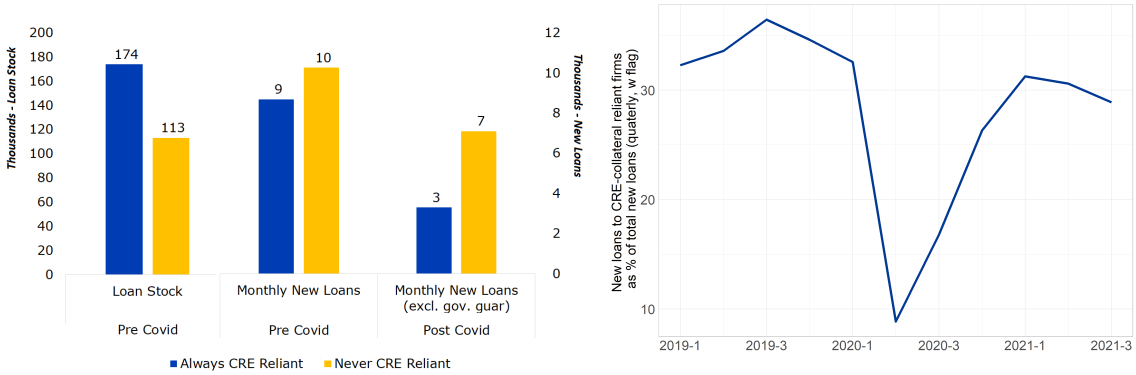
(c) Performance



Note: Firms are grouped depending on: 1. If they have lending from a single bank or multiple banks, 2. If they use real estate collateral Always (in all lending relationships), Never (in none of their lending relationships), or Sometimes (in one of their lending relationships but not in another). Of firms in the sample, those who are always reliant on CRE form 19%, those who are sometimes reliant on CRE 4% and those who are never reliant on CRE 77%.

Figure 7: Lending to real estate and non-real estate reliant firms

(a) Mean Monthly New Lending (b) Share of New Loans to real estate reliant firms



Note: In Figure b, firms are categorised on based on their real estate reliance pre-Covid-19. Only loans to firms with existing banking relationships pre-Covid-19 are included.

A concern in this analysis is that lending dynamics following the Covid-19 pandemic could be affected by the introduction of various loan support measures across the euro area, as we know that the use of government guarantees as collateral increased sharply in that period. In particular these support measures could affect the sensitivity of lending outcomes to fluctuations in collateral values, could reduce the incentive for banks to revalue collateral and may also bias results if, for example, firms using real estate collateral were also more or less reliant on the schemes. AnaCredit variables allow us to identify loans impacted by Covid-19 support policies such as moratoria and government guarantees and thus account for their possible impact on revaluation and lending. Loans which are under moratoria can be identified in AnaCredit by a combination of forbearance status, changing final maturity dates, outstanding loan values, and days past due, allowing us to pinpoint the exact stage of moratoria on a monthly basis. In addition, government guaranteed loans can also be identified in AnaCredit. Our approach utilises the granularity of AnaCredit to identify government guaranteed loans by a combination of their collateral type, country, protection provider, and exact date of protection valuation. As we expect that companies negatively affected by the pandemic would be more likely to apply for government-guaranteed loans, we remove government-guaranteed loans from our database.[13]

The richness of our data set allows us to construct a range of further control variables (see Table 10 in the Annex for more details on how the variables within the data set are constructed). X_i represents a range of bank-borrower controls such as the loan to value ratio, whether the loan was cross border, the borrower sector, if the loan was non-performing, and if the loan was under moratoria at some point during the pandemic. Z_j includes a range of bank controls including pre-Covid-19 CET1 and NPL ratios in our baseline specification and further controls when we run robustness checks.

Our decision to carry out regressions at the bank-borrower level allows us to include α_i, a series of borrower fixed effects. As discussed in Section 2 this allows us to address an important source of endogeneity. In the case of the Covid-19 shock this endogeneity could

[13] While the current paper does not go into more details on the impact of government support measures on lending, this is an interesting area for a further research which could be performed using the approaches we apply. This is further considered in Appendix D where we examine the factors that impact the likelihood of a given collateral asset being revalued, including moratoria policies.

arise from borrowers who use real estate collateral also being exposed to real estate markets in other ways, for example in terms of cash flow from renting out the real estate buildings or selling them after construction. In this case banks may have given less loans to these borrowers because of their sharp drop in profitability and future expected profitability with the onset of the pandemic decreasing their repayment capacity and increasing their probability of default. Equally, borrowers exposed to real estate markets may not have wanted to expand their businesses during the pandemic and so may not have wanted new loans. By including borrower fixed effects our difference-in-differences effectively compares borrowing by a given firm across a range of its banking relationships, depending on the extent of real estate collateral use in each relationship prior to the pandemic. In doing so we completely control for any borrower characteristics, such as its business model and exposure to real estate markets, which may affect either borrower credit demand or banks' concern regarding its probability of default and are able to isolate the effect of real estate collateral use - which crucially varies across a borrower's various banking relationships - on new lending.

Using borrower fixed effects in this way effectively restricts our sample to borrowers with multiple bank relationships prior to Covid-19. To ensure our results are not driven by characteristics specific to this sample of borrowers, we also re-run regressions using the industry, size, location fixed effects from Degryse et al. (2019). We also acknowledge that our use of firm fixed effects varies somewhat from the original Khwaja and Mian (2008) approach whereby the treatment variable (banks' exposure to a liquidity shock) is at the bank-level instead of the bank-borrower level.

4.2 Impact of Revaluations on Credit

While this first set of regressions will tell us whether banks avoided making loans to real estate collateral-reliant borrowers despite not making large scale downward revaluations, we also want to know how revaluations affect lending behaviour when they are carried out. Our second set of regressions examine how real estate collateral revaluations identified in Section 3 impact real estate collateralised lending.

For this set of regressions we restrict our sample to banks' real estate collateralised lending activity only. We build a monthly panel data set at the bank-borrower level, starting in February 2020 and ending in September 2021. For each bank-borrower pairing we calculate month-on-month revaluations of existing real estate collateral and identify newly posted real estate collateral each month. We then identify new loans made against real estate collateral at the bank-borrower level each month. We remove data from the small number of banks which report no revaluations over the entire period, in case this is due to revaluations occurring but not being entered into AnaCredit. We also remove borrowers who do not experience any revaluations over the period and borrowers who do not take out any loans as we need to have variation in both of these variables for our borrower fixed effects to work.

Our final data set includes 18,445 bank-borrower relationships when we restrict our sample to firms with multiple borrowing relationships and 683,246 when we include all firms. Revaluations occur in approximately 6.6 per cent of observations. New loans are made in only 3.8 per cent of observations; this relatively small size makes sense in light of the sharp drop in real estate collateralised lending which occurred during the pandemic (see previous Section). There are a roughly equal number of negative and positive revaluations.As shown in Figure 4 revaluation activity shows some seasonality but is broadly constant over the time period studied.

As in a number of related papers (Gan (2007) for example) we examine implications of revaluation for both the extensive margin of lending - Was a loan made? - and the intensive margin - How big was the loan?. Our data also allow us to examine implications of revaluation for the interest rate on loans and the loans' maturity, thus providing a comprehensive picture of how revaluations affected a borrower's access to credit.[14] To account for the possibility that non-random selection in new lending will bias our sample, we first run the intensive and then extensive margin regressions as part of a two-stage Heckmann method. However, we find that inverse Mills ratios are completely insignificant and so, to simplify our method in computational terms, we run all regressions shown in Section 5.1 separately.

Equation 2 shows our extensive margin regression, carried out using a probit model. Our left hand side variable is a dummy equalling one when a new real estate collateralised loan is made in month t, by bank j to firm i. We have two coefficients of interest. β_2 will show us the effects of collateral revaluation on the likelihood of a loan being made. We enter this into our regression first using dummies which capture the occurrence of negative and positive revaluations and then enter the size of the revaluation in percentage terms.

Our second coefficient of interest, β_3, will identify if this relationship differs between high and low LTV borrowers. If changes in credit provision are driven by revaluation of collateral, we would expect the effects to be most pronounced among highly leveraged borrowers as they are likely the closest to their financing constraints, increasing the effect of changes in collateral value. While the existing literature uses a range of proxies for this type of credit constraint, we are able to measure the constraint directly by calculating the pre-pandemic loan-to-value (LTV) ratio for real estate collateralised lending in that bank-borrower relationship. Again, we use the pre-pandemic value to avoid the measure being affected by revaluations over the course of the pandemic. In our baseline specification we enter this variable as a dummy which equals 1 when the LTV is above 75 per cent. This is in line with the 75th percentile value for the variable. In our baseline regressions we examine the effect of revaluation in a given month on lending in the same month. We then extend our analysis to look at the effect of past revaluation on current lending. Throughout all of our analysis we cluster errors at the bank-borrower level.

$$\begin{aligned} new\ loan\ dummy_{i,j,t} = \beta_0 + \beta_1 * coll.\ reval.\ occurred_{i,j,t} + \beta_2 * coll.\ reval.\ nature_{i,j,t} + \\ \beta_3 * coll.reval.\ nature_{i,j,t} * high.LTV_{i,j} + \Gamma * X_{i,j,t} + \Phi * Z_j + \alpha_i + \varepsilon \end{aligned} \tag{2}$$

Again this part of our analysis faces a range of possible endogeneity issues. As before, it is possible that downward revaluations also reflect an expected drop in cash flow or viability of the firms' wider business model. We address this source of endogeneity by including firm

[14] Where multiple new loans are made in a given month we aggregate new loan volumes and calculate weighted average maturity and interest rates.

fixed effects (α_i) so that our baseline regressions compare lending for a given firm across its lending relationships, depending on revaluation actions by each bank. We then replace these fixed effects with industry, location, size fixed effects to allow our sample to include firms with only one banking relationship.

A second source of endogeneity arises from the possibility that revaluations are not randomly assigned. In particular, it is quite likely that revaluation of existing collateral is a standard part of banks' new lending process. In this case we would likely find a very strong link between revaluation occurring and a new loan being made, regardless of the direction or size of revaluation. As our goal is to understand how revaluation affects new lending via changes in the value of collateral available to be posted, we need to separate out this procedural aspect of the revaluation-lending relationship. We do this by adding a dummy which equals one when revaluation occurs at all. This means that we have two revaluation entries in our regression: One which captures whether or not a revaluation occurred at all ($coll.reval.occurred_{i,j,t}$) and another which captures the nature of this revaluation ($coll.reval.nature_{i,j,t}$). Thus the first variable should capture the "procedural" element of revaluation activity, while the second captures the "collateral value" element.

Our second step regression (Equation 3) captures the effect of revaluations on the characteristics of loans which do get made. Again our coefficients of interest are those capturing the effects of revaluations and the interaction of revaluation and leverage (β_2 and β_3). As in our first set of regressions we include firm fixed effects to address possible endogeneity issues and then replace these with industry, size, location fixed effects. We also include the dummy capturing the occurrence of revaluation, to account for the fact that revaluation may be part of banks' standard practice for certain types of new loans (e.g. large new loans) but not others. We repeat the analysis shown in Equation 3 with loan size, loan maturity and then loan interest rate as our dependent variable.

$$\begin{aligned} new\ loan\ size_{i,j,t} = \beta_0 + \beta_1 * coll.\ reval.\ occurred_{i,j,t} + \beta_2 * coll.\ reval.\ nature_{i,j,t} + \\ \beta_3 * coll.reval.\ nature_{i,j,t} * high.LTV_{i,j} + +\Gamma * X_{i,j,t} + \Phi * Z_j + \alpha_i + \varepsilon \end{aligned} \tag{3}$$

$X_{i,t}$ represents a range of bank-borrower controls. The most important of these captures the posting of new collateral by the borrower in a given month. For example, it is possible that following a downward revaluation borrowers are asked to post extra collateral but by doing so they are able to offset the effects of revaluation on their likelihood of getting a new loan. AnaCredit's granularity allows us to control for newly posted collateral and so isolate the effect of the revaluation itself. We also control for a range of characteristics of the lending relationship prior to Covid-19, such as the number of new loans between that bank and borrower which existed pre-Covid-19 and the average number of new loans made per year in the two years prior to Covid-19. Our goal here is to account for the possibility that banks carry out more revaluations on their more active lending relationships. As in our first set of regressions, Z_j includes a range of bank controls such as pre-Covid-19 CET1 and NPL ratios.

As an extension on our baseline regressions we add variables capturing the nature of revaluations at the bank level. In particular, we add a dummy equalling one if the bank's overall revaluation of real estate collateral it held was negative in that month. The purpose here is twofold. First, we want to ensure that our coefficients of interest (β_2 and β_3) specifically capture the effects of revaluation of a given borrower's collateral on new lending. For example, a bank which has developed a negative view of real estate markets or which is under stress in general may increase its revaluation activity and reduce lending to all borrowers. Thus without controlling for bank-level revaluation dynamics we run the risk of confusing borrower-level changes in collateral value with this bank-level sentiment shift. Second, the coefficient on this variable is interesting in and of itself. For example, if both the bank-borrower-level and bank-level coefficients are significant this implies that revaluations of a given borrower's collateral will affect its access to credit but that spillovers may also exist, with downward revaluation of one borrower's collateral also being associated with reduced access to credit among the bank's other real estate collateralised borrowers.

5 Implications for lending - Results

5.1 Impact of Real Estate Collateral Reliance on Credit

Our regression results confirm in the formal setting that the CRE-collateral reliant companies received less new loans than non-CRE reliant companies in the first 6 months of the Covid-19 pandemic, when the shock hit real estate markets. Table 1 shows the set of results based on the difference-in-differences econometric approach (see Section 4.1) with the ratio of new loans in the first 6 months of Covid-19 to the pre-Covid-19 stock of loans as the left-hand side variable. We control for the set of bank-borrower and bank-level variables (Borrower LTV; a dummy for domestic vs cross-border relationship; Bank NPL ratio; Bank CET1 ratio; and a dummy taking the value of 1 if any of the loans of the borrower in a given bank had been under moratoria during the Covid-19 period). In addition, we also include the borrower fixed effects, which implies that in this very conservative specification we estimate our coefficient of interest (for CRE reliance dummy) using information only about companies which had multiple bank relationships (see also Section 4.1 for more discussion).

