

FIRM'S FINANCE AND INFLUENCE OF GLOBAL FINANCIAL CRISIS IN THE SELECTED EUROPEAN COUNTRIES

Lucie Szczeponková¹

¹Department of National Economy, Faculty of Economics, VŠB-TU Ostrava, 17. listopadu 15/2172,
708 33 Ostrava-Poruba, Czech Republic

Abstract

SZCZEPONKOVÁ LUCIE. 2018. Firm's Finance and Influence of Global Financial Crisis in the Selected European Countries. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 66(2): 583–593.

Small and medium enterprises (SME) are key in creation of new jobs and they significantly involved on GDP, innovations and economic growth. These firms very often rely on financial extraneous sources, but access to these finance is significant business barrier. It means that SME face to financial constraint. This financial constraint is exacerbated by the financial crisis. The goal of this article is to clarify influence of the systemic banking crisis on use own and external sources of finance within small and medium enterprises in the selected European countries. The influence of global financial crisis on firm's finance in selected European countries is estimated by the method Difference-in-Difference (DiD) in combination with panel data. The results show, that companies in regions hit by the systemic banking crisis had a lower share of long-term investments funded by share issues in 2009 or 2012, compared with companies in regions not affected by this crisis in 2005, 2009 or 2012, and companies in regions affected by the systemic crisis in 2005 and higher share of long-term investments financed from equity capital. During the financial crisis the conditions for providing extraneous sources to private entities are diminishing, and especially small and medium-sized businesses are forced to use other sources of funds.

Keywords: small and medium enterprises, access to finance, global financial crisis, difference in difference, panel data, firm's finance, business barriers

INTRODUCTION

All firms regardless of size, age, ownership need for their business activities financial funds whether they own – equity capital (in form of undivided profit) or extraneous sources (in form of bank loans or credits). If the country is affected by financial crisis, conditions for provision financial funds are worse and sources of finance are limited. Private subjects are forced to use different sources of finance, for example business credit (Carbó *et al.*, 2012).

The article is focused on SME which have significant role within economies, because they are key to creation of new jobs. In countries OECD, SME with less than 250 employees employ 2/3 of total workforce (Beck *et al.*, 2008) and they significantly

involve on GDP, innovations and economic growth. Based on these facts it is obvious that SME are for individual countries very important and they have fundamental importance for revival of the economy after financial crisis. These SME are often relied on financial extraneous sources. On the other hand, access to these finance SME evaluate as significant business barrier and they face to financial constraint (EC, 2009).

Ardic, Mylenko and Saltane (2011) claim, that as a result of the crisis, that hit countries at the turn of the years 2008 and 2009, conditions for provision of financial funds were tightened, the volume of loans granted decreased and banks demanded a greater collateral of credit. Limited access to finance has greater influence on SME

during the crisis, because large enterprises usually has access to the capital market or they have long-term relationship with big banks. The most common reasons for non-assignment a bank loans are, for example, insufficient collateral, insufficient creditworthiness, unsatisfactory credit history, high risk premium but also high transaction costs (IFC, 2009). During and after the crisis is needed to facilitate to SME access to extraneous sources and not limit it, because these financial funds are necessary for creation new jobs and economic growth in countries affected crisis (Ardic, Mylenko and Saltane *et al.*, 2011).

Corporate investment is one of the main sources of economic growth. The main question therefore is how companies get capital to finance their investments. Casey and O'Toole devide funding methods on traditional, including financial markets and banks, which are a significant source of funding for companies, especially in developed countries, and alternative sources of funding. These resources provide an equally important source of funding both in developed and developing economies. Alternative sources of funding include equity capital in the form of retained earnings and extraneous sources of funding, which include family and friends loans in the form of equity and/or debt or business loans (Casey and O'Toole, 2013).

Bank loans may also have disadvantages. Allen *et al.* (2012) report that this form of loan often requires better information on potential problems with liquidity and solvency. This results in tighter credit conditions and higher monitoring costs for these businesses. Chava and Purnanandam (2011) found that firms that are dependent on bank loans and credits are much more responsive to the banking crisis, facing greater losses and a consequent decline in capital spending and profit compared to businesses that use other sources of funding. The pro-cyclicality of bank financing can cause a much greater loss of funds in times of economic downturn or financial crisis. Alternatives to bank financing are more important for companies, but only until traditional bank lending is restored.

An important complementary role for bank lending may have other sources of finance even in the absence of financial instability. For example, equity capital is often the most important source of capital across economies. Brealey *et al.* (2010) states that other alternatives are considered, on average, as important as bank lending, although large firms in high income economies have a higher incidence of bank financing than firms in low-income economies.

As shown by Campello *et al.* (2011), firms with limited access to credit (small, private, non-investment and non-profitable companies)

draw more funds from their credit lines in the crisis than large, public, pro-investment and profitable companies. The authors also deal with the question of how real activities (capital investment) are influenced during the crisis by means of credit lines and holding cash. Firm access to credit lines, according to authors, increases corporate investment in the crisis but only for companies holding large cash.

The goal of this article is to clarify influence of the systemic banking crisis on use own and external sources of finance within small and medium enterprises in the selected european countries. The aim of the article is not financial analysis of individual companies.

The reminder of this paper is organized as follows. The first part after introduction is focused on methodology, specifically on the selection of countries and the time horizon, the data sources and the explanation of individual variables. Attention is also paid to the Difference-in-Difference method, its mathematical expression and the context of this method and panel data. In the second part of this work the results are presented. The last part is focused on confronting the results achieved with previously published works.

MATERIALS AND METHODS

This section is focused on the description of the data, the variables and the research methods.

