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The transmission of bank credit conditions to firms-evidence from linked surveys

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Abstract

Using a novel dataset linking firm level data from the Survey on Access to Finance of Enterprises (SAFE) and bank level data from the Bank Lending Survey (BLS), we explore how changes in credit standards pass through to firms at a granular level. We find that tighter credit standards decrease loan availability reported by firms, increase the likelihood they report access to finance as the worst problem and decrease their investment. After controlling for country-sector-time fixed effects that capture cyclical macroeconomic conditions, effects only remain for firms that need finance. Moreover, we find that a more diversified funding base insulates firms from the negative impacts of tighter credit standards on availability of bank loans and access to finance, although there is little evidence of such an effect for investment. Effects are asymmetric, with stronger impacts recorded for a tightening than an easing. Our results underscore the importance of demand conditions when interpreting the credit conditions and we thus propose a new indicator of demand adjusted credit standards at a euro area level, which can be used to analyse broader credit dynamics.

JEL classification: D22, E22, E52

Keywords: Finance, credit conditions, surveys, firm-bank relationships.

Non-technical summary

Changes in credit conditions can affect firms' access to finance and their business decisions and are therefore closely monitored by policymakers. The transmission of a given change in credit conditions can depend on the situation and behaviour of both banks and firms. In this paper we aim to assess this transmission via both firms and banks by focusing on the perceptions that they both have on changes in financing conditions. We use a unique dataset linking two surveys: the ECB's Survey on Access to Finance of Enterprises (SAFE) that provides information from the firms' side, and the Bank Lending Survey (BLS) which scrutinises euro area banks. In our novel approach, we analyse the direct impact of changes in credit supply of a specific bank (in the BLS) on the availability of loans as perceived by firms (in the SAFE) that are customers of that bank.

We focus on the concept of credit standards as defined in the BLS. The survey collects information on changes in credit standards, which are the internal guidelines or loan approval criteria defined by each bank that loan officers should apply when borrowers approach them for a bank loan. From the side of the firms, we look, instead, at the likelihood of firms in reporting difficulties to access finance and the pass-through to their investment decisions of changes in the credit standards applied by their bank(s).

In our empirical analysis we rely on a sample of 22,799 firms matched to banks in 11 countries for the period 2010-2022. We find that tighter (looser) credit standards lead (i) to a decrease (increase) in firms' reported loan availability, (ii) to an increased (decreased) likelihood of a firm reporting access to finance as their worst problem and (iii) to lower (higher) firm investment. These effects are significant mainly for those firms that signalled an increased need for bank loans during the period we analyse. In addition, by exploring the time developments, we find that our results are mainly driven by periods of tightening, with very little effects present for periods of easing.

We also provide evidence of the importance for firms of having access to a diversified funding base. Indeed, among firms needing a bank loan, those having a more diversified funding base can more easily counteract the effect of a tightening of bank loans conditions. Our results underscore the importance of demand conditions when interpreting the credit conditions and we propose a new indicator of demand adjusted credit standards at a euro area level, which can be used to analyse broader credit dynamics.

1 Introduction

Credit conditions are a key channel through which monetary policy affects the economy (Bernanke and Gertler, 1995). A change in monetary policy can induce a simultaneous change in both credit supply and demand and this makes it challenging to precisely estimate the effect of a change in credit supply on bank lending. For this reason, various techniques and more granular data have been used to more cleanly identify credit supply effects and have established that changes in credit supply significantly affect firms' access to finance and consequently their investment behaviour (Amiti and Weinstein (2018)). Moreover, the transmission of a change in credit standards - for instance, following a change in monetary policy - will crucially depend also on the condition of both banks and borrowers (Jiménez et al. (2012) and Altavilla et al. (2021)). For instance, heterogeneity in borrower outcomes following an aggregate change in credit conditions could potentially stem from how banks behave and transmit the shock or how firm characteristics accentuate or mitigate the shock. Therefore, granular information on credit supply by individual banks and the impact on individual firms is crucial in capturing how aggregate credit standards ultimately affect firms' access to finance and investment.

In this paper, we use a novel and granular dataset on banks and businesses to explore the effects of changes in credit standards on firms. The unique dataset links individual firms' responses from the ECB's Survey on Access to Finance of Enterprises (SAFE) and individual banks' responses to the Bank Lending Survey (iBLS). It allows for a quantification of the impact of changes in banks' credit standards, as measured by bank responses to the BLS, on firms' reported availability of loans, on access to finance being their worst problem and on the pass-through to their investment decisions, as measured in the SAFE. By linking the two surveys at a granular level, we can explore not just the direct impact of changes in contemporaneous credit standards, but also the accumulation of changes over multiple periods. This combines the strengths of the two surveys well. While the SAFE is useful for exploring contemporaneous changes, it is more difficult to assess the cumulative impact of credit constraints as firms may appear on multiple occasions but they do not necessarily take part in consecutive surveys. However, using BLS credit supply variables allows for the calculation of a bank specific loan supply effect that we can follow over time. Second, the SAFE contains useful data on firm specific conditions (like demand) and outcomes (like investment) that can be explored at a micro level. Similarly, while individual bank-level responses from the BLS are informative for

the demand a specific bank faces, information from the SAFE survey allows for assessing how heterogeneity in demand can interact with credit supply conditions. Overall, combining these rich micro level survey data can allow for an in-depth exploration of the channels of credit conditions and how banks and firms can lead to variation in how a shock to credit conditions propagates.

First, we find that, as expected, tighter (looser) credit standards lead (a) to a decrease (increase) in firm level reported loan availability, (b) to an increased (decreased) likelihood of reporting access to finance as the worst problem facing their firm and (c) to lower (higher) investment. Yet when country-sector-time fixed effects are included in addition to firm level fixed effects, the effects of credit standards on firms' access to finance and investment become insignificant, implying that banks' credit supply decisions and firms' investment decisions are dominated by sectoral and cyclical considerations. However, when a firm has an increased demand for credit, it is significantly more likely to report credit constraints and lower investment when faced with tighter credit standards, even when compared to other firms in the same sector, country and time period. This suggests that, in addition to sectoral and cyclical factors, it is crucial to consider individual firms' credit demand conditions when assessing the impact of a change in credit supply on firm outcomes.

Second, using information on firms' financing structure from the SAFE, we find evidence that a diversified funding base mitigates the impact of a credit tightening. Having a more varied funding base can counteract the effect of a tightening for those firms who have increased need for bank loans, indicating that differentiated sources of funds can help smooth credit constraints coming from a tighter bank credit conditions.

Third, we find the effects from changes in credit conditions are asymmetric, as the strongest effects on access to finance and investment are reported by firms during periods of tightening, while periods of easing suggest more limited effects.

In addition, we find that tighter (looser) credit standards mainly pass through to investment through a lower (higher) probability of increasing investment, rather than a higher (lower) probability of decreasing investment. We quantify that the impact of a one unit increase in the tightness of credit standards decreases the probability of increasing investment by 0.08 points after one period, up to 0.13 points after 3 periods of tightening, illustrating the combination of both a lagging and cumulative effect. For loan availability, the effects of a tightening (easing) of credit standards are stronger for increasing (decreasing) the probability of reporting declining

loan availability (0.03 points after one period, rising to 0.10 after three periods), but it also has some significant negative (positive) impact on the probability of a firm reporting increasing (decreasing) loan availability. Both of these effects are strong relative to the overall proportion of firms that report increases or decreases each period.

Finally, leaning on the firm-bank micro level information, we propose a new measure of demand adjusted credit standards that can provide a deeper understanding of the dynamics of credit conditions in the euro area. Our results show that, when demand is higher, the effects of changes in credit standards are stronger. Therefore, adjusting credit supply measures by considering also demand conditions can be more informative than looking purely at credit standards alone. When comparing our demand adjusted credit standards to an unadjusted series, we find that during the sovereign debt crisis unadjusted credit standards would have shown a relatively more benign picture compared to the adjusted series. Moreover, during the tightening period in 2022, the adjusted series signals that credit conditions were less tight once demand is accounted for. This new indicator can be a useful additional metric to enhance our understanding of the pass-through of credit standards to the real economy.

To the best of our knowledge, this is the first paper that explicitly links the replies of the two surveys at a granular level. We do so by matching firm-bank level outcomes at a half-yearly basis. In this way we can control for both individual bank loan supply (from BLS) and firm demand (from SAFE) to explore the interaction between the two factors and derive a measure of demand adjusted credit standards.

This paper contributes to the literature that uses survey-based information to explore the factors that impact firms' access to finance. This is possible thanks to the wide array of firm specific information available within the SAFE. Our results particularly speak to the study of Ongena et al. (2012) that showed that firms with alternative sources of finance are less likely to need bank credit. We find that firms with a more diversified funding base are less affected by a bank based tightening of credit standards in cases where they need credit. Additionally, our findings confirm also that firm and country-level characteristics are relevant determinants for access to finance as in Beck et al. (2005). The paper also adds to the literature that assesses the information content of bank lending surveys to examine both credit conditions and their impact on the economy (Lown and Morgan (2006), de Bondt et al. (2010), Del Giovane et al. (2011) and Altavilla et al. (2019)). This literature typically uses loan flows to analyse banks' survey responses. In our case, the use of firm survey data allows us to directly assess the impact of

changes in credit supply on firms' financing situations, as firms report on changes in their credit demand, in their perceived supply conditions and economic outcomes. Moreover, the SAFE survey allows us to build a large sample of responses over time in a clean fashion, building on previous work to assess qualitatively measured outcomes and responses of firms.

The rest of the paper proceeds as follows. Section 2 introduces our data sources, section 3 shows our empirical results, section 4 introduces demand adjusted credit standards and section 5 concludes.

2 Data

Our empirical methodology relies on several data sources, the key two being the Survey on Access to Finance for Enterprises (SAFE) and Bank Lending Survey (BLS) datasets. A crucial innovation of this study is that these two surveys are then matched at firm-bank level using the information on the names of the main banks as reported by SAFE firms in the BvD Orbis database. We briefly describe the attributes of each dataset.

2.1 SAFE

The SAFE has been conducted on behalf of the European Central Bank and the European Commission since 2009. SAFE gathers firm-level information about the financial situation and the financing needs and access to finance in the euro area. The survey is conducted at half yearly intervals with questions examining the previous and next six months. Firms in the sample are randomly selected from the Dun-Bradstreet database. The sample is stratified by firm-size class, economic activity, and country. The sample size for each economic activity is chosen to guarantee representation across the four largest industries: manufacturing, construction, trade, and services. Also, the sample sizes are selected based on representation at the country level. The first two surveys were conducted with the periods of interest being January-June and July-December, but since the first survey in 2010, the survey concentrates on the periods April-September and October-March. Most firms within the survey are small and medium-sized enterprises (SMEs) and are thus mostly reliant on financing from banks relative to large enterprises. Thus, the survey is highly appropriate for analysing the impact of changes in bank credit standards or terms and conditions.

2.2 BLS/iBLS

The BLS has been conducted by the ECB since 2003 and asks a panel of euro area banks about changes in their lending conditions. The survey is conducted quarterly with key questions focusing on changes in credit standards, terms and conditions, rejection rates and the demand for loans set by or faced by each bank. Questions are either backward looking over the previous three months or forward looking over the next three months.

