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SME FINANCING CONDITIONS IN EUROPE: CREDIT CRUNCH OR FUNDAMENTALS?

Sarah Holton, Martina Lawless and Fergal McCann*

Cross-country divergence in credit availability to Small and Medium Enterprises (SMEs) has been a salient feature of the recent Euro Area economic crisis. This paper uses firm level and macroeconomic data to identify heterogeneity in SME credit conditions within the Euro Area since 2009. By taking account of differences in firm quality and in the risk-free interest rate, we use remaining residual differences in credit supply conditions to identify a 'credit crunch'. We investigate whether macroeconomic conditions such as real economy growth and private sector leverage can explain these residual credit crunches, finding that banks respond to these factors when allocating credit to SMEs. The analysis allows identification of economies where credit conditions appear both unexpectedly restrictive and accommodative.

Keywords: credit supply; credit demand; economic crisis; debt overhang

JEL Classifications: G01; G21

1. Introduction

One of the defining features of the recent Euro Area crisis has been the significant contraction in credit to the real economy, along with the large variation in the pace of this decline across countries. There is ongoing debate as to whether the decline in lending is supply or demand driven, with the pace of decline in certain countries leading to fears that firms in these countries are experiencing a 'credit crunch'. Due to difficulties in verifying firm performance and prospects, higher lender transaction costs, and perceived higher credit risk, the provision of bank credit to SMEs has been a topic of perennial importance for researchers. From a policy perspective, the identification of the existence of credit supply constraints is of huge importance due to the deleterious impacts of such constraints on investment, employment and firm survival.[1]

This paper examines the heterogeneity in credit supply conditions across the Euro Area. We use a firm level survey, which helps overcome the difficulties in disentangling supply and demand effects when using aggregate lending volumes. The definition of a credit crunch is based on the Bernanke and Lown (1991) approach of "a significant leftward shift in the supply for bank loans, holding constant both the safe real interest rate and the quality of the borrower." Following this rationale, we identify credit crunches as significant differences in credit supply across time and countries that are not accounted for by borrower characteristics or 'risk free rates'. Finally, credit crunch estimates are explained by macroeconomic variables such as weaknesses in real economy growth and high private sector leverage. Economies in which credit crunch measures are higher than those explained by these macroeconomic factors are interpreted to be those in which lending to SMEs is the most restrictive in the Euro Area.

While bank lending to the real economy is always a concern in the aftermath of a financial crisis,[2] the

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problem has been of first order importance in the Euro Area post-2008 for a number of reasons. Firstly, the financial crisis has highlighted weaknesses in the integration of the European monetary area. Sovereign bond yields, which in the pre-crisis era had almost converged, have diverged substantially since 2008. Given that these rates generally influence interbank markets, this has contributed to wide cross-country divergence in banks' funding costs. Secondly, firms in the Euro Area are characterised by an extremely high reliance on bank funding. According to the European Central Bank (ECB) President Mario Draghi, "in the United States 80 per cent of credit intermediation goes via the capital markets. In the European situation it is the other way round. Eighty per cent of financial intermediation goes through the banking system."

This article borrows from the set-up of Rottmann and Wollmershauser (2013), extending the methodology to a cross-country setting. The first stage involves probit regressions which predict firms' rejection when applying for bank credit, their perception that credit availability has deteriorated, and their experience of interest rates having increased. Results common to the literature are found – smaller firms, with weaker turnover, internal funds, capital or credit history are found to be more likely to experience credit constraints. The country-time residuals from this stage, which capture credit conditions not explained by borrower characteristics, are then regressed on the risk-free rate, with the residual from this second stage regression giving a measure that can be interpreted as a credit crunch in the spirit of Bernanke and Lown (1991). As pointed out by Coeure (2012), the sovereign crisis led to "the emergence of large and variable credit risk premia in the pricing of supposedly risk-free securities issued by Euro Area governments". For this reason, calling them 'safe' may seem a misnomer, but sovereign yields still have an important impact on banks' funding and pricing of loans. Therefore, given their benchmark status, they remain a relevant measure for banks' costs of funds and the so called 'safe' interest rate.

In a third stage, we investigate the extent to which macroeconomic variables may explain the varying availability of credit to SMEs. We find that banks' lending decisions are associated positively with growth in the real economy, and negatively with private sector indebtedness. Despite the inclusion of these additional explanations for credit conditions, there remain economies which deviate from the estimated relationship between credit availability and economic activity. Results of this analysis confirm a fragmentation of the Euro Area economy, with Germany, Belgium and Finland having favourable SME conditions by most measures, while Ireland, Spain, Portugal, Italy, and the Netherlands have the most stringent credit conditions facing SMEs.

The remainder of the paper is organised as follows. Section 2 provides background on the heterogeneity that has emerged in Euro Area credit conditions during recent years and precisely defines what is meant by a credit crunch. Section 3 presents the methodology, describing the three stages of estimation used and also describes the data. Section 4 discusses the results. Section 5 concludes.

2. The credit crunch and heterogeneity in the Euro Area

2.1 Euro Area heterogeneity in credit conditions

As credit has contracted since mid-2007 in the Euro Area, certain countries have shown more pronounced declines than others. Figure 1 shows average annual flows of loans up to €1 million, which is commonly used as a proxy for loans to smaller firms, and illustrates the variation in lending flows across Euro Area countries over time. Figure 2 shows that the variation in interest rates on loans up to €1 million has increased significantly since the onset of the financial crisis. The bottom chart also indicates that smaller firms have faced relatively tougher credit conditions, as the interest rate spread between small and large loans remains at historic highs.

These patterns of credit quantity and price heterogeneity have stoked fears of impairment in the monetary transmission mechanism. The monetary transmission mechanism is "the process by which changes in the benchmark rate of interest of a central bank are transmitted through the financial system to the real economy" (Draghi, 2012). When the monetary transmission mechanism functions well, decisions on the official interest rate appropriately affect the economy through various channels, as outlined by Mishkin (1996). An important channel is the credit channel of monetary policy. Bernanke and Gertler (1995) explore the two subcategories of the credit channel: the bank lending channel and the borrower balance sheet channel. The bank lending channel is sometimes known as the pure supply channel as it relates to changes in banks' balance sheets that affect the supply of credit, unrelated to borrower quality. The borrower balance sheet channel on the other hand involves changes in the

