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Access to Credit and Unconventional Monetary
Policy in the Eurozone after the Financial Crisis

Petr Koráb

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Research Centre

Faculty of Business and Economics

Mendel University in Brno

Zemědělská 1, 613 00 Brno

Czech Republic

<http://vyzc.pef.mendelu.cz/en>

+420 545 132 605

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Abstract

Petr Koráb: **Access to Credit and Unconventional Monetary policy in the Eurozone after the Financial Crisis**

This paper investigates the availability of bank credit to enterprises in the Eurozone after the recent financial crisis. The analysis draws from a rich firm-level dataset on perceived credit availability of micro, small and medium-sized, and large enterprises in 11 countries in the Euro Area during the time horizon 2010 – 2014. Employing probit and logit estimators, the empirical results suggest that GDP growth is a significant factor improving availability to small and medium-sized and large firms in the post-crisis period. On the contrary, the asset-purchase programmes of the European Central Bank did not show a significant impact on credit availability to micro and small and medium-sized enterprises. The findings support the decision of the ECB to further intensify asset purchasing and officially introduce the program of quantitative easing in 2015.

Key words

credit availability, credit rationing, credit constraints, credit supply, financial crisis recovery

JEL: E51, E52

Contacts

Petr Koráb, Department of Finance and the Research Centre, Faculty of Business and Economics, Mendel university in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, e-mail: petr.korab@mendelu.cz.

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Introduction

The Eurozone banking sector has partly recovered from the turmoil that was caused by the recent financial crisis. The reaction of the European Central Bank (ECB) to support the liquidity of the banking system with massive asset-purchase programmes has had the aim to boost bank lending and contain adverse economic outcomes (Eser and Schwaab, 2016). The ECB officially launched its programme of quantitative easing in 2015, but the first reaction to the crisis with large-scale asset purchasing occurred in 2009, followed by Second Covered Bond Purchase programme launched in 2011 and Securities Markets Programme introduced in 2010 (ECB, 2012). Across the Euro area, lending to non-financial corporations returns to moderate growth being supported by increasing demand across all loan categories (ECB, 2016).

Access to bank credit is crucial for economic recovery and stressed credit conditions are an important factor constraining the pace of the recovery (Kannan, 2012). On average it takes about eight years to reach the pre-crisis level of growth (Reinhard and Rogoff, 2014). In particular, industries relying more on external finance grow more slowly than other industries during recoveries from recessions associated with financial crises (Kannan, 2012). Micro, small and medium-sized firms (SMEs) are primarily affected by stressed credit conditions due to their limited ability to substitute bank credit to other forms of external finance (Klein, 2014; Koráb and Poměnková, 2014). Similarly, innovative firms face higher growth obstacles due to their high demand for external capital (Lee et al., 2015).

This paper investigates the availability of bank credit to enterprises in 11 Eurozone countries during the recovery from the recent financial crisis. The empirical analysis employs a unique firm-level publicly unavailable survey dataset provided by the European Central Bank on perceived credit availability, and the paper extends the literature in several ways. It contributes to the literature with the firm-level evidence on credit availability in the Eurozone during the post-crisis period. Moreover, it attempts to estimate the effects of quantitative easing on credit availability at the firm-level (prior studies employed mostly bank-level (Bowman, et al. 2015), and aggregated data (Weale, Wieladek, 2016)).

The empirical methodology of this study follows the standards in the literature (e.g. Ogura, 2012; Fidrmuc et al. 2013; Canton et al. 2013) and employs probit and logit estimators to analyse the unbalanced panel of 37 293 micro, small and medium-sized, and large firms from 11 Eurozone countries during the period 2010-2014.

The paper is organised as follows: after the introduction, the first part reviews the literature, the next section presents the data, the following section describes the model and empirical methods, the fifth part provides results and their discussion, and the last part concludes the paper.

1 The factors that determine loan accessibility: literature review

Numerous studies have attempted to find evidence about the factors influencing the access to bank credit and bank lending. There are three streams of the literature studying the determinants of bank lending at the macroeconomic, bank and firm-level.