This paper uses a proprietary micro level dataset of individual bank responses to the BLS survey, called iBLS. The iBLS allows us to exploit bank level heterogeneity beyond the country level heterogeneity that can be seen in the aggregated country-level dataset. The dataset comprises individual level responses to the BLS questionnaire from 120 banks across 15 euro area countries.[1]

2.3 The matching process - SAFE - BvD Orbis

The dataset used in this paper involves matching the BLS and SAFE individual level replies by using an ECB proprietary dataset that links SAFE firms to the financial statements as provided by Bureau Van Dijk (BvD) Orbis database. In addition, BvD Orbis provides a list of main banks associated to the firms in the database. This list is directly compiled by BvD using a combination of firm registries and direct interviews with firm representatives. It should be noted that firms could report more than one bank. We exploit this full universe of banks within our matching process, in order to match all possible banks to each individual SAFE firm. This contrasts with prior approaches that made an assumption that banks were ordered in terms of their importance to each individual firm (see for example Corbisiero and Faccia (2020), Ferrando et al. (2019) and Kalemli-Özcan et al. (2022)).

Given the characteristics of the bank variable in the BvD Orbis dataset, we need to assume that bank-firm relationships are unchanged throughout our sample. This assumption is not so strong as it may look *prima facie*, as in general these relationships tend to be sticky over time. This is backed by evidence seen in Kalemli-Özcan et al. (2022) and Giannetti and Ongena (2012), who find that by comparing multiple vintages of the Orbis-Amadeus bank-firm matches, that there are very limited changes over time. Moreover, this is even less likely to be an issue in

[1] Banks in Cyprus, Greece, Malta and Slovenia are not included in the iBLS sample. Our final matched sample is further limited by data availability on the names of firms' banks, as is shown in Table 4.

our case in that we do not restrict ourselves to only focusing on a single bank for a given firm, and instead use all for whom they have a relationship.

The data provided in the BvD Orbis dataset come in uncleaned format, with only the raw text names of banks. As such, the matching process between SAFE and BLS is necessarily a multi-step automated and manual approach. As a first step, firms for whom their banks' names match precisely the legal name of a BLS bank are automatically mapped to that bank. Regarding the remainding ones, manual matching is undertaken, with each unique entry assessed and matched to a BLS bank if a match exists. Such an approach is preferable to a fuzzy matching approach, as in many cases either colloquial names are used for banks or individual banks have similar names. This both maximises the size of our matched set and minimises our risks of false positives.

2.4 Dataset characteristics

Our initial dataset includes 29,768 firms, of which 22,799 are matched to at least one bank. Of these, 13,703 (60.1%) are matched to one single bank, while the rest are matched to more than one bank from the BLS sample, varying from a total of 2 matches to 19 for three cases. The distribution of these is shown in Table 1.

Regarding the panel structure of the dataset, the total number of firms broken down by their number of occurrences is shown in Table 2 while the total number of observations per wave is shown in Table 3. As can be seen the majority of firms appear more than once in the survey, allowing us to use firm fixed effects. Regarding the time distribution, survey rounds prior to the eleventh wave (September 2014) are relatively underrepresented, with the first three rounds having particularly low numbers. This is just the result of the greater coverage of firms in the anonymised SAFE - BvD Orbis dataset from this point onwards.

Table 1. Distribution of total number of banks for each firm

Number of BLS Matches	Total Matches	Percentage
1	13703	60.10
2	3700	16.23
3	1736	7.61
4	1024	4.49
5	579	2.54
6	551	2.42
7	407	1.79
8	286	1.25
9	229	1.00
10-14	501	2.21
15-19	83	0.36
Total	22799	100

Table 2. Distributiion of the number of rounds each firm appears in the survey

Appearances in dataset	Number of firms	Percentage of dataset
1	7854	34.45
2	4578	20.08
3	3019	13.24
4	1990	8.73
5	1809	7.93
6	970	4.25
7	1231	5.40
8	534	2.34
9	302	1.32
10-14	472	2.07
15-22	40	0.18
Total	22799	100

Table 3. Total observations by wave

Wave number	Total observations	Wave number	Total observations
1	39	15	3621
2	145	16	3901
3	182	17	3637
4	602	18	3713
5	749	19	3579
6	987	20	3686
7	1411	21	3536
8	1706	22	3456
9	2226	23	3552
10	2023	24	3403
11	3603	25	3424
12	3922	26	3526
13	3628	27	2520
14	3658		

We have observations from 11 euro area countries, limited, on one side, by coverage in the iBLS dataset, and, on the other side, by coverage in the firm-bank matching data in the BvD Orbis database. The distribution of the number of firms by country is shown in Table 4, alongside their relative matching rates. In general, the larger countries have a higher number of observations, with Germany, Spain and France making up the largest proportion of our sample. Regarding matching, we see that in Austria and Germany the relative matching rate is lower, partly reflecting the high number of banks within those countries, while countries with a more concentrated banking system (like Spain) have a higher matching rate.

Table 4. Distribution of sample by country

Country	*Total Firms*	*Unmatched*	*Matched unique firms in final dataset*	*Matching Success Rate*	*Total observations in sample*	*Average observations per firm*
Austria	3382	1796	1586	46.90%	4793	3.02
Germany	7354	3365	3989	54.24%	12117	3.04
Estonia	325	1	324	99.69%	607	1.87
Spain	5276	127	5149	97.59%	17418	3.38
France	4272	813	3459	80.97%	10912	3.15
Ireland	2023	100	1923	95.06%	6206	3.23
Lithuania	647	104	543	83.93%	1154	2.13
Luxembourg	259	11	248	95.75%	511	2.06
Latvia	544	255	289	53.13%	557	1.93
Netherlands	3166	217	2949	93.15%	8967	3.04
Portugal	2520	180	2340	92.86%	7193	3.07
TOTAL:	29768	6969	22799	76.59%	70435	3.09

2.5 Key Variables

For our analysis, we use measures of credit supply from the BLS and assess their impact on firm level results from the SAFE. This exploits a key advantage of our matched dataset. Since the SAFE, by construction, is not a balanced panel we cannot delve into the longer run effects of changes in loan supply at the firm level. By contrast, using the information from the BLS we can construct a long run measure of credit supply as a backward looking average. For the analysis we go back up to one and a half years (three survey rounds in SAFE), alongside more contemporaneous metrics.

Our measure of credit supply is based on the banks' responses on credit standards from the BLS. Banks are asked each quarter about changes in their credit standards applied to loans to firms over the previous three months. Banks can respond with five possible answers, each

reflecting the direction and the level of intensity of changes. The question is framed in terms of a tightening or an easing, with banks stating whether: (with the standard numerical values assigned to each response in brackets afterwards) "tightened considerably" (1), "tightened somewhat" (2), "unchanged" (3), "eased somewhat" (4) and "eased considerably" (5).

As the BLS is quarterly and the SAFE is biannual (firms are asked about the changes over the previous six months), we average banks' responses over the two BLS rounds that correspond to each SAFE round. In addition, as firms are often matched to more than one bank, we construct a firm level measure of credit standards by averaging the responses of each bank matched to the firm. This gives us a continuous scale measuring the full universe of credit standards faced by each firm in a wave. We transform the responses to be on a scale between -2 and +2, with +2 being the strongest tightening and -2 the strongest easing easing.[2]

We are interested in both the impact of short-run changes in credit standards but also the longer run changes, as taking individual survey round responses alone will not account for the impact of continuous changes in credit standards across multiple periods. Letting $oneperiod\ cs_{f,t}$ denote the individual period credit standards facing firm f at time t. We construct the following measure:

$$CS_{f,t} = \frac{\sum_{k=0}^{K-1} oneperiodcs_{f,t-k}}{K} \tag{1}$$

We construct this measure for $K = 1, 2, 3$. This provides 3 measures of credit standards - $K = 1$ is simply equivalent to $oneperiod\ cs_{t,f}$ and is the single period change in contemporaneous credit standards. For $K = 2$ and $K = 3$ we measure the longer run credit standards facing a firm, for periods of a year and a year and a half respectively. A one unit increase for $K = 1$ is equivalent to a single unit of increased tightening, while for $K = 2$ and $K = 3$, a one unit increase can be interpreted as a more long-run continuous tightening.

From the SAFE, we are interested in assessing potential responses of firms to changes in credit standards. We do so by extracting three variables measuring (a) changes in the availability of bank loans (b) whether access to finance was the worst problem faced by a firm and (c) changes in investment by firms, with each variable being measured over the previous six months corresponding to the SAFE round.

[2]This is done in order to simplify the interpretation of the econometric results with interaction terms, with zero values mapping to firms who experienced no change in credit standards.

The first variable, the changes in the availability of bank loans, is measured using a trinomial scale, whereby firms are asked if the availability of bank loans (with assigned numeric values in brackets) improved (1) remained unchanged (2) or deteriorated (3) over the last six months. We exclude all *don't know* and *not applicable* responses and multiply all values by -1 such that larger figures correspond to an increase and smaller to a decrease.[3]

Looking at the changes in bank loan availability we achieve two main goals. First, we can assess the goodness of our matching of the two surveys as we should find a structural relationship between credit standards and availability. Second, by examining the variation in firms' responses according to how long the trailing average of credit standards is, we can comment on precisely which firms are impacted by changing credit standards, but also over which time horizon impacts are most strongly felt.

The second variable measures how strong is the lack of access to finance as an impediment for firms to run their business. In the survey firms are asked on a scale of one to ten, how pressing is a list of problems. These problems range from finding customers and competition to increased costs of production of labour and regulation.[4] We use the information from this question to construct a simple binary variable taking on a value of 1 if access to finance was the worst problem facing a firm and 0 otherwise.

This is a measure of perceived financial constraints. This measure is distinct from bank loan availability, as it captures pass-through of credit standards changes to overall financing constraints.

Finally, we wish to study the transmission of credit standards changes to the real economy, and for this reason we use the replies on changes in fixed investment in SAFE. Similar to the question on bank loan availability, firms' responses are trinomial, taking on values of 1 for an increase, 2 for unchanged and 3 for a decrease in fixed investment over the previous six months. Also in this case, we invert the sign of the variable to keep it consistent with higher values indicating an increase.

Descriptive statistics for our three key response variables are shown in Table 5. As can

[3]We additionally run specifications in which response variables are indicator variables rather than assuming continuity across the scale.

[4]Prior to 2012, firms were asked directly what the most pressing problem facing their firm was from the same list and those that choose the "Access to Finance" from the provided options are then considered as facing major financing obstacles.

Table 5. SAFE Response Variables

	Yes	*No*	
Finance Worst Problem	6.49%	93.51%	
	Increase/Improvement	***No Change***	***Decrease/Deterioration***
Investment	29.58%	57.20%	13.22%
Availability	23.35%	64.35%	12.29%

be seen, access to finance as the worst problem facing the firm is a relatively rare event, with only a small number of firms reporting this as their biggest problem. This motivates our use of a Linear Probability Model (LPM) approach, in that a LPM outperforms models such as logistic regression for rare events data with fixed effects (Timoneda, 2021). Regarding the other variables, there is a slight bias towards reporting an increase/improvement relative to a decrease/deterioration, while a large majority of firms report no changes in investment in the previous six months.

