Collateral and Bank Credit – A Puzzle

Natalia Nehrebecka

Department of Econometrics and Statistics, University of Warsaw, Poland

Aneta Dzik-Walczak

Department of Econometrics and Statistics, University of Warsaw, Poland

Abstract

The impact of firms characteristics on bank debt financing has always been a field of conflicts among economists (e.g. trade-off theory vs. pecking order theory). The pecking order theory predicts that firms holding more tangible assets are less prone to asymmetric information problems and reduce the agency cost. Generally, the supply of bank loans is expected to be higher for firms with higher collateral. In the empirical literature, this relationship is not always confirmed. We analyse this phenomenon from three points of view: meta-analysis of literature, country level data and case of Poland. This study provides a systematic analysis of the empirical literature on the usage of bank debt by conducting a meta-analysis. In particular, the problem of publication selection bias is discussed. We explore the sources of heterogeneity among studies including moderator variables in random- and fixed effects regressions. Our results indicate that there is an evidence of publication selection. Based on country level data we conclude that the impact of collateral on bank credit is negative. For Polish case we find that the impact of collateral on debt is positive, except for the subsample of large enterprises. [1]

Keywords: bank credit, collateral, meta-regression analysis, Polish firms, publication selection bias

Introduction

The aim of this study is to analyze a collateral and bank credit relation. On one hand, we conduct a meta-analysis, we make comparison of results differentiating between publications and verify publication selection bias, on the other, we explore the impact of collateral on bank loan financing based on the country level data and Polish firms level data.

Access to finance is key to business development. Investment, innovation and survival are not possible without adequate financing. In recent years, the uncertainty and instability caused by the economic crisis has affected businesses. The decreased international demand and increased competitiveness caused that both small and medium sized companies, and large firms faced greater difficulties in sustaining their profit levels and surviving in a unfavourable environment.

Modigliani and Miller (1958) formed the basis of modern thinking on capital structure. They claimed that under the assumption of perfect markets where for example taxes and transaction costs do not exist the value of a company would be independent of the capital structure. Nevertheless, subsequent studies have examined the determinants of capital structure and provided new theories with different views on the determinants of capital structure: the pecking order theory, the trade-off theory, the agency theory, the market timing theory.

For collateral the pecking order theory predicts that firms holding more tangible assets are less prone to asymmetric information problems and reduce the agency cost. Generally the supply of bank loans is expected to be higher for firms with higher collateral. Firms operating in industries characterized by a higher level of asset tangibility are expected to face lower credit constraints. Results of empirical researches are not always in line with this expectations.

[1] Meta-Regression Methods for Detecting and Estimating Empirical Effects in the Presence of Publication Selection

We start with meta-analysis, the analysis of empirical analyses that attempts to integrate and explain the literature about some specific parameter. The purpose of meta-analysis is to provide objective and comprehensive summaries of researches conducted by different authors. Meta-analysis is aimed at finding explanation of variation in the regression results published by independent researchers and presenting a statistical conclusion (Sauerbrei and Blettner, 2003). In order to econometrically analyse the sources of heterogeneity in published effects of collateral on firms' bank loans financing, we reviewed existing empirical studies. 30 studies on the determinants of bank loan financing, for which the dependent variables were constructed in a similar way were selected from the review of literature on sources of business financing (over 130 articles). Then we analyse collateral – bank credit phenomenon based on country level data. In the last phase we estimate a dynamic econometric model, describing how the long-term and short-term credit contracted by non-financial companies in Poland is affected by collateral. In the estimation we control for three categories of factors: macroeconomic (WIBOR3M and the effective currency rate), microeconomic – associated with the internal financial situation and structural.