Macroeconomic environment affects the profitability of commercial banks as well as firms. GDP growth is often used to approximate the expectations of firms and banks about the future economic activity (Bernanke and Blinder, 1988), and is expected to have a positive effect on bank lending. Profitability of banks associated with better macroeconomic performance enables banks to broaden credit portfolio and enhance credit availability. Gunji and Yuan (2010) show that less profitable banks tend to reduce loans under a negative monetary shock more substantially than profitable banks because these banks can obtain financing outside deposits more easily.

Bank capital is found by numerous authors (see e.g. Berrospide, Edge, 2010; Herrera, Hurlin, Zaki, 2013; Feyen, Mazo, 2013) as a significant determinant of bank lending. The size of the bank may affect the scale of the "capital crunch", i.e. sharp decline of bank capital. Hancock and Wilcox (1998) have shown that in response to declines in their own bank capital, small banks shrank their loan portfolios considerably more than large banks. Capital regulatory measures force banks to hold large volumes of capital on their balance sheets, which reduces the available resources for providing credit (Fidrmuc, Hainz, 2013).

Interbank market plays a key role in the short-term financing of commercial banks. Its freezing, i.e. a liquidity crunch, has dramatic effects on credit supply. Iyer et al (2014) have shown that the unexpected freeze of the European interbank market during the 2007-2009 financial crisis lead to a decline of credit supply in Portugal mainly for banks largely relying on interbank borrowing. The credit supply reduction was stronger for small firms, with weaker banking relationships, which cannot compensate the bank credit with other sources of debt. Furthermore, the impact of illiquidity on the credit supply was stronger for less solvent banks. Similarly, Vodová (2015) has shown that the confidence crisis in the interbank market during the financial crisis in the group of Visegrad countries (Czech Republic, Slovakia, Hungary and Poland) sharply increased interbank interest rates, many

segments of the structured credit and mortgage market ceased to trade making it difficult to price outstanding positions.

Deposits of households and corporations at commercial banks serve as the source of capital for providing credit (Herrera, Hurlin, Zaki, 2013; Hurlin, Kierzenkowski, 2007). Shortage of liquid assets can have dramatic consequences on bank lending behaviour. Ivashina and Scharfstein (2010) examined bank lending during the financial crisis of 2008 in the USA and have shown that banks cut their lending less if they had better access to deposit financing.

Firm-level balance sheet indicators play a key role in the success of credit applications. Banks evaluate firm-specific credit risk and decide on providing the loan and the lending interest rate. Kaplan and Zingales (1997) and Lamont et al. (2001) show that short-term and long-term debt, cash-flow and Tobin Q ratio determine the access of firms to external financing. Hadlock and Pierce (2010) find that firm size and age are particularly useful predictors of financial constraint levels.

This paper focuses on subjectively perceived constraints, rather than analysing objective information related to the success of loan applications. This stream of the literature often uses data from company surveys (see e.g. Cole, Sokolyk, 2016). Canton et al (2013) investigate perceived bank loan accessibility of SMEs in the EU during the pre-crisis period. Their findings show that the youngest and smallest firms have the worst perception of access to bank loans and that SMEs in nations with concentrated banking sectors are more positive about loan accessibility. Using survey data for the Euro area during the recovery period, Ferrando and Grieshaber (2011) show that only age and ownership are robust explanatory variables for firms' perceived financing obstacles while mixed results are found for size and economic branches.

2 Data

This empirical study follows the stream in the literature (e.g. Fidrmuc and Hainz, 2013; Kremp and Sevestre, 2013), employing firm-level survey data on perceived difficulties in accessing bank credit. The advantage of using survey data is low bias in credit availability identification, compared to the other empirical methods (Silva and Carreira, 2012).

The unbalanced firm-level dataset comes from the EC/ECB Survey on Access to Finance of Enterprises (SAFE) database covering the period 2010 – 2014. Yearly pooled cross-sectional dataset uses survey data of 37 293 micro, small and medium-sized and large firms in Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, Netherlands and Portugal.