3 Empirical approach and results

The aim of our analysis is to assess the impact of changes in credit standards on the real decisions and outcomes of firms by using high dimensional fixed effects in an OLS regression with robust standard errors. For each variable we estimate the regression as shown in Equation 2.[5]

$$SAFEVariable_{f,c,s,t} = \alpha_f + \delta_{c,s,t} + \gamma_1 CS_{f,c,t} + \epsilon_{f,c,s,t} \tag{2}$$

$SAFEVariable_{f,c,s,t}$ refers to our SAFE variable of interest for firm f in country c, in sector s at time t. $CS_{f,t}$ refers to a firm's credit standards at that time point (with this variable being either a vector of individual lags or a backward looking average). In all specifications, we add firm fixed effects α_f to account for time invariant firm specific factors, exploiting the fact that most firms in the SAFE have multiple observations. To control for time varying macroeconomic and sectoral factors that may also impact on these results, we add country-sector-time fixed effects to control for any broader macroeconomic factors that may be driving our results, with

[5] All estimations are carried out using the **reghdfe** package in STATA (Correia, 2016).

the time unit in question being the six month periods of the SAFE survey. We estimate this regression for our key variables of interest, namely access to finance being the worst problem facing a firm, availability of bank loans and investment.

3.1 Baseline results

Baseline results for estimating Equation 2 for each of our three key dependent variables are shown in Tables 6 to 8, with and without country-sector-time fixed effects.

TABLE 6. Regression of bank loan availability on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period	-0.106***			-0.00961		
	(0.000)			(0.613)		
Credit Standards - 2 Periods		-0.183***			-0.00182	
		(0.000)			(0.944)	
Credit Standards - 3 Periods			-0.229***			0.0310
			(0.000)			(0.329)
Constant	-1.876***	-1.875***	-1.874***	-1.879***	-1.879***	-1.880***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	No	No	No	Yes	Yes	Yes
Observations	35883	35920	35965	35784	35821	35866
R^2	0.406	0.407	0.407	0.463	0.463	0.463

Notes: The table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in bank loan availability, -2 if they reported no change and -3 for a decrease in bank loan availability. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 7. Regression of finance being the worst problem facing a firm on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period	-0.00383			-0.00449		
	(0.355)			(0.443)		
Credit Standards - 2 Periods		0.00608			-0.00150	
		(0.253)			(0.851)	
Credit Standards - 3 Periods			0.0166***			-0.00319
			(0.008)			(0.744)
Constant	0.0639***	0.0636***	0.0633***	0.0640***	0.0638***	0.0638***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	No	No	No	Yes	Yes	Yes
Observations	54526	54593	54668	54469	54536	54611
R^2	0.419	0.419	0.419	0.452	0.452	0.452

Notes: Table shows the results of a regression in which the dependent variable is a binary variable taking on a value of 1 if access to finance was reported as the most pressing problem facing a firm during the SAFE survey period and 0 otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 8. Regression of investment on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period	-0.0931***			-0.0245		
	(0.000)			(0.137)		
Credit Standards - 2 Periods		-0.175***			-0.0360	
		(0.000)			(0.118)	
Credit Standards - 3 Periods			-0.209***			-0.0271
			(0.000)			(0.341)
Constant	-1.831***	-1.830***	-1.831***	-1.833***	-1.833***	-1.833***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	No	No	No	Yes	Yes	Yes
Observations	49320	49386	49462	49312	49378	49454
R^2	0.385	0.385	0.385	0.415	0.415	0.415

Notes: Table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in investment, -2 if they reported no change and -3 for a decrease in investment. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Starting with the specifications with firm fixed effects only, credit standards affect changes in loan availability and investment with the expected negative sign and they are strongly significant. In the regression where the dependent variable is finance being the worst problem, the effect is also as expected and enters with the correct sign, but is only significant in the three period case (i.e. the averaging of credit standards over three SAFE rounds). Taken together, these results can be read as indicating a successful matching process - a tightening of credit standards corresponds to a perceived reduction in the availability of bank loans and in investment.

Of more fundamental interest, however, is that once country-sector-time fixed effects are added, the impact of credit standards becomes insignificant. This suggests that that there is a significant country-sector time dimension driving credit standards.

3.2 Introducing Demand

One aspect of the SAFE survey is that we can directly control for firms' demand for bank loans. This is the novel element of our approach as the response in the BLS on loan demand by firms is just a macro level judgement by individual banks, without any possibility to identify any characteristics of the firms that have increased or decreased demand. By contrast, the SAFE has a direct question on whether firms had increased, decreased or not changed their needs for bank loans over the previous six months. This measure allows us to introduce a direct microeconomic measure of loan demand into our main regression specification. We construct it as a binary variable taking on a value of one if a firm's loan needs increased and zero otherwise.

We add a demand effect to Equation 2 with an interaction between demand and credit standards. In this way we can dig further on the importance of credit standards and ask the following: is there a different effect of credit standards depending on individual firms' loan demand? Our results are shown in Tables 9 and 11, with all specifications having both firm and country-sector-time fixed effects, allowing for maximum saturation. The introduction of demand shows a strong interaction effect with the expected sign for all three variables of interest.

Table 9. Regression of bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.00251		
	(0.905)		
Increased Need For Bank Loans=1	0.0561***	0.0583***	0.0585***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.0386		
	(0.232)		
Credit Standards - 2 Periods		0.0308	
		(0.279)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.126***	
		(0.002)	
Credit Standards - 3 Periods			0.0649*
			(0.058)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.135***
			(0.002)
Constant	-1.888***	-1.889***	-1.890***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.465	0.466	0.465

Notes: Table shows the results of a regression in which the dependent variable is a value of -1 if firms in SAFE reported increase in bank loan availability, -2 if they reported no change and -3 for a decrease in bank loan availability. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

TABLE 10. Regression of finance being the worst problem facing a firm on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.00968		
	(0.341)		
Increased Need For Bank Loans=1	0.0441***	0.0430***	0.0423***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	0.0257		
	(0.109)		
Credit Standards - 2 Periods		-0.0110	
		(0.423)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		0.0618***	
		(0.001)	
Credit Standards - 3 Periods			-0.0177
			(0.282)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0811***
			(0.000)
Constant	0.0752***	0.0751***	0.0752***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	31590	31623	31666
R^2	0.487	0.487	0.488

Notes: Table shows the results of a regression in which the dependent variable is a binary variable taking on a value of 1 if access to finance was reported as the most pressing problem facing a firm during the SAFE survey period and 0 otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over, looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 11. Regression of investment on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	0.00336		
	(0.898)		
Increased Need For Bank Loans=1	0.183***	0.184***	0.184***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.0892**		
	(0.040)		
Credit Standards - 2 Periods		0.00763	
		(0.834)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.147**	
		(0.013)	
Credit Standards - 3 Periods			0.0139
			(0.756)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.152**
			(0.031)
Constant	-1.849***	-1.849***	-1.850***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.450	0.450	0.450

Notes: Table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in investment, -2 if they reported no change and -3 for a decrease in investment. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over, looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses sho w p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

In the case of loan availability, we see a strong and significant negative relationship with credit standards, conditional on the firm reporting an increased demand for bank loans and the effect becomes significant after two periods. This suggests that if a firm has increased need for loans and faces a tightening (easing) of credit standards, its loan availability declines (improves), providing evidence that it is not only important to control for demand at a micro level, it is important to assess exactly which firms feel the bite of credit standards changes.

This interaction effect moves against the base effect for an increased need for bank loans, which is positive as anticipated as those firms that are more likely to need bank loans are also more likely to apply for bank loans and thus an improvement in perceived availability is more likely to be noted. As such, these two results together may highlight that if firms had no tightening (or easing) of credit standards, and they had an increased need for bank loans, they are more likely to report improved loan availability, which is to be expected in the absence of credit standards changes. This base effect is overruled by the interaction with credit standards after two periods, shedding light on how changing credit standards pass through to firms.

In addition, the base effect for credit standards is insignificant as in our baseline results in all but the long-term period (three survey rounds), where it enters with an unexpected positive sign. When we consider the base group, for which this effect is attributed (to firms with decreasing or unchanged loan demand), it may be indicative of a selection effect by banks, whereby in periods of consecutive tightening, credit standards are passed through less substantially to those firms who are less financially constrained, and such firms may even be "preferred" in such cases. We note, however, the effect is relatively small and only enters in this specification.

To further shed light on this, we re-estimate the regression with the need for bank loans variable defined as a three way categorical variable, with no change in need as the base effect, and decreasing and increasing need as separate categorical variables. Results for this specification are shown in the Appendix in Table A1. Once again, we see a relatively strong interaction effect between increased need for bank loans and credit standards, backing up our initial results, while the unexpected positive coefficient on credit standards enters as a base effect for the no change group, albeit weaker than before. By contrast, the interaction is insignificant for the decreasing need group. This may be seen as weak evidence of a selection effect for those firms with unchanged loan demand during continuous tightening (or easing) cycles. Interestingly, the base effect for bank loan need is positive for both the increasing and decreasing loan need case. We see here two contradictory factors - those with decreasing need for bank loans may be

financially healthier and, as such, are preferred by the banks relative to those with no change in need, while those with increasing need may be reporting increasing availability, purely by the nature of engaging with banks in looking for loans.

In the regression on finance being the worst problem facing a firm (Table 10), there is a positive and significant interaction effect from the two-period average onwards, with the effect after one period being only marginally insignificant at the 10% level (and indeed this becomes significant in the specification with the broader split of the need for bank loans variable in Table A2). Once again, combined with the baseline results showing no effect and the insignificant base effects for credit standards, it suggests that the impact of changing credit standards is felt mostly by those firms with increased need for bank loans.

Finally, in the regression on changes in investment (Table 11), we see an immediate negative interaction effect, significant also in the longer periods at the 5% level. Firms with increased need for bank loans are more likely to report increased investment as expected, but tighter (looser) credit standards, reduces (increases) investment. This indicates that when firms need credit for investment, tightening credit standards can significantly lower investment. These effects hold in the broader split of the need for bank loans variable as shown in Table A3.

Taken together, the empirical results provide a strong message for the pass-through of credit conditions to firms: changes in credit standards are mostly felt by those firms who actively need loans, and such effects are likely to be stronger during cycles in which there is increasing demand. Thus, it is necessary for policymakers to examine these concepts simultaneously, rather than relying on separate individual indicators.