Data and variables used

In this paper microeconomic data from European bank for reconstruction and development, concretly from database Business environment and enterprise performance survey (BEEPS) are examined. This database includes data about individual firms from almos 140 countries of the world, which are obtained on the basis of questionnaire in this firms. Questionnaires contain questions from the area of corruption, competition, infrastructure and from area access to finance (BEEPS, 2017). This source of data was chosen primarily due to continuity of the data between surveys, instead of World Bank questionnaires. The second source of data is database Eurostat. Data of two control variables (income of households and unemployment rate in the region) were obtained from Eurostat.

The basic unit of observation is a firm (small or medium), whose size is given by the number of full time employees in these companies. Micro data about firms are averaged and aggregated into larger spatial units – NUTS2¹. These units ensure both

1 NUTS, or nomenclature of territorial units of statistics is hierarchical system of the teritory of the European Union created by the Eurostat in order to harmonize and develop regional statistics, create socio-economic analysis of regions and also shape regional policy EU (Eurostat, 2017).

representativeness of the averages and the sufficient number of observations.

In line with the works outlined in the introduction to this article, the size of the company was the only selection criterion. A sample of companies is made up of all small and medium-sized enterprises in selected countries, regardless of industry, company age, or capital structure. It is not possible to ensure the representativeness of the sample in terms of the capital structure due to the unavailability of the financial statements for individual companies and hence also the detailed financial data. The data listed in BEEPS are rather of a general macroeconomic nature.

The geographic sample are selected countries from the region Europe and central Asia, according to the World Bank classification. These countries were selected: Czech Republic, Slovakia, Poland, Hungary, Estonia, Latvia, Lithuania, Croatia, Romania, Bulgaria and Slovenia.

Data were gained from questionnaires from years 2005, 2009 and 2012. Other available questionnaires from years 2002 and 2015 were not selected due to inconsistency of research questions and acquired data.

The following four explained variables were selected:

- shares – percentage share of long-term investments funded by the issue of new shares,
- own resources – the percentage share of long-term investments financed from internal resources or retained earnings,
- loans – the percentage share of long-term investments financed by bank loans and loans from private local commercial banks,
- long-term assets – percentage share of companies that purchased long-term assets (machines, vehicles, plant, land or buildings).

Explanatory variables include:

- age – the age of the company, expressed by the number of years that have elapsed since the official start of each company's activity until the year in which the questionnaire was held,
- size – dummy variable takes value 1 if it is a medium-sized company (with 50-249 full-time employees in 2005 and 20-99 full-time employees in 2009 and 2012), otherwise takes value 0 - a small company (with 2-49 full-time employees in 2005 and 5 to 19 full-time employees in 2009 and 2012),
- BU/SU – dummy variable expressing the ownership of a current or savings account,
- income – income of households in the NUTS2 region (in PPS² based on final consumption per capita),

- unemployment – unemployment rate in the NUTS2 region (in %, people over 15 years of age are counted).

In accordance with the Difference-in-Difference (DiD) method, which will be discussed in the next section, the models also include the following variables:

- dummy_time – the dummy variable captures the impact of time and it takes value 1 in the years 2009 and 2012 (periods after the systemic banking crisis) and it takes value 0 in year 2005 (year before the systemic banking crisis),
- dummy_2012 – dummy variable for year 2012, it is a control variable and captures the year in which the systemic banking crisis was still underway,
- krize_0812 – dummy variable for the systemic banking crisis in 2008 and 2012, which is an approximation of the global financial crisis. This variable takes value 1 for all regions affected by the systemic banking crisis and value 0 for all regions that were not affected by the systemic banking crisis,
- did – this variable is the product of the variables dummy_time and krize_0812, it takes value 0 or 1. Variable did takes value 0 if it is a region that was not hit by the systemic banking crisis and is monitored in any of the observed years (2005, 2009 and 2012) and in the case of a region monitored in 2005 and hit by a systemic banking crisis. Variable did takes value 1 if it is a region affected by the systemic banking crisis and is monitored in 2009 and 2012.

Data about the systemic banking crisis are derived from the database created by Laeven and Valencia (2012a). The banking crisis becomes systemic if two basic conditions are met, namely:

- there are significant signs of financial distress within the banking system (run on banks, losses in the banking system and/or liquidation of banks),
- significant banking policy interventions are being implemented in response to significant losses in the banking system.

The first year, in which both criteria are met, is considered as a year when the crisis became systemic. Political interventions in the banking sector are rated as significant if at least three measures have been used in the following enumeration:

- extensive liquidity support (5% of deposits and liabilities to non-residents),
- restructuring of gross bank costs (at least 3% of GDP),
- significant nationalization of banks,
- introducing significant safeguards,
- significant purchases of assets (at least 5% of GDP) and
- freezing deposits and/or declaring bank holidays.

Based on data from the Laeven and Valencia databases, the systemic banking crisis was found

2 PPS Purchasing Power Standard is an artificially created currency unit that is used in international comparisons to express the volume of economic aggregate indicators. 1 PPS corresponds to the average purchasing power of one euro in the European Union (EU 27). The PPS data can be obtained from the value expressed in national currency by dividing the respective PPP - Purchasing Power Parity (CSU, 2015).