The dataset is consequently completed with macro-level and banking variables (Table 1) at the country level. The analysis especially focuses on non-standard monetary measures (asset-purchase programmes) that the European Central bank used to tackle the crisis (growth of central bank assets).

Table 1: Definition of country-level variables

Variable	Definition	Expected relationship	Source
GDP	Gross domestic product in current prices.	+	Eurostat
IR	Lending interest rate to non-financial corporations	-	ECB data warehouse
Lend.Cap	Lending capacity of commercial banks. Household deposits at commercial banks.	+	ECB data warehouse
CAP	Capital and reserves of monetary financial institutions (MFI).	+	ECB data warehouse
CBasset	Central bank assets. Measure of non-standard monetary instruments (asset-purchase programmes) conducted by the European central Bank.	+	IMF
LIQ	Liquid Liabilities to GDP.	-	World Bank
ROA	Return on assets of commercial banks. Profitability indicator of commercial banks.	+	World Bank
I.Income	Net interest income. Profitability indicator of commercial banks.	+	ECB data warehouse

Variables GDP, Lend.Cap, CBasset and CAP are for the purpose of the empirical analysis transformed to growth rates. The lending interest rate, ROA and LIQ are measured in [%], interest income is used in % of total assets. GDP is seasonally-adjusted.

Detailed information on the structure of the firm-level dataset is provided in Table 3. Table 4 provides summary statistics of the variables used in the analysis, Table 5 presents their pairwise correlations (all tables are in the appendix).

3 Model and methods

3.1 The model

Availability of bank credit $credit_{it}$ is used as the outcome variable in the empirical model. The enterprises in the sample were asked the question:

"Would you say that availability of bank loans has improved, remained unchanged or deteriorated for your firm over the past 6 months?"

Responses from SAFE surveys have an ordinal specification:

$$credit_{it} = \begin{cases} 3 = \text{"improved"} \\ 2 = \text{"remained unchanged"} \\ 1 = \text{"deteriorated"} \end{cases} \quad (1)$$

The model is then specified as:

$$credit_{it} = \beta_0 + \beta_1 \Delta Macro_{it} + \beta_2 \Delta Banks_{it} + \gamma_t + \sigma_i + \nu_i + \tau_{it} + \varepsilon_{it} \quad (2)$$

where $credit_{it}$ is dependent variable characterizing availability of bank credit, $Macro_{it}$ is a vector of explanatory macroeconomic variables specified in the previous section, $Banks_{it}$ is a vector of banking sector explanatory variables, the β_0 parameter represents the overall constant in the model, while γ_t captures country effects, σ_i firm sector fixed effects, τ_{it} firm size fixed effects, ν_i age fixed effects and ε_{it} is the error terms for a firm i in time t .

A series of dummy variables is constructed to reflect the firm age ν_i and firm size τ_{it} . Both fixed effects are used from the SAFE surveys. For the size, the classes are constructed for micro (1-9 employees), small (10-49 employees) and medium-sized (50-249 employees), and large enterprises (250 or more employees). For the age fixed effect, the firms are classified into four classes: $\nu_i \geq 10$ years, $\nu_i \in (10 \text{ years}, 5 \text{ years})$, $\nu_i \in (5 \text{ years}, 2 \text{ years})$, and $\nu_i < 2$ years.

3.2 Empirical methods

The empirical framework uses discrete choice models that are commonly used in the literature (Ogura, 2012; Fidrmuc et al. 2013; Canton et al. 2013) - the ordered probit and ordered logit estimators. The model in (2) is estimated by the maximum likelihood of the following equation (3):

$$credit_{it} = \begin{cases} P(credit_{it} = 3 | x_{it}, \beta, m) = F(m_1 - x_{it}, \beta) \\ P(credit_{it} = 2 | x_{it}, \beta, m) = F(m_2 - x_{it}, \beta) - F(m_1 - x_{it}, \beta) \\ P(credit_{it} = 1 | x_{it}, \beta, m) = F(m_3 - x_{it}, \beta) - F(m_2 - x_{it}, \beta) \end{cases}, \quad (3)$$

where β are regression parameters, m_1 , m_2 and m_3 are thresholds, and $F(\cdot)$ is distribution function of the residual term ε_{it} in (2).