3.3 The impact of diverse financing sources

Up to now we have documented the pass-through of credit standards to firms that have an increased need for bank loans. Next, we want to see how this result is affected by the availability of other sources of funding for firms. To shed light on this, we turn to more data from the SAFE survey, examining a question in which firms are asked whether different sources of finance are relevant for them -that is, whether they have you used them in the past or considered using them in the future-, with firms providing a simple yes or no answer.[6]

[6]The sources of finance that firms are asked about are: bank loans, credit lines, grants or subsidised bank loans, trade credit, other loans, leasing or hire purchase, debt securities, equity capital, factoring, sale of assets or retained earnings, other sources of financing (such as subordinated debt, participating loans, peer to peer lending or

We use this question to construct a measure of the level of concentration of the funding base for each firm in our sample. We construct a variable $Finance\ Source_{f,c,s,t}$ for each firm f, defined as the count of the number of financing sources a firm deemed as relevant in that survey round, divided by the total number of financing sources listed in same round (excluding *do not know* responses). As such, higher values denote a more diversified portfolio of financing sources and a lower value indicates a more concentrated funding base. We augment the specification in 2 by adding a triple interaction between this measure and the need for bank loans and credit standards. This allows us to delve into the effect of having a diversified financing source, but also how diversification interacts with the need for bank loans and credit standards. Theoretically a diversified funding base should mitigate to some extent the impact of the tightening for firms with increased need for bank loans. Results can be seen in Tables 12 to 14. In these regressions, the base effects for credit standards and need for bank loans (and their interaction) becomes difficult to interpret, as they condition on the financing source variable taking on a value of zero (i.e. no financing sources are relevant to the firm). For this reason, we do not examine these coefficients in detail and we concentrate on the interactions involving the financing source variable as the average effects for these initial coefficients can be seen in the analysis in Section 3.2.

crowdfunding) and mezzanine financing.

Table 12. Regression of bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.0753		
	(0.145)		
Increased Need For Bank Loans=1	-0.000746	0.00496	0.00739
	(0.976)	(0.840)	(0.764)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.241**		
	(0.012)		
Fin Source Concentration	0.0490*	0.0503*	0.0541**
	(0.064)	(0.058)	(0.042)
Credit Standards - 1 Period X Fin Source Concentration	0.124		
	(0.131)		
Increased Need For Bank Loans=1 X Fin Source Concentration	0.109**	0.102**	0.0977**
	(0.011)	(0.018)	(0.024)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	0.397**		
	(0.020)		
Credit Standards - 2 Periods		-0.0336	
		(0.593)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.402***	
		(0.000)	
Credit Standards - 2 Periods X Fin Source Concentration		0.108	
		(0.279)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		0.541***	
		(0.007)	
Credit Standards - 3 Periods			0.0215
			(0.763)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.420***
			(0.001)
Credit Standards - 3 Periods X Fin Source Concentration			0.0705
			(0.525)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			0.565***
			(0.009)
Constant	-1.915***	-1.917***	-1.920***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.466	0.466	0.466

Notes: Table shows the results of a regression in which the dependent variable is a value of -1 if firms in SAFE reported increase in bank loan availability, -2 if they reported no change and -3 for a decrease in bank loan availability. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 13. Regression of finance being the worst problem facing a firm on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.0439*		
	(0.072)		
Increased Need For Bank Loans=1	0.0736***	0.0721***	0.0717***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	0.117**		
	(0.015)		
Fin Source Concentration	-0.0262**	-0.0268**	-0.0264**
	(0.039)	(0.035)	(0.038)
Credit Standards - 1 Period X Fin Source Concentration	0.0600		
	(0.119)		
Increased Need For Bank Loans=1 X Fin Source Concentration	-0.0558***	-0.0549**	-0.0555**
	(0.009)	(0.011)	(0.011)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	-0.170**		
	(0.044)		
Credit Standards - 2 Periods		-0.0514*	
		(0.080)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		0.161***	
		(0.003)	
Credit Standards - 2 Periods X Fin Source Concentration		0.0727	
		(0.112)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		-0.186*	
		(0.054)	
Credit Standards - 3 Periods			-0.0442
			(0.179)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.140**
			(0.016)
Credit Standards - 3 Periods X Fin Source Concentration			0.0482
			(0.339)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			-0.113
			(0.273)
Constant	0.0899***	0.0901***	0.0900***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	31590	31623	31666
R^2	0.488	0.488	0.488

Notes: Table shows the results of a regression in which the dependent variable is a binary variable taking on a value of 1 if access to finance was reported as the most pressing problem facing a firm during the SAFE survey period and 0 otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 14. Regression of investment on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	0.0520		
	(0.476)		
Increased Need For Bank Loans=1	0.126***	0.121***	0.114***
	(0.000)	(0.000)	(0.001)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.263*		
	(0.062)		
Fin Source Concentration	0.00836	0.0106	0.0103
	(0.813)	(0.763)	(0.770)
Credit Standards - 1 Period X Fin Source Concentration	-0.0829		
	(0.469)		
Increased Need For Bank Loans=1 X Fin Source Concentration	0.104*	0.114**	0.125**
	(0.073)	(0.050)	(0.031)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	0.315		
	(0.191)		
Credit Standards - 2 Periods		0.110	
		(0.265)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.234	
		(0.218)	
Credit Standards - 2 Periods X Fin Source Concentration		-0.173	
		(0.263)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		0.150	
		(0.644)	
Credit Standards - 3 Periods			0.129
			(0.264)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.00992
			(0.964)
Credit Standards - 3 Periods X Fin Source Concentration			-0.195
			(0.282)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			-0.270
			(0.475)
Constant	-1.854***	-1.855***	-1.855***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.450	0.450	0.450

Notes: Table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in investment, -2 if they reported no change and -3 for a decrease in investment. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

For both loan availability and the likelihood of reporting access to finance as the worst problem, the base effect for the diversification of financing sources (interpretable as the effect for firms with no change in credit standards and no change in need for bank loans) is positive and negative respectively. This is as expected - a diversified funding base means that firms are more likely to report improved loan availability, but also are less likely to report that they are financially constrained. Interestingly, there is no clear base effect for investment, suggesting that in this case, a diversified funding source does not materially impact on firms' investment decisions.

Turning to the interaction effects, we see a positive and negative interaction respectively for financing sources and loan availability and financing being the worst problem facing a firm. In both cases this is indicative of an improvement: firms who needed bank loans are more likely to report improved availability, and less likely to be financially constrained if they have a more diversified array of financing options. Similarly, also in the case of investment we find a positive interaction, suggesting that for those firms who needed bank loans and faced no change in credit standards, a diversified funding base increases the likelihood of increasing investment.

On the other hand, there is no statistically significant effect of the interaction between a more diversified financing source and changes in credit standards on the three dependent variables. Technically, we should expect this as this relates to the base group (i.e. firms that had no increase in need for bank loans). These results, though, reinforce our findings from Section 3.2: firms who do not report an increased need for bank loans do not feel the effect of changes in credit standards, and, furthermore, there is no additional impact of having access to more diversified financing sources in such cases.

Finally, turning to the triple interactions, we see some strong results. For loan availability in particular, the triple interaction gives large and positive coefficients. This indicates that for those firms experiencing a tightening in credit standards with an increase in loan demand, having access to a diversified funding base insulates against the negative impact of a tightening (with the opposite for the case of an easing). When considering the specification on finance being the worst problem facing a firm, results are similar for the one and two period case, but less clear for the three-period case, with an expected negative coefficient for the first two, and no significance in the final case. Thus there is evidence of this "insulation effect" - with a diversified funding base lowering the likelihood of being financially constrained if a firm with increased credit needs faced a tightening. Interestingly, there is no clear impact of this triple

interaction for investment, suggesting that diversified funding sources do not have an impact here, unlike for access to finance. Indeed most credit standards variables become insignificant for investment, suggesting some evidence that diversified funding sources may have significant influence on the transmission of credit standards shocks, although the interactions still enter with the expected sign, and in the the one period the coefficient remains significant interacted with the demand for bank loans.

3.4 Asymmetric effects of tightening and easing

Thus far, the results have assumed a symmetric reaction to changes in credit standards across firms - with both an easing and a tightening assumed to have the same (opposite) effect. To examine if this is actually the case, we split our credit standards variables to create two separate variables. Considering that our credit standards variable $CS_{f,t}$ is an interval between -2 and +2, with -2 being the strongest easing and +2 the strongest tightening, with 0 signifying unchanged, we define $Ease_{f,t}$ and $Tight_{f,t}$ as:

$$Ease_{f,t} = \begin{cases} -1 \times CS_{f,t} & \text{if } CS_{f,t} < 0 \\ 0 & \text{if } CS_{f,t} \geq 0 \end{cases}$$

$$Tight_{f,t} = \begin{cases} CS_{f,t} & \text{if } CS_{f,t} > 0 \\ 0 & \text{if } CS_{f,t} \leq 0 \end{cases}$$

This thus defines these variables as taking a continuous value on a scale of 0 to 2 depending on the intensity of the easing in the case of $Ease_{f,t}$ and the intensity of the tightening in the case of $Tight_{f,t}$. We repeat our specification with demand interactions, and show the results in Tables 15 to 17.

Table 15. Regression of bank loan availability on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period Tightening Only	0.00823					
	(0.771)					
Increased Need For Bank Loans=1	0.0593***	0.0663***	0.0672***	0.0557***	0.0553***	0.0566***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only	-0.0713*					
	(0.076)					
Credit Standards - 2 Period Tightening Only		0.0611				
		(0.117)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only		-0.198***				
		(0.000)				
Credit Standards - 3 Period Tightening Only			0.124***			
			(0.009)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only			-0.224***			
			(0.000)			
Credit Standards - 1 Period Easing Only				0.0242		
				(0.490)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only				-0.0252		
				(0.683)		
Credit Standards - 2 Period Easing Only					0.0154	
					(0.738)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only					-0.0181	
					(0.823)	
Credit Standards - 3 Period Easing Only						0.0128
						(0.810)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only						-0.0618
						(0.510)
Constant	-1.889***	-1.891***	-1.895***	-1.889***	-1.889***	-1.889***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34069	34103	34148	34069	34103	34148
R^2	0.465	0.466	0.465	0.465	0.465	0.465

Notes: Table shows the results of a regression in which the dependent variable is a value of -1 if firms in SAFE reported increase in bank loan availability, -2 if they reported no change and -3 for a decrease in bank loan availability. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 16. Regression of finance being the worst problem facing a firm on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period Tightening Only	-0.0179					
	(0.188)					
Increased Need For Bank Loans=1	0.0421***	0.0394***	0.0386***	0.0445***	0.0448***	0.0456***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only	0.0435**					
	(0.029)					
Credit Standards - 2 Period Tightening Only		-0.0193				
		(0.303)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only		0.0912***				
		(0.000)				
Credit Standards - 3 Period Tightening Only			-0.0375*			
			(0.099)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only			0.106***			
			(0.000)			
Credit Standards - 1 Period Easing Only				-0.00313		
				(0.853)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only				0.00841		
				(0.783)		
Credit Standards - 2 Period Easing Only					-0.00292	
					(0.895)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only					-0.00372	
					(0.925)	
Credit Standards - 3 Period Easing Only						-0.00731
						(0.776)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only						-0.0392
						(0.398)
Constant	0.0760***	0.0759***	0.0768***	0.0751***	0.0750***	0.0751***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31590	31623	31666	31590	31623	31666
R^2	0.487	0.487	0.488	0.487	0.487	0.487