I: Descriptive statistics

Variable	N	Mean	St. dev.	Min	Max
long-term assets	117	59.8	19.5	14.0	100.0
loans	117	14.8	8.5	0.0	43.6
shares	117	4.2	5.0	0.0	22.4
own resources	117	64.9	13.6	19.3	93.0
dummy_time	117	0.7	0.5	0.0	1.0
krize_0812	117	0.2	0.4	0.0	1.0
Did	117	0.1	0.3	0.0	1.0
dummy_2012	117	0.3	0.5	0.0	1.0
Age	117	15.1	3.1	7.7	26.2
size	117	0.3	0.5	0.0	1.0
BU/SU	117	0.9	0.2	0.0	1.0
income	113	8867.3	3615.8	2600.0	21500.0
unemployment	115	9.7	4.3	3.1	23.1
Zem_2_CR	117	0.2	0.4	0.0	1.0
Zem_3_SR	117	0.1	0.3	0.0	1.0
Zem_4_HU	117	0.1	0.3	0.0	1.0
Zem_5_SL	117	0.1	0.2	0.0	1.0
Zem_6_LV	117	0.0	0.2	0.0	1.0
Zem_7_RO	117	0.1	0.3	0.0	1.0
Zem_8_BUL	117	0.2	0.4	0.0	1.0
Zem_9_EST	117	0.0	0.2	0.0	1.0
Zem_10_LA	117	0.0	0.2	0.0	1.0
Zem_11_CRO	117	0.1	0.2	0.0	1.0

Source: BEEPS, 2017; own adjustment.

to have occurred in Hungary, Latvia and Slovenia from 2008 to 2012. These three countries belong to the treated countries group and all others creates a control group. (Laeven and Valencia, 2012b).

Tab. I contains descriptive characteristics of variables used (including characteristics of selected countries). This is the number of observations, average, standard deviation, minimum and maximum values.

Research methods

In this paper Difference-in-Difference method and panel data are used.

The first promoter of the DiD idea was John Snow (1855), who studied the cholera epidemic in London in the middle of the 19th century. Snow has confirmed the hypothesis that cholera is transmitted by polluted drinking water by comparing the mortality rate in different regions, differing by companies supplying water to these regions. In 1852, one of the companies began to supply potable water from a relatively less polluted area, with the result that mortality in the water supply regions of this company fell dramatically (Snow, 1854; Snow, 1855).

In present, the DiD method is generally used primarily to understand sudden changes in the economic environment or government policy (eg. raising minimum wages). It is also considered as a quasi-experimental technique, because it

is based on a natural experiment. Changes in the economic environment or government policy (generally called as the treatments or interventions) are exogenous (Roberts, 2012). Apart from the DiD method, exogenous changes can be evaluated based on the cross-sectional changes observed after the intervention or on the basis of the time changes observed within the group that was affected by the intervention. Both approaches are described below.

Cross-sectional changes

As reported by Roberts (2012) and Gertler *et al.* (2010), it is possible to compare the selected statistical units, which were influenced by the intervention with the units, which were not affected by this intervention and thus form a so-called control group. This comparison is performed after the intervention and the quality of the evaluation depends very much on the quality of the control group. Cross-sectional changes can be expressed as follows:

$$y_i = \beta_0 + \beta_1 I(\text{treat}_i) + \varepsilon_i, \quad (1)$$

where y_i is the average value per statistical unit even in any year after the intervention and $I(\text{treat}_i) = 1$, if the statistical unit has been affected by this intervention, provided that:

$$E(\varepsilon_i | I(\text{treat}_i)) = 0 \quad (2)$$

$$E(y_i | I(\text{treat}_i) = 0) = \beta_0 \quad (3)$$

$$E(y_i | I(\text{treat}_i) = 1) = \beta_0 + \beta_1 \quad (4)$$

$$E(y_i | I(\text{treat}_i) = 1) - E(y_i | I(\text{treat}_i) = 0) = \beta_1 \quad (5)$$

From the equations above it is obvious derivation of the coefficient for tracking the cross-sectional changes. The situation, when the country (region, firm) was not affected by intervention expresses the coefficient β_0 . Conversely, if the country (region, firm) was affected by the intervention, the coefficients β_0 and β_1 are monitored. By calculating the difference, the coefficient β_1 can be obtained reflecting the cross-sectional variation.

The problem of this approach lies in the assumption, that $E(\varepsilon_i | I(\text{treat}_i)) = 0$, because the statistical units may differ from one another. Moreover, the differences may not only be due to the application of government measures or changes in the economic environment, but due to other unnoticed factors. In other words, companies would be different even if no intervention was implemented. There is a certain distortion due to the missing variable which is contained in ε_i and is correlated with the intervention performed. The solution may be to add this variable to regression, however, as Roberts describes, there will still be some heterogeneity between the intervention and the control group of the statistical units that is contained in the random component (Roberts, 2012).

Changes in time series

The second option how to track exogenous changes in the economic environment or government policy are changes in time series. These changes are observed within a group of statistical units that were affected by exogenous intervention. For this, panel regression with only two time periods (before and after the intervention) can be used and to express this as follows:

$$y_{it} = \beta_0 + \beta_1(I(\text{Post}_{it}) + \varepsilon_{it}, \quad (6)$$

where $I(\text{Post}_{it}) = 1$ in any year after the intervention and $I(\text{Post}_{it}) = 0$ in any of the years preceding the intervention, provided that:

$$E(\varepsilon_{it} | I(\text{Post}_{it})) = 0 \quad (7)$$

$$E(y_{it} | I(\text{Post}_{it}) = 0) = \beta_0 \quad (8)$$

$$E(y_{it} | I(\text{Post}_{it}) = 1) = \beta_0 + \beta_1 \quad (9)$$

$$E(y_{it} | I(\text{Post}_{it}) = 1) - E(y_{it} | I(\text{Post}_{it}) = 0) = \beta_1 \quad (10)$$

From the equations mentioned above, the derivation of the coefficient for monitoring the time changes is obvious. The basis for the calculation is the same as for cross-sectional

variations. However, in this case, the coefficient β_1 captures the time change, ie how the observed unit (country, region, firm) changes over time, that is, before and after the intervention.