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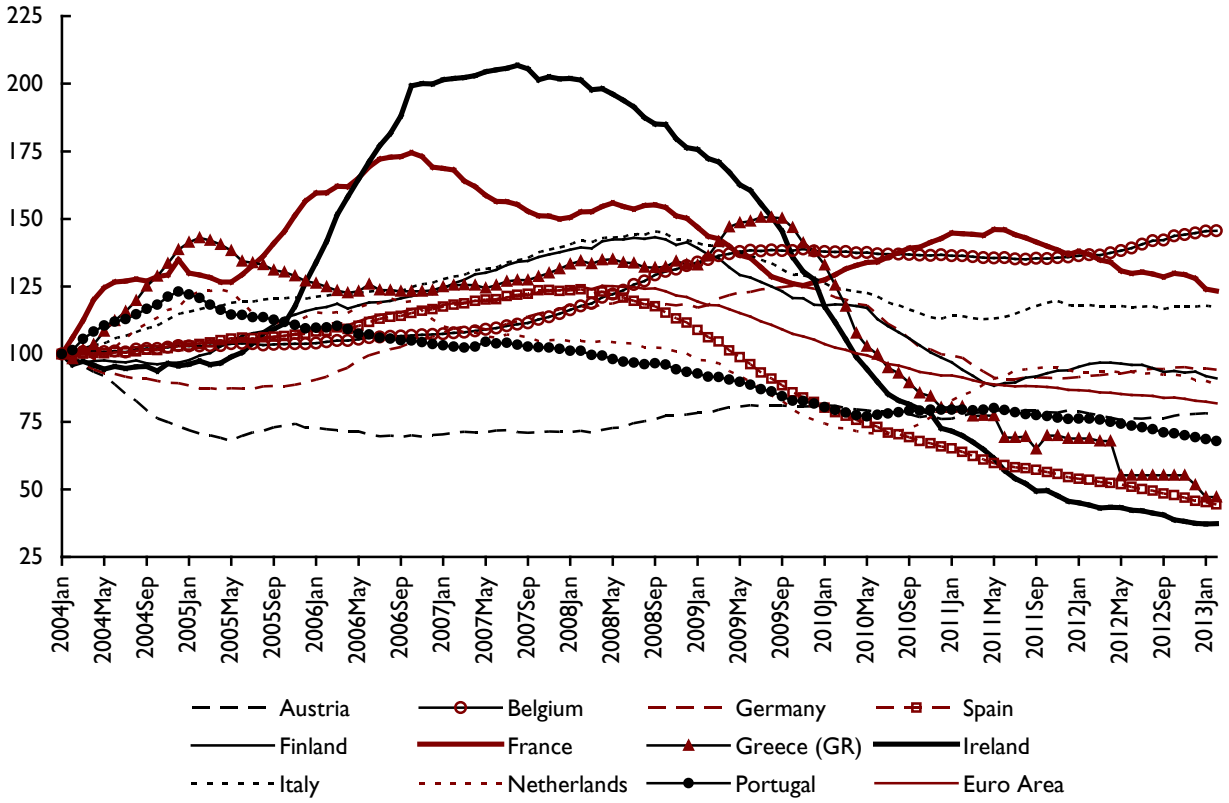
Figure 1. Average annual flows of new loan volumes to NFCs up to 1 million – indexed to 2003



supply of credit due to changes in borrowers' balance sheets. Significant changes in both of these channels and divergences in the Euro Area would affect the transmission of monetary policy.

In normal times monetary policy should transmit smoothly to all regions in a monetary union, so that changes in the policy rate should lead to similar changes in the 'risk free rate' and bank financing costs across Euro Area countries. However, the Euro Area crisis led to changes in the monetary policy transmission mechanism and affected the determination of the risk free rates and bank funding costs leading to substantial heterogeneity in funding costs across Euro Area countries. The European Central Bank (ECB), in announcing arguably the most significant monetary policy action of the European crisis, the Outright Monetary Transactions (OMT) programme, pointed towards the issue of a broken transmission mechanism in justifying its policy shift:

> We have substantial, significant and important evidence that the European monetary area is now fragmented, the actions we decided on today are geared to repairing monetary policy transmission channels.[3]

While the OMT has succeeded in its primary aim of calming fears in sovereign bond markets, the issue of divergent credit conditions in the real economy has remained at the forefront of Euro Area policy concerns. The sovereign bond crisis, which stemmed from concerns regarding certain governments' creditworthiness, saw the emergence of large and variable credit risk premia in the pricing of supposedly risk-free securities issued by Euro Area governments and contributed to a severe fragmentation in the single financial market Coeure (2012). Tensions in sovereign bond markets have impaired the monetary transmission mechanism as "the role of the risk-free rate as a pricing benchmark is distorted" (Gonzalez-Paramo (2011).

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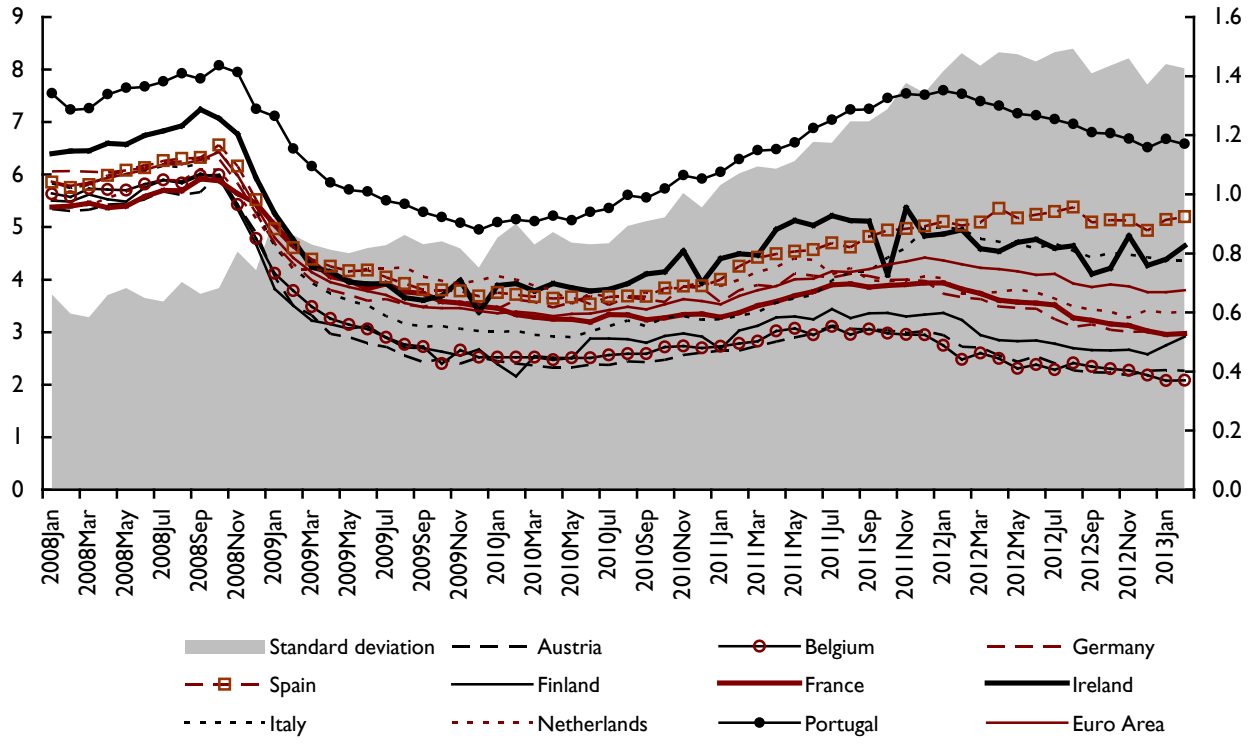
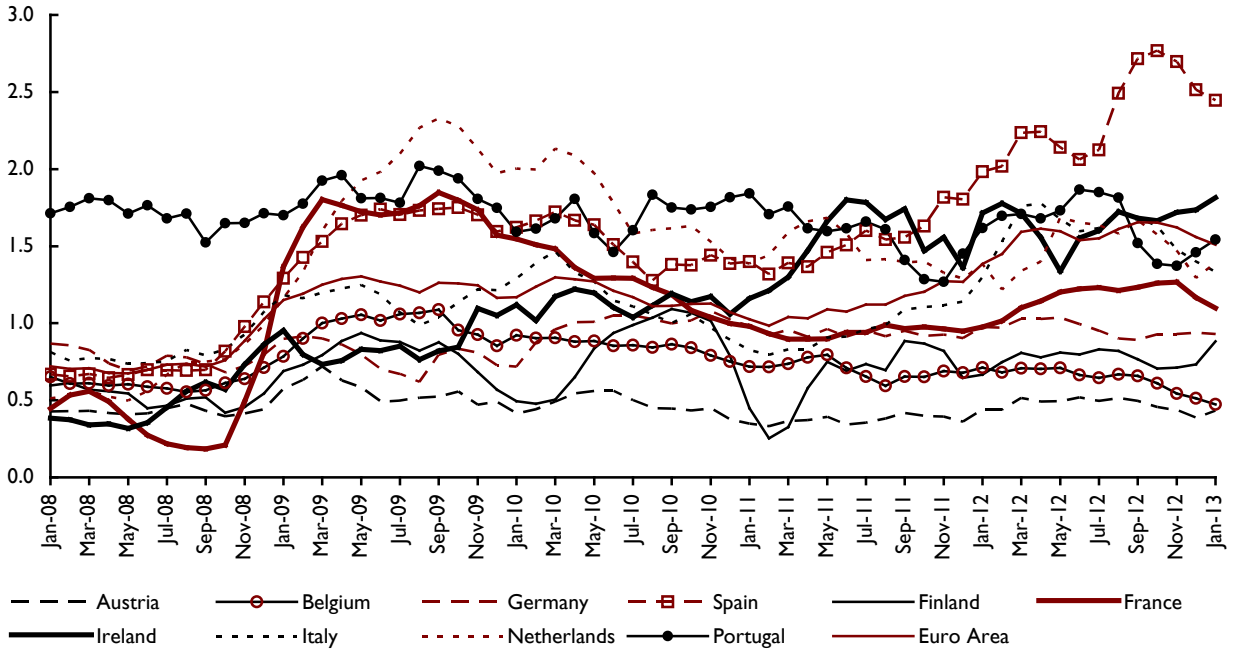
Figure 2. Interest rates on loans to non-financial corporations up to 1 million euro (top) and spread between loans up to and over 1 million euro (bottom)