Notes: Table shows the results of a regression in which the dependent variable is a binary variable taking on a value of 1 if access to finance was reported as the most pressing problem facing a firm during the SAFE survey period and 0 otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 17. Regression of investment on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period Tightening Only	0.0363					
	(0.315)					
Increased Need For Bank Loans=1	0.192***	0.195***	0.196***	0.182***	0.181***	0.182***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only	-0.182***					
	(0.001)					
Credit Standards - 2 Period Tightening Only		0.0319				
		(0.544)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only		-0.271***				
		(0.001)				
Credit Standards - 3 Period Tightening Only			0.0783			
			(0.247)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only			-0.328***			
			(0.001)			
Credit Standards - 1 Period Easing Only				0.0493		
				(0.243)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only				-0.0640		
				(0.414)		
Credit Standards - 2 Period Easing Only					0.0232	
					(0.675)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only					-0.0147	
					(0.887)	
Credit Standards - 3 Period Easing Only						0.0420
						(0.507)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only						-0.0373
						(0.752)
Constant	-1.851***	-1.851***	-1.853***	-1.851***	-1.850***	-1.851***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28229	28263	28310	28229	28263	28310
R^2	0.450	0.450	0.450	0.450	0.449	0.449

Notes: Table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in investment, -2 if they reported no change and -3 for a decrease in investment. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

In all cases, results show that there is a highly asymmetric response of the dependent variables to a tightening and an easing of credit standards, with most effects concentrated on the tightening side. In each case, the interaction term and base effect are both insignificant for the easing variable, indicative of a much weaker pass-through of an easing of credit standards to firms' perceived loan availability, probability of reporting access to finance as their worst problem and changes in investment. On the other hand, results for a tightening are stronger than those presented in Section 3.2, suggesting that the effects estimated by using the aggregated variable are underestimating the impact of a tightening and overstating the impact of an easing, when viewed with the assumption of symmetry. Compared to the baseline specifications, the interaction effects are significant instantaneously, rather than with one period lag and all have the expected sign (for banks with increased need for bank loans, a tightening lowers loan availability, increases the likelihood of access to finance being the worst problem facing a firm, and decreases investment).

Interestingly, the puzzling positive coefficient after three periods for the credit standards base effect persists for loan availability, and indeed a significant negative coefficient is also present in the three-period case for the base effect for finance being the worst problem facing a firm. The fact that this is not present in the short-run but it is there in the long-run may indicate a paradoxical effect as mentioned before - in periods of longer term tightening, firms with no increased need are potentially experiencing positive "selection effects" relative to those firms who have increased financing needs, and are thus perceiving loan availability as being relatively more available when compared to the broader tightening environment.

3.5 Asymmetric responses increases and decreases in availability and investment

While the previous section deals with asymmetry of the independent variable, we have not commented on potential asymmetries in the dependent variable. For availability and investment, each variable is takes a value on a scale from -1 to -3, depending on if the firm saw an increase (-1), no change (-2) and a decrease (-3). The previous regression results have also been hard to interpret quantitatively, as the coefficients can be seen as the change in the average rank of the variable for a given change in credit standards (or loan need). Moreover, it is difficult to put them into meaningful numeric terms (as is the case for interpreting the change in probability of reporting access to finance as the worst problem facing a firm).

Thus, to explore asymmetry and produce more meaningful numeric results, we run two

separate specifications in each case, with binary dependent variables taking on a value of 1 in the case of an increase and 0 otherwise, with a complementary specification for the case of a decrease. Results are shown in Tables 18 to 21. This allows for the interpretation of the coefficients as the impact on the likelihood of reporting an increase/decrease relative to not doing so, for given changes in credit standards.

Table 18. Regression of increased bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.0113		
	(0.472)		
Increased Need For Bank Loans=1	0.0970***	0.0980***	0.0978***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.00993		
	(0.679)		
Credit Standards - 2 Periods		0.00132	
		(0.950)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.0499*	
		(0.092)	
Credit Standards - 3 Periods			0.0115
			(0.652)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.0392
			(0.235)
Constant	0.223***	0.223***	0.222***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.439	0.439	0.439

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported increased availability of bank loans and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

TABLE 19. Regression of decreased bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.00877		
	(0.445)		
Increased Need For Bank Loans=1	0.0410***	0.0396***	0.0393***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	0.0287		
	(0.103)		
Credit Standards - 2 Periods		-0.0295*	
		(0.057)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		0.0762***	
		(0.000)	
Credit Standards - 3 Periods			-0.0534***
			(0.004)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0963***
			(0.000)
Constant	0.111***	0.111***	0.112***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.476	0.476	0.476

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported decreased availability of bank loans and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 20. Regression of increased investment on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	0.000767		
	(0.967)		
Increased Need For Bank Loans=1	0.157***	0.157***	0.157***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.0813***		
	(0.008)		
Credit Standards - 2 Periods		0.0225	
		(0.380)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.113***	
		(0.007)	
Credit Standards - 3 Periods			0.0417
			(0.186)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.130***
			(0.009)
Constant	0.298***	0.297***	0.297***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.461	0.461	0.461

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported increased investment and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table 21. Regression of decreased investment on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.00259		
	(0.854)		
Increased Need For Bank Loans=1	-0.0259***	-0.0267***	-0.0263***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	0.00796		
	(0.734)		
Credit Standards - 2 Periods		0.0149	
		(0.448)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		0.0334	
		(0.295)	
Credit Standards - 3 Periods			0.0278
			(0.249)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0226
			(0.552)
Constant	0.147***	0.147***	0.147***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.420	0.420	0.420

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported decreased investment and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

In both cases, the results reveal a relatively asymmetric reaction of the response variables, with this being particularly stark in the case of investment.

Concentrating on the key interaction effects, we see an instantaneous increase (decrease) in the likelihood of reporting a decrease in availability for a tightening (easing) of credit standards, given a firm had an increased need for bank loans. This is only marginally insignificant after one period and becomes strongly significant after two periods, with a 1 unit change in credit standards over two periods increasing the probability of reporting lower loan availability by 0.08 points, with the effect remaining significant over three periods. On the other hand, the likelihood of reporting an increase in availability is very weak after one period, but mildy significant and negative after two periods, although insignificant again after three periods. The effect is as expected, with a tightening (easing) of credit standards lowering (increasing) the likelihood of reporting improved loan availability. Taken together, it suggests that changes in credit standards primarily impact on loan availability through changing the relative likelihood of firms seeing a decrease in availability, although some effect is present on the other side.

For investment, the results are much more strong. Conditional on needing a bank loan, the effect of a change in credit standards is primarily felt through changing the likelihood of increasing investment, with no such effects present for decreasing investment. Considering a tightening, after one period a one unit relative tightening of credit standards reduces the likelihood of reporting an increase in investment for firms with higher need for bank loans by 0.08, while this rises to 0.13 after 3 periods of consistent tightening. We thus posit that the core effect is a disinvestment one, rather than an active decrease in investment, and, as such, a tightening of credit standards may to some extent cool investment when rising sharply, while not decreasing it sharply.

Additionally, for loan availability, intriguingly the base effect of need for bank loans is positive for both an increase and a decrease. Considering that this is the estimated effect for firms facing no change in credit standards, this may indicate two competing effects at play. On one side, firms are more likely to engage with a bank if they have increased need for bank loans, and thus have a higher likelihood of reporting improved loan availability through such engagement. On the other side, firms may also be more likely to report a decrease in loan availability if they are financially in a weaker position and need bank loans. While seemingly paradoxical at first, taken together this may simply indicate that firms in this category are less likely to have reported no change on aggregate, and are more likely to have formed an

impression of perceived availability given their search for finance. This may to some extent explain the result seen in Table A1, whereby firms with decreasing loan demand are reporting improved loan availability - as this may be purely reflecting the relative financial health of such firms. At the same time, firms with increased need have competing factors - namely increased awareness of loan availability making them more likely to report improvements, while their innate need for more loans may indicate weaker balance sheets, and thus lowers the likelihood of reporting greater loan availability.

Results for interactions with financing sources can be seen in the Appendix, in Figures A7 to A10. For availability, the results for the triple interaction reflect the baseline case, with most of the impact being seen on the decreasing side. We see indeed a strong mitigation effect of having a diversified funding source on the likelihood of reporting a decrease in loan availability, conditional on having an increased need for bank loans and facing a tightening of credit standards. Results are much more muted for an increase, with the triple interaction having the expected sign, albeit statistically insignificant with p-values of between 0.141 and 0.175. For investment, along with the baseline results we see no effect for the triple interaction term, in line with previous results.

4 Demand adjusted credit standards - a new macroeconomic variable

The key finding in this paper is that changes in credit standards alone do not impact on firms both in their likelihood of having financial constraints and in their investment decisions. Their effect becomes visible only when they are conditional on the firm having increased need for bank loans. This has implications for the interpretation of surveys at an aggregate level, in that by examining credit standards alone, one is likely to underestimate the impact of a tightening in times of levels of high demand, and overestimate the impact of a tightening in periods of low demand. We thus propose a new macroeconomic indicator that accounts for this at an aggregate level that we denote as *demand adjusted credit standards*. This builds on previous work in the development of a financing gap indicator for the SAFE seen in Ferrando et al. (2013), and can be seen as a complement to measures such as the Loan Supply Indicator constructed in Altavilla et al. (2019). While the Loan Supply Indicator focuses on a pure supply effect, this measure can be seen as measuring the interacting effects of supply and demand.

To construct this, we calculate a simple net percentage. Let $CS_{f,t}$ be the universe of credit

standards facing a firm f during a SAFE round t, defined on the -2 to +2 scale as before. Consider the following trinomial variable for a firm f:

$$DemAdjCS_{f,t} = \begin{cases} -1 & \text{if } CS_{f,t} < 0 \text{ and } NeedBankLoan = 1 \\ 1 & \text{if } CS_{f,t} > 0 \text{ and } NeedBankLoan = 1 \\ 0 & \text{Otherwise} \end{cases}$$