Table 1: Relationship between lending and CRE collateral reliance - ratio of new loans to the pre-Covid-19 loan stock

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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 (pre-Covid)	0.0743	0.0715	0.0753	0.0556	0.0801
	(0.0726)	(0.0722)	(0.0743)	(0.0713)	(0.0766)
Bank CET1 ratio (pre-Covid)	-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					
Borrower	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*

Table 2: Relationship between lending and CRE collateral reliance - ratio of new loans to the pre-Covid-19 new loans

Dependent Variable:	New loans to pre-covid new loans (without gov-guaranteed loans)				
Model:	(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	-0.0549***		-0.0502***	-0.0775***	-0.0700***
	(0.0155)		(0.0156)	(0.0225)	(0.0201)
CRE inc. gen. reliance dummy		-0.0642***			
		(0.0156)			
RRE reliance dummy		-0.0553**			
		(0.0247)			
CRE own use reliance dummy		-0.0743***			
		(0.0185)			
Borrower LTV	-0.0009**	-0.0009**	-0.0009**	-0.0008**	-0.0027***
	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0008)
Cross-border dummy	-0.1271	-0.1305	-0.1287	-0.1878	-0.2717*
	(0.0842)	(0.0851)	(0.0837)	(0.1391)	(0.1478)
Bank NPL ratio (pre-Covid)	-0.0680	-0.0693	-0.0628	-0.1233	-0.0237
	(0.2807)	(0.2799)	(0.2823)	(0.2913)	(0.2894)
Bank CET1 ratio (pre-Covid)	0.0840	0.0871	0.0882	0.1654	0.1281
	(0.1017)	(0.1016)	(0.1021)	(0.1148)	(0.1155)
Moratorium dummy	-0.0713***	-0.0705***	-0.0716***	-0.0887***	-0.0716***
	(0.0179)	(0.0180)	(0.0181)	(0.0187)	(0.0188)
CRE purpose share dummy			-0.0256		
			(0.0180)		
Fixed-effects					
Borrower	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	548,099	548,099	548,099	430,092	375,700
R^2	0.85882	0.85885	0.85884	0.86729	0.84687
Within R^2	0.00234	0.00252	0.00245	0.00310	0.00265

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

The first column of Table 1 shows that the coefficient of interest is, in line with expectations, negative and significant. Its value of -0.036 means that the ratio of new loans to the pre-Covid-19 stock seems to have been 3.6 pp lower for CRE-collateral reliant companies than for other companies. Keeping in mind that the average ratio of new loans during the pandemic to loans outstanding pre-pandemic was at around 9 p.p. for non-CRE reliant borrowers, this finding implies that banks extended roughly one third less loans to CRE-collateral reliant companies than for non CRE-collateral reliant companies in the first 6 months of the Covid-19 pandemic.

Columns 2-5 of the Table 1 aim at controlling carefully for an important source of endogeneiety - simultaneity between using real estate as collateral, and depending on an income stream generated by real estate. As can be seen in Figure 2b, almost one third of real estate collateral posted was classified as income generating CRE, and over one third as RRE, which by construction, as we cover only RRE owned by NFCs, is also an income-producing asset. Accounting for this simultaneity is crucial, since the pandemic-related shock to real estate markets affected negatively not only the perceived value of the property, but also the profitability perspective for real estate. While the borrower fixed effects should already address this source of endogeneity, we also run additional checks to make sure results hold. In addition, it is possible that lending relationships across banks could be different for the same company, i.e. real estate collateralized loans could be used for the purchase of real estate planned for income generation, and we want to take this into account.

The second column shows results when we replaced the CRE-collateral reliance dummy with the dummies for real estate subcategories: RRE, CRE for own use [15] and income-generating CRE. For our needs the CRE reliance dummy based on CRE for own use is the most relevant. The results confirm that bank lending to companies which relied on CRE used for own needs as collateral was lower than for other companies in the beginning of the pandemic. Next, in the third column we control for the share of CRE-purposed loans pre-pandemic in a given bank-borrower relationship. Also in this specification the coefficient of interest is negative and significant, even if a bit smaller. Column 4 and 5 show the results of the specification from column 1, but on reduced samples. In column 4 all the borrowers who had any CRE-purposed loans in a given bank are removed. This is based on the assumption that if these borrowers had CRE-purposed loans, they would be at least to some extent reliant on CRE-income stream. Finally, column 5 shows the results where we removed all the borrowers classified as operating in any of the real estate-related NACE sectors. In columns 4 and 5 the expected effect is confirmed and the magnitude of the coefficient of interest increased to -0.0486 and -0.0461 respectively. As the results are almost unchanged, also with largely unchanged order of magnitude of the coefficient, we conclude that the endogeneity stemming from the simultaneity between using real estate as collateral and depending on income stream generated by real estate is fully accounted for in the baseline specification in column 1.

Table 2 contains a similar set of results, but with a different left hand side variable: the ratio of new loans in the first 6 months of the Covid-19 pandemic to the new loans in the period between January 2019 and February 2020. This way we get a cleaner measure of how new lending changed from before the pandemic to once it started, and we also include only the bank-borrower relationships which were actively used by the borrower to get lending in the period pre-pandemic. However, the sample size automatically reduces

[15] AnaCredit specifically identifies this type of real estate collateral as collateral which is not related to the firm's cash flow.

from 1,727,594 in columns 1-3 in Table 1 to 548,099 in the same columns of Table 2. The regression results with the ratio of new loans in Covid-19 period to new loans in pre-Covid-19 period confirm the earlier results that CRE collateral reliant companies have received less credit once the negative shock to real estate markets started than non-CRE reliant companies, with the coefficients of 0.0502-0.0743 across specifications, all of them strongly significant.

In addition, Appendix F contains a battery of robustness checks. First, we re-run the regressions contained in Tables 1 and 2 with industry-size-location fixed effects instead of borrower fixed effects to control for possible sources of endogeneity. This way we estimate the coefficient of interest using information about both companies borrowing from multiple banks and from one bank only, which tend to be smaller companies than those with many bank relationships. The results shown in Tables 16 and 20 confirm the results with almost unchanged magnitude and significance of coefficients of CRE-collateral reliance dummy. Second, Tables 17 and 21 show the results when we reduced the sample by removing the borrowers who relied partially on CRE collateral pre-pandemic, i.e. 50% to 99% of their collateral pledged in a given bank pre-pandemic was real estate. These regression results show that the coefficient of the CRE-collateral reliance dummy is negative and significant, but unsurprisingly larger in magnitude than in baseline specifications.

Finally, we also run a set of regressions accounting for the share of CRE collateral pre-pandemic at bank-level in addition to the CRE-collateral reliance dummy computed at bank-borrower level: in Tables 18 and 22 we re-run the specifications from Tables 1 and 2 including the variable on the bank share of CRE collateral, and in Tables 19 and 23 we in addition interact this variable with the CRE-collateral reliance dummy. Those regressions also show that our results largely hold, while the smaller magnitude of the analysed effect is in line with expectations given a relatively high correlation between the bank share of CRE collateral and the CRE-collateral reliance dummy at bank-borrower level.

Overall, our results seem to confirm that the expected correction of real estate prices once the pandemic started led to an instantaneous reduction of bank lending to real estate collateral reliant companies. In other words, using the Covid-19 period as a case study where a large exogenous shock hit euro area real estate markets, we empirically show how a feedback loop between asset prices and credit can start, thus leading to the "financial accelerator effect". Our results hold across a range of specifications, confirming their robustness. Importantly, by including borrower fixed effects and thus comparing outcomes for a given firm across its lending relationships, we control for firm characteristics and can isolate the effect of the type of collateral on access to credit.

There are a number of additional interesting aspects to our results. First, it is surprising that we see very limited change in banks' revaluation of real estate collateral but at the same time see a very pronounced drop in their lending to firms reliant on this collateral. Indeed, traditional economic theory would suggest that such a drop in lending should be associated with banks carrying out widespread and substantial downward revisions in their beliefs regarding real estate collateral values. Alternatively, if they do not revise downward their expectations of real estate values, then we should not see any change in lending via a collateral channel.

Second, in the second column of Tables 1 and 2 we decompose our reliance dummy into our three types of real estate collateral and find that banks cut lending across all types of collateral, including residential assets. This is interesting because in hindsight we know that residential real estate price growth actually accelerated over the period examined. However, this type of real estate price index data is typically available with a lag of multiple months and so banks may not have been aware of what direction the market was moving at the time. Indeed REIT share price dynamics show us that at this early stage of the pandemic market participants had priced a correction across all types of real estate assets (see Figure 1).

Taking these two points together we propose the following: During periods of heightened uncertainty in asset markets the collateral channel of lending can operate via an "uncertainty channel" whereby banks do not necessarily revise the collateral values up or down but still sharply reduce lending against this collateral due to uncertainty regarding the future path of its value.

Of course there remains the possibility that revaluations recorded in AnaCredit and shown in Section 3.1 are simply formalities carried out by banks and are not economically meaningful. However we will show in the next Section that, where they are carried out, they do have the expected impact on lending outcomes, suggesting that the traditional "revaluation channel" exists alongside this "uncertainty channel". Of course we accept that our analysis is only a first step in examining the existence of these two channels and that further work would be needed to formalise these as economic theory.

5.2 Impact of Revaluations on Credit

Next we present results of our econometric analysis linking observed revaluations with lending outcomes. Before carrying out more complex regressions, we first run a number of simple probits to understand how the key variables in our data set relate to each other. The first column in Table 3 shows that there is a positive and highly significant association between revaluation occurring and a new loan being made in that month. As discussed in Section 4.2 this may be simply due to revaluation of existing collateral being part of banks' lending procedures. The second column shows that new collateral being posted also has a positive and statistically significant association with new lending occurring. Finally, we can see from the third column that new collateral is more likely to be posted in months where a new loan is made and where revaluation occurs, although the second relationship is slightly weaker when that revaluation is negative. This contradicts our initial assumption that borrowers would post more collateral in response to downward revaluations and instead suggest that in periods where positive revaluations occur borrowers further increase their borrowing capacity with their bank by also posting new collateral.

Table 4 shows baseline results for our regressions examining revaluation and the extensive margin of contemporaneous lending. As discussed in Section 4.2, to account for the fact that carrying out revaluation on existing collateral is likely a standard part of the new lending process, in all specifications we control for the fact that revaluation has occurred at all and indeed we find that across all of our specifications, the coefficient for this dummy is always positive and statistically significant. In the first column we begin with a simple specifications which simply asks if the direction of revaluation affects the likelihood of a new loan being made. We find that, once revaluation has occurred, a negative revaluation decreases the likelihood of a new loan being made.

Table 3: Relationship between lending, revaluation and collateral posting variables - simple probits

Dependent Variables:	New loan dummy		New coll. posted dummy
Variables			
(Intercept)	-1.793***	-2.027***	-2.200***
	(0.0041)	(0.0048)	(0.0059)
Reval. dummy	0.2977***		0.3088***
	(0.0134)		(0.0221)
New coll. posted dummy		2.201***	
		(0.0127)	
Neg. reval. dummy			-0.0565*
			(0.0311)
New loan dummy			2.138***
			(0.0123)
Fit statistics			
Observations	342,990	363,672	342,990
Squared Correlation	0.00160	0.24588	0.26024
Pseudo R^2	0.00410	0.25597	0.30877
BIC	111,501.4	88,222.1	68,882.3

IID standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

To examine the magnitude and therefore economic significance of our coefficients, we compare the predicted likelihood of a new loan being made to a firm depending on whether it experiences a positive or negative revaluation (via the negative revaluation dummy equalling 0 and then 1). To calculate these predicted outcomes we keep the dummy for new collateral posting set to zero and use average values for all other control variables and the fixed effect. We find that a negative revaluation reduces the likelihood of new loan being made by 21 per cent, suggesting that negative revaluations did have sizeable implications for access to credit over the period studied and that, had banks carried out widespread downward revaluations of collateral values, this would have had a sizeable impact on aggregate credit dynamics.

In the second column we interact this negative revaluation dummy with our high LTV dummy and find that the effect is driven largely by highly leveraged borrowers, with a negative and significant coefficient for the interaction term and the negative revaluation dummy being insignificant when entered alone. To understand the economic magnitude of coefficients we repeat our previous exercise using the second specification and keeping the LTV dummy equal to one. Here we find that for a highly leveraged firm, a negative revaluation reduced the likelihood of receiving a new loan by 42 per cent, double our estimate without incorporating leverage.

We run a number of further specifications to further understand the link between revaluation and lending and to ensure the robustness of our results. In column 3 we instead examine the effect of receiving a positive revaluation and, as we would expect, find that this is associated with an increased likelihood of a loan being made, although there is no leverage effect in this case. Finally, we enter revaluation as a continuous variable and find that the size of a revaluation is positive and statistically significant, again indicating that revaluation activity affects borrowers' access to credit.

All specifications in Table 4 include borrower fixed effects, which has the additional implication that the sample is reduced to firms which borrow from multiple banks. We repeat this analysis using industry-size-location fixed effects and this time also including firms which borrow from one bank only. All previous findings hold, suggesting that our results apply to all firms not just those which borrow from multiple banks. We do not include time fixed effects in our baseline regressions as the inclusion of both time and borrower fixed effects does not leave much scope for variation in other key variables and we have shown that revaluation dynamics remain largely consistent over the period studied. We double check that this is not driving results by including time, industry, size, location fixed effects as a robustness check and find that the sign and significance of key coefficients remain unchanged. These results can be seen in Appendix F.

Table 5 then examines the implications of revaluation for loan size once a loan is made. Column 1 shows that following a negative revaluation loans are typically smaller but there is no differentiation between borrowers with high and low LTVs, However, Column 2 shows that the size of the revaluation is insignificant. In Column 3 we replace borrower fixed effects with industry-size-location fixed effects and expand our sample to include firms which borrow from multiple banks. We find no revaluation effect in this case. Finally, we re-run our specification *without* fixed effects. We do this for two reasons. First, to understand the role of controlling for endogeneity in driving our results and, second, because we are still interested in whether firms experiencing downward revaluations had less access to credit during Covid-19, even if this was due to firm characteristics as opposed to collateral dynamics. Here we find that firms experiencing downward revaluations received smaller loans.