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2.2 Defining a credit crunch

In defining a credit crunch we aim to distinguish 'normal' shifts in loan supply (due for instance to changes in the risk free rate from a monetary policy decision) from excessive contractions in credit. Divergence in borrower quality and the risk free rate have most likely contributed to Euro Area heterogeneity in lending conditions. The external financing conditions facing a borrower should, according to the balance sheet channel as outlined by Bernanke and Gertler (1995), depend on the "borrower's financial position". A number of papers have addressed the changes in borrower quality and its implications for credit supply. Jimenéz, Ongena, Peydró, and Saurina (2012) use both micro firm and bank balance sheet data in Spain, and find that heterogeneity in firms' balance sheets determines loan granting in normal and crisis times, and is particularly influential during the crisis. Albertazzi and Marchetti (2010) also find, using micro level data for firms and banks in Italy, that credit was allocated away from riskier firms during the crisis. Due to the lack of firm balance sheet data across all Euro Area countries, we use a firm survey to try to capture changes in borrower quality.

Fragmentation in the Euro Area has affected sovereign bond yields, which are the typical measure of risk free rates. Developments in supposedly risk free rates are important as they affect banks' refinancing costs (Rottmann and Wollmershauser (2013). This is why the ECB's securities market programme (SMP) and the outright monetary transactions (OMT) aim to influence this market segment. In the context of the financial crisis, it should be noted that the interactions between sovereign bond yields and bank riskiness can operate in both directions. The experience of Ireland, for example, showed how sovereign bonds could be affected by the costs of bank recapitalisations.

Gonzalez-Paramo (2011) outlines three ways in which sovereign bonds affect bank funding and the supply of credit. Firstly, the price channel operates as sovereign bonds have traditionally served as a benchmark, indeed a floor, for the interest rates banks charged for loans. Secondly, the balance sheet channel operates through changes in the value of government bonds held by banks for trading, or for sale. Thirdly, the liquidity channel refers to banks' access to interbank and central bank funding as government bonds are the primary source of collateral used in these markets.

3. Data and methodology

3.1 Firm level data

Since 2009, the ECB has conducted half-yearly waves of the Survey on Access to Finance of Small and Medium Enterprises (SAFE). The aim of the survey is to provide information on the financing needs of SMEs, their experience in attempting to access finance, along with information on their perceptions of current economic and financial conditions. The survey also asks firms about changes in their turnover, employment, ownership type, age and sector of activity. In this paper we use the biannual SAFE data for five waves covering the period between September 2010 and March 2013 to identify credit supply restrictions across eleven Euro Area countries: Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal. We only use the fourth wave onwards (excluding data from 2009 to mid-2010) as there was a large increase in the sample size among the smaller countries at this point. For each of these sample periods, approximately 5,600 firm observations are available, giving a total of close to 28,000 firm observations in the dataset. A more detailed description of the data is provided in Holton, Lawless, and McCann (2012).

3.1.1 Defining credit supply variables

There are a number of questions that we use as dependent variables in our analysis. On loan applications, firms are asked:

> If you applied and tried to negotiate for this type of financing over the past 6 months, did you: Receive all the financing you requested; receive only part of the financing you requested; refuse to proceed because of unacceptable costs or terms and conditions; or have you not received anything at all?

We code as 'Rejected' all firms who received less than 75 per cent of the requested financing, refused to proceed or received nothing at all. Only firms that received all or more than 75 per cent of requested financing are coded as 'Not Rejected'.

Firms were also asked to give their opinion on the availability of finance. This question is useful in that it allows us to include credit perceptions from firms that did not formally apply for a loan and therefore captures any potentially discouraged borrowers. This is based on a question for bank loans and overdrafts, with firms asked:

> Would you say that their availability has improved, remained unchanged or deteriorated for your firm over the past 6 months?

We use a dummy variable equal to 1 if firms report deterioration in bank credit availability and 0 otherwise. Finally, to capture the cost of credit, we use the following question:

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Table 1. Loan rejection, credit perceptions and interest rate experience

	Bank rejection for firms applying					Deterioration of credit					Interest rate increase				
	11H1	11H2	12H1	12H2	13H1	11H1	11H2	12H1	12H2	13H1	11H1	11H2	12H1	12H2	13H1
AT	5.4	9.2	4.1	7.7	12.7	15.2	22.5	17.6	15.9	14.6	44.8	56.7	36.9	26.4	23.4
BE	13.1	16.4	16.6	20.0	20.8	11.5	12.2	17.1	18.9	21.8	48.1	39.2	42.9	19.6	20.8
DE	12.9	13.7	9.4	10.1	7.9	10.6	13.1	10.7	11.0	7.5	37.4	37.3	17.1	14.9	9.4
ES	26.2	28.8	35.5	31.9	34.6	22.5	20.7	27.0	27.5	25.3	82.8	85.6	85.9	77.7	78.4
FI	6.2	2.5	11.4	7.5	14.8	6.2	9.7	10.5	18.9	19.4	49.2	33.7	38.6	30.8	54.1
FR	17.5	17.3	14.6	19.4	19.8	15.8	20.4	18.1	22.2	20.6	43.3	50.9	46.0	25.5	13.6
GR	36.9	45.9	54.4	49.4	42.3	36.0	51.4	52.1	63.6	47.1	76.9	88.5	84.0	68.3	45.6
IE	38.2	44.4	36.1	40.2	32.4	40.9	36.0	32.1	32.6	24.9	70.3	77.7	53.4	61.0	53.3
IT	16.1	21.5	28.1	27.3	23.8	13.3	17.5	23.7	22.1	19.8	60.9	81.1	83.7	78.1	71.0
NL	29.0	37.0	32.1	58.1	37.7	20.6	22.1	21.4	29.3	30.0	38.4	52.6	37.9	41.3	45.6
PT	21.3	32.2	22.1	37.1	26.1	27.3	34.1	47.0	38.8	28.6	76.9	73.2	75.9	66.1	63.2
All countries	19.9	23.5	23.7	25.3	23.2	18.9	21.9	23.6	25.1	22.2	58.7	64.7	58.9	49.7	44.3

> For interest rates, could you please indicate whether they were increased, remained unchanged or were decreased over the past 6 months?

We use a dummy variable equal to 1 if firms report an increase in interest rates, and 0 otherwise.

Table 1 shows the percentage of firms in each country for each wave of the survey responding 1 to the three questions above. Substantial variation across countries can be seen for each of the variables. For example, in the most recent wave of the survey, around 40 per cent of Greek firms reported being rejected for a loan. This is close to double the average rejection rate for the Euro Area as a whole and many multiples of the rejection rates of 7.9 per cent in Germany and 12.7 per cent in Austria.