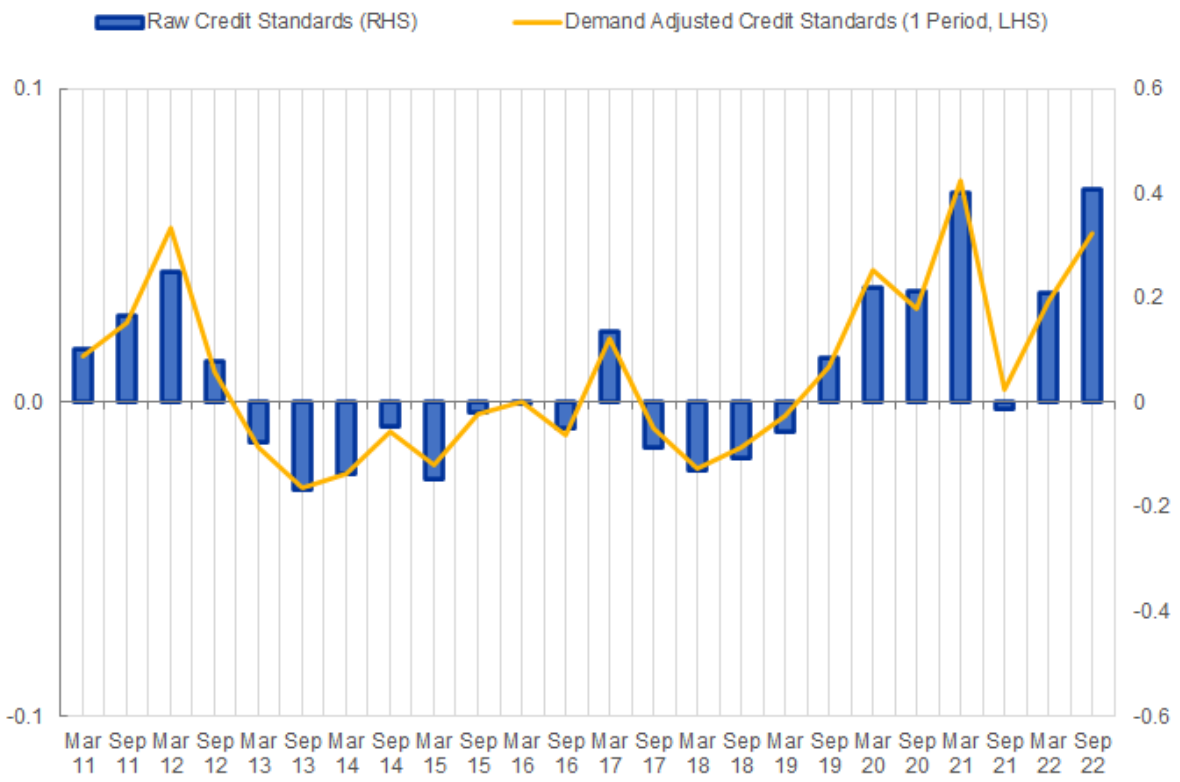
In other words, taking a value of -1 for an easing, 1 for a tightening, conditional on having increased loan demand and 0 otherwise. To aggregate this to a macro level, we sum this value across all firms, and divide by the total number of firms (excluding those with no response to either the need bank loans question or with no recorded credit standards in that period). Thus we define demand adjusted credit standards for the euro area at each time point (with F firms, labelled 1,⋯,F) as:

$$DemAdjCS_t = \frac{\sum_{f=1}^{F} DemAdjCS_{f,t}}{F} \tag{3}$$

In essence, this is the total number of firms reporting a tightening, less the total number of firms reporting an easing of credit standards conditional on having increased need for bank loans. This series is shown in Figure 1.[7] As a comparison we also plot a raw net percentage of unadjusted credit standards (i.e. we construct the equivalent to Equation 3 only without conditioning on the need of bank loans. This is preferable to comparing to the standard BLS credit standards series for two reasons. First, it keeps our sample constant and second, it aligns with our aggregated measure of credit standards across all banks at the firm level. This is particularly important as our sample only contains a subset of euro area countries, while the headline BLS series contains data for all 19 countries that were in the euro area during our sample period.

[7]We do not consider the first three SAFE rounds owing to a relatively low number of matched firms.

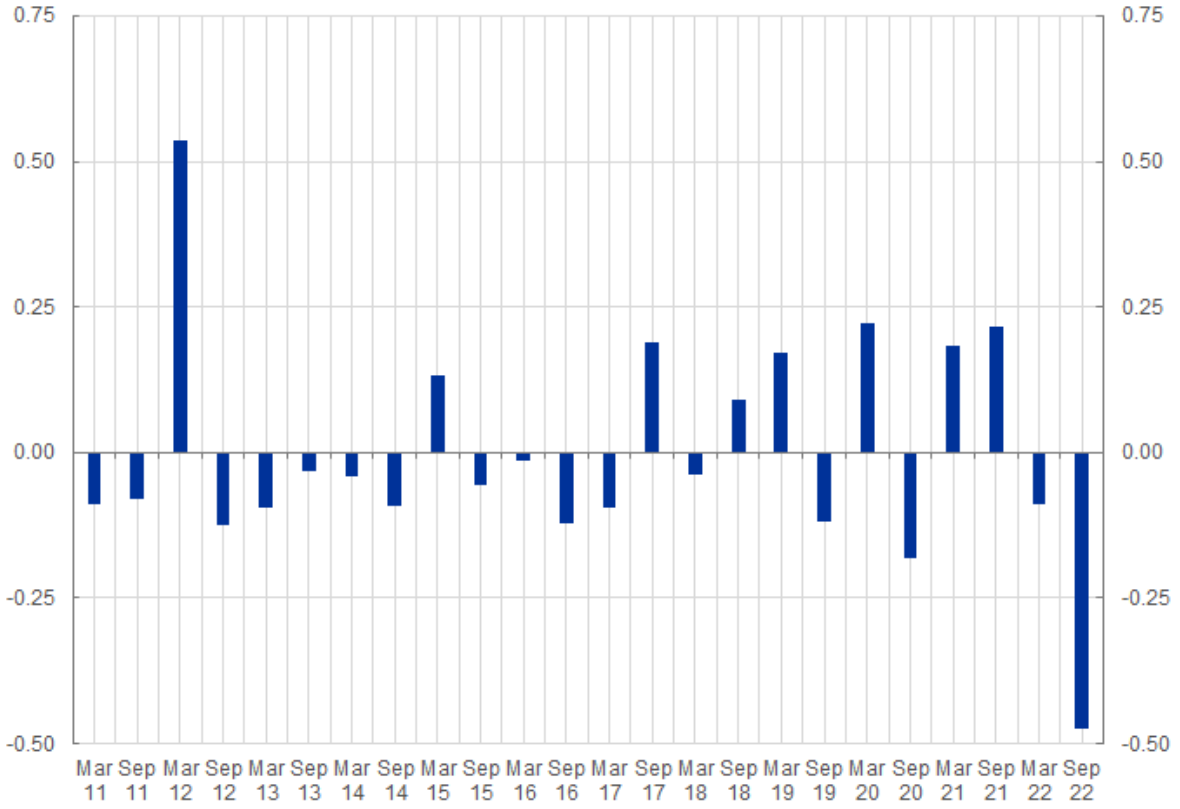
Figure 1. Comparison of demand adjusted credit standards with unadjusted credit standards



As can be seen, by construction the net percentages for the adjusted series are much lower, given the more restricted sample at each time point. While the two measures track each other quite closely in terms of overall patterns, if we concentrate on mapping the levels it becomes clear that there are a number of time points in which the adjusted series gives a relatively more (or less) pronounced reading for similar levels of the unadjusted series.

To show this more clearly, Figure 2 shows the difference between unadjusted and demand-adjusted credit standards, with both series standardised to have a mean of zero and standard deviation of one. Positive values indicate that unadjusted credit standards have a higher relative value, while negative values indicate that adjusted credit standards had a higher relative value.

FIGURE 2. Difference between normalised unadjusted credit standards and demand adjusted credit standards



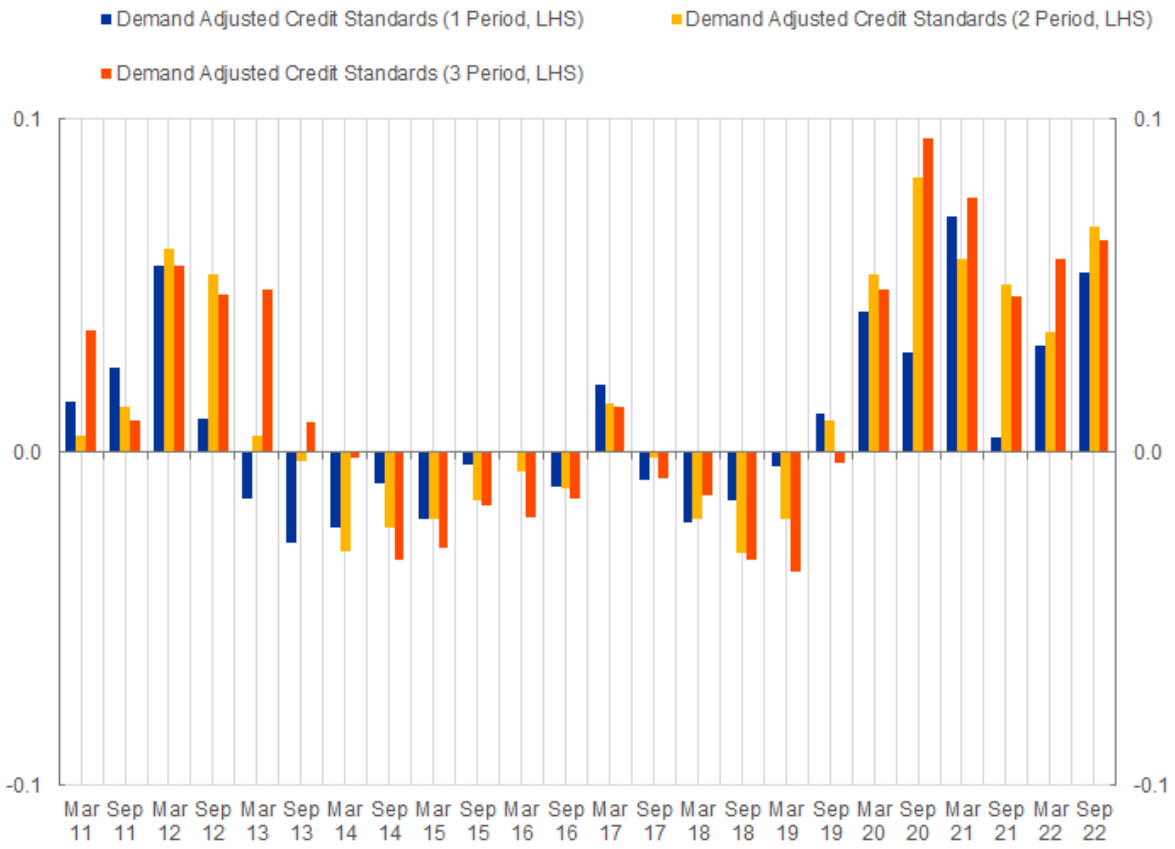
There are two bars that stand out. The first corresponds to the period around the sovereign debt crisis (towards the end of 2011 and start of 2012), when demand-adjusted credit standards were much higher than unadjusted credit standards. If we compare this to Figure 1, we see that while the unadjusted credit standards figure is low relative to the Covid-19 period, or the tightening of credit standards seen in 2022, the adjusted figure lies somewhere between the two. This is indicative that examining unadjusted credit standards alone during this time period would likely have underestimated the macroeconomic impact of the tightening.

The second highest bar corresponds to the final survey wave in our sample. During the credit standards tightening period seen between March and September 2022, the adjusted figure is much lower than the unadjusted figure, though it is still high in relative terms compared to the rest of the sample. Moreover, when compared to the peak of the Covid-19 period, the adjusted figure is more benign. This indicates that the recent tightening may be slightly less

biting than it would be anticipated, although it is still quite large.

Next, it is important to consider the other dimension that we have explored in this paper, that is the fact that the effects of credit standards tend to cumulate and have an impact on firms with a small lag. To adjust for the interdependence of time periods, we repeat the construction of demand adjusted credit standards in Equation 3, but in this case rather than use contemporaneous credit standards, we also use the rolling average of firm level credit standards over two and three periods, in line with our main regression specifications. These indicators are shown in Figure 3.