Literature review

The pecking order theory predicts that firms holding more tangible assets are less prone to asymmetric information problems and reduce the agency cost. Generally the supply of bank loans is expected to be higher for firms with higher collateral. Firms operating in industries characterized by a higher level of asset tangibility are expected to face lower credit constraints. When firms use tangible assets as collateral, they reduce the cost of bank loans by limiting exposure and asset-substitution problems (Myers and Majluf, 1984; Detragiache, 1994; Boot et al., 1991; Leeth and Scott, 1989; among others). As a result higher levels of tangibility would imply more bank debt. Petersen and Rajan (1994) report that large firms with a high level of tangible assets use more bank credit. Cole (2008) shows that firms in certain industries, such as construction, manufacturing and transportation, are thought to be more creditworthy because they typically have more tangible assets that can be used as collateral than do firms in other industries, such as business services. Bougheas et al. (2004) confirm that the short-term debt share in total liabilities is higher for companies with a lower level of collateral. A higher collateral level provides greater access to long-term funding, thereby reducing the long-term debt share in total debt. Dewaelheyns and Van Hulle (2007) indicate that large companies with a high share of fixed assets in total assets use bank credit to a greater extent, while firms belonging to capital groups prefer internal financing, due to its lower cost. Cole (2010) finds that firms having less tangible assets do not use bank credit. According to findings presented by Liberti and Sturgess (2012), collateral – and non-specific collateral in particular – is a channel through which borrowers can mitigate bank-specific lending channel effects without turning to alternate lenders in the credit market. Firms with a low collateral level and a high probability of bankruptcy experience worst consequences of the shock. Companies pledging specific collateral (such as inventories, machinery and equipment, accounts receivable, guarantees and promissory notes) experience a smaller decline in lending when exposed to credit supply shock. Borrowers with a low creditworthiness, less collateral and generating lowest returns experience greatest declines in lending is response to the credit supply shock. Borrowers pledging non-specific collateral (real estate, cash and liquid securities) experience lower cuts in lending under a bank-wide credit supply shock. Jimenéz et al. (2013) prove that firms with more tangible assets or cash tend to contract less new loans, relying on internal financing rather. The decisions on granting loans to businesses with certain specifications differ depending on the interest rate. Collateral is less important during the credit market constriction. The balance channel of monetary policy impulses transmission is based on the fact that the changes of interest rates lead to the changes in the values of collateral offered as security by potential debtors. The loss of value may force the businesses to limit the investment expenditure because their credit standing becomes weaker (Bernanke and Gertler, 1995). The increase of interest rates results in the drop of share prices and reduction of the cash flow value. It also decreases the value of the asset to be used as collateral and thus may lead to lower credit supply. The amount of the loan taken by businesses may be limited by the value of owned assets used as payment security.

Publication selection bias

Stanley and Jarrell (1989) considered why do researchers come to such different findings when they are investigating the same phenomenon. Is it because of statistical methods, model misspecifications, different data sets? The authors offered a quantitative methodology for reviewing the empirical economic literature. Proposed meta-regression analysis is the regression analysis of regression analyses. Meta-regression analysis not only recognizes the specification problem but also attempts to estimate its effects by modelling variations in selected econometric specifications.

There is a probability that the results obtained by the researchers may be affected by the problem of statistical significance selection (so-called: publication selection bias). The selection of publications occurs when the researchers and reviewers prefer the statistically significant results.

The funnel graph is a classic method used for the identification of the publication selection bias. It is a distribution diagram for the precision (measured usually as the inverse of the standard error) from the estimated coefficient. In the case of the absence of the publication selection bias, the diagram should resemble an upside down funnel – wide at the base, tapering as the values on the vertical axis increase. The funnel diagram should also be symmetrical, regardless of the value of the true effect, at which the estimations should converge.

30 studies on the determinants of financing with bank loans, for which the dependent variables were constructed in a similar fashion were selected from the review of literature on business financing sources (over 130 articles). Finally, 119 regressions from 22 publications were selected for further analysis.

The publications to date obtained positive, negative and insignificant estimations for collateral coefficient (Table 2). The lack of publication selection is evident when the estimated parameters change randomly and symmetrically around the "true" population effect. The asymmetry of the graph can be used as an evidence of the presence of publication bias in the literature. Based on the graphical analysis, Figure 1 indicates publication selection. It is worth noting that man econometric decisions, such as omission of variables, selection of the estimation method or functional form can also change the shape of the chart. However, the discussed sources of variance may be described as bias related to wrong model specification. Furthermore, the heterogeneity of the "true effect" between the studies, caused by the application of different sets of data for different times and countries may be the reason for the asymmetry in the funnel chart, even in the case of the lack of publication selection bias.

In Figure 1, the top point approaches the value near 0 and the mean of all collateral estimations is 0,089 – far more than the top chart value. The expected upside down funnel shape is determined by heteroscedasticity. The studies on small samples characterised by larger standard errors and the resulting lower precision are located on the bottom of the diagram which results in the more dispersed base of the chart. Figure 2 illustrates how the parameter estimations changed in time. There is no clear correlation visible for collateral.

In order to identify if there is publication bias in our meta-samples we follow Stanley et al. (2008) and we estimate equation (1).

$$t_i = \beta_{SE} + \beta_e \left(\frac{1}{SE_i}\right) + v_i \quad (1)$$

where: $t_i - t - distribution