As with cross-sectional changes, there may be other factors (apart from the applied measure) that influence the differences between statistical units over time. The solution can again be adding a control variable (Roberts, 2012).

Solution in the form of DiD

According to Roberts (2012), both ways of estimating the impact of intervention have their disadvantages. On the contrary, the DiD method uses the positive features of both estimates and it estimates the effect of the intervention, which does not affect all units in the same time in the same way. The DiD method is therefore based on a comparison of four groups of objects, three of which are not influenced by interventions. Time plays an important role in distinguishing individual groups (Lechner, 2010). Equation of regression analysis Best (2015), Roberts (2012), Lechner (2010), and Angrist and Pischke (2009) express as follows:

$$y_{it} = \beta_0 + \beta_1 I(\text{treat}_{it}) + \beta_2 I(\text{Post}_{it}) + \beta_3 I(\text{treat}_{it}) \times I(\text{Post}_{it}) + \varepsilon_{it}, \quad (11)$$

where $(I(\text{treat}_{it}) = 1)$ is a group of statistical units influenced by the intervention. If $(I(\text{treat}_{it}) = 0)$, this is a control group, either in the pre-intervention period, when $(I(\text{post}_{it}) = 0)$ or after intervention $(I(\text{post}_{it}) = 1)$.

The DiD estimate is the expressed by the coefficient β_3 , which is obtained:

$$E(y_{it} | I(\text{treat}_{it}) = 1, I(\text{Post}_{it}) = 1) = \beta_0 + \beta_1 + \beta_2 + \beta_3 \quad (12)$$

$$E(y_{it} | I(\text{treat}_{it}) = 1, I(\text{Post}_{it}) = 0) = \beta_0 + \beta_1 \quad (13)$$

$$E(y_{it} | I(\text{treat}_{it}) = 0, I(\text{Post}_{it}) = 1) = \beta_0 + \beta_2 \quad (14)$$

$$E(y_{it} | I(\text{treat}_{it}) = 0, I(\text{Post}_{it}) = 0) = \beta_0 \quad (15)$$

and furthermore:

$$\{E(y_{it} | I(\text{treat}_{it}) = 1, I(\text{Post}_{it}) = 1) - E(y_{it} | I(\text{treat}_{it}) = 1, I(\text{Post}_{it}) = 0)\} - \quad (16)$$

$$\{E(y_{it} | I(\text{treat}_{it}) = 0, I(\text{Post}_{it}) = 1) - E(y_{it} | I(\text{treat}_{it}) = 0, I(\text{Post}_{it}) = 0)\} = \beta_3 \quad (17)$$

The equations above represent the derivation of the β_3 coefficient, which contains a combination of time and cross-sectional changes. First, the difference between the units affected by the intervention after the intervention and before intervention it is calculated. Subsequently, the difference between the monitored units within the so-called control group is calculated - the unit not affected by interventions in the period before and after the intervention. The resulting coefficient β_3 is

the difference of these differences. Given that E represents the mean value, the resulting coefficient β_3 is, in other words, the difference of the difference between the mean values of the treated group in the year after the crisis and before the crisis and the difference in the average values of the control group in the year after the crisis and before the crisis.

According to Best (2015), it is possible to extend the model by individual control variables as follows:

$$y_{it} = \beta_0 + \beta_1 I(\text{treat}_{it}) + \beta_2 I(\text{Post}_{it}) + \beta_3 I(\text{treat}_{it}) \times I(\text{Post}_{it}) + \beta_4 X'_{it} + \varepsilon_{it} \quad (18)$$

The estimation results should be more accurate by adding control variables. However, if intervention occurs at the same time as changes in the control variables in the group affected by this intervention but not in the control group, the effects of the intervention and changes of the control variables will be unified (Best, 2015).

Difference-in-Difference and panel data

Within the DiD method are observed the units i in the country (region, firm) s , at time t . The time periods are usually two (before and after the intervention) as well as two countries (regions, firms). The explained variable can be called Y_{its} .

This brief characteristic represents the most basic form of panel data that is used to describe data with more than one observation within each unit. This makes it possible to track both cross-section changes and changes in time series (Greene, 1997).

As Best (2015) states, due to this interconnection, the DiD method can be expressed using individual fixed effects (FE) and time FE:

$$Y_{it} = T_t + F_i + \beta D_{it} + u_{it} \quad (19)$$

where T_t are time FE and F_i individual FE. This can be further modified:

$$Y_{i1} - Y_{i0} = (T_1 - T_0) + \beta(D_{i1} - D_{i0}) + (u_{i1} - u_{i0}) \quad (20)$$

and then, thanks to FE, edit:

$$\beta = E[Y_{i1} - Y_{i0} \mid D = 1] - E[Y_{i1} - Y_{i0} \mid D = 0], \quad (21)$$

it corresponds to a simple estimate of the DiD method. The basic assumption is:

$$E[u_{i1} - u_{i0} \mid D = 1] = E[u_{i1} - u_{i0} \mid D = 0]. \quad (22)$$

Individual fixed effects

Individual FE allow to track the effects of time-varying variables and examine the relationship between explained variable and explanatory variables within each entity (country, region, business). Each of these entities has its own characteristics that can influence either the explanatory or the explained variable.