Figure 3. Comparison of demand adjusted credit standards with varying backward looking windows



By construction, these two measures are more persistent and the variance tends to increase across the measures as more firms are experiencing a tightening the wider the window. In this respect, the longer term measures report cumulative effects, while the shorter term measure is more like an instantaneous snapshot.

Furthermore, looking at specific periods, we see that the moderation of the tightening of credit standards seen at the end of 2021 is picked up by the one period measure, but is not seen in the longer term measures. This is in line with previous studies on the leading indicator properties of the BLS (as seen in Köhler-Ulbrich and Hünnekes (2023)), suggesting that the effects of the strong tightening seen in late 2020 and early 2021 would still be felt by firms in the subsequent year. The longer term measures also allow for the compounding of the two tightening periods either side of September 2021, seen as continuity from the tightening in the Covid19 period to the tightening seen during the monetary policy normalisation period in 2022.

Looking backwards, another interesting period is around March 2013. Here the sluggishness of the long term measures once the relative easing began. In particular, the three period measure is likely to pick up with a reasonable degree the residual pass-through of lagged changes in credit standards. This simple description of the development of the different measure of credit standards reiterates the importance of using the longer term measures in the econometric analyses to fully examine the potential pass-through to outcomes such as firms being financially constrained and their investment decisions.

5 Conclusion

Analysing the transmission of changes in credit standards to firms' decisions can help us understand the dynamics of the broader financial system. In this paper we have linked two different surveys on banks' and firms' perceptions of financing conditions at firm-bank level. In the empirical analysis we have shown that the pass-through of changes in credit standards to two different aspects of firms' financing conditions - bank loan availability and the likelihood of access to finance being the worst problem facing a firm- and investment is strong if we consider only firm-fixed effects. Once we control for a set of country-sector-time fixed effects, the pass-through effect disappears, suggesting that the baseline relationship is mainly driven by broader macroeconomic conditions. However, the pass-through becomes again statistically significant when we focus on firms that had an increased need for bank loans, indicating the importance of controlling for demand when assessing the pass-through of credit conditions to firms' overall access to finance. Furthermore, we highlight the importance for firms to have a diversified financing base to mitigate against those bank supply side shocks.

We also show a degree of asymmetry in firms' perceptions of changes in financing conditions

and investment to changes in credit standards, with a tightening of credit standards appearing to have more bite than an easing, suggesting a stronger attention of firms on constraining credit conditions rather than accommodative ones. This result is in line with a recent study based on SAFE data that shows that firms respond more to contractionary monetary shocks by significantly updating their bank loan availability beliefs, than in the case of accomodative ones (Ferrando and Forti Grazzini, 2023).

Based on our empirical results on the role of firm loan demand, we proposed to adjust aggregated indicators of credit standards to account for that demand. In this respect, our new measure of demand-adjusted credit standards can be used as a more realistic indicator of the level of binding credit standards facing firms. This measure can provide real time information on the likely pass-through of constraints to firms, and can be useful for policymakers going forward. We showed that the measure of credit standards normally used by policymakers was underestimating the impact of a tightening in several occasions, such as during the sovereign debt crisis, when loan demand was high. By contrast, in 2022 the same measure was overestimating the impact of credit standards, whereas the dynamics of demand was pointing to a softer pass-through, though credit standards were still at historic highs.

Appendix

TABLE A1. Regression of bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	0.00229		
	(0.921)		
Need For Bank Loans=1	0.0630***	0.0628***	0.0628***
	(0.000)	(0.000)	(0.000)
Need For Bank Loans=3	0.0725***	0.0746***	0.0748***
	(0.000)	(0.000)	(0.000)
Need For Bank Loans=1 X Credit Standards - 1 Period	-0.0136		
	(0.710)		
Need For Bank Loans=3 X Credit Standards - 1 Period	-0.0436		
	(0.193)		
Credit Standards - 2 Periods		0.0286	
		(0.352)	
Need For Bank Loans=1 X Credit Standards - 2 Periods		0.0150	
		(0.744)	
Need For Bank Loans=3 X Credit Standards - 2 Periods		-0.125***	
		(0.002)	
Credit Standards - 3 Periods			0.0642*
			(0.080)
Need For Bank Loans=1 X Credit Standards - 3 Periods			0.00703
			(0.892)
Need For Bank Loans=3 X Credit Standards - 3 Periods			-0.137***
			(0.003)
Constant	-1.905***	-1.905***	-1.906***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.466	0.467	0.466

Notes: Table shows the results of a regression in which the dependent variable is a value of -1 if firms in SAFE reported increase in bank loan availability, -2 if they reported no change and -3 for a decrease in bank loan availability. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. Higher values indicate tighter credit standards. Need for bank loans is a categorical value with 1 indicating a decreased need, 3 an increased need, and 2 acting as a base category (no change in need). All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

TABLE A2. Regression of finance being the worst problem for firms on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.0123		
	(0.265)		
Need For Bank Loans=1	-0.00721	-0.00718	-0.00731
	(0.114)	(0.115)	(0.108)
Need For Bank Loans=3	0.0421***	0.0411***	0.0403***
	(0.000)	(0.000)	(0.000)
Need For Bank Loans=1 X Credit Standards - 1 Period	0.00959		
	(0.576)		
Need For Bank Loans=3 X Credit Standards - 1 Period	0.0283*		
	(0.087)		
Credit Standards - 2 Periods		-0.0131	
		(0.377)	
Need For Bank Loans=1 X Credit Standards - 2 Periods		0.00709	
		(0.737)	
Need For Bank Loans=3 X Credit Standards - 2 Periods		0.0639***	
		(0.001)	
Credit Standards - 3 Periods			-0.0216
			(0.222)
Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0135
			(0.570)
Need For Bank Loans=3 X Credit Standards - 3 Periods			0.0848***
			(0.000)
Constant	0.0772***	0.0770***	0.0772***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	31590	31623	31666
R^2	0.487	0.487	0.488

Notes: Table shows the results of a regression in which the dependent variable is a binary variable taking on a value of 1 if access to finance was reported as the most pressing problem facing a firm during the SAFE survey period and 0 otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over, looking backwards from the current period. Higher values indicate tighter credit standards. Need for bank loans is a categorical value with 1 indicating a decreased need, 3 an increased need, and 2 acting as a base category (no change in need). All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A3. Regression of investment on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.00557		
	(0.847)		
Need For Bank Loans=1	-0.0663***	-0.0666***	-0.0667***
	(0.000)	(0.000)	(0.000)
Need For Bank Loans=3	0.166***	0.167***	0.166***
	(0.000)	(0.000)	(0.000)
Need For Bank Loans=1 X Credit Standards - 1 Period	0.0291		
	(0.539)		
Need For Bank Loans=3 X Credit Standards - 1 Period	-0.0799*		
	(0.076)		
Credit Standards - 2 Periods		-0.0188	
		(0.639)	
Need For Bank Loans=1 X Credit Standards - 2 Periods		0.0927	
		(0.148)	
Need For Bank Loans=3 X Credit Standards - 2 Periods		-0.120**	
		(0.049)	
Credit Standards - 3 Periods			-0.0104
			(0.832)
Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0823
			(0.273)
Need For Bank Loans=3 X Credit Standards - 3 Periods			-0.127*
			(0.082)
Constant	-1.832***	-1.832***	-1.832***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.450	0.450	0.450

Notes: Table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in investment, -2 if they reported no change and -3 for a decrease in investment. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over, looking backwards from the current period. Higher values indicate tighter credit standards. Need for bank loans is a categorical value with 1 indicating a decreased need, 3 an increased need, and 2 acting as a base category (no change in need). All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A4. Regression of bank loan availability on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period Tightening Only	-0.0532					
	(0.408)					
Increased Need For Bank Loans=1	0.0112	0.0233	0.0272	-0.0117	-0.0131	-0.0110
	(0.660)	(0.363)	(0.293)	(0.639)	(0.603)	(0.665)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only	-0.324***					
	(0.005)					
Fin Source Concentration	0.0462*	0.0461*	0.0539*	0.0615**	0.0591**	0.0630**
	(0.090)	(0.093)	(0.052)	(0.022)	(0.029)	(0.020)
Credit Standards - 1 Period Tightening Only X Fin Source Concentration	0.109					
	(0.286)					
Increased Need For Bank Loans=1 X Fin Source Concentration	0.0915**	0.0810*	0.0755*	0.129***	0.131***	0.129***
	(0.040)	(0.072)	(0.097)	(0.003)	(0.003)	(0.004)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only X Fin Source Concentration	0.498**					
	(0.016)					
Credit Standards - 2 Period Tightening Only		-0.0101				
		(0.896)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only		-0.527***				
		(0.000)				
Credit Standards - 2 Period Tightening Only X Fin Source Concentration		0.125				
		(0.305)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only X Fin Source Concentration		0.649***				
		(0.007)				
Credit Standards - 3 Period Tightening Only			0.0964			
			(0.275)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only			-0.566***			
			(0.000)			
Credit Standards - 3 Period Tightening Only X Fin Source Concentration			0.0471			
			(0.730)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only X Fin Source Concentration			0.684***			
			(0.007)			
Credit Standards - 1 Period Easing Only				0.138		
				(0.149)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only				0.0839		
				(0.666)		
Credit Standards - 1 Period Easing Only X Fin Source Concentration				-0.195		
				(0.208)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only X Fin Source Concentration				-0.216		
				(0.525)		
Credit Standards - 2 Period Easing Only					0.0914	
					(0.460)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only					0.136	
					(0.587)	
Credit Standards - 2 Period Easing Only X Fin Source Concentration					-0.127	
					(0.525)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only X Fin Source Concentration					-0.301	
					(0.495)	
Credit Standards - 3 Period Easing Only						0.141
						(0.314)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only						0.0697
						(0.809)
Credit Standards - 3 Period Easing Only X Fin Source Concentration						-0.217
						(0.335)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only X Fin Source Concentration						-0.266
						(0.603)
Constant	-1.914***	-1.917***	-1.925***	-1.923***	-1.922***	-1.924***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34069	34103	34148	34069	34103	34148
R^2	0.466	0.467	0.466	0.466	0.466	0.466