To estimate the effects of explanatory variables specified in the previous sections, the empirical analysis uses ordered logistic regression (ordered logit) where ε_{it} are logistic distributed, and ordered probit where the residual term is standard normal distributed.

4 Results and discussion

The estimations are performed on the whole sample of enterprises, consequently on the panels of micro enterprises, SMEs and large firms, employing both ordered logit and ordered probit estimators (Table 2). In all panels except micro enterprises, GDP growth significantly affects the availability of bank credit. The effect of the lending interest rate on credit availability is in accordance with economic theory in the whole sample and in the micro enterprises panels. The lending rate, however, does not have a significant effect on credit availability to SMEs and large firms. This fact may be explained by stronger banking relationships of medium and large firms, compared to micro and small enterprises (Jiménez et al. 2010). Firms with strong banking relationships tend to pay significantly lower interest rate premia in times of financial distress (Kawai, Hashimoto and Izumida, 1996) and generally have increased credit availability and more effectively overcome financial distress (Sang-Woo, 2004). The market lending rate, therefore, may not affect them due to their individual specific loan contracts.

In all panels except large firms, the effect of the central bank assets, i.e. the variable that captures the non-standard asset purchase programmes launched after the onset of financial crisis, on credit availability at the firm-level is insignificant. It should be noted that the analysis focuses on the period 2010 – 2014 during which the quantitative easing was not yet introduced, but the ECB was conducting different types of asset purchase programmes.

Apart from the subsample of large enterprises, this study has provided evidence that the asset-purchase programmes conducted by the ECB before the introduction of quantitative easing did not have a significant effect on credit availability. The results, therefore, support further enhancing of the scale of the asset-purchase programmes that was done by the ECB in March 2015 in the form of the Public Sector Purchase Programme, i.e. the quantitative easing.

Table 2: Ordered probit and ordered logit estimation of credit availability

Dependent variable: Credit availability, 2010-2014								
Independent variables	Whole sample		Micro firms		SMEs		Large firms	
	OLogit	OProbit	OLogit	OProbit	OLogit	OProbit	OLogit	OProbit
GDP	0.066 *** (0.0136)	0.035 ** (0.007)	0.017 (0.0257)	0.008 (0.0147)	0.073 *** (0.017)	0.039 *** (0.009)	0.184 *** (0.047)	0.106 *** (0.027)
IR	-0.163 * (0.088)	-0.090 * (0.051)	-0.303 ** (0.167)	-0.178 * (0.097)	-0.174 (0.112)	-0.094 (0.064)	0.225 (0.298)	0.172 (0.175)
CBasset	-0.0006 (0.0007)	-0.0003 (0.0004)	0.0012 (0.0013)	0.0006 (0.0007)	-0.0006 (0.0009)	-0.0003 (0.0005)	-0.0056 ** (0.0026)	-0.003 ** (0.0014)
ROA	-0.0244 (0.028)	-0.018 (0.0164)	-0.0038 (0.052)	-0.0072 (0.0304)	-0.0083 (0.0365)	-0.0096 (0.021)	-0.128 (0.098)	-0.069 (0.057)
CAP	-0.0031 (0.005)	-0.0013 (0.0031)	0.0097 (0.0096)	0.0053 (0.0056)	-0.0062 (0.0069)	-0.0027 (0.0039)	-0.025 (0.0203)	-0.013 (0.011)
Lend.Cap	0.031 * (0.018)	0.017 * (0.0103)	0.027 (0.033)	0.0168 (0.0193)	0.0279 (0.0229)	0.015 (0.013)	0.077 (0.065)	0.048 (0.038)
I.Income	0.715 *** (0.217)	0.430 *** (0.127)	0.889 ** (0.388)	0.534 ** (0.227)	0.704 ** (0.276)	0.420 *** (0.162)	-0.157 (0.920)	-0.118 (0.534)
LIQ	-0.015 * (0.009)	-0.008 (0.005)	-0.005 (0.0173)	-0.0036 (0.0099)	-0.0103 (0.011)	-0.0044 (0.006)	-0.104 *** (0.0344)	-0.060 *** (0.019)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Age FE	YES	YES	YES	YES	YES	YES	YES	YES
Size FE	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES
R2	0.0328	0.0322	0.0368	0.036	0.0313	0.0306	0.0293	0.029
Number of Obs.	14423	14423	4352	4352	8922	8922	1149	1149