In most countries, the percentage of firms reporting a perceived deterioration in loan availability is similar to the loan rejection rates, although it should be borne in mind that this question has a higher response rate as it is asked of all firms and not just those that have applied for credit. Increases in interest rates on loans have been reported as affecting over half of firms across the Euro Area and up to three-quarters of firms in countries such as Spain and Greece in some of the time periods.

In terms of changes across time, in most countries the percentage of firms affected by the deterioration in credit conditions increased over time, until the most recent wave when there was a noticeable decline in rejection rates and interest rate increases.

3.1.2 Capturing borrower quality

The explanatory variables are mainly categorical variables available in the SAFE data. These are the size of the firm (measured in categories: less than ten employees, ten to fifty employees, and fifty to two hundred and fifty employees), turnover (measured as categories: under €2 million, €2–10 million and €10–50 million, with over €50 million as the reference group), a dummy variable to capture if the firm is a subsidiary (which might allow it access to greater funding opportunities than a stand-alone firm of similar size), the age of the firm, if there has been a change in the internal funds the firm has available to it, changes in credit history and in the firm's capital position (for these last three variables, the measures are categories improved, unchanged and deteriorated as the reference group). Sector dummies are for the seven sectors: mining, construction, industry, wholesale and retail, transport, real estate and services.

3.2 'Risk free' rates and macroeconomic fundamentals

We use 10-year sovereign bond yields for each country in order to control for changes in the risk free rate. As outlined in section 2, sovereign bonds play an important role in the transmission of monetary policy and bank finance to the private sector. Rottmann and Wollmershauser (2013) use a similar approach, as these rates accurately capture "changes in the banks' refinancing costs". However, fears regarding government finances meant that sovereign bonds in certain countries lost their 'risk free' status and a spiral between bank and sovereign financing costs began. Other measures could capture bank refinancing costs that would affect credit provision to the real economy. For this reason we also use an aggregate measure of deposit interest rates in each country. This is to check that our results are robust

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Table 2. Country-level macroeconomic variables

Risk-free rates		
10-year govt bond yields	10-year benchmark govt bond redemption yield	Average over relevant half-year period (Datastream)
Deposit interest rates	Interest rates on households and non-financial corporations deposits with agreed maturity	Credit and other institutions, total maturity, annualised agreed rate, outstanding amount business coverage (ECB SDW)
Macroeconomic fundamentals		
Private credit to GDP	Outstanding loans and securities to the private sector at beginning of period over annual GDP	Credit: Outstanding loans and securities of monetary financial institutions (MFIs) excluding ECB to Euro Area Non-MFIs excluding general govt in each country at beginning of relevant half-year period (ECB SDW). GDP at market prices (Datastream)
Domestic demand	Growth of domestic demand component of GDP	Percentage change in domestic demand over relevant half-year period (Eurostat)
GDP growth	Growth of GDP	Percentage change in GDP over relevant half-year period (Eurostat)
Investment growth	Growth of Gross Fixed Capital Formation (GFCF)	Percentage change in GFCF over relevant half-year period (Eurostat)
Banks' econ. expectations	Net percentage of banks reporting that expectations regarding general economic activity affected bank's credit standards as applied to the approval of loans or credit lines to SMEs	Sum of net percentage responses over relevant two quarters (ECB Bank lending survey)

when using another 'risk free' rate or cost of funding measure.

In the final stage we wish to see which fundamental macroeconomic variables have an impact on differences in credit conditions. We assess the effect of five variables: growth in domestic demand, GDP, investment, stock of private credit to GDP and banks' expectations about general economic conditions from the bank lending survey. All these variables are defined fully in table 2.

3.3 Methodology

To identify a credit crunch across countries and time, we adopt a two-step approach similar to Rottmann and Wollmershauser (2013). The first stage involves controlling for borrower quality by including a wide range of firm-level characteristics. The second step estimates how much of the variation in credit supply that is not explained by borrower characteristics is accounted for by differences in the 'risk free' rate across countries and uses the residuals remaining after this as our measure of a credit crunch. We extend the approach of Rottmann and Wollmershauser (2013) by adding a third stage, which exploits the cross-country panel nature of our survey data and examines whether our credit crunch indicators are explained by macroeconomic conditions.

The first step explains credit supply in a probit regression based on firm characteristics:

$$Pr(Credit\ Supply_{ijkt}) = fn(FirmCharacteristics, Sector, \varepsilon_{jt}) \quad (1)$$

For the dependent variable ($Credit\ Supply_{ijkt}$) we use three different measures: bank rejection, availability deterioration and interest increase, as defined in section 3.1.1, for firm i, country j, sector k and time t. We use a number of explanatory firm level categorical variables to capture size, age, sector, turnover, subsidiary status, internal funds projections, credit history and capital position, as defined in section 3.1.2. Along with controlling for these measures of firm quality, the country time dummies are included. The coefficients ε_{jt} capture the probability of a firm being rejected for credit in a given country–time period relative to Germany in April to December 2011 (wave 5 of the survey).

In the second stage we use the variation in credit supply conditions captured by the country time dummies and control for changes in the 'risk free rate' i:

$$\varepsilon_{jt} = c + i_{jt} + u_{jt} \quad (2)$$

We use the sovereign bond yield to control for this rate as it has an important effect on bank funding costs.

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Given that other factors may also influence banks' cost of funds, for this reason we also use deposit rates over different countries and time. The remaining residuals u_{jt} can be thought of as our credit crunch variable and should capture the variation in supply of bank loans after controlling for borrower quality (in stage 1) and the risk free rate (in stage 2).

In a third stage, we control for the fact that a credit crunch, as measured by the standard methodology applied above, may be further impacted by the macroeconomic conditions in banks' host countries. We take the residuals from stage 2, $u_{jt,2}$ and regress these on $Macro_{jt}$, a set of macroeconomic measures outlined in section 3.2.

$$u_{jt,2} = c + Macro_{jt} + e_{jt} \quad (3)$$

Regression results are presented, which report the extent to which banks respond to macroeconomic conditions in their lending decisions. Bilateral scatter plots are also presented which allow an exposition of country-wave observations which deviate furthest from the predicted relationship between credit crunches and the macroeconomy. Such scatter plots can be interpreted as providing a categorisation of countries into those with unexpectedly tight, and loose, credit conditions.

4. Results

4.1 First stage

Table 3 shows the results from stage 1 where we regress our three credit measures on the firm level characteristics and the country time dummies. Column 1 shows that micro firms and firms with lower turnover are more likely

Table 3. Effect of firm-level characteristics on credit supply (Stage 1)

	(1) Bank reject	(2) Availability deterioration	(3) Interest increase
Micro	0.135**	–0.000823	–0.0463
	(2.42)	(–0.02)	(–0.78)
Small	0.0141	–0.0295	–0.0229
	(0.26)	(–1.11)	(–0.57)
Turnover up to 2 million	0.341**	0.120*	–0.268**
	(2.50)	(1.82)	(–2.52)
Turnover over 2 up to 10 million	0.267**	0.105*	–0.161*
	(2.24)	(1.70)	(–1.76)
Turnover over 10 up to 50 million	0.134	0.0537	–0.115
	(1.39)	(1.00)	(–1.39)
Subsidiary	0.0651	–0.181***	–0.0671
	(0.88)	(–5.50)	(–1.64)
over 10 years	–0.114	–0.0982	0.181
	(–0.76)	(–0.95)	(1.10)
over 5 up to 10 years	0.000887	0.00741	0.225
	(0.01)	(0.07)	(1.37)
over 2 up to 5 years	0.0931	–0.00121	0.194
	(0.53)	(–0.01)	(1.14)
Int funds improve	–0.00503	–0.260***	–0.166***
	(–0.12)	(–7.60)	(–4.57)
Int funds unchanged	–0.129***	–0.335***	–0.172***
	(–3.78)	(–13.47)	(–5.00)
Credit history improve	–0.517***	–0.673***	–0.388***
	(–10.44)	(–17.24)	(–7.50)
Credit history unchanged	–0.466***	–0.706***	–0.282***
	(–11.98)	(–20.48)	(–7.68)
Capital improve	–0.233***	–0.494***	–0.102**
	(–4.50)	(–14.85)	(–2.12)
Capital unchanged	–0.228***	–0.398***	–0.144***
	(–5.27)	(–12.75)	(–3.64)
Constant	–0.683***	0.447***	0.393**
	(–3.56)	(4.05)	(2.08)
N	8350	20925	8439
r2	0.1179	0.1288	0.1947

Note: t statistics in parentheses. Sector and country-time dummies included but not reported. * p <0.1, ** p < 0.05, *** p < 0.01.