We then repeat the exercise in relation to interest rates (Table 6) and maturity of new loans (Table 7). When fixed effects are included we find no link between revaluations and loan interest rates. However, when fixed effects are excluded, thus allowing for endogeneity, we find that firms which received downward revaluations typically had higher interest rates on their new loans, although counter intuitively this result reverses for highly leveraged borrowers.[16] Table 7 examines implications for the maturity of new loans and again find no link between revaluation and maturity when fixed effects are included. When fixed effects are excluded we can see that those firms which experienced negative revaluations were given shorter maturity loans by their banks. Again, this highlights the importance of fully controlling for borrower characteristics when examining the relationship between collateral dynamics and lending outcomes.

Table 8 repeats a number of key specifications, now also accounting for revaluation at the bank-level (i.e. was net revaluation across all of the bank's real estate collateral positive or negative?). Column 1 shows that when we examine the implication of negative revaluation for a loan being extended, there is an effect from revaluation at the bank-borrower-level and the bank-level. This suggests that our previous finding was not simply driven by bank-level behaviour but that fluctuations in value of a borrower's own collateral do indeed affect their access to credit. However, the additional significance of the bank-level

[16] We also control for the maturity of the new loan, in case revaluation affects banks' willingness to extend long maturity loans and this also affects the loan's interest rate.

Table 4: Implications of revaluation for likelihood of a loan being made

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*

variable suggests that spillover effects may also be present, with revaluation at bank-level affecting new lending behaviour, even when revaluation of a borrower's own collateral is already accounted for. For example, this suggests that borrowers not experiencing negative revaluations may still experience reduced access to credit if their bank develops a more negative view on the value of all of their real estate collateral.

When we look at impact on loan size in Column 2 we find no impact from bank-level revaluation and the coefficient for borrower-level revaluation remains significant as in Table 5. Columns 3 and 4 then repeat our specification looking at loan interest rate and maturity, without including fixed effects as this appears to be where the effect of revaluation is most pronounced in previous specifications. For loan maturity, the borrower-level variable remains negative and significant as before and bank-level revaluation appears to have no effect. For loan interest rate the borrower-level variable loses its significance and, excluding highly leveraged borrowers, the effect of revaluation on loan size appears to operate instead via bank-level revaluations.

Finally, we repeat our analysis instead looking at the effects of past revaluations on current lending. Specifically we look at the implications of cumulative revaluation of collateral over the past quarter and then past six months on contemporaneous lending. Again we find that negative revaluations reduce the likelihood of a new loan being made and that the size of a revaluation also affects the likelihood of loan extension, although the implications of being highly leveraged are less clear. As before the effects of revaluations appear to play out primarily via the extensive channel rather than the intensive channel, with implications for the characteristics of new loans once they are made being less clear. Key results can be found in Appendix F.

Taken together these results suggest that the formal revaluations of collateral values that we can identify in our data are indeed economically meaningful and do reflect banks' views on individual collateral values, given they have implications for bank lending decisions. Our results also confirm findings from the literature that changes in real estate values do have implication for firm credit via the role of real estate as a form of collateral. Our results show that this finding persists even when endogeneity arising from firm characteristics is accounted for and that accounting for this endogeneity has significant implications for econometric outcomes. We show that the effect of revaluation on the likelihood of new loans being extended is also economically significant in terms of its magnitude and so, should banks carry out a widespread downward revaluation of collateral values, this would have significant implications for the real economy's access to credit. Finally, our results confirm previous findings from the literature that changes in collateral values have particularly strong effects for firms who are already highly leveraged, underlining the role of leverage in amplifying feedback loops between asset prices and credit.

Table 5: Implications of revaluation for loan size once loan is made

Dependent Variable:	Loan size (% pre-Covid stock)			
Model:	(1)	(2)	(3)	(4)
Variables				
Reval. dummy	0.1419	-0.0595	-0.0298	-0.0646
	(0.2971)	(0.2807)	(0.1987)	(0.1230)
Neg. reval. dummy	-0.9095**		-0.2950	-0.4332***
	(0.4630)		(0.3187)	(0.1609)
LTV > 75% dummy	0.0481		-0.5712	-0.9431***
	(0.6390)		(0.3508)	(0.1104)
New collateral dummy	0.2861		0.4268**	0.4342***
	(0.3971)		(0.1858)	(0.0997)
Avg. size new loans 3 years pre-Covid	-6.34×10^{-7}*	-6.18×10^{-7}*	-6.42×10^{-7}***	-2.54×10^{-7}
	(3.36×10^{-7})	(3.54×10^{-7})	(1.95×10^{-7})	(2.92×10^{-7})
Bank CET1 ratio (pre-Covid)	1.043	0.9008	-0.2650	-0.3291
	(4.232)	(4.232)	(1.826)	(0.4182)
Bank NPL ratio (pre-Covid)	-33.29	-33.60	-20.01	-1.843*
	(37.93)	(38.35)	(15.06)	(1.119)
Neg. reval. dummy × LTV > 75% dummy	1.132		0.3206	0.1737
	(0.8427)		(0.3819)	(0.1952)
Reval. size (%)		-0.8836		
		(1.671)		
New coll. posted (%)		0.0136		
		(0.0162)		
(Intercept)				2.319***
				(0.1260)
Fixed-effects				
Borrower	Yes	Yes		
ISL			Yes	
Fit statistics				
Observations	8,510	8,510	23,754	23,754
R^2	0.72536	0.72520	0.71339	0.00470
Within R^2	0.00274	0.00215	0.00470	

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

Table 6: Implications of revaluation for loan interest rate once loan is made

Dependent Variable:	New loan interest rate			
Model:	(1)	(2)	(3)	(4)
Variables				
Reval. dummy	0.0002	6.64×10^{-5}	2.55×10^{-5}	8.97×10^{-5}
	(0.0003)	(0.0003)	(0.0002)	(0.0001)
Neg. reval. dummy	0.0002		0.0003	0.0005*
	(0.0005)		(0.0004)	(0.0003)
LTV > 75% dummy	0.0006		0.0002	4.3×10^{-6}
	(0.0004)		(0.0002)	(0.0001)
New collateral dummy	3.07×10^{-5}		-0.0002	-0.0008***
	(0.0002)		(0.0002)	(0.0001)
Avg. rate all pre-Covid loans	0.1841***	0.1822***	0.3185***	0.4713***
	(0.0407)	(0.0409)	(0.0251)	(0.0135)
Bank CET1 ratio (pre-Covid)	0.0029	0.0031	0.0067***	0.0141***
	(0.0029)	(0.0029)	(0.0018)	(0.0007)
Bank NPL ratio (pre-Covid)	-0.0155	-0.0153	0.0310*	0.0486***
	(0.0192)	(0.0195)	(0.0160)	(0.0042)
New loan maturity	$-2.14 \times 10^{-7***}$	$-2.14 \times 10^{-7***}$	$-4.09 \times 10^{-7***}$	$-7.01 \times 10^{-7***}$
	(7.69×10^{-8})	(7.75×10^{-8})	(4.35×10^{-8})	(2.39×10^{-8})
Neg. reval. dummy × LTV > 75% dummy	-0.0009		-0.0008	-0.0016***
	(0.0008)		(0.0006)	(0.0004)
Reval. size (%)		0.0012		
		(0.0015)		
New coll. posted (%)		2.68×10^{-6}		
		(3.65×10^{-6})		
(Intercept)				0.0080***
				(0.0004)
Fixed-effects				
Borrower	Yes	Yes		
ISL			Yes	
Fit statistics				
Observations	10,007	10,007	30,278	30,278
R^2	0.91275	0.91263	0.88203	0.37928
Within R^2	0.04550	0.04417	0.10722	

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

Table 7: Implications of revaluation for loan maturity once loan is made

Dependent Variable:	New loan maturity			
Model:	(1)	(2)	(3)	(4)
Variables				
Reval. dummy	14.43	88.22	29.21	128.3
	(182.8)	(132.0)	(78.83)	(117.3)
Neg. reval. dummy	279.0		-108.6	-302.1*
	(275.7)		(128.3)	(176.8)
LTV > 75% dummy	-165.3		125.8	132.7
	(261.3)		(103.4)	(88.79)
New collateral dummy	214.9*		255.6***	802.8***
	(110.3)		(58.25)	(60.67)
Avg. initial maturity all pre-Covid loans	0.3104***	0.3092***	0.3618***	0.6721***
	(0.0882)	(0.0892)	(0.0340)	(0.0212)
Bank CET1 ratio (pre-Covid)	-1,589.1	-1,582.8	-953.8	299.8
	(1,716.1)	(1,726.0)	(693.5)	(520.8)
Bank NPL ratio (pre-Covid)	-2,729.3	-3,247.6	-4,850.5	-2,900.0***
	(6,393.1)	(6,561.5)	(3,189.4)	(1,069.0)
Neg. reval. dummy × LTV > 75% dummy	-418.4		-12.27	2.983
	(422.4)		(196.0)	(280.3)
Reval. size (%)		-57.30		
		(1,143.8)		
New coll. posted (%)		-1.775		
		(3.455)		
(Intercept)				777.3***
				(145.0)
Fixed-effects				
Borrower	Yes	Yes		
ISL			Yes	
Fit statistics				
Observations	10,566	10,566	32,423	10,566
R^2	0.80358	0.80311	0.78635	0.34967
Within R^2	0.03265	0.03031	0.06063	

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

Table 8: Implications of revaluation at bank-level

Dependent Variables:	Loan made	Loan size	Loan maturity	Loan interest rate
Model:	(1)	(2)	(3)	(4)
	Probit	OLS	OLS	OLS
Variables				
Reval. dummy	0.2132***	0.2162	-52.40	0.0001
	(0.0288)	(0.2985)	(47.98)	(0.0001)
Neg. reval. dummy	-0.0960**	-1.077**	-275.9***	0.0004
	(0.0405)	(0.5301)	(73.77)	(0.0003)
New coll. posted dummy	2.392***			
	(0.0222)			
Avg. num new loans 3 years pre-Covid	0.0259***			
	(0.0075)			
Num. pre-Covid loans	0.0019*			
	(0.0011)			
Bank CET1 ratio (pre-Covid)	0.0779	0.8488	-1,249.5***	0.0139***
	(0.1087)	(4.187)	(203.0)	(0.0008)
Bank NPL ratio (pre-Covid)	0.3522	-32.83	-3,357.1***	0.0484***
	(0.4499)	(37.86)	(547.7)	(0.0042)
Neg. bank-level reval. dummy	-0.0283**	0.5193	-19.18	0.0003**
	(0.0130)	(0.4539)	(31.16)	(0.0001)
LTV > 75% dummy		0.0341	249.2***	-1.75×10^{-5}
		(0.6406)	(45.43)	(0.0001)
New collateral dummy		0.2815	916.0***	-0.0008***
		(0.3992)	(31.17)	(0.0001)
Avg. size new loans 3 years pre-Covid		-6.53×10^{-7}*		
		(3.36×10^{-7})		
Neg. reval. dummy × LTV > 75% dummy		1.081	95.52	-0.0016***
		(0.8326)	(117.9)	(0.0004)
(Intercept)			1,135.8***	0.0079***
			(77.15)	(0.0004)
Avg. initial maturity all pre-Covid loans			0.6124***	
			(0.0117)	
Avg. rate all pre-Covid loans				0.4711***
				(0.0135)
Loan maturity				-7×10^{-7}***
				(2.39×10^{-8})
Fixed-effects				
Borrower	Yes	Yes		
Fit statistics				
Observations	267,701	8,510	32,423	30,278
Squared Correlation	0.28650	0.72559	0.34045	0.37942
Pseudo R^2	0.34268	0.17451	0.02203	-0.07462
BIC	142,539.4	91,311.2	599,143.6	-207,923.6

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

5.3 Linking Real Estate Collateral Reliance and Revaluations

Finally, we want to check that results from our two econometric approaches are consistent with one another. Table 9 repeats our difference-in-differences analysis but adds additional variables capturing changes in value of real estate collateral over the course of the pandemic. This variable includes changes arising from the posting of new collateral and from revaluations. Results confirm that the findings discussed in Section 5.1 and Section 5.2 are indeed consistent. In simple terms, our analysis shows that banks avoided lending against real estate collateral during the pandemic, despite not carrying out large-scale downward revaluations of collateral values. However, where borrowers relied on real estate collateral *and* this collateral decreased in value the contraction in lending was larger again. In contrast, where collateral increased in value the reduction in lending was not as severe. Again this suggests that during the Covid-19 pandemic both uncertainty and revaluation channels may have been operating at the same time.

6 Conclusion

Our findings confirm that the use of real estate as collateral can create a link between real estate market dynamics and firm credit. We also confirm that borrower leverage can amplify this link and that during the Covid-19 pandemic firms relying on real estate as collateral saw a sharp reduction in their access to credit. Given the widespread use of real estate as collateral by firms, this underlines the importance of monitoring and understanding dynamics in commercial real estate markets by financial stability (and monetary) authorities. Moreover, it underlines the importance of continuing work to expand the macroprudential toolkit so that systemic risks arising from firms' exposures to commercial real estate markets can be mitigated. Progress on both of these fronts has been hampered in recent years by persistent data gaps, reducing the capacity for commercial real estate markets and banks' exposures to them to be fully understood. The development of new data sets such as AnaCredit is an important step in closing these gaps.

However, our findings also suggest that banks' treatment of collateral in the face of asset price shocks is more complex than we may have previously assumed. In particular, we show that an implicit assumption that banks map asset price fluctuations onto collateral values may be overly simplistic, with national institutional differences playing a clear role in collateral value changes and the significant asset price shock arising from the Covid-19 pandemic not appearing to drive large-scale downward revaluation of real estate collateral values. Asset market fluctuations appear to affect firms' access to credit via any associated changes in collateral values. However, it seems that asset market dynamics can also affect firms' access to credit in cases where the banking system simply avoids lending against certain types of collateral in the face of elevated market uncertainty. In this sense our work underlines the importance of granular data in helping us understand how economic theory plays out in practice. Of course, further work will need to be done to understand these "revaluation" and "uncertainty" channels we have proposed in this paper.