The equation of individual FE can be expressed as follows:

$$Y_{it} = \alpha_i + \beta_1 X_{it} + u_{it}, \quad (23)$$

where α_i ($i = 1 \dots N$) is the constant for each unit (country, region, firm), Y_{it} is a dependent variable ($i = \text{unit}$ and $t = \text{time}$), X_{it} expresses an independent variable, β_1 is the coefficient of this independent variable and u_{it} is the random component.

Individual FE can also be expressed using binary variables, namely:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \dots + \beta_k X_{k,it} + y_2 A_2 + \dots + y_n A_n + u_{it}, \quad (24)$$

where Y_{it} is again the dependent variable ($i = \text{unit}$ and $t = \text{time}$), $X_{k,it}$ expresses independent variables, β_k is the coefficient of independent variables and u_{it} is the random component. A_n is the statistical unit n (country, region, firm). The number of these units in the model is $n-1$, given the binary form of these variables. y_2 is the coefficient of binary variables. Both equations mentioned above are equivalents (Baltagi, 2011; Torres-Reyna, 2007; Greene, 1997).

Time fixed effects

Time FE, unlike individual FE, captures a change over time, not a change between countries. Time FE can be expressed as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \dots + \beta_k X_{k,it} + \sigma_2 T_2 + \dots + \sigma_t T_t + u_{it}, \quad (25)$$

where Y_{it} is again the dependent variable ($i = \text{unit}$ and $t = \text{time}$), $X_{k,it}$ expresses independent variables, β_k is the coefficient of independent variables and u_{it} is the random component. T_t is a binary time variable. The number of these time variables in the model is $n-1$. σ_t is the coefficient of the binary time variable (Torres-Reyna, 2007; Greene, 1997).

Individual and time fixed effects

As reported by Torres-Ryna (2007), it is possible to use both individual and time FE in panel data. The resulting equation has the form:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \dots + \beta_k X_{k,it} + y_2 A_2 + \dots + y_n A_n + \sigma_2 T_2 + \dots + \sigma_t T_t + u_{it}. \quad (26)$$

RESULTS

This part is focused on the interpretation of the results of the individual models, which are summarized in Tab. II. The results of the used tests are shown in Tab. III. All models consistently contain robust standard errors, FE for regions and FE for each country in the form of dummy variables. The FE are used to capture the characteristics of the countries (regions) and their possible influence

on selected explanatory variables. The least square dummy variable model was used.

Purchase of fixed assets

The first monitored variable is the share of companies that purchased long-term assets. The estimation results are given in the first column of the Tab. II. The negative effect was noted in the case of the variable *dummy_time*, which shows that in 2009 and 2012, the share of firms that purchased long-term assets was lower by 18.8 pp in comparison with 2005. The value of the coefficient of the variable *dummy_2012* shows, that in 2012 the share of companies that purchased long-term assets was 11.6 pp lower than in 2005 and 2009. Negative relationships can also be observed between the share of firms buying long-term assets and the share of long-term assets funded by bank loans. In this case, the increase in the share of long-term assets financed by bank loans by 1 pp led to a decrease in the share of firms that purchased long-term assets by 0.4 pp.

The share of companies that have purchased fixed assets is higher by 6.9 pp for companies owning a current or savings account than for companies that do not own neither of these accounts.

Dummy variables for each country were included in the model. Each of the following five countries (the Czech Republic, Romania, Estonia, Lithuania and Croatia) had a larger share of firms, that purchased long-term assets, ranging from 11.1 to 19.3 pp compared to Poland (the value of the constant, 74.5%).

Long-term investments financed from loans from private local commercial banks

In the model 2 (second column of Tab. II) the effect of selected variables on the share of long-term investments financed from loans from private local commercial banks was monitored. Unlike the previous model, a statistically significant relationship between the explained variable and the time variables *dummy_time* and *dummy_2012* was not found. On the other hand, the impact of the systemic banking crisis (*crisis_0812*) was proved. Companies in regions affected by the systemic banking crisis, which continued in these regions in 2012, had a higher share of long-term investments financed by loans from private local commercial banks by 7.4 pp, than firms in the regions not affected by the crisis.

The positive effect of the variable *age* was found. The increase in the number of years reflecting the age of the company by one year results in an increase in the share of long-term investments financed by bank loans by 0.5 pp. The results also show that medium-sized companies have by a 5.7 pp higher share of long-term investments financed by bank loans, than small companies.

Six countries (the Czech Republic, Slovakia, Bulgaria, Estonia, Lithuania and Croatia) had

a higher share of long-term investments financed by bank loans ranging from 5.0 to 8.3 pp.

Long-term investments funded by issuing new shares

Negative effect was found for the variable *did*, which has a value 1 if it is an area affected by the systemic banking crisis in 2009 or 2012 and a value of 0 in the case of regions not affected by this crisis in 2005, 2009 or 2012 and also in the case of the regions affected by this crisis in 2005. It follows from the results, that companies in regions affected by the systemic banking crisis had by a 9.2 pp lower share of long-term equity-funded investments in 2009 or 2012 than firms in regions not affected by this crisis in 2005, 2009 or 2012 and companies in the regions affected by this crisis in 2005.

The higher share of long-term investments financed by the issue of shares is shown by medium-sized companies, compared to small companies by 2.1 pp.

From country fixed effects follows, that four countries (Slovakia, Romania, Lithuania and Croatia) had a larger share of long-term equity-funded investments in the range of 2.6–5.5 pp compared to Poland over the period under review. On the other hand, Slovenia compared to Poland, had a smaller share of long-term equity-funded investments, by 8.3 pp. This result is in line with the value of the coefficient of the variable *did*, as Slovenia is one of the countries hit by the systemic banking crisis.