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Figure 3. Country time dummy coefficients from stage 1 regressions

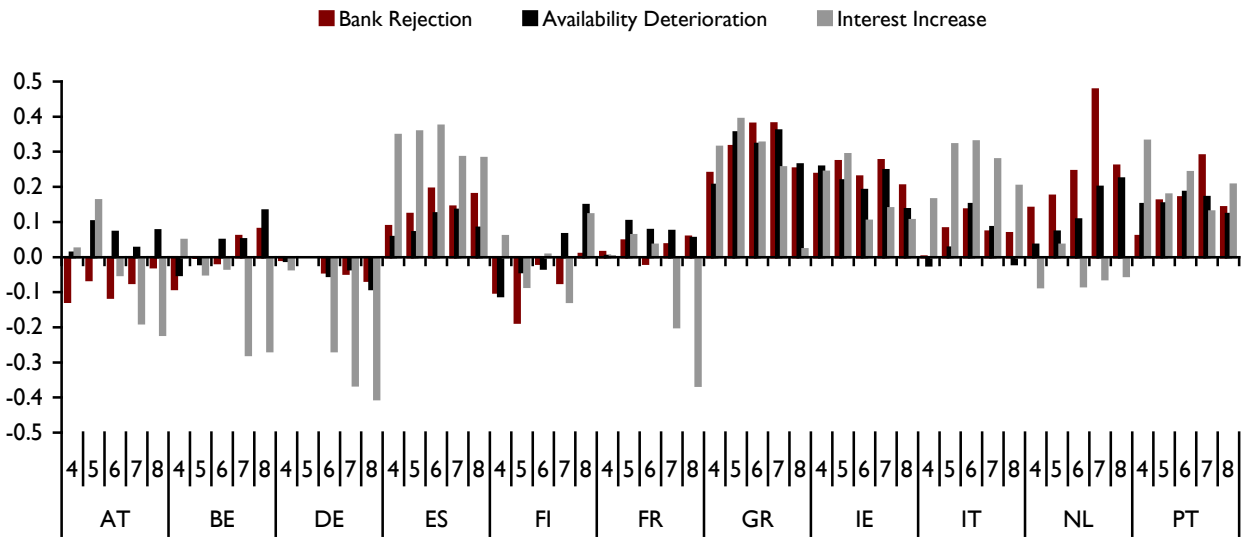

Table 4. Government bond yields and Stage 1 credit supply residuals (Stage 2)

	(1) Bank reject	(2) Availability deterioration	(3) Interest increase
10-year government bond yields	0.0158***	0.0135***	0.0197***
	(5.53)	(7.11)	(4.43)
Constant	0.00586	0.0202	−0.0472
	(0.26)	(1.33)	(−1.32)
N	43	54	54
r^2	0.371	0.493	0.274

Notes: *t* statistics in parentheses. * $p < 0.1$,** $p < 0.05$, *** $p < 0.01$.

to be rejected, whereas age and subsidiary status are not significant. Firms that have improved or unchanged internal funds, credit history or capital (relative to deteriorated) are less likely to be rejected. Columns 2 and 3 for credit availability deterioration and interest rate increases show similar results. We again see that firms with improved or unchanged internal funds, credit history or capital are less likely to report adverse supply conditions for both variables. For perceptions of credit availability in column 2, subsidiaries are less likely to have perceived a deterioration, whereas firms with lower turnover are more likely to. Column 3 on the other hand shows that firms with lower turnover are less likely to have seen an interest increase.

The country time dummies for this regression are not shown, but are broadly all significant and are displayed in the bar charts in figure 3 for each regression. The red positive coefficients show that even after controlling for firm characteristics, firms in the Netherlands, Portugal, Spain, Greece, Ireland and to a lesser extent Italy, are all more likely to have had their bank credit application rejected than firms in Germany. Firms in Finland and Austria are less likely to have been rejected. In terms of perceptions of availability, shown in black, firms in particular from the Netherlands, Portugal, Greece, Ireland and to a lesser extent Spain are more likely to have perceived deterioration in credit availability. As for the cost of credit, shown in grey, firms in Portugal,

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Spain, Greece, Ireland and Italy are all more likely to have seen interest rate increases.

4.2 Second stage

To control for the fragmentation in the risk-free rate and bank funding costs, we regress the country time dummies on sovereign bond yields. The results in table 4 show that higher sovereign yields are associated with increased credit constraints and confirm that financial market fragmentation is having a significant efferct on access to finance. The residuals from this regression leave us with the variation in credit supply that is not accounted for by firm characteristics or differences in the 'safe' interest rate and give us our credit crunch measure.

These residuals which measure the credit crunch across countries and time are shown in figure 4. For bank rejections, the residuals for all countries except the Netherlands are all lower than in figure 3, indicating that the effect of sovereign yields on bank funding costs explains much of the Euro Area heterogeneity in credit supply conditions. The only other country that has residuals that are significantly positive consistently over all five time periods is Ireland. Notably over most time periods, bank credit rejections in Greece, Italy, Portugal and to a lesser extent Spain are not significantly different from Germany after taking account of firm quality and variation in the so called safe rate. In terms of credit availability perceptions, the residuals are even smaller after controlling for the sovereign yields, with Ireland being the only country now that has perceptions that are consistently worse than Germany. For the cost of credit, only Spain, Italy and to a lesser extent Ireland have evidence of a credit crunch relative to Germany.

4.3 Third stage

As outlined in the previous section, the residuals from stage 2 represent a measure of 'credit crunch' that follows the definition set out in previous literature. We extend on the approach adopted by Rottmann and Wollmershauser (2013), by observing the relationship between credit crunch measures and macroeconomic fundamentals that are described in section 3.2 and table 2.