While our paper largely focuses on the issue from a financial stability perspective, our findings also have clear implications for the transmission of monetary policy via the collateral channel.

Table 9: Impact of both CRE dependence and changes in collateral on lending

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.0353***		-0.0322***	-0.0457***	-0.0431***
	(0.0053)		(0.0055)	(0.0102)	(0.0070)
CRE inc. gen. reliance dummy		-0.0324***			
		(0.0059)			
RRE reliance dummy		-0.0365***			
		(0.0051)			
CRE own use reliance dummy		-0.0308***			
		(0.0049)			
CRE purpose share dummy			-0.0193***		
			(0.0057)		
Borrower LTV	-5.36×10^{-5}	-5.12×10^{-5}	-5.36×10^{-5}	-6.27×10^{-5}	-5.48×10^{-5}
	(4.65×10^{-5})	(4.62×10^{-5})	(4.66×10^{-5})	(5.14×10^{-5})	(4.83×10^{-5})
Cross-border dummy	-0.0283**	-0.0276**	-0.0292**	-0.0281	-0.0362**
	(0.0118)	(0.0118)	(0.0118)	(0.0194)	(0.0164)
Bank NPL ratio (pre-Covid)	0.0756	0.0753	0.0765	0.0573	0.0801
	(0.0734)	(0.0735)	(0.0749)	(0.0716)	(0.0770)
Bank CET1 ratio (pre-Covid)	-0.0057	-0.0052	-0.0032	0.0132	-0.0128
	(0.0398)	(0.0399)	(0.0407)	(0.0508)	(0.0557)
Moratorium dummy	-0.0383***	-0.0383***	-0.0383***	-0.0533***	-0.0439***
	(0.0099)	(0.0099)	(0.0101)	(0.0130)	(0.0118)
Collateral increased	0.0152***	0.0133***	0.0165***	0.0102	0.0070
	(0.0050)	(0.0050)	(0.0048)	(0.0072)	(0.0064)
Collateral decreased	-0.0222***	-0.0241***	-0.0193***	-0.0286***	-0.0284***
	(0.0052)	(0.0053)	(0.0049)	(0.0072)	(0.0069)
Fixed-effects					
Borrower_fe	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	0.79567	0.79565	0.79573	0.81034	0.77768
Within R^2	0.00319	0.00308	0.00349	0.00397	0.00361

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

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A APPENDIX: Data set structure

Table 10: This table displays summary descriptive statistics for some of the key bank/borrower- and bank-level variables included in the difference-in-difference and probit regression analyses, including information on data sources.

	Regression Analysis		
	Difference-in-difference	***Panel probit***	
Variable	***Mean***		***Source***
Dependent Variables			
New loans to pre-Covid stock of loans	14.7%		AnaCredit
New loans to pre-Covid new loans	30%		AnaCredit
Loan made dummy		0.006	AnaCredit
Loan size (% pre-Covid)		2.1%	AnaCredit
New loan interest rate		0	AnaCredit
New loan maturity (days)		4102	AnaCredit
Variables of Interest			
CRE collateral reliance dummy	0.203		AnaCredit
CRE inc. gen. reliance dummy	0.062		AnaCredit
CRE own use reliance dummy	0.053		AnaCredit
RRE reliance dummy	0.066		AnaCredit
Revaluation dummy		0.0357	AnaCredit
Negative revaluation dummy		0.0191	AnaCredit
Positive revaluation dummy		0.0165	AnaCredit
Revaluation size		-0.0002	AnaCredit
Control Variables			
Borrower Loan to Value	74.7%	48.6%	AnaCredit
Cross-border dummy	0.01		AnaCredit
Moratorium dummy	0.25		AnaCredit
Bank NPL ratio (pre-Covid)	5%	0%	FINREP
Bank CET1 ratio (pre-Covid)	16%	20%	FINREP
New collateral posted dummy		0.005	AnaCredit
Number pre-Covid new loans (2 years)		0.344	AnaCredit
Number pre-Covid loans		1.576	AnaCredit
Negative bank-level revaluation dummy		0.331	AnaCredit

B APPENDIX: Additional Charts on Real Estate Collateral Revaluation during Covid-19 crisis

Figure 8: Frequency of Real Estate Collateral Revaluation

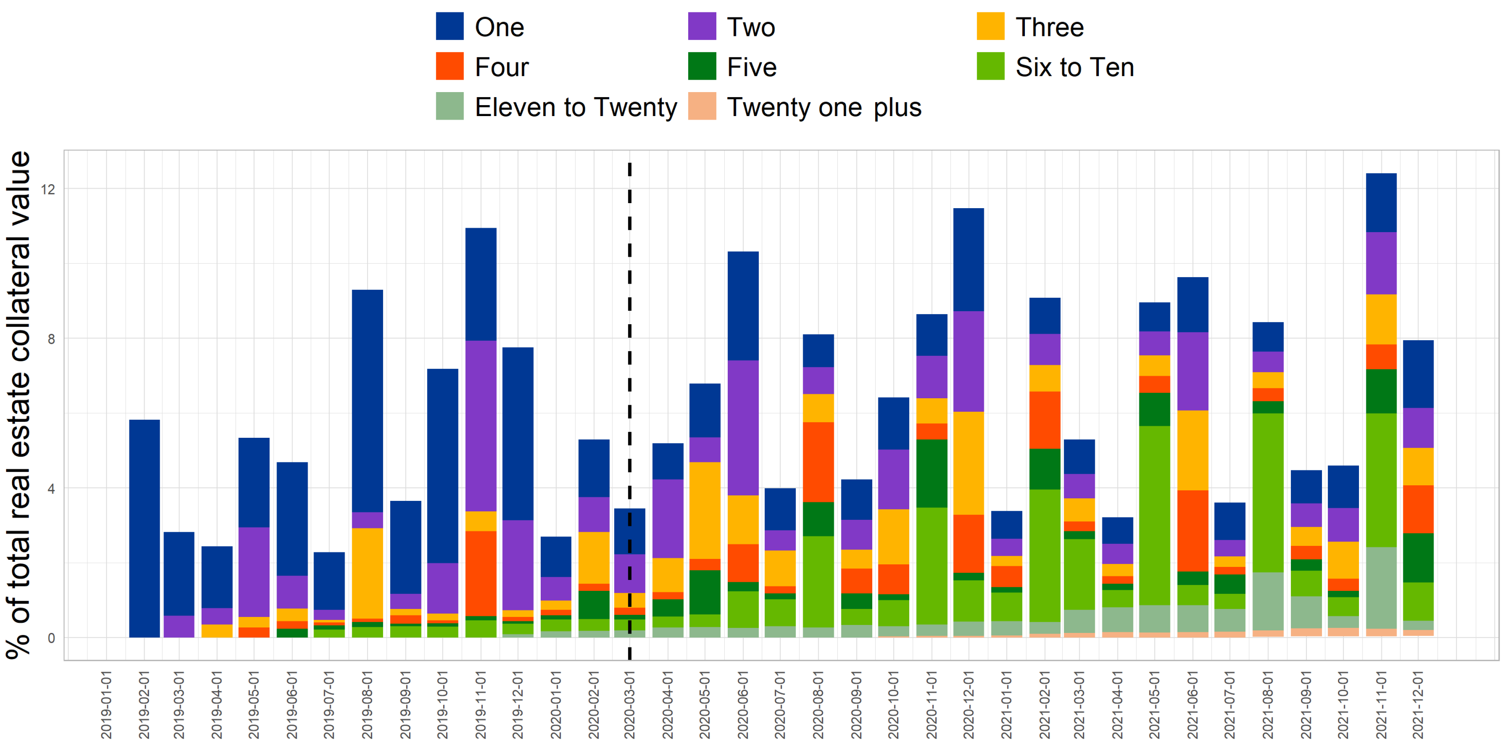


Figure 9: Frequency of Real Estate Collateral Revaluation by Country

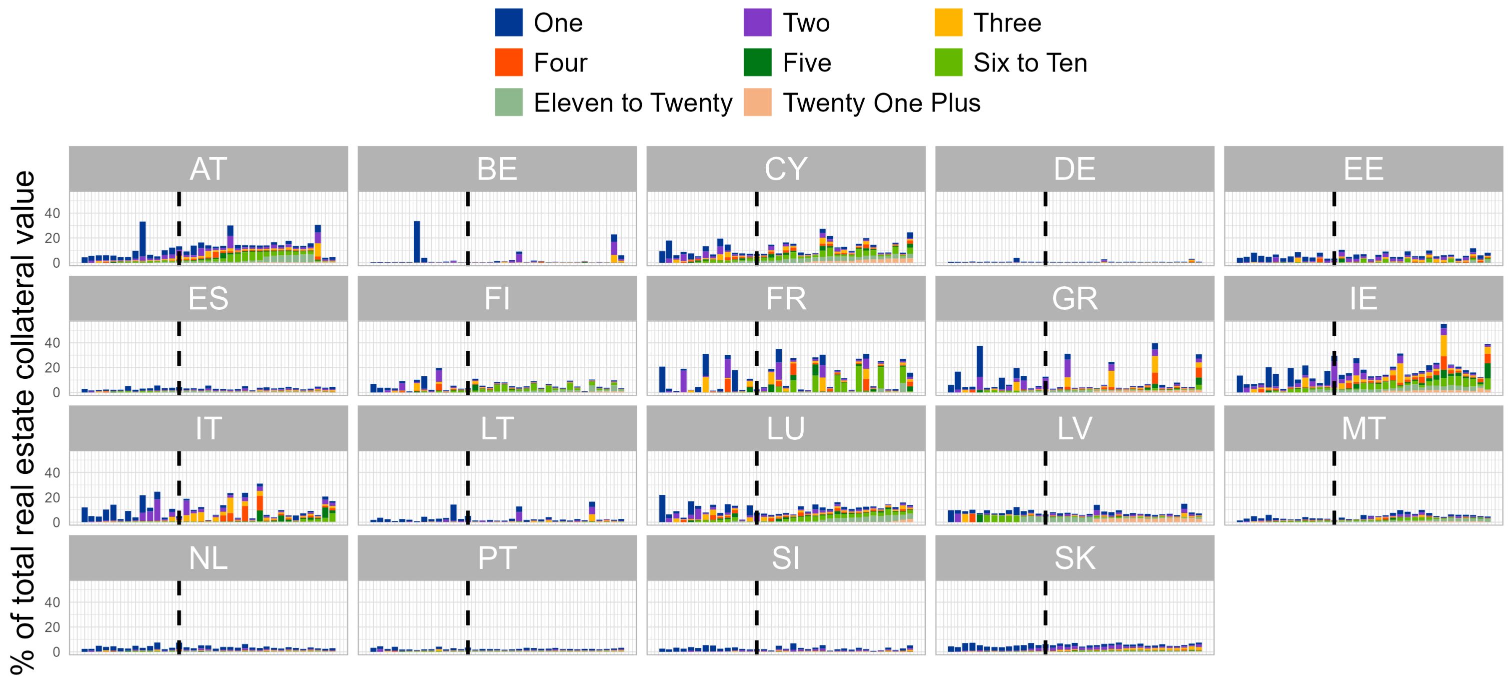
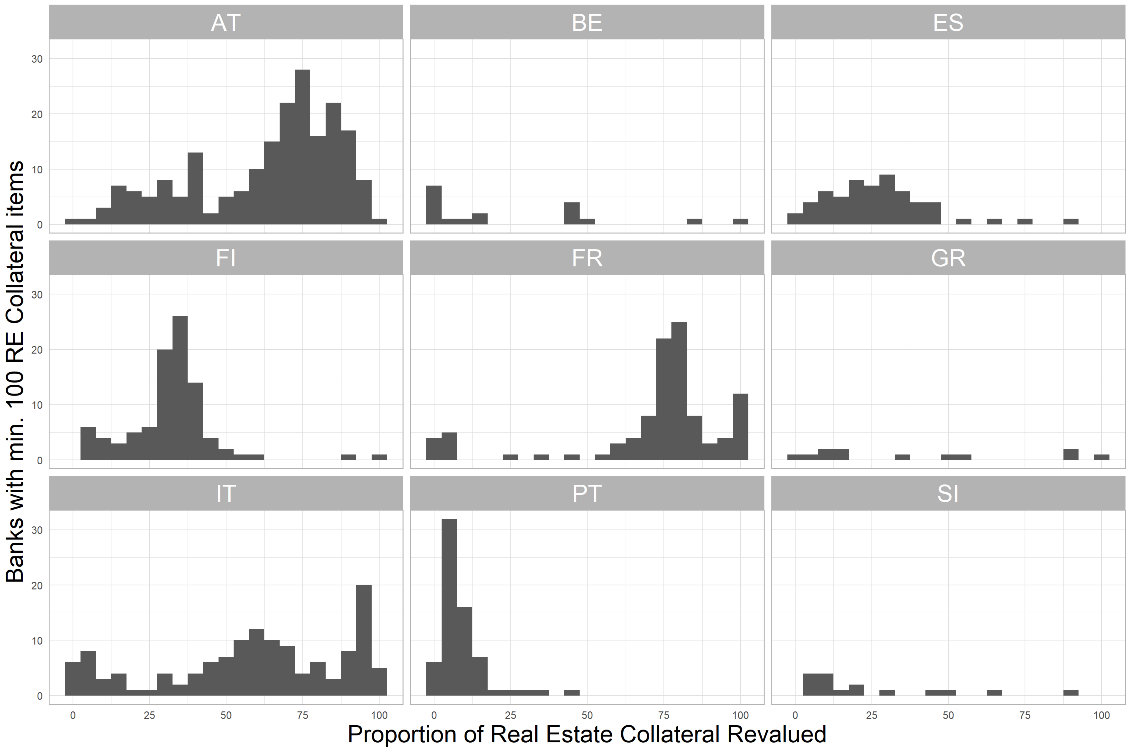
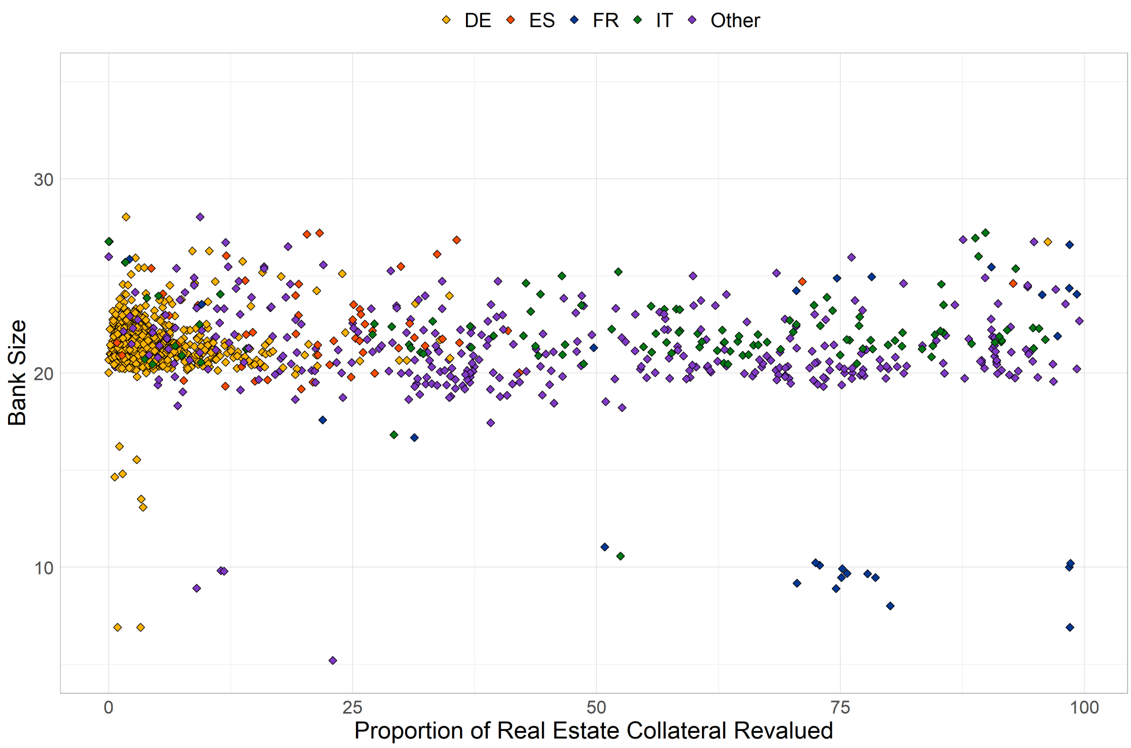