Long-term investments financed from own resources (retained earnings)

Positive influence was found for the variable *did*, which implies that companies in regions affected by the systemic banking crisis had in 2009 or 2012 by 10.5 pp higher share of long-term investments financed from own funds than companies in regions not affected by this crisis in 2005, 2009 or 2012 and companies in the regions affected by this crisis in 2005.

The size of the company has a negative effect here, so middle companies have by 6.7 pp lower share of long-term investments financed from own resources than small firms.

The negative effect was also found for four countries (the Czech Republic, Slovakia, Lithuania and Croatia). In comparison with Poland (58.9%), these countries had a lower share of long-term investments financed from own resources, ranging from 7.8 to 12.9 pp.

Robust standard errors were used in all models. Due to the use of robust standard errors, error estimates are robust to cross-sectional heterogeneity and serial autocorrelation. In all models, the Stata program automatically eliminates the *_IZem_6_LV* variable due to multi-collinearity. The subsequent multi-collinearity test (Mean VIF) has not demonstrated the multi-collinearity. All Mean VIF coefficients are greater than 1 and therefore there is no multi-collinearity in the models. Normality

II: Model estimates

VARIABLES	Long-term assets	Loans	Shares	Own resources
	(1)	(2)	(3)	(4)
	OLS with dummy variables	OLS with dummy variables	OLS with dummy variables	OLS with dummy variables
dummy_time	-18.832*** (5.236)	4.531 (2.842)	1.123 (1.267)	-0.860 (4.580)
krize_0812	-0.165 (12.897)	7.377* (4.096)	15.253*** (3.698)	-18.342*** (6.027)
did	6.833 (10.247)	-3.412 (3.159)	-9.224*** (3.151)	10.531** (5.110)
dummy_2012	-11.614** (4.722)	1.574 (2.145)	-1.234 (0.971)	5.260 (3.825)
loans	-0.410* (0.213)			
shares	-0.060 (0.345)			
own resources	-0.018 (0.115)			
age	-0.467 (0.529)	0.486** (0.209)	-0.067 (0.149)	0.322 (0.557)
size	2.013 (4.955)	5.705** (2.414)	2.062** (0.991)	-6.676* (3.832)
BU/SU	6.868* (3.685)	-2.211 (2.948)	-0.544 (2.421)	4.308 (6.805)
income	-0.000 (0.001)	-0.001* (0.000)	0.000 (0.000)	0.000 (0.001)
unemployment	0.329 (0.457)	0.045 (0.255)	0.175 (0.174)	0.096 (0.480)
_IZem_2_CR	15.450*** (5.361)	6.259* (3.402)	0.666 (1.297)	-10.784* (5.794)
_IZem_3_SR	5.042 (4.671)	7.016*** (2.226)	4.497** (2.197)	-12.939*** (4.914)
_IZem_4_HU	-8.204 (10.465)	2.871 (3.942)	-3.580 (3.028)	4.367 (4.461)
_IZem_5_SL	18.180 (12.303)	0.436 (4.812)	-8.333** (3.982)	2.978 (5.880)
_IZem_6_LV	omitted	omitted	omitted	omitted
_IZem_7_RO	11.076* (6.547)	3.197 (3.403)	5.520* (2.795)	-0.817 (6.299)
_IZem_8_BUL	1.043 (5.823)	5.010* (2.781)	0.985 (1.669)	1.643 (4.865)
_IZem_9_EST	11.502* (6.647)	7.781*** (2.170)	0.583 (1.079)	-2.102 (4.088)
_IZem_10_LA	14.680** (5.783)	7.944** (3.365)	4.464*** (1.663)	-9.234* (5.469)
_IZem_11_CRO	19.283*** (3.995)	8.265*** (2.713)	2.624** (1.278)	-7.773* (4.348)
constant	74.507*** (15.716)	3.109 (8.276)	-1.931 (5.715)	58.936*** (15.953)

VARIABLES	Long-term assets	Loans	Shares	Own resources
	(1)	(2)	(3)	(4)
	OLS with dummy variables	OLS with dummy variables	OLS with dummy variables	OLS with dummy variables
Number of observations	113	113	113	113
Number of regions	39	39	39	39
Number of time periods	3	3	3	3
R-squared	0.654	0.337	0.364	0.281
Country FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Robust standard errors	YES	YES	YES	YES
F-test (Prob > F)	0.000	0.000	0.000	0.000

Source: Own calculations.

Note: Variable _JZem_6_LV was automatically excluded by the program Stata because of multi-collinearity. *** p < 0.01, ** p < 0.05, *p < 0.1.

III: Used tests

TESTS	Long-term assets	Loans	Shares	Own resources
	(1)	(2)	(3)	(4)
	OLS with dummy variables	OLS with dummy variables	OLS with dummy variables	OLS with dummy variables
Robust standard errors	YES	YES	YES	YES
Multi-collinearity, Mean VIF	3.000	2.840	2.730	2.880
Heteroskedasticity	-	-	-	-
Autocorrelation	-	-	-	-
Normality of residues – swilk test (W)	0.985	0.911	0.939	0.970
Normality of residues – qnorm	N	N	N	N
Normality of residues – kdensity	N	N	N	N

Source: own calculations.

Note: The letter N in the last two lines of the table indicates the normality of the residues.

of residuals was demonstrated on the basis of the Shapiro-Wilk test (swilk test), the high values of which indicate normal residuals, as well as graphical tests. A graph of Kernel density estimation and a quantitative diagram were used in graphical tests.