Table 5 provides the results of fifteen bivariate regressions of the three estimated credit crunch indicators on the five macroeconomic measures. The *t*-statistics and R^2 values from each regression are reported below the coefficients. The table reports that changes in domestic demand, GDP and investment, along with the leverage of the private sector, all explain bank rejection residuals in the expected direction; increases in the first three measures have a negative impact on the residual probability of rejection, while increases in leverage have a positive impact. This indicates that banks tighten credit conditions as one would expect – where the real economy is weaker, or the private sector is more indebted, banks are less likely to sanction lending, even

Figure 4. Residuals from stage 2 regressions

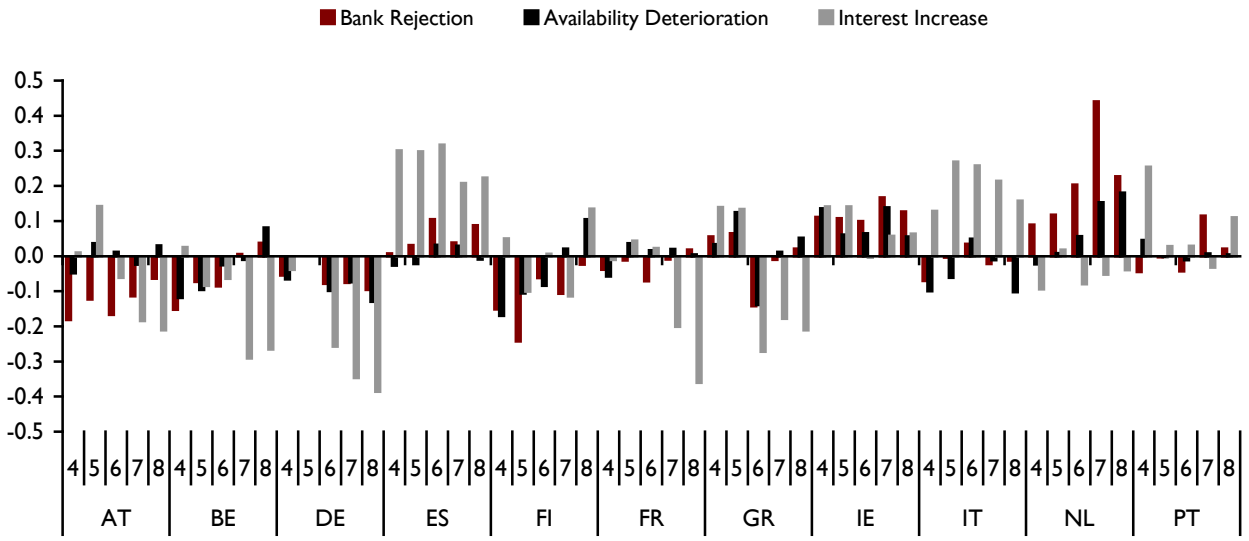

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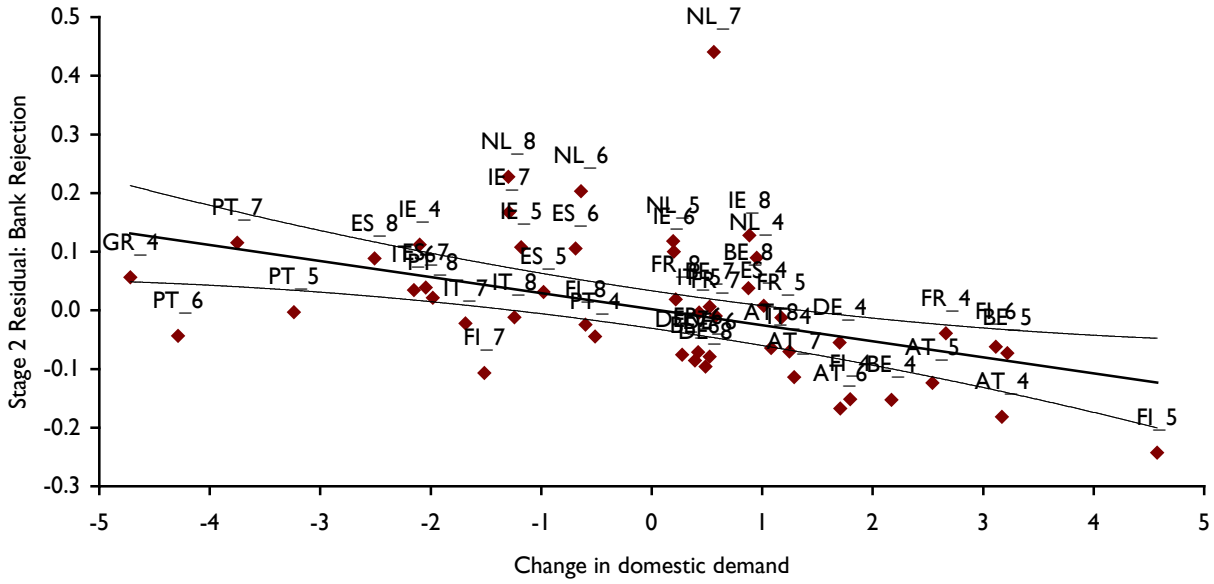
Figure 5. Stage 3: Stage 2 residuals on Bank Rejection versus selected macro indicators