Figure 10: Proportion of Real Estate Collateral Revalued per Bank



Note: This histogram shows how many banks in each considered country revalued a given amount of their total holdings of real estate collateral over the period (2019-2021). The revaluation proportions are shown in 5% bins on the x-axis. The of banks in this chart are those registered as holding at least 100 Real Estate (RE) collateral items against their NFC loan portfolios.

Figure 11: Bank Revaluations of Real Estate Collateral and Bank Size



Note: Sample of banks are those registered as holding at least 100 Real Estate collateral items.

C APPENDIX: Further Information on CRE Reliant Borrowers

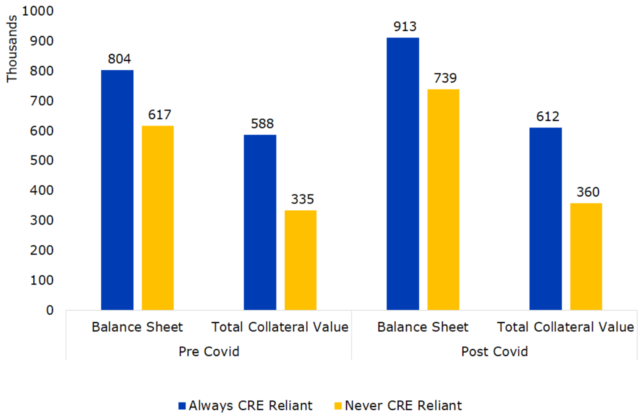
Table 11: This table compares the median characteristics of borrowers in our sample depending on their level of reliance on CRE collateral in their lending relationships.

		Always CRE Reliant	*Never CRE Reliant*	*Sometimes CRE Reliant*
Financial Position				
Pre Covid	Balance Sheet	804,000	617,231	2,208,213
	Total Collateral Value	587,980	334,682	2,019,280
Post Covid	Balance Sheet	913,000	739,422	2,746,000
	Total Collateral Value	612,396	359,608	2,141,984
Change	Balance Sheet	+14%	+20%	+24%
	Total Posted Collateral Value	+4%	+7%	+6%
Borrowing Behaviours				
Pre Covid	Loan Stock	173,727	113,089	609,324
	Mean Monthly New Loans	8,689	10,256	35,992
Post Covid	Loan Stock (excl. gov. guar.)	168,470	109,380	596,556
	Loan Stock (incl. gov. guar.)	171,921	119,664	639,153
	Monthly New Loans (excl. gov. guar.)	3,292	7,098	20,411
	Monthly New Loans (incl. gov. guar.)	4,601	10,960	32,792
Change	Loan Stock (excl. gov. guar.)	-1%	+6%	+5%
	Monthly New Loans (excl. gov. guar.)	-62%	-31%	-43%
Performance				
Pre Covid	Loan to Value Ratio	38%	42%	50%
	Probability of Default	1.20%	1.98%	1.86%
Post Covid	Loans under moratoria (prop. of borrowers with min. 1)	20%	25%	24%

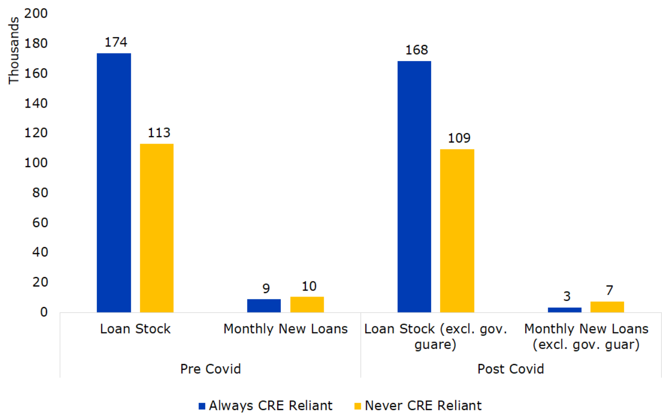
Note: All figures are median unless otherwise stated. Monthly New Loans are the mean value of the 14 months pre-Covid-19 and the 6 months post-Covid-19.

Figure 12: Comparison of Borrower Types - Simplified

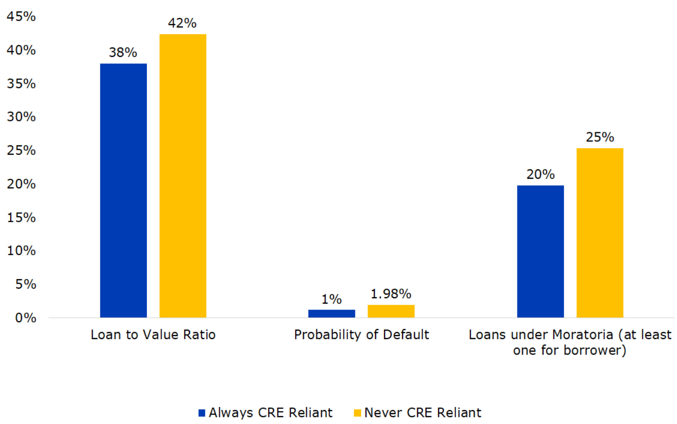
(a) Financial Position



(b) Borrowing Behaviour



(c) Performance



Note: This chart is a simplified version of Figure 6 which provides a more detailed breakdown of borrower characteristics based on their CRE reliance and the number of banking relationships the firm holds. In this chart, the number of firm relationships is not considered and firms who are Sometimes CRE Reliant are excluded to allow for simple comparison of CRE reliant and non-CRE reliant firms.

D APPENDIX: What collateral gets revalued?

The fact that not all collateral was revalued over the considered time period in response to the shock of Covid-19 raises the question; which collateral items were revalued? We provide some examination of this question here that was undertaken to complement our understanding of real estate collateral revaluations more generally.

A panel probit model with country and time fixed effects was used to investigate the loan, borrower, and collateral characteristics that significantly impacted the likelihood of a real estate collateral asset being revalued by a bank. The primary specification employed a binary dependent variable of whether revaluation took place in a given quarter. Subsequently a multinominal probit model was used to examine if the revaluation probabilities changed when considering either upward or downward revaluation to see if certain characteristics play a different role in the up- and downswings of the cycle. Country and time fixed effects were applied to reduce endogeneity, in that revaluation probabilities may be determined by factors outside of that considered in the model and rather were triggered by localised market factors during the period.

Fixed Effects Probit Model

$$Y_{i,t} = \alpha_i + \lambda_t + \sum \beta_k(V_k) + \varepsilon \tag{4}$$

$$\text{where} \quad Y^*_{i,t} = \begin{cases} 0 & \text{no revaluation} \\ 1 & \textit{Specification 1:} \text{ any change in collateral value} \\ 1 & \textit{Specification 2:} \text{ a positive change in collateral value} \\ 1 & \textit{Specification 3:} \text{ a negative change in collateral value} \end{cases}$$

α_i = country fixed effects
λ_t = time fixed effects
V_k = time varying covariates of loan, collateral, bank, and borrower characteristics
ε is i.i.d. logistic and presents a strict exogeneity assumption on the regressors

Result tables are presented with coefficients, the level of significance, and odds ratios in the brackets, due to the limited interpretational value of coefficients in a probit model. The odds ratios are calculated as the exponents of the coefficient, with the interpretation that, all else equal, an increase of the variable by 1 unit, odds of $y = 1$ vs $y = 0$ increase by factor $\exp(\beta)$.

Across the majority of specifications, a loan being in financial distress (i.e. being flagged as non-performing) significantly increased the likelihood of the revaluation of an associated collateral item (Table 12). This is seen at an aggregate level and remains significant in all asset type and country level breakdowns, though the strength of the coefficient varies. This suggests that banks are more proactive in monitoring the potential losses given default (LGDs) of those loans with a higher risk profile..

A collateral item being associated with a loan under moratoria during the pandemic also increased its likelihood of being revalued over the period, likely for similar reasons of increased risk associated with these loans in the case that repayment did not continue following the end of the moratoria. Again, this finding held across specifications, through its strength varied at a country level (Table 15). As such, the use of Covid-19 policies such as moratoria were unlikely to be a primary explanatory factor in the limited levels of revaluation at an aggregate level seen during the period. Another borrower level factor that influenced revaluation likelihood in aggregate specifications was the type of collateral asset; however there was instability in this finding when looking at country level specifications. A breakdown of the differences between the revaluation drivers for CRE (income generating and own use) and RRE assets is included in Table 13.

While the coefficients for borrower leverage are not strong, it is interesting to note that on aggregate, revaluation is slightly more likely in cases of downward revaluation than for upward revaluation. This links to the analysis in Section 5.2 on the lending outcomes for leveraged borrowers when a revaluation takes place.

Table 12: Factors influencing the likelihood of revaluation

	Any Revaluation	*Upward Revaluation*	*Downward Revaluation*
Borrower Variables			
LTV Ratio	−0.00***	−0.06***	0.04***
	(1.00)	(0.95)	(1.04)
Non Performing Loan	0.28***	0.26***	0.25***
	(1.32)	(1.30)	(1.28)
Moratoria	0.25***	0.26***	0.24***
	(1.28)	(1.29)	(1.27)
Borrower Size	−0.03***	−0.01***	−0.05***
	(0.97)	(0.99)	(0.95)
Time Since Revaluation	−0.50***	−0.52***	−0.48***
	(0.60)	(0.59)	(0.62)
Own Use Collateral	0.19***	0.19***	0.19***
	(1.21)	(1.21)	(1.21)
RRE Collateral	0.25***	0.24***	0.24***
	(1.29)	(1.27)	(1.27)
Bank Variables			
CET1 ratio (pre-Covid)	0.04***	0.04***	0.04***
	(1.04)	(1.04)	(1.04)
Bank Size	0.04***	0.06***	0.04***
	(1.04)	(1.06)	(1.04)
Sector			
Accommodation	−0.14***	−0.15***	−0.13***
	(0.87)	(0.86)	(0.88)
Construction	−0.03***	−0.05***	−0.02***
	(0.97)	(0.96)	(0.98)
Manufacturing	−0.01***	−0.03***	0.01
	(0.99)	(0.97)	(1.01)
Real Estate	0.11***	0.10***	0.12***
	(1.12)	(1.11)	(1.13)
Trade	−0.10***	−0.10***	−0.08***
	(0.91)	(0.91)	(0.92)
Transport	0.01	0.00	0.02*
	(1.01)	(1.00)	(1.02)
Log Likelihood	−1496204.48	−997287.16	−1019049.42
Deviance	2992408.95	1994574.33	2038098.85
Num. obs.	3309036	2753344	2771805

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

In general, the significant heterogeneity in how individual countries approach revaluation limited the ability to produce stable findings from this analysis. The factors that influence the likelihood of a collateral revaluation varied highly across countries with few variables remaining significant at both the aggregate and subset levels. Some patterns can be found by grouping countries with similar approaches to revaluation (Table 15).