Notes: Table shows the results of a regression in which the dependent variable is a value of -1 if firms in SAFE reported increase in bank loan availability, -2 if they reported no change and -3 for a decrease in bank loan availability. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A5. Regression of finance being the worst problem facing a firm on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period Tightening Only	-0.0514*					
	(0.085)					
Increased Need For Bank Loans=1	0.0675***	0.0665***	0.0676***	0.0782***	0.0819***	0.0819***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only	0.161***					
	(0.006)					
Fin Source Concentration	-0.0281**	-0.0277**	-0.0259*	-0.0218*	-0.0194	-0.0200
	(0.031)	(0.035)	(0.051)	(0.090)	(0.136)	(0.125)
Credit Standards - 1 Period Tightening Only X Fin Source Concentration	0.0592					
	(0.209)					
Increased Need For Bank Loans=1 X Fin Source Concentration	-0.0479**	-0.0509**	-0.0545**	-0.0634***	-0.0696***	-0.0681***
	(0.031)	(0.024)	(0.016)	(0.004)	(0.002)	(0.002)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only X Fin Source Concentration	-0.219**					
	(0.031)					
Credit Standards - 2 Period Tightening Only		-0.0467				
		(0.187)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only		0.178***				
		(0.006)				
Credit Standards - 2 Period Tightening Only X Fin Source Concentration		0.0503				
		(0.357)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only X Fin Source Concentration		-0.166				
		(0.147)				
Credit Standards - 3 Period Tightening Only			-0.0479			
			(0.231)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only			0.146**			
			(0.030)			
Credit Standards - 3 Period Tightening Only X Fin Source Concentration			0.0193			
			(0.749)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only X Fin Source Concentration			-0.0795			
			(0.506)			
Credit Standards - 1 Period Easing Only				0.0389		
				(0.409)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only				-0.0254		
				(0.793)		
Credit Standards - 1 Period Easing Only X Fin Source Concentration				-0.0724		
				(0.338)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only X Fin Source Concentration				0.0605		
				(0.720)		
Credit Standards - 2 Period Easing Only					0.0858	
					(0.158)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only					-0.156	
					(0.204)	
Credit Standards - 2 Period Easing Only X Fin Source Concentration					-0.155	
					(0.113)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only X Fin Source Concentration					0.278	
					(0.197)	
Credit Standards - 3 Period Easing Only						0.0753
						(0.279)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only						-0.173
						(0.225)
Credit Standards - 3 Period Easing Only X Fin Source Concentration						-0.144
						(0.194)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only X Fin Source Concentration						0.246
						(0.331)
Constant	0.0918***	0.0914***	0.0914***	0.0873***	0.0858***	0.0863***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31590	31623	31666	31590	31623	31666
R^2	0.488	0.488	0.488	0.488	0.488	0.488

Notes: Table shows the results of a regression in which the dependent variable is a binary variable taking on a value of 1 if access to finance was reported as the most pressing problem facing a firm during the SAFE survey period and 0 otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A6. Regression of investment on BLS credit standards

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Standards - 1 Period Tightening Only	0.0510					
	(0.601)					
Increased Need For Bank Loans=1	0.148***	0.147***	0.141***	0.120***	0.124***	0.136***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only	-0.480***					
	(0.007)					
Fin Source Concentration	0.00711	0.0157	0.0213	0.000408	-0.0000211	0.00170
	(0.845)	(0.673)	(0.571)	(0.991)	(1.000)	(0.963)
Credit Standards - 1 Period Tightening Only X Fin Source Concentration	-0.0261					
	(0.865)					
Increased Need For Bank Loans=1 X Fin Source Concentration	0.0780	0.0863	0.100	0.112*	0.102*	0.0825
	(0.200)	(0.164)	(0.110)	(0.059)	(0.088)	(0.172)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Tightening Only X Fin Source Concentration	0.552*					
	(0.073)					
Credit Standards - 2 Period Tightening Only		0.131				
		(0.344)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only		-0.576**				
		(0.022)				
Credit Standards - 2 Period Tightening Only X Fin Source Concentration		-0.170				
		(0.433)				
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Tightening Only X Fin Source Concentration		0.551				
		(0.202)				
Credit Standards - 3 Period Tightening Only			0.251			
			(0.147)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only			-0.516*			
			(0.093)			
Credit Standards - 3 Period Tightening Only X Fin Source Concentration			-0.294			
			(0.278)			
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Tightening Only X Fin Source Concentration			0.328			
			(0.530)			
Credit Standards - 1 Period Easing Only				-0.0749		
				(0.533)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only				-0.173		
				(0.500)		
Credit Standards - 1 Period Easing Only X Fin Source Concentration				0.209		
				(0.274)		
Increased Need For Bank Loans=1 X Credit Standards - 1 Period Easing Only X Fin Source Concentration				0.204		
				(0.641)		
Credit Standards - 2 Period Easing Only					-0.121	
					(0.437)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only					-0.346	
					(0.303)	
Credit Standards - 2 Period Easing Only X Fin Source Concentration					0.242	
					(0.329)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Period Easing Only X Fin Source Concentration					0.610	
					(0.290)	
Credit Standards - 3 Period Easing Only						-0.0618
						(0.722)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only						-0.765**
						(0.042)
Credit Standards - 3 Period Easing Only X Fin Source Concentration						0.171
						(0.537)
Increased Need For Bank Loans=1 X Credit Standards - 3 Period Easing Only X Fin Source Concentration						1.343**
						(0.039)
Constant	-1.855***	-1.860***	-1.865***	-1.851***	-1.850***	-1.851***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28229	28263	28310	28229	28263	28310
R^2	0.450	0.450	0.450	0.450	0.450	0.450

Notes: Table shows the results of a regression in which the dependent variable is a trinomial variable taking on a value of -1 if firms in SAFE reported increase in investment, -2 if they reported no change and -3 for a decrease in investment. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

5.0.1 Interactions with financing sources

TABLE A7. Regression of increased bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.0547		
	(0.154)		
Increased Need For Bank Loans=1	0.0618***	0.0636***	0.0644***
	(0.001)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.100		
	(0.163)		
Fin Source Concentration	0.0177	0.0185	0.0197
	(0.370)	(0.349)	(0.320)
Credit Standards - 1 Period X Fin Source Concentration	0.0746		
	(0.223)		
Increased Need For Bank Loans=1 X Fin Source Concentration	0.0671**	0.0653**	0.0633**
	(0.035)	(0.042)	(0.049)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	0.179		
	(0.159)		
Credit Standards - 2 Periods		-0.0354	
		(0.450)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.153*	
		(0.070)	
Credit Standards - 2 Periods X Fin Source Concentration		0.0625	
		(0.399)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		0.203	
		(0.175)	
Credit Standards - 3 Periods			-0.0231
			(0.663)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			-0.157*
			(0.081)
Credit Standards - 3 Periods X Fin Source Concentration			0.0583
			(0.481)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			0.236
			(0.141)
Constant	0.213***	0.212***	0.211***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.440	0.440	0.439

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported increased availability of bank loans and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A8. Regression of decreased bank loan availability on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	0.0206		
	(0.464)		
Increased Need For Bank Loans=1	0.0626***	0.0586***	0.0571***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	0.141***		
	(0.007)		
Fin Source Concentration	-0.0313**	-0.0319**	-0.0344**
	(0.030)	(0.027)	(0.017)
Credit Standards - 1 Period X Fin Source Concentration	-0.0499		
	(0.266)		
Increased Need For Bank Loans=1 X Fin Source Concentration	-0.0418*	-0.0366	-0.0344
	(0.073)	(0.118)	(0.143)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	-0.219**		
	(0.018)		
Credit Standards - 2 Periods		-0.00180	
		(0.958)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		0.250***	
		(0.000)	
Credit Standards - 2 Periods X Fin Source Concentration		-0.0453	
		(0.403)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		-0.338***	
		(0.002)	
Credit Standards - 3 Periods			-0.0445
			(0.250)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.263***
			(0.000)
Credit Standards - 3 Periods X Fin Source Concentration			-0.0122
			(0.840)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			-0.329***
			(0.005)
Constant	0.128***	0.129***	0.131***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	34069	34103	34148
R^2	0.476	0.477	0.477

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported decreased availability of bank loans and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A9. Regression of increased investment on BLS credit standards - asymmetric responses

	(1)	(2)	(3)
Credit Standards - 1 Period	0.0227		
	(0.659)		
Increased Need For Bank Loans=1	0.0973***	0.0923***	0.0879***
	(0.000)	(0.000)	(0.000)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	-0.175*		
	(0.078)		
Fin Source Concentration	-0.0461*	-0.0457*	-0.0463*
	(0.065)	(0.067)	(0.063)
Credit Standards - 1 Period X Fin Source Concentration	-0.0374		
	(0.643)		
Increased Need For Bank Loans=1 X Fin Source Concentration	0.107***	0.116***	0.124***
	(0.009)	(0.005)	(0.002)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	0.171		
	(0.314)		
Credit Standards - 2 Periods		0.0509	
		(0.463)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		-0.115	
		(0.391)	
Credit Standards - 2 Periods X Fin Source Concentration		-0.0480	
		(0.660)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		0.000780	
		(0.997)	
Credit Standards - 3 Periods			0.0460
			(0.572)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0633
			(0.685)
Credit Standards - 3 Periods X Fin Source Concentration			-0.00572
			(0.964)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			-0.354
			(0.185)
Constant	0.325***	0.324***	0.324***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.461	0.461	0.461

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported decreased investment and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

Table A10. Regression of decreased investment on BLS credit standards

	(1)	(2)	(3)
Credit Standards - 1 Period	-0.0293		
	(0.456)		
Increased Need For Bank Loans=1	-0.0282	-0.0285	-0.0262
	(0.128)	(0.123)	(0.155)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period	0.0878		
	(0.248)		
Fin Source Concentration	-0.0544***	-0.0563***	-0.0566***
	(0.004)	(0.003)	(0.003)
Credit Standards - 1 Period X Fin Source Concentration	0.0455		
	(0.461)		
Increased Need For Bank Loans=1 X Fin Source Concentration	0.00269	0.00188	-0.00133
	(0.931)	(0.952)	(0.966)
Increased Need For Bank Loans=1 X Credit Standards - 1 Period X Fin Source Concentration	-0.144		
	(0.268)		
Credit Standards - 2 Periods		-0.0587	
		(0.269)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods		0.119	
		(0.247)	
Credit Standards - 2 Periods X Fin Source Concentration		0.125	
		(0.134)	
Increased Need For Bank Loans=1 X Credit Standards - 2 Periods X Fin Source Concentration		-0.150	
		(0.394)	
Credit Standards - 3 Periods			-0.0830
			(0.183)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods			0.0732
			(0.539)
Credit Standards - 3 Periods X Fin Source Concentration			0.189*
			(0.053)
Increased Need For Bank Loans=1 X Credit Standards - 3 Periods X Fin Source Concentration			-0.0837
			(0.682)
Constant	0.179***	0.180***	0.180***
	(0.000)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Country Sector Wave FE	Yes	Yes	Yes
Observations	28229	28263	28310
R^2	0.421	0.421	0.421

Notes: Table shows the results of a regression of a binary variable taking on a value of one if firms in SAFE reported increased investment and zero otherwise. Credit standards are measured using the responses of the firms' matched BLS banks, and are averaged over time, with the number of periods referring to the number of SAFE rounds they have been averaged over looking backwards from the current period. The credit standards variable is split into two separate variables, taking on an index value equalling the magnitude of the tightening or easing respectively (between 0 and 2), and is coerced to equal zero otherwise. Higher values for the tightening variable indicate a larger degree of tightening, while higher values for the easing variable indicate a larger degree of easing. Increased need for bank loans is a binary variable, taking on a value of 1 if a firms need for bank loans increased, and 0 otherwise. Fin source concentration is an index between 0 and 1, whereby higher values indicate a wider diversification of funding sources. All regressions have firm and country-sector-wave fixed effects. Parentheses show p-values, with the following convention: * p<0.1, ** p<0.05, *** p<0.01.

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