DISCUSSION

From comparison of firms in regions affected by the systemic banking crisis and enterprises in regions not affected by the crisis across models shows, that enterprises in regions affected by this crisis had a higher share of long-term investments funded from both bank loans (by 7.4 pp) and share issues (by 15.3 pp). These results are in line with the conclusions of Casey and O'Tool (2013), that european SME are more likely to use alternative forms of financing in times of crisis. On the other hand, the share of long-term investments financed by own resources was lower by 18.3 pp for firms in regions affected by the systemic banking crisis than for companies in not affected regions. The problem is that the variable crisis_0812 only

allows cross-section comparisons between regions, regardless of time.

Taking into account the time (variable did), the results are opposite. Companies in regions hit by the systemic banking crisis had a lower (by 9.2 pp) share of long-term investments funded by share issues in 2009 or 2012, compared with companies in regions not affected by this crisis in 2005, 2009 or 2012, and companies in regions affected by the systemic crisis in 2005 and higher share of long-term investments financed from own resources (by 10.5 pp). These results correspond to the conclusions of Wignaraja and Jinjark (2015), Whinger (2013), Carbó *et al.* (2012); Ardic, Mylenko and Saltane (2011) and Brealey *et al.* (2010). Wehinger (2013), Carbo *et al.* (2012) and Ardic *et al.* (2011) agree, that during the financial crisis the conditions for providing extraneous sources to private entities are diminishing, the volume of lending is decreasing, banks are demanding more collateral, and especially small and medium-sized businesses are forced to use other sources of funds. Wignaraja and Jinjark (2015) and Brealey *et al.* (2010) adds that these sources are the most often sources of financing.

The statistically significant influence of the company's age was recorded only on the share of long-term investments financed by bank loans, which again corresponds to the conclusions of Wignaraja and Jinjark (2015) and Chavis *et al.* (2010). The authors point out, that younger companies usually rely on other forms of financing than on bank loans, while older firms are using bank loans.

SME are much more restricted in accessing funds than large companies. This difference is further exacerbated by financial crises. Comparison of small and medium-sized firms shows that medium-sized firms have a larger share of long-term investments financed by bank loans (by 5.7 pp), but also by issuing new shares (by 2.1 pp) compared to small firms. On the other hand, in the case of long-term investments financed from own funds, medium-sized firms have a 6.7 percentage point lower share of these investments, than small firms. From these results it is clear that medium-sized businesses are not as risky as small firms, and

are approaching big companies that often have a long-term relationship with commercial banks and have an acceptable credit history. This findings also partly reflects the higher risk associated with smaller firms, uncertainty about their growth, or the difficulty of monitoring small businesses.

Given the importance of economic growth, employment growth and job creation (especially after the economic or financial crisis), it would be advisable to improve firms' awareness of available funding opportunities or to expand the supply of alternative sources of finance (eg micro loans). From the point of view of banks and banking institutions, the main provider of loans and credits, could be a better and more thorough assessment of the creditworthiness of clients. Lack of information about a small or medium-sized companies may lead to premature rejection of a loan application or a higher risk premium, that is likely to discourage the firm from lending.

CONCLUSION

This article on Firms's finance and the influence of global financial crisis in the selected european countries was focused on SME that make up a significant part of the business sector in european countries and they are often reliant on the use of external funds. A key factor affecting SME access to finance is the global financial crisis, which hit many countries at the turn of 2008 and 2009.

The Difference-in-Difference method, combined with panel data and the least squares model with dummy variables, was chosen as the most appropriate method for achieving the results. Thanks to the combination of the DiD method and the panel data, it was possible to track both cross-sectional and time differences between regions and time periods. All models were supplemented by control variables capturing company characteristics, as well as dummy variables per country, showing their specifics.

The goal of this article was to clarify influence of the systemic banking crisis on use own and external sources of finance within small and medium enterprises in the selected european countries.

As can be seen from the results, in 2009 and 2012 compared to 2005 there was a significant decrease in the share of companies that purchased long-term assets. Businesses logically responded to the economic recession and systemic banking crisis that hit Hungary, Slovenia and Latvia in 2008. Companies in the affected regions had a much lower share of long-term equity-funded investments in 2009 or 2012 than companies in non-affected regions in any of the surveyd periods and firms in affected regions in 2005. On the other hand, companies in the regions of Hungary, Slovenia and Latvia had a substantially higher share of self-financed investments in 2009 or 2012, which are usually more expensive for businesses than extraneous sources of financing. If the country is hit by a systemic banking crisis as was defined in this work (significant bank runes, bank sector losses, and major intervention measures), then own resources eg in the form of retained earnings are one of the few options of financing the necessary investments.

An important control variable was the size of the company. For long-term investments funded from local private commercial bank loans and equity-funded investments, medium-sized firms have a higher share of these investments than small businesses. This suggests, that medium-sized firms may have better access to bank loans than small firms, and because of their size they are more likely to form a joint stock company than small businesses. In the case of long-term investments financed from own funds, medium-sized firms had a smaller share of these investments than small businesses. Smaller equity requirements and their uses in financing long-term investments may be due to a larger share of long-term investments financed by bank loans due to better access to these extraneous sources.

Acknowledgements

This paper was financially supported within the VŠB – Technical University SGS grant project “Monetary, Fiscal and Institutional Aspects of Economic Policy in Selected Countries“ [No. SP2016/101].