Table 13: Factors influencing the likelihood of revaluation - By Asset Type

	CRE			RRE		
	Any	*Up*	*Down*	*Any*	*Up*	*Down*
Borrower Variables						
LTV Ratio	0.02***	−0.03***	0.06***	−0.01***	−0.08***	0.04***
	(1.02)	(0.97)	(1.06)	(0.99)	(0.92)	(1.04)
Non Performing Loan	0.21***	0.19***	0.19***	0.38***	0.38***	0.34***
	(1.23)	(1.21)	(1.20)	(1.46)	(1.46)	(1.40)
Moratoria	0.25***	0.25***	0.25***	0.28***	0.30***	0.27***
	(1.28)	(1.29)	(1.29)	(1.33)	(1.35)	(1.31)
Borrower Size	−0.00	0.02***	−0.04***	−0.04***	−0.02***	−0.05***
	(1.00)	(1.02)	(0.97)	(0.96)	(0.98)	(0.95)
Time Since Revaluation	−0.57***	−0.53***	−0.62***	−0.38***	−0.46***	−0.31***
	(0.56)	(0.59)	(0.54)	(0.68)	(0.63)	(0.73)
Bank Variables						
CET1 ratio (pre-Covid)	0.02***	0.03***	0.02***	0.05***	0.05***	0.05***
	(1.02)	(1.03)	(1.02)	(1.06)	(1.06)	(1.06)
Bank Size	−0.00	0.01***	0.00	0.11***	0.13***	0.10***
	(1.00)	(1.01)	(1.00)	(1.12)	(1.14)	(1.10)
Sector						
Accommodation	−0.17***	−0.17***	−0.16***	−0.01	−0.02	−0.00
	(0.85)	(0.84)	(0.85)	(0.99)	(0.98)	(1.00)
Construction	−0.04***	−0.04***	−0.04***	−0.01	−0.03***	−0.00
	(0.96)	(0.96)	(0.96)	(0.99)	(0.97)	(1.00)
Manufacturing	−0.03***	−0.04***	−0.01	0.02**	0.02	0.03**
	(0.97)	(0.96)	(0.99)	(1.02)	(1.02)	(1.03)
Real Estate	0.18***	0.18***	0.19***	−0.08***	−0.08***	−0.07***
	(1.20)	(1.19)	(1.21)	(0.93)	(0.93)	(0.94)
Trade	−0.10***	−0.10***	−0.09***	0.00	−0.00	0.00
	(0.91)	(0.90)	(0.91)	(1.00)	(1.00)	(1.00)
Transport	−0.04***	−0.04**	−0.03**	0.09***	0.07***	0.10***
	(0.97)	(0.96)	(0.97)	(1.10)	(1.08)	(1.11)
Log Likelihood	−954136.28	−639545.25	−650089.52	−514877.92	−340598.22	−348627.11
Deviance	1908272.56	1279090.50	1300179.05	1029755.85	681196.44	697254.21
Num. obs.	2069037	1700539	1725498	1239999	1052805	1046307

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 14: Factors influencing the likelihood of revaluation - Large Countries

	Aggregate	*Germany*	*France*	*Italy*	*Spain*
Borrower Variables					
LTV Ratio	−0.00***	−0.03***	−0.01***	−0.08***	0.10***
	(1.00)	(0.97)	(0.99)	(0.93)	(1.11)
Non Performing Loan	0.28***	0.27***	0.52***	0.03***	0.74***
	(1.32)	(1.31)	(1.68)	(1.03)	(2.09)
Moratoria	0.25***	0.10***	0.37***	0.34***	0.39***
	(1.28)	(1.10)	(1.44)	(1.40)	(1.47)
Borrower Size	−0.03***	0.12***	−0.04***	−0.04***	−0.12***
	(0.97)	(1.13)	(0.96)	(0.96)	(0.89)
Time Since Revaluation	−0.50***	−0.48***	−0.91***	−1.09***	−0.20***
	(0.60)	(0.62)	(0.40)	(0.34)	(0.82)
Own Use Collateral	0.19***	−0.33***	−0.03***	0.22***	0.05***
	(1.21)	(0.72)	(0.97)	(1.25)	(1.05)
RRE Collateral	0.25***	−0.39***	0.51***	−0.07***	0.02***
	(1.29)	(0.68)	(1.67)	(0.93)	(1.02)
Bank Variables					
CET1 ratio (pre-Covid)	0.04***	−0.05***	0.14***	−0.12***	−0.04***
	(1.04)	(0.95)	(1.15)	(0.89)	(0.96)
Bank Size	0.04***	0.01**	−0.16***	0.13***	−0.05***
	(1.04)	(1.01)	(0.85)	(1.14)	(0.95)
Sector					
Accommodation	−0.14***	−0.02	−0.57***	−0.07***	0.12***
	(0.87)	(0.98)	(0.56)	(0.93)	(1.12)
Construction	−0.03***	0.09***	−0.01	−0.11***	0.10***
	(0.97)	(1.10)	(0.99)	(0.90)	(1.10)
Manufacturing	−0.01***	0.01	−0.40***	−0.05***	0.05***
	(0.99)	(1.01)	(0.67)	(0.95)	(1.05)
Real Estate	0.11***	−0.06***	0.36***	−0.02*	0.03***
	(1.12)	(0.94)	(1.44)	(0.99)	(1.03)
Trade	−0.10***	−0.06***	−0.47***	−0.04***	0.04***
	(0.91)	(0.94)	(0.62)	(0.96)	(1.04)
Transport	0.01	−0.10***	−0.12***	−0.04*	0.04*
	(1.01)	(0.90)	(0.88)	(0.96)	(1.04)
Log Likelihood	−1496204.48	−122296.62	−438655.14	−225325.28	−183727.84
Deviance	2992408.95	244593.23	877310.29	450650.57	367455.68
Num. obs.	3309036	712700	972233	455121	415807

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 15: Factors influencing the likelihood of revaluation - By Country Groupings

	Aggregate	*High*	*Medium*	*Low*
Borrower Variables				
LTV Ratio	−0.00***	−0.03***	0.07***	−0.03***
	(1.00)	(0.97)	(1.07)	(0.97)
Non Performing Loan	0.28***	0.11***	0.66***	0.43***
	(1.32)	(1.12)	(1.93)	(1.54)
Moratoria	0.25***	0.27***	0.34***	0.11***
	(1.28)	(1.30)	(1.40)	(1.12)
Borrower Size	−0.03***	−0.05***	−0.02***	0.11***
	(0.97)	(0.96)	(0.98)	(1.12)
Time Since Revaluation	−0.50***	−0.88***	−0.24***	−0.44***
	(0.60)	(0.41)	(0.79)	(0.64)
Own Use Collateral	0.19***	0.23***	−0.10***	0.83***
	(1.21)	(1.26)	(0.91)	(2.28)
RRE Collateral	0.25***	0.20***	0.12***	0.93***
	(1.29)	(1.23)	(1.12)	(2.54)
Bank Variables				
CET1 ratio (pre-Covid)	0.04***	0.05***	0.02***	0.04***
	(1.04)	(1.05)	(1.02)	(1.04)
Bank Size	0.04***	0.08***	0.00	0.08***
	(1.04)	(1.09)	(1.00)	(1.09)
Sector				
Accommodation	−0.14***	−0.18***	0.06***	−0.06***
	(0.87)	(0.84)	(1.06)	(0.94)
Construction	−0.03***	−0.06***	0.02***	0.00
	(0.97)	(0.94)	(1.02)	(1.00)
Manufacturing	−0.01***	−0.03***	0.02*	−0.01
	(0.99)	(0.97)	(1.02)	(0.99)
Real Estate	0.11***	0.23***	−0.10***	−0.07***
	(1.12)	(1.26)	(0.91)	(0.94)
Trade	−0.10***	−0.13***	0.01	−0.09***
	(0.91)	(0.88)	(1.01)	(0.91)
Transport	0.01	−0.01	0.07***	−0.13***
	(1.01)	(0.99)	(1.07)	(0.88)
Log Likelihood	−1496204.48	−930853.82	−320588.05	−200012.89
Deviance	2992408.95	1861707.65	641176.10	400025.78
Num. obs.	3309036	1639663	705824	963549

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

E APPENDIX: Robustness Tests - Difference in difference

Table 16: Robustness Check 1:
LHS: New loans to pre-Covid-19 stock
Industry Size Location Fixed Effects
Full Sample

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.0305***		-0.0268***	-0.0434***	-0.0538***
	(0.0076)		(0.0069)	(0.0128)	(0.0132)
CRE inc. gen. reliance dummy		-0.0336***			
		(0.0087)			
RRE reliance dummy		-0.0385***			
		(0.0093)			
CRE own use reliance dummy		-0.0390***			
		(0.0077)			
Borrower LTV	-4.65×10^{-5}	-4.81×10^{-5}	-4.69×10^{-5}	-6.7×10^{-5}	-8.32×10^{-5}
	(3.3×10^{-5})	(3.34×10^{-5})	(3.28×10^{-5})	(5.21×10^{-5})	(7.44×10^{-5})
Cross-border dummy	-0.0258***	-0.0266***	-0.0255***	-0.0314*	-0.0332**
	(0.0093)	(0.0094)	(0.0094)	(0.0163)	(0.0162)
Bank NPL ratio (pre-Covid)	0.0717	0.0671	0.0726	0.0621	0.0856
	(0.1006)	(0.1004)	(0.1017)	(0.1200)	(0.1226)
Bank CET1 ratio (pre-Covid)	-0.0176	-0.0196	-0.0163	-0.0088	-0.0209
	(0.0346)	(0.0349)	(0.0353)	(0.0484)	(0.0705)
Moratorium dummy	-0.0169***	-0.0162***	-0.0175***	-0.0286***	-0.0254***
	(0.0055)	(0.0055)	(0.0057)	(0.0087)	(0.0095)
CRE purpose share dummy			-0.0233***		
			(0.0074)		
Fixed-effects					
ISL_fe	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	0.56484	0.56506	0.56521	0.60774	0.59924
Within R^2	0.00297	0.00348	0.00383	0.00420	0.00455

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

Table 17: Robustness Check 2:
LHS: New loans to pre-Covid-19 stock
Borrower Fixed Effects
Sub-Sample (Removed 50-99% CRE reliant borrowers)

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.0511***		-0.0478***	-0.0629***	-0.0583***
	(0.0089)		(0.0088)	(0.0134)	(0.0099)
CRE inc. gen. reliance dummy		-0.0475***			
		(0.0087)			
RRE reliance dummy		-0.0533***			
		(0.0091)			
CRE own use reliance dummy		-0.0494***			
		(0.0077)			
Borrower LTV	-6.45×10^{-5}	-6.26×10^{-5}	-6.53×10^{-5}	-6.83×10^{-5}	-6.19×10^{-5}
	(5.29×10^{-5})	(5.25×10^{-5})	(5.31×10^{-5})	(5.23×10^{-5})	(5.35×10^{-5})
Cross-border dummy	-0.0363***	-0.0359***	-0.0370***	-0.0339	-0.0382**
	(0.0134)	(0.0134)	(0.0134)	(0.0207)	(0.0173)
Bank NPL ratio (pre-Covid)	0.0647	0.0627	0.0656	0.0373	0.0665
	(0.0859)	(0.0859)	(0.0871)	(0.0835)	(0.0888)
Bank CET1 ratio (pre-Covid)	-0.0142	-0.0137	-0.0134	0.0178	-0.0187
	(0.0507)	(0.0509)	(0.0514)	(0.0612)	(0.0683)
Moratorium dummy	-0.0465***	-0.0465***	-0.0465***	-0.0610***	-0.0508***
	(0.0122)	(0.0122)	(0.0123)	(0.0146)	(0.0137)
CRE purpose share dummy			-0.0150**		
			(0.0064)		
Fixed-effects					
dbtr_id	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	1,460,551	1,460,551	1,460,551	1,074,643	949,771
R^2	0.80779	0.80778	0.80782	0.81741	0.78940
Within R^2	0.00351	0.00344	0.00364	0.00431	0.00388

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

Table 18: Robustness Check 3:
LHS: New loans to pre-Covid-19 stock
Borrower Fixed Effects
Full Sample
Control for bank share of CRE collateral

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.0268***		-0.0234***	-0.0377***	-0.0360***
	(0.0047)		(0.0048)	(0.0088)	(0.0062)
CRE inc. gen. reliance dummy		-0.0355***			
		(0.0061)			
RRE reliance dummy		-0.0328***			
		(0.0048)			
CRE own use reliance dummy		-0.0339***			
		(0.0046)			
Borrower LTV	-5.13×10^{-5}	-5.4×10^{-5}	-5.19×10^{-5}	-6.22×10^{-5}	-5.07×10^{-5}
	(4.66×10^{-5})	(4.66×10^{-5})	(4.67×10^{-5})	(5.16×10^{-5})	(4.84×10^{-5})
Cross-border dummy	-0.0269**	-0.0281**	-0.0281**	-0.0278	-0.0346**
	(0.0118)	(0.0118)	(0.0118)	(0.0197)	(0.0167)
Bank NPL ratio (pre-Covid)	0.0637	0.0621	0.0650	0.0398	0.0679
	(0.0723)	(0.0720)	(0.0739)	(0.0711)	(0.0765)
Bank CET1 ratio (pre-Covid)	-0.0186	-0.0199	-0.0150	0.0100	-0.0240
	(0.0407)	(0.0406)	(0.0417)	(0.0515)	(0.0570)
Moratorium dummy	-0.0372***	-0.0368***	-0.0372***	-0.0522***	-0.0428***
	(0.0097)	(0.0098)	(0.0099)	(0.0127)	(0.0116)
Bank share of CRE coll.	-0.0377**	-0.0348**	-0.0364**	-0.0456**	-0.0407**
	(0.0153)	(0.0148)	(0.0153)	(0.0194)	(0.0177)
CRE purpose share dummy			-0.0201***		
			(0.0058)		
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	0.79566	0.79573	0.79573	0.81039	0.77771
Within R^2	0.00315	0.00348	0.00348	0.00422	0.00373

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

Table 19: Robustness Check 4:
LHS: New loans to pre-Covid-19 stock
Borrower Fixed Effects
Full Sample
Control for bank share of CRE collateral - Interactions