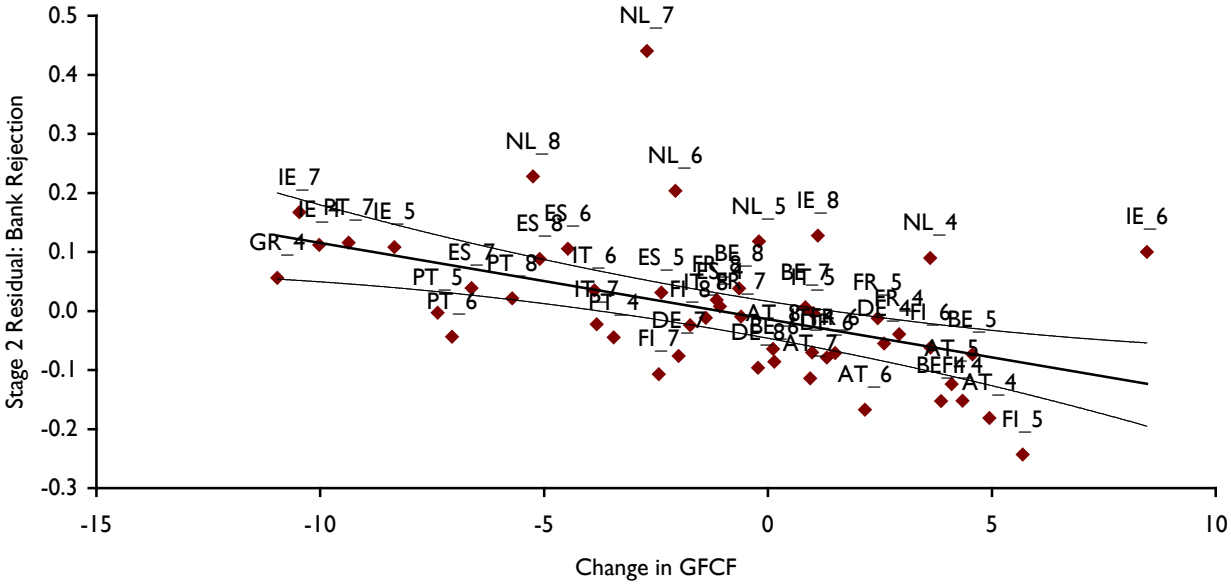


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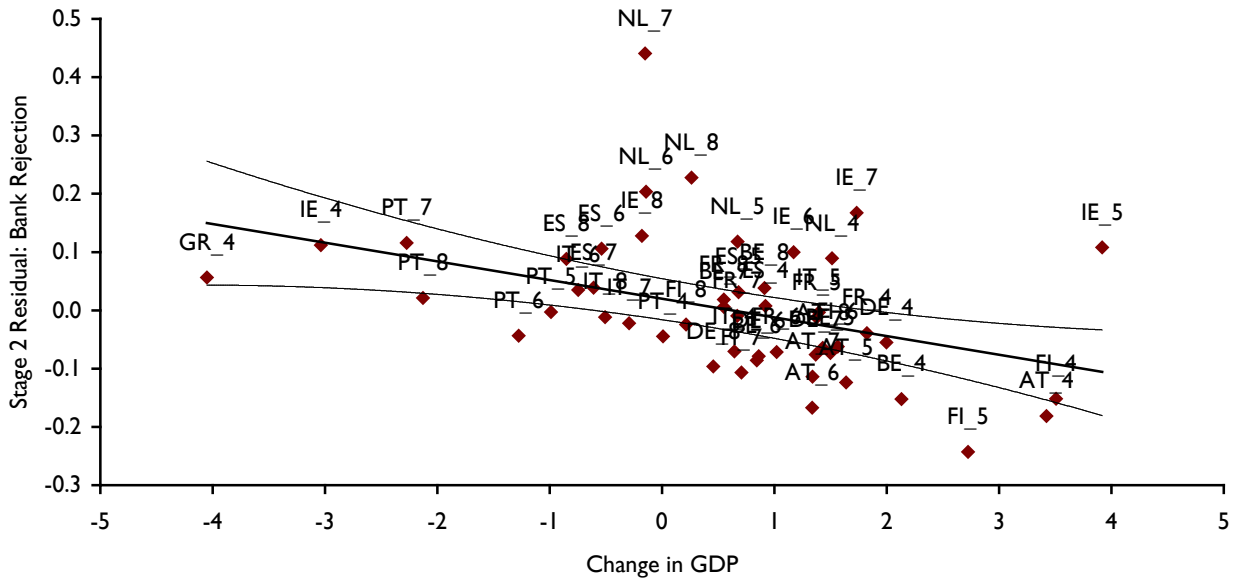
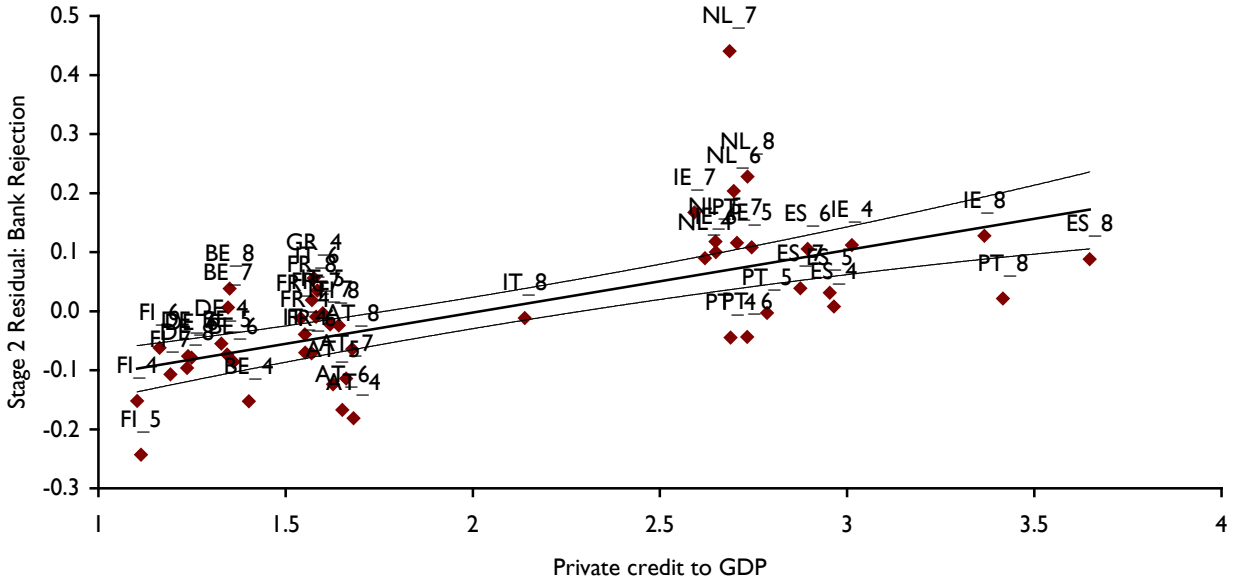
Figure 5 (continued)





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controlling for borrower characteristics and the risk-free rate. The implication of these findings is that banks, by adjusting their risk appetite in response to changes in the economic environment, are likely to prolong economic cycles both in periods of growth and of recession.

The statistically significant bivariate relationships in Column (1) of table 5, those using bank rejection probabilities as our *Y* variable, are plotted in figure 5. Country-wave observations which lie outside the confidence intervals of these regression lines can be thought of as those with particularly restrictive (above regression line) or accommodative (below the line) SME credit markets. There are a number of empirical regularities across the four scatter plots: the Netherlands is consistently the country which appears with the most restrictive SME lending market across most of the five sample periods; Ireland is the next most likely to be estimated as a restrictive lending market, with waves 7 and 8 (March 2012 to March 2013) appearing restrictive relative to fundamentals. The economies in which bank lending policies appear overly accommodative relative to fundamentals are Portugal during the period March 2011 to March 2012, Austria during waves 4–6 (September 2010 to March 2012) and Finland in wave 5 (March 2011 to September 2012). Similarly, Greece, Spain, Belgium, France and Germany can be thought of as having credit markets in which banks make lending decisions in line with economic fundamentals.

These relationships, while certainly not allowing any causal interpretation, can be thought of as a policy tool which allows identification of markets that deviate from the expected relationship between bank lending and economic fundamentals. Given that the Y values in the scatter plots in stage 3 have already controlled for borrower characteristics and the risk-free rate, deviations in stage 3 can be reliably thought of as deviations that are driven by supply-side frictions such as weak bank balance sheets, deleveraging requirements and changing lender risk appetite.

4.4 Robustness

Although the sovereign bond yield is an important benchmark for pricing and credit supply given its effect on bank funding costs, there may be other measures that are important for banks' credit supply decisions. For this reason, we also include deposit rates in stage two. Table 6 shows the results regressing country time coefficients on deposit rates and confirms that for all measures of credit supply, deposit rates are positive and significant. Moreover, the residuals using this method are very similar to the results when using sovereign bond yields, as the scatterplots between the residuals using both methods shown in figure 6 shows.

5. Conclusion

The effect of the recent economic and financial crisis on the availability of credit to SMEs, and the potential knock-on effects of this on the employment and

Table 5. Stage 3: Relationship between credit crunch indicators (*Y*) and macroeconomic fundamentals (*X*), fifteen bivariate regressions

	(1) Bank reject	(2) Availability deterioration	(3) Interest increase
Domestic demand growth	–0.0273***	–0.0159***	–0.0279**
	(–3.53)	(–3.18)	(–2.23)
	0.206	0.174	0.0939
GDP growth	–0.0321***	–0.0174**	–0.0273
	(–3.13)	(–2.61)	(–1.65)
	0.169	0.125	0.0540
Investment growth	–0.0129***	–0.00831***	–0.0114**
	(–3.92)	(–3.99)	(–2.08)
	0.242	0.249	0.0826
Private credit to GDP	0.106***	0.0504***	0.120***
	(5.94)	(3.90)	(3.88)
	0.424	0.240	0.239
Bank's econ. expectations	0.000448	0.000195	0.000109
	(1.22)	(0.79)	(0.19)
	0.0278	0.0120	0.000672

Notes: *t* statistics in parentheses. R2 reported below *t* statistics. * $p < 0.1$,** $p < 0.05$, *** $p < 0.01$. Sample sizes range between 50 and 54 depending on available macro data.