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

The effect of other variables (liquidity of commercial banks and interest income) is in line with economic theory expectations. Interest income as the indicator of bank profit has a positive significant effect on credit availability in micro firms and SMEs (Table 2). Liquidity of commercial banks significantly impacts credit availability to large firms. The estimates show a negative coefficient, but from the construction of the indicator (Liquid liabilities to GDP), the estimates show improvement of credit availability with the increasing liquid liabilities in the numerator of the ratio.

Conclusions

This paper identifies determinants of perceived credit availability to enterprises in the 11 Eurozone countries. The empirical analysis uses a unique firm-level dataset of perceived loan availability and investigates the effects of the firm-level, banking and macroeconomic factors using ordered discrete choice models during the post-crisis period (2010 - 2014). The main findings of this study show that GDP growth is a significant factor improving availability to small and medium-sized and large firms. On the contrary, the asset-purchase programmes of the European Central Bank did not show a significant

impact on credit availability to micro and small and medium-sized enterprises. The empirical results, therefore, show that the asset-purchase programmes during the time horizon 2010 – 2014 did not effectively improve the availability of credit to micro, small and medium-sized enterprises. The findings support the decision of the ECB to further intensify asset purchasing and officially introduce the program of quantitative easing in March 2015, whose central objective was to boost bank lending.

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Table 3: Structure of the firm-level dataset

Year	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT	Euro area
2010	200	203	1000	1000	100	1003	200	100	1000	256	250	5312
2011	502	500	1006	1001	500	1002	500	502	1001	500	502	7516
2012	506	500	1006	1001	500	1001	500	500	1000	500	500	7514
2013	501	500	1000	1001	501	1002	500	500	1000	500	500	7505
2014	502	501	1337	1303	501	1500	501	500	1500	800	501	9446
Total	2211	2204	5349	5306	2102	5508	2201	2102	5501	2556	2253	37293

Table 4: Summary statistics

	mean	sd	min	p1	p50	p99	max
Credit	2.064	0.625	1	1	2	3	3
Cbasset	9.956	36.596	-54.166	-54.166	2.777	108.137	108.137
GDP	0.615	2.254	-9.1	-7.3	0.6	8.5	8.5
IR	3.366	0.757	1.927	1.946	3.283	5.940	6.045
CAP	5.148	6.548	-10.573	-2.612	4.258	23.506	33.859
LIQ	120.462	26.106	70.693	72.173	120.301	166.588	166.588
ROA	-0.104	1.150	-9.531	-3.083	0.134	1.643	1.643
LendCap	1.938	3.010	-14.678	-13.556	1.659	6.596	6.874
IIncome	1.394	0.423	0.992	0.992	1.222	2.761	2.970

Note: The table reports summary statistics for all variables.

Table 5: Pairwise correlations

	credit	GDP	IR	Cbasset	ROA	CAP	LendCap	LIQ	IIncome
Credit	1								
GDP	-0.2049	1							
IR	0.1788	-0.6594	1						
Cbasset	0.0135	-0.0645	-0.0615	1					
ROA	-0.0696	0.4294	-0.4021	-0.2317	1				
CAP	0.0041	-0.3216	-0.0429	0.3834	-0.4654	1			
LendCap	-0.1793	0.737	-0.6767	-0.0075	0.2851	-0.1667	1		
LIQ	0.0106	-0.1951	0.1823	0.0652	-0.135	0.46	-0.0166	1	
IIncome	0.1612	-0.7743	0.5338	0.1609	-0.5481	0.4418	-0.8048	0.3103	1

Note: The table reports pairwise correlations for all variables.