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.0563***		-0.0533***	-0.0488**	-0.0654***
	(0.0157)		(0.0154)	(0.0249)	(0.0209)
CRE inc. gen. reliance dummy		-0.0624***			
		(0.0173)			
RRE reliance dummy		-0.0682***			
		(0.0181)			
CRE own use reliance dummy		-0.0614***			
		(0.0152)			
Bank share of CRE coll. (Bank CRE)	-0.0463**	-0.0442**	-0.0452**	-0.0471**	-0.0459**
	(0.0194)	(0.0192)	(0.0193)	(0.0214)	(0.0207)
Bank CRE × CRE reliance dummy	0.0430*		0.0434*	0.0156	0.0415
	(0.0255)		(0.0261)	(0.0443)	(0.0342)
Bank CRE × CRE inc. gen. dummy		0.0408			
		(0.0266)			
Bank CRE × RRE reliance dummy		0.0496*			
		(0.0264)			
Bank CRE × CRE own use dummy		0.0423*			
		(0.0239)			
Borrower LTV	-5.17×10^{-5}	-5.43×10^{-5}	-5.23×10^{-5}	-6.24×10^{-5}	-5.13×10^{-5}
	(4.67×10^{-5})	(4.67×10^{-5})	(4.68×10^{-5})	(5.16×10^{-5})	(4.85×10^{-5})
Cross-border dummy	-0.0273**	-0.0286**	-0.0284**	-0.0279	-0.0347**
	(0.0118)	(0.0119)	(0.0119)	(0.0197)	(0.0168)
Bank NPL ratio (pre-Covid)	0.0617	0.0581	0.0630	0.0395	0.0667
	(0.0725)	(0.0722)	(0.0741)	(0.0711)	(0.0766)
Bank CET1 ratio (pre-Covid)	-0.0184	-0.0209	-0.0148	0.0099	-0.0243
	(0.0410)	(0.0410)	(0.0419)	(0.0516)	(0.0573)
Moratorium dummy	-0.0373***	-0.0367***	-0.0374***	-0.0522***	-0.0428***
	(0.0097)	(0.0098)	(0.0099)	(0.0127)	(0.0115)
CRE purpose share dummy			-0.0202***		
			(0.0058)		
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	0.79568	0.79575	0.79575	0.81039	0.77772
Within R^2	0.00325	0.00359	0.00358	0.00423	0.00378

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

Table 20: Robustness Check 5:
LHS: New loans to pre-Covid-19 new loans
Industry Size Location Fixed Effects
Full Sample

Dependent Variable:	New loans to pre-covid new loans (without gov-guaranteed loans)				
Model:	(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	-0.0495***		-0.0444***	-0.0647**	-0.0828***
	(0.0164)		(0.0149)	(0.0277)	(0.0290)
CRE inc. gen. reliance dummy		-0.0496***			
		(0.0164)			
RRE reliance dummy		-0.0606***			
		(0.0202)			
CRE own use reliance dummy		-0.0613***			
		(0.0170)			
Borrower LTV	-0.0003*	-0.0003*	-0.0003*	-0.0010	-0.0016
	(0.0002)	(0.0002)	(0.0002)	(0.0007)	(0.0011)
Cross-border dummy	-0.0691	-0.0707	-0.0693	-0.0425	-0.1297
	(0.0493)	(0.0495)	(0.0492)	(0.0953)	(0.1035)
Bank NPL ratio (pre-Covid)	-0.1139	-0.1194	-0.1074	-0.1597	-0.1075
	(0.4674)	(0.4659)	(0.4697)	(0.5777)	(0.5832)
Bank CET1 ratio (pre-Covid)	0.0279	0.0288	0.0292	0.0902	0.1223
	(0.0930)	(0.0932)	(0.0937)	(0.1438)	(0.1703)
Moratorium dummy	-0.0363**	-0.0357**	-0.0374**	-0.0559**	-0.0450*
	(0.0157)	(0.0157)	(0.0159)	(0.0223)	(0.0240)
CRE purpose share dummy			-0.0315*		
			(0.0188)		
Fixed-effects					
ISL_fe	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	548,099	548,099	548,099	430,092	375,700
R^2	0.69742	0.69748	0.69753	0.73009	0.71902
Within R^2	0.00320	0.00339	0.00357	0.00407	0.00331

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

Table 21: Robustness Check 6:
LHS: New loans to pre-Covid-19 new loans
Borrower Fixed Effects
Sub-Sample (Removed 50-99% CRE reliant borrowers)

Dependent Variable:	New loans to pre-covid new loans (without gov-guaranteed loans)				
Model:	(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	-0.0704***		-0.0656***	-0.0808***	-0.0745***
	(0.0196)		(0.0197)	(0.0267)	(0.0237)
CRE inc. gen. reliance dummy		-0.0612***			
		(0.0208)			
RRE reliance dummy		-0.0570**			
		(0.0274)			
CRE own use reliance dummy		-0.0783***			
		(0.0230)			
Borrower LTV	-0.0009**	-0.0008**	-0.0009**	-0.0007**	-0.0034***
	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0012)
Cross-border dummy	-0.1542*	-0.1543*	-0.1546*	-0.2187	-0.2420
	(0.0883)	(0.0886)	(0.0882)	(0.1627)	(0.1789)
Bank NPL ratio (pre-Covid)	-0.0711	-0.0721	-0.0663	-0.1551	-0.0235
	(0.2934)	(0.2933)	(0.2942)	(0.2990)	(0.3000)
Bank CET1 ratio (pre-Covid)	0.0641	0.0620	0.0650	0.1631	0.1181
	(0.1208)	(0.1208)	(0.1211)	(0.1299)	(0.1334)
Moratorium dummy	-0.0790***	-0.0790***	-0.0793***	-0.0970***	-0.0799***
	(0.0191)	(0.0191)	(0.0192)	(0.0193)	(0.0195)
CRE purpose share dummy			-0.0220		
			(0.0222)		
Fixed-effects					
dbtr_id	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	485,561	485,561	485,561	393,556	341,937
R^2	0.86435	0.86435	0.86436	0.86984	0.85232
Within R^2	0.00274	0.00270	0.00280	0.00354	0.00299

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

Table 22: Robustness Check 7:
LHS: New loans to pre-Covid-19 new loans
Borrower Fixed Effects
Full Sample
Control for bank share of CRE collateral

Dependent Variable:	New loans to pre-covid new loans (without gov-guaranteed loans)				
Model:	(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	-0.0277		-0.0241	-0.0441*	-0.0422*
	(0.0180)		(0.0187)	(0.0262)	(0.0226)
CRE inc. gen. reliance dummy		-0.0368**			
		(0.0171)			
RRE reliance dummy		-0.0336			
		(0.0251)			
CRE own use reliance dummy		-0.0569***			
		(0.0179)			
Borrower LTV	-0.0009**	-0.0009**	-0.0009**	-0.0008**	-0.0027***
	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0008)
Cross-border dummy	-0.1191	-0.1234	-0.1206	-0.1774	-0.2676*
	(0.0852)	(0.0858)	(0.0847)	(0.1416)	(0.1492)
Bank NPL ratio (pre-Covid)	-0.1119	-0.1128	-0.1068	-0.1814	-0.0617
	(0.2856)	(0.2849)	(0.2866)	(0.2984)	(0.2949)
Bank CET1 ratio (pre-Covid)	0.0675	0.0705	0.0714	0.1567	0.1148
	(0.1032)	(0.1031)	(0.1035)	(0.1156)	(0.1168)
Moratorium dummy	-0.0679***	-0.0675***	-0.0682***	-0.0856***	-0.0687***
	(0.0177)	(0.0177)	(0.0178)	(0.0185)	(0.0187)
Bank share of CRE coll.	-0.0909*	-0.0875*	-0.0894*	-0.1001*	-0.0824*
	(0.0483)	(0.0477)	(0.0480)	(0.0530)	(0.0499)
CRE purpose share dummy			-0.0219		
			(0.0171)		
Fixed-effects					
dbtr_id	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	548,099	548,099	548,099	430,092	375,700
R^2	0.85894	0.85895	0.85895	0.86740	0.84697
Within R^2	0.00314	0.00327	0.00322	0.00397	0.00327

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

Table 23: Robustness Check 8:
LHS: New loans to pre-Covid-19 new loans
Borrower Fixed Effects
Full Sample
Control for bank share of CRE collateral - Interactions

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.1004***		-0.0977***	-0.0831	-0.1166**
	(0.0346)		(0.0341)	(0.0571)	(0.0534)
CRE inc. gen. reliance dummy		-0.1085***			
		(0.0376)			
RRE reliance dummy		-0.0290			
		(0.0619)			
CRE own use reliance dummy		-0.1147***			
		(0.0407)			
Bank share of CRE coll. (Bank CRE)	-0.0986*	-0.0961*	-0.0972*	-0.1017*	-0.0869*
	(0.0514)	(0.0515)	(0.0510)	(0.0545)	(0.0520)
Bank CRE × CRE reliance dummy	0.0951		0.0962	0.0499	0.0956
	(0.0592)		(0.0599)	(0.0925)	(0.0835)
Bank CRE × CRE inc. gen. dummy		0.1008*			
		(0.0604)			
Bank CRE × RRE reliance dummy		-0.0028			
		(0.0893)			
Bank CRE × CRE own use dummy		0.0833			
		(0.0675)			
Borrower LTV	-0.0009**	-0.0009**	-0.0009**	-0.0008**	-0.0027***
	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0008)
Cross-border dummy	-0.1202	-0.1227	-0.1217	-0.1770	-0.2687*
	(0.0856)	(0.0858)	(0.0851)	(0.1418)	(0.1492)
Bank NPL ratio (pre-Covid)	-0.1157	-0.1206	-0.1106	-0.1820	-0.0635
	(0.2862)	(0.2860)	(0.2872)	(0.2986)	(0.2952)
Bank CET1 ratio (pre-Covid)	0.0680	0.0698	0.0719	0.1558	0.1134
	(0.1028)	(0.1029)	(0.1031)	(0.1157)	(0.1168)
Moratorium dummy	-0.0681***	-0.0673***	-0.0684***	-0.0856***	-0.0687***
	(0.0176)	(0.0177)	(0.0178)	(0.0185)	(0.0187)
CRE purpose share dummy			-0.0221		
			(0.0171)		
Fixed-effects					
dbtr_id	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	548,099	548,099	548,099	430,092	375,700
R^2	0.85895	0.85896	0.85896	0.86741	0.84697
Within R^2	0.00321	0.00334	0.00329	0.00398	0.00331

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

F APPENDIX: Robustness Tests for revaluation and credit

Table 24: Implications of revaluation for likelihood of a loan being made - Industry-size-location fixed effects

Dependent Variable:	Loan made			
Model:	(1)	(2)	(3)	(4)
Variables				
Reval. dummy	0.2656***	0.2664***	0.1919***	0.2262***
	(0.0145)	(0.0145)	(0.0159)	(0.0113)
Neg. reval. dummy	-0.0745***	-0.0300		
	(0.0205)	(0.0230)		
New coll. posted dummy	2.438***	2.438***	2.439***	2.439***
	(0.0145)	(0.0145)	(0.0145)	(0.0145)
Avg. num new loans 3 years pre-Covid	0.0221***	0.0220***	0.0220***	0.0221***
	(0.0053)	(0.0053)	(0.0053)	(0.0054)
Num. pre-Covid loans	0.0017*	0.0016*	0.0016*	0.0016*
	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Bank CET1 ratio (pre-Covid)	0.2093***	0.2103***	0.2070***	0.2095***
	(0.0708)	(0.0707)	(0.0706)	(0.0708)
Bank NPL ratio (pre-Covid)	0.7719**	0.7567**	0.7675**	0.7827**
	(0.3337)	(0.3340)	(0.3341)	(0.3341)
LTV > 75% dummy		-0.0169	-0.0192	
		(0.0126)	(0.0127)	
Neg. reval. dummy × LTV > 75% dummy		-0.1734***		
		(0.0336)		
Pos. reval. dummy			0.0960***	
			(0.0219)	
Pos. reval. dummy × LTV > 75% dummy			-0.1020***	
			(0.0346)	
Reval. size (%)				0.3258***
				(0.0808)
Fixed-effects				
ISL	Yes	Yes	Yes	Yes
Fit statistics				
Observations	594,196	594,196	594,196	594,196
Squared Correlation	0.26830	0.26825	0.26828	0.26834
Pseudo R^2	0.29839	0.29851	0.29844	0.29843
BIC	431,089.6	431,083.9	431,101.4	431,078.1

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

Table 25: Implications of revaluation for likelihood of a loan being made - Industry-size-location-time fixed effects

Dependent Variable:	Loan made			
Model:	(1)	(2)	(3)	(4)
Variables				
Reval. dummy	0.6646***	0.6644***	0.4462***	0.6581***
	(0.0462)	(0.0462)	(0.0486)	(0.0464)
Neg. reval. dummy	-0.2207***	-0.0894		-0.2023***
	(0.0610)	(0.0683)		(0.0617)
New coll. posted dummy	3.556***	3.558***	3.560***	3.557***
	(0.0471)	(0.0474)	(0.0474)	(0.0472)
Avg. num new loans 2 years pre-Covid	0.0389***	0.0387***	0.0388***	0.0388***
	(0.0106)	(0.0106)	(0.0105)	(0.0106)
Num. pre-Covid loans	0.0027**	0.0026**	0.0027**	0.0027**
	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Bank CET1 ratio (pre-Covid)	0.2529*	0.2412	0.2391	0.2819*
	(0.1478)	(0.1475)	(0.1482)	(0.1493)
Bank NPL ratio (pre-Covid)	1.674**	1.652**	1.684**	1.687**
	(0.7250)	(0.7230)	(0.7298)	(0.7274)
LTV > 75% dummy		-0.0414	-0.0410	
		(0.0275)	(0.0277)	
Neg. reval. dummy × LTV > 75% dummy		-0.5141***		
		(0.0965)		
Pos. reval. dummy			0.3082***	
			(0.0645)	
Pos. reval. dummy × LTV > 75% dummy			-0.3872***	
			(0.0934)	
Neg. bank-level reval. dummy				-0.0544**
				(0.0229)
Fixed-effects				
ISL-Time	Yes	Yes	Yes	Yes
Fit statistics				
Observations	79,055	79,055	79,055	79,055
Squared Correlation	0.52033	0.52101	0.52080	0.52051
Pseudo R^2	0.49171	0.49228	0.49216	0.49180
BIC	200,205.6	200,182.3	200,191.9	200,209.6