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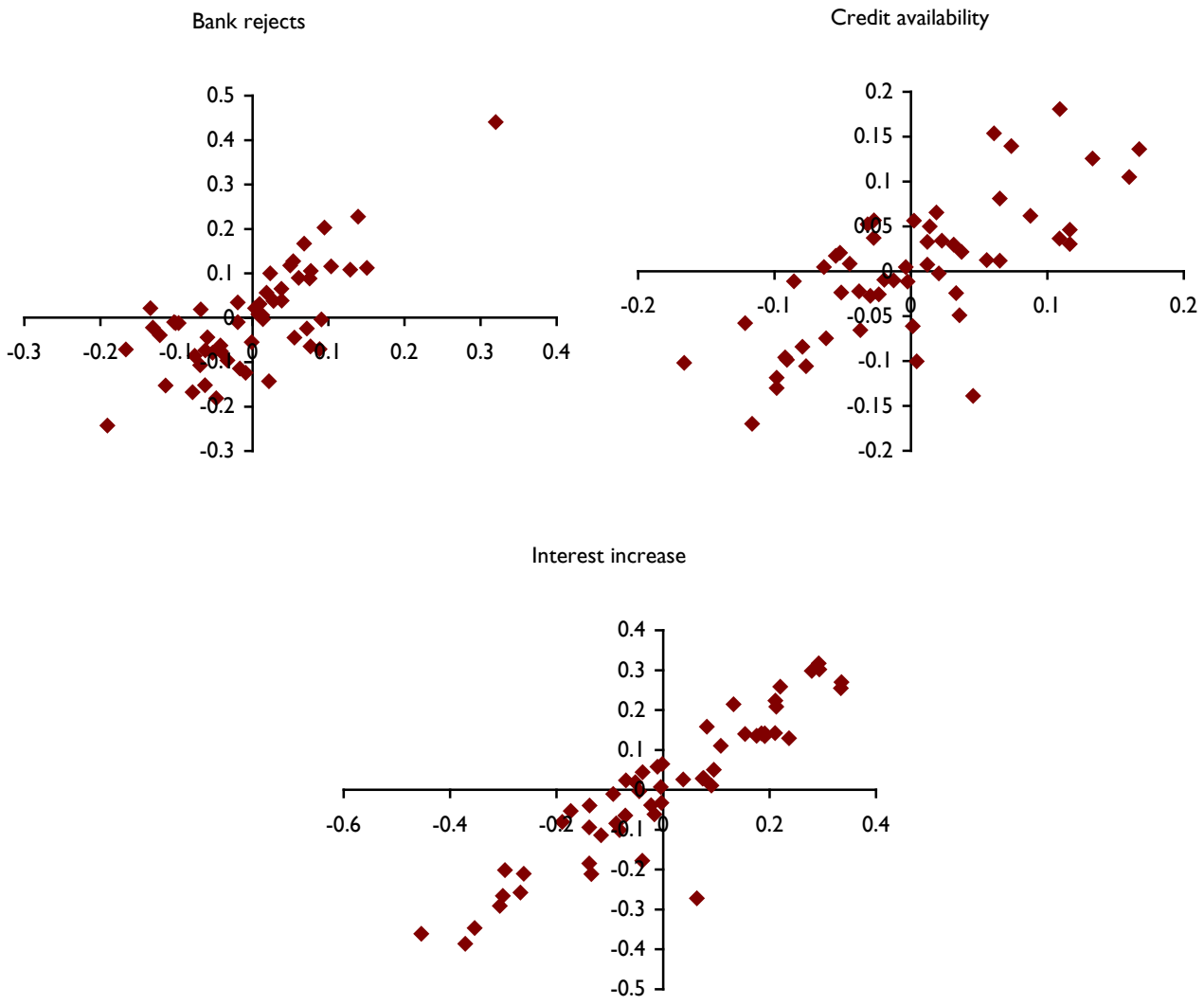
Table 6. Regression of country time dummy coefficients on deposit rates (Stage 2 robustness check)

	(1) Bank reject	(2) Availability deterioration	(3) Interest increase
Deposit interest rates	0.158***	0.109***	0.120***
	(9.11)	(7.61)	(3.21)
Constant	–0.320***	–0.188***	–0.248**
	(–6.75)	(–4.83)	(–2.44)
N	54	54	54
r^2	0.615	0.527	0.165

Notes: *t* statistics in parentheses. * $p < 0.1$,** $p < 0.05$, *** $p < 0.01$.

Figure 6. Comparing original residuals (y axis) with robust residuals (x axis)



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investment activities of these firms, has been a source of considerable policy concern across many countries. From a policy perspective, identifying the source of weak credit supply is key to determining whether there exists a 'credit crunch'. There has been some debate as to whether the fall in credit is driven by lack of supply by banks, beyond that expected due to shifts in fundamentals, or lack of demand by firms in a climate of decreasing investment opportunities. The survey data used in this study capture the supply of credit, which can be driven by changes in banks' balance sheets and their ability to lend, or by changes in borrower creditworthiness. The observed fall in credit is not a sufficient criterion for judging that firms have been subject to a 'credit crunch'. For such a term to be used, the reduction in credit should be greater than can be accounted for by changes in the quality of the borrowers and shifts in the basic cost of funding that can be accessed by the lending institutions.

This paper uses a multi-stage estimation process to examine the evolution of credit to SMEs across Europe over five survey periods from 2011 to 2013. Three different measures of credit supply are used – loan rejection rates, perceptions of credit availability and increases in the cost of borrowing. The first stage of the estimation process is to examine how firm level characteristics affect each of these measures, thus controlling for a wide range of borrower-level indicators of performance. In line with previous research, we find that smaller firms and those with lower turnover are more likely to have loan applications rejected. In addition, firms that have seen improvements in their internal funds, credit history or capital positions are less likely to report experiencing adverse credit conditions.

Country-time dummies are included in this first-stage regression and in the next stage we regress these dummies on sovereign bond yields to control for the effect of differences in the risk free rate and bank funding costs. We interpret the residuals from this second stage regression as our credit crunch measure. We find that controlling for the differences in funding costs accounts for a very significant portion of the differences in credit availability across countries. Our final stage is to examine what macroeconomic factors are associated with the credit crunch measures. We find that banks tighten credit conditions when the real economy is weaker and in the face of higher private sector debt levels. These effects remain even after controlling for borrower quality and the risk free rate, and may indicate an increased risk aversion that is more related to general economic conditions than individual firm characteristics.

One limitation of this study is that the survey data available relate only to the crisis period, with no information on the relationships that existed in more 'normal' times. This means that we are unable to investigate whether there have been significant changes driven by the crisis environment in how firm characteristics affect credit supply for example. It is also important to note that most of the data collected in the survey are of a qualitative nature and the model would be improved if it was possible to include more quantitative balance sheet data, such as leverage and other financial ratios and performance measures. Such continuous measures of SME performance would most likely lead to a richer set of results than those using the categorical variables available in the SAFE data. The possibility of two-way causation between sovereign bond yields and the credit crunch indicators is another avenue for further research in this area.

There are a number of potential policy responses that could improve access to finance for SMEs. These can come from governments, central banks and regulators. Given the stress on banks' balance sheets, programmes that make it easier for banks to use SME loan assets as collateral for central bank lending (such as for example through changes in haircuts or securitisation of SME loans) would increase the incentive for banks to make such loans. More direct policies of government loan guarantees could also be used, but the fiscal position of many Euro Area countries might preclude taking this particular route.

More broadly however, our paper shows a widespread tightening of credit that is explained to a considerable extent by the weak real economy. In that context, tailored policy measures to address the SME sector's credit needs may help to address some of the problem but could be of limited benefit. The changes in risk aversion and the pressure on banks to restore their capital positions remain. Therefore, the various policy initiatives in place to restore stability to the overall banking sector (the single supervisor, the upcoming asset quality review and stress tests) are crucial to bring about a restoration of the smooth functioning of the SME credit market and a convergence in the functioning of the transmission mechanism.

Broader policies towards a banking union and banking reconstruction are a matter of some urgency to restore efficient market functioning as soon as possible. More targeted policies to help SMEs access credit could be considered as an interim arrangement given the longer-term negative consequences for employment, investment and growth that lack of access to credit can entail.

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NOTES

1 See for example, Campello, Graham and Harvey (2010), Mach and Wolken (2011).

2 Jorda, Schularick and Taylor (2011) study the role of leverage in almost 200 recessions in fourteen countries since 1870 and find that recessions resulting from financial crises tend to be associated with slowdowns in credit growth and investment that are inversely related to the build-up of credit during the previous expansion. Abiad, DellAriccia and Li (2011) report that economic recoveries that occur in the absence of credit growth are generally the result of financial crises and are one third weaker than 'normal' recoveries.

3 http://www.ecb.int/press/pressconf/2012/html/is120906.en.html.

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