REFERENCES

- ANGRIST, J. D. and PISCHKE J. S. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. New York: Princeton University Press.
- BALTAGI, B. H. 2011. *Econometrics*. 5th Edition. Berlin: Springer.
- BECK, T. et al. 2008. *Bank Financing for SMEs Around the World: Drivers, Obstacles, Business Models, and Lending Practices*. [Online]. No. 4785. Washington D. C.: World Bank. Available at: <https://openknowledge.worldbank.org/bitstream/handle/10986/6315/WPS4785.pdf?sequence=1&isAllowed=y> [Accessed: 2017, February 27].
- BEEPS. 2017. Methodology. *Beeps*. [Online]. Available at: <http://ebrd-beeps.com/methodology/> [Accessed: 2017, February 13].
- BEST, M. 2015. *Panel Data: Fixed Effects and Differences in Differences*. [Online]. Stanford: Stanford University. Available at: https://web.stanford.edu/~mbest/8_-_Panel_Data-Fixed_Effects_and_Differences_in_Differences.pdf [Accessed: 2017, February 13].
- BREALEY, R. A. et al. 2010. *Principles of Corporate Finance*. 10th Edition. New York: McGraw-Hill Companies.
- CARBÓ-VALVERDE, S. et al. 2012. Trade Credit, the Financial Crisis, and Firm Access to Finance. *Central Bank of Ireland Conference on the SME Lending Market*. [Online]. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.458.7452&rep=rep1&type=pdf> [Accessed: 2017, February 13].
- CASEY, E. and O'TOOLE, C. M. 2013. *Bank-Lending Constraints and Alternative Financing During the Financial Crisis: Evidence from European SMEs*. Working Paper, The Economic and Social Research Institute (ESRI), Dublin, No. 450. [Online]. Available at: <https://www.econstor.eu/bitstream/10419/100185/1/739797212.pdf>. [Accessed: 2017, February 13].
- CHAVIS, L. W. et al. 2010. *The Impact of the Business Environment on Young Firm Financing*. Policy Research Working Paper No. 5322. [Online]. Washington DC: World Bank. Available at: <http://documents.worldbank.org/curated/en/693541468153859429/pdf/WPS5322.pdf> [Accessed: 2017, February 13].
- CSU. 2015. European Comparison Program [in Czech: Evropský srovnávací program]. *Český statistický úřad*. [Online]. Available at: https://www.czso.cz/csu/czso/evropsky_srovnacni_program [Accessed: 2017, July 5].
- EC. 2009. *European SMEs Under Pressure: Annual Report on EU Small and Medium-Sized Enterprises*. Luxembourg: European Commission.
- EUROSTAT. 2017. *Overview*. [Online]. Available at: <http://ec.europa.eu/eurostat/web/nuts/overview>. [Accessed: 2017, February 14].
- GERTLER, P. J. et al. 2010. *Difference in Differences & Panel Data*. [Online]. Washington DC: World Bank. Available at: https://siteresources.worldbank.org/EXTHDOFFICE/Resources/5485726-1295455628620/Impact_Evaluation_in_Practice.pdf [Accessed: 2017, February 13].
- GREENE, W. H. 1997. *Econometric Analysis*. 3rd Edition. Upper Saddle River: Prentice Hall.
- IFC. 2009. *The SME Banking Knowledge Guide*. [Online]. Washington D. C.: The World Bank Group. Available at: <https://www.ifc.org/wps/wcm/connect/b4f9be0049585ff9a192b519583b6d16/SMEE.pdf?MOD=AJPERES> [Accessed: 2017, February 27].
- LAEVEN, L. and VALENCIA, F. 2012a. *Systemic Banking Crises Database: An Update*. IMF Working Paper No. 12/163. [Online]. Washington: IMF. Available at: <https://www.imf.org/external/pubs/ft/wp/2012/wp12163.pdf> [Accessed: 2017, March 23].
- LAEVEN, L. and VALENCIA, F. 2012b. *Systemic Banking Crises Database: An Update*. [Online]. Washington: IMF. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=26015> [Accessed: 2017, February 13].
- LECHNER, M. 2010. The Estimation of Causal Effects by Difference-in-Difference Methods. *Econometrics*, 4(3): 165–224.
- ROBERTS, R. M. 2012. *Differences in Differences (DD)*. [Online]. Pennsylvania: Wharton University. Available at: <http://finance.wharton.upenn.edu/~mrrobert/resources/Teaching/CorpFinPhD/RDD.pdf> [Accessed: 2017, February 13].
- SNOW, J. 1854. The Cholera Near Golden Square, and at Deptford. *Medical Times and Gazette*, 9: 321–322.
- SNOW, J. 1855. *On the Mode of Communication of Cholera*. 2nd Edition. London: Jon Churchill.
- TORRES-REYNA, O. 2007. *Panel Data Analysis. Fixed and Random Effects using Stata*. [Online]. New Jersey: Princeton University. Available at: <https://www.princeton.edu/~otorres/Panel101.pdf> [Accessed: 2017, March 16].
- WEHINGER, G. 2013. SMEs and the Credit Crunch: Current Financing Difficulties, Policy Measures and a Review of Literature. *OECD Journal: Financial Market Trends*, 2: 115–148.
- WIGNARAJA, G. and JINJARAK, Y. 2015. *Why Do SMEs Not Borrow More from Banks? Evidence from the People's Republic of China and Southeast Asia*. ADBI Working Paper, No. 509. [Online]. Available at: <https://www.adb.org/sites/default/files/publication/156364/adbi-wp509.pdf> [Accessed: 2017, February 13].
- ARDIC, P. O., MYLENKO, N. and SALTANE V. 2011. *Small and Medium Enterprises. A Cross-Country Analysis with a New Data Set*. [Online]. No. 5538. Washington D. C.: World Bank. Available at: <http://documents.worldbank.org/curated/en/967301468339577330/pdf/WPS5538.pdf> [Accessed: 2017, February 27].

Contact information

Lucie Szczeponková: lucie.szczeponkova@vsb.cz