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

Table 26: Implications of revaluation over the past quarter

Dependent Variables:	Loan made		Loan size	Loan maturity	Loan rate
Model:	(1)	(2)	(3)	(4)	(5)
	Probit	Probit	OLS	OLS	OLS
Variables					
Reval. dummy 1q lagged	0.2469***	0.1954***	-0.3567	55.60	0.0002
	(0.0204)	(0.0155)	(0.5859)	(158.5)	(0.0003)
New loan dummy 1q lagged	0.1387***	0.1659***			
	(0.0149)	(0.0141)			
Neg. reval. dummy 1q lagged	-0.1629***		-0.2107	-22.23	5.84×10^{-5}
	(0.0326)		(0.4803)	(222.5)	(0.0004)
LTV > 75% dummy	0.0184		-0.0503	-117.2	0.0003
	(0.0199)		(0.6853)	(278.2)	(0.0004)
New coll. posted dummy	2.507***	2.465***			
	(0.0251)	(0.0238)			
Avg. num new loans 3 years pre-Covid	0.0261***	0.0249***			
	(0.0080)	(0.0078)			
Num. pre-Covid loans	0.0019*	0.0020*			
	(0.0010)	(0.0010)			
Bank CET1 ratio (pre-Covid)	-0.1548	0.0049	0.7677	-896.5	0.0007
	(0.1104)	(0.1062)	(4.621)	(1,904.3)	(0.0034)
Bank NPL ratio (pre-Covid)	0.9518**	0.3621	-38.73	-3,575.4	-0.0101
	(0.4823)	(0.4468)	(45.34)	(7,643.0)	(0.0280)
Neg. reval. dummy 1q lagged × LTV > 75% dummy	-0.0417		0.6718	-193.7	4.12×10^{-5}
	(0.0456)		(0.4731)	(439.1)	(0.0007)
Reval. size (%)		0.6014***			
		(0.2008)			
New collateral dummy			0.1541	210.5*	0.0001
			(0.4606)	(122.5)	(0.0002)
Avg. size new loans 3 years pre-Covid			-7.11×10^{-7}*		
			(3.77×10^{-7})		
Avg. initial maturity all pre-Covid loans				0.3116***	
				(0.0940)	
Avg. rate all pre-Covid loans					0.1559***
					(0.0464)
Loan maturity					-2.57×10^{-7}***
					(5.66×10^{-8})
Fixed-effects					
Borrower	Yes	Yes			
Borrower			Yes	Yes	Yes
Fit statistics					
Observations	209,681	228,488	7,600	9,451	8,929
Squared Correlation	0.30815	0.30493	0.73537	0.81219	0.91902
Pseudo R^2	0.35058	0.35333	0.17696	0.08739	-0.37141
BIC	126,459.9	130,960.0	83,254.7	215,086.7	-35,712.9

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

Table 27: Implications of revaluation over the past 6 month

Dependent Variables:	Loan made		Loan size	Loan maturity	Loan rate
Model:	(1)	(2)	(3)	(4)	(5)
	Probit	Probit	OLS	OLS	OLS
Variables					
Reval. dummy 6m lagged	0.2111***	0.1648***	-0.4765	-10.61	0.0003
	(0.0203)	(0.0155)	(0.7594)	(165.1)	(0.0003)
New loan dummy 6m lagged	0.0472***	0.0627***			
	(0.0141)	(0.0130)			
Neg. reval. dummy 6m lagged	-0.1438***		-0.5574	89.21	-1.94×10^{-5}
	(0.0305)		(0.5452)	(217.3)	(0.0005)
LTV > 75% dummy	0.0224		-0.5791	-119.3	0.0005
	(0.0237)		(0.9667)	(337.3)	(0.0005)
New coll. posted dummy	2.535***	2.522***			
	(0.0287)	(0.0268)			
Avg. num new loans 3 years pre-Covid	0.0269***	0.0268***			
	(0.0089)	(0.0081)			
Num. pre-Covid loans	0.0023**	0.0019*			
	(0.0009)	(0.0010)			
Bank CET1 ratio (pre-Covid)	-0.0225	0.0293	0.4548	-1,200.1	0.0041
	(0.1220)	(0.1217)	(5.008)	(2,202.3)	(0.0039)
Bank NPL ratio (pre-Covid)	0.2221	0.3494	0.1658	2,042.3	0.0029
	(0.5884)	(0.5135)	(14.09)	(8,242.6)	(0.0261)
Neg. reval. dummy 6m lagged × LTV > 75% dummy	-0.0076		0.9696	-534.3	-0.0004
	(0.0432)		(0.7013)	(399.4)	(0.0006)
Reval. size (%)		0.7625***			
		(0.2299)			
New collateral dummy			-0.2060	206.6	0.0001
			(0.4049)	(148.1)	(0.0002)
Avg. size new loans 3 years pre-Covid			-7.9×10^{-7}		
			(5.15×10^{-7})		
Avg. initial maturity all pre-Covid loans				0.2857***	
				(0.1018)	
Avg. rate all pre-Covid loans					0.1578***
					(0.0541)
Loan maturity					-2.84×10^{-7}***
					(6.67×10^{-8})
Fixed-effects					
Borrower	Yes	Yes			
Borrower			Yes	Yes	Yes
Fit statistics					
Observations	144,830	168,690	6,139	7,561	7,129
Squared Correlation	0.32377	0.32278	0.81547	0.82722	0.92984
Pseudo R^2	0.35758	0.36069	0.22800	0.09164	-0.39283
BIC	100,129.0	109,292.9	65,489.3	172,697.7	-28,547.9

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

G APPENDIX: Other Regression Tables

Table 28: Linking Regression 1:
Borrower Fixed Effects
Full Sample

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans)				
Model:	(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	-0.0353***		-0.0322***	-0.0457***	-0.0431***
	(0.0053)		(0.0055)	(0.0102)	(0.0070)
CRE inc. gen. reliance dummy		-0.0324***			
		(0.0059)			
RRE reliance dummy		-0.0365***			
		(0.0051)			
CRE own use reliance dummy		-0.0308***			
		(0.0049)			
CRE purpose share dummy			-0.0193***		
			(0.0057)		
Borrower LTV	-5.36×10^{-5}	-5.12×10^{-5}	-5.36×10^{-5}	-6.27×10^{-5}	-5.48×10^{-5}
	(4.65×10^{-5})	(4.62×10^{-5})	(4.66×10^{-5})	(5.14×10^{-5})	(4.83×10^{-5})
Cross-border dummy	-0.0283**	-0.0276**	-0.0292**	-0.0281	-0.0362**
	(0.0118)	(0.0118)	(0.0118)	(0.0194)	(0.0164)
Bank NPL ratio (pre-Covid)	0.0756	0.0753	0.0765	0.0573	0.0801
	(0.0734)	(0.0735)	(0.0749)	(0.0716)	(0.0770)
Bank CET1 ratio (pre-Covid)	-0.0057	-0.0052	-0.0032	0.0132	-0.0128
	(0.0398)	(0.0399)	(0.0407)	(0.0508)	(0.0557)
Moratorium dummy	-0.0383***	-0.0383***	-0.0383***	-0.0533***	-0.0439***
	(0.0099)	(0.0099)	(0.0101)	(0.0130)	(0.0118)
Collateral increased	0.0152***	0.0133***	0.0165***	0.0102	0.0070
	(0.0050)	(0.0050)	(0.0048)	(0.0072)	(0.0064)
Collateral decreased	-0.0222***	-0.0241***	-0.0193***	-0.0286***	-0.0284***
	(0.0052)	(0.0053)	(0.0049)	(0.0072)	(0.0069)
Fixed-effects					
Borrower_fe	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	0.79567	0.79565	0.79573	0.81034	0.77768
Within R^2	0.00319	0.00308	0.00349	0.00397	0.00361

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

Table 29: Linking Regression 2:
Industry Size Location Fixed Effects
Full Sample

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans), ISL Fixed Effects				
Model:	(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	-0.0302***		-0.0274***	-0.0403***	-0.0479***
	(0.0069)		(0.0065)	(0.0126)	(0.0123)
Collateral increased	0.0122**	0.0096	0.0137**	0.0064	0.0017
	(0.0058)	(0.0059)	(0.0056)	(0.0091)	(0.0103)
Collateral decreased	-0.0234***	-0.0251***	-0.0196***	-0.0369***	-0.0393***
	(0.0070)	(0.0070)	(0.0063)	(0.0109)	(0.0095)
Borrower LTV	-4.69×10^{-5}	-4.64×10^{-5}	-4.68×10^{-5}	-6.96×10^{-5}	-9.01×10^{-5}
	(3.36×10^{-5})	(3.35×10^{-5})	(3.33×10^{-5})	(5.32×10^{-5})	(7.72×10^{-5})
Cross-border dummy	-0.0259***	-0.0261***	-0.0255***	-0.0318*	-0.0346**
	(0.0095)	(0.0095)	(0.0096)	(0.0164)	(0.0167)
Bank NPL ratio (pre-Covid)	0.0731	0.0698	0.0732	0.0678	0.0863
	(0.1022)	(0.1027)	(0.1033)	(0.1198)	(0.1230)
Bank CET1 ratio (pre-Covid)	-0.0064	-0.0043	-0.0064	-0.0052	-0.0117
	(0.0345)	(0.0345)	(0.0354)	(0.0484)	(0.0700)
Moratorium dummy	-0.0163***	-0.0165***	-0.0171***	-0.0281***	-0.0248***
	(0.0055)	(0.0055)	(0.0057)	(0.0086)	(0.0094)
CRE income generating reliance dummy		-0.0218***			
		(0.0055)			
RRE reliance dummy		-0.0350***			
		(0.0081)			
CRE own use reliance dummy		-0.0301***			
		(0.0067)			
CRE purpose share dummy			-0.0216***		
			(0.0070)		
Fixed-effects					
ISL_fe	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	0.56520	0.56516	0.56551	0.60801	0.59955
Within R^2	0.00380	0.00372	0.00452	0.00487	0.00531

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

Table 30: Linking Regression 3:
Borrower Fixed Effects
Filtered Sample (Removed 50-99% CRE reliant borrowers)

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans), Borrower Fixed Effects				
Model:	(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	-0.0566***		-0.0538***	-0.0667***	-0.0617***
	(0.0092)		(0.0092)	(0.0146)	(0.0107)
Collateral increased	0.0309***	0.0237***	0.0317***	0.0302***	0.0264***
	(0.0046)	(0.0044)	(0.0046)	(0.0078)	(0.0065)
Collateral decreased	-0.0034	-0.0105***	-0.0012	-0.0051	-0.0084
	(0.0037)	(0.0035)	(0.0036)	(0.0068)	(0.0056)
Borrower LTV	-6.42×10^{-5}	-5.96×10^{-5}	-6.47×10^{-5}	-6.79×10^{-5}	-6.27×10^{-5}
	(5.3×10^{-5})	(5.21×10^{-5})	(5.31×10^{-5})	(5.22×10^{-5})	(5.37×10^{-5})
Cross-border dummy	-0.0358***	-0.0340**	-0.0364***	-0.0339	-0.0382**
	(0.0135)	(0.0134)	(0.0135)	(0.0207)	(0.0173)
Bank NPL ratio (pre-Covid)	0.0674	0.0666	0.0684	0.0409	0.0690
	(0.0867)	(0.0866)	(0.0878)	(0.0842)	(0.0894)
Bank CET1 ratio (pre-Covid)	-0.0121	-0.0098	-0.0118	0.0166	-0.0170
	(0.0510)	(0.0512)	(0.0517)	(0.0612)	(0.0685)
Moratorium dummy	-0.0469***	-0.0470***	-0.0469***	-0.0612***	-0.0510***
	(0.0122)	(0.0122)	(0.0123)	(0.0145)	(0.0137)
CRE income generating		-0.0458***			
reliance dummy		(0.0083)			
RRE reliance dummy		-0.0534***			
		(0.0086)			
CRE own use reliance dummy		-0.0456***			
		(0.0074)			
CRE purpose share dummy			-0.0151**		
			(0.0064)		
Fixed-effects					
Borrower_fe	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	1,460,551	1,460,551	1,460,551	1,074,643	949,771
R^2	0.80785	0.80780	0.80788	0.81743	0.78943
Within R^2	0.00382	0.00352	0.00395	0.00443	0.00403

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

Table 31: Linking Regression 4:
Industry Size Location Fixed Effects
Filtered Sample (Removed 50-99% CRE reliant borrowers))

Dependent Variable:	New loans to pre-covid stock of loans (without gov-guaranteed loans), ISL Fixed Effects				
Model:	(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	-0.0520***		-0.0493***	-0.0657***	-0.0729***
	(0.0127)		(0.0120)	(0.0198)	(0.0195)
Collateral increased	0.0297***	0.0218***	0.0310***	0.0316***	0.0282***
	(0.0063)	(0.0059)	(0.0063)	(0.0102)	(0.0100)
Collateral decreased	-0.0053	-0.0115**	-0.0018	-0.0107	-0.0151*
	(0.0059)	(0.0057)	(0.0055)	(0.0100)	(0.0087)
Borrower LTV	-9.27×10^{-5}	-9.05×10^{-5}	-9.31×10^{-5}	-0.0001	-0.0001
	(6.92×10^{-5})	(6.83×10^{-5})	(6.95×10^{-5})	(0.0001)	(9.89×10^{-5})
Cross-border dummy	-0.0282**	-0.0283**	-0.0281**	-0.0357*	-0.0387**
	(0.0120)	(0.0120)	(0.0120)	(0.0207)	(0.0187)
Bank NPL ratio (pre-Covid)	0.0617	0.0557	0.0611	0.0504	0.0742
	(0.1224)	(0.1230)	(0.1233)	(0.1426)	(0.1409)
Bank CET1 ratio (pre-Covid)	-0.0117	-0.0069	-0.0139	-0.0082	-0.0143
	(0.0412)	(0.0410)	(0.0422)	(0.0553)	(0.0829)
Moratorium dummy	-0.0208***	-0.0212***	-0.0214***	-0.0353***	-0.0310***
	(0.0071)	(0.0072)	(0.0073)	(0.0109)	(0.0119)
CRE income generating reliance dummy		-0.0350***			
		(0.0091)			
RRE reliance dummy		-0.0555***			
		(0.0137)			
CRE own use reliance dummy		-0.0467***			
		(0.0110)			
CRE purpose share dummy			-0.0193***		
			(0.0063)		
Fixed-effects					
ISL_fe	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	1,460,551	1,460,551	1,460,551	1,074,643	949,771
R^2	0.59093	0.59077	0.59111	0.62561	0.62037
Within R^2	0.00533	0.00493	0.00578	0.00612	0.00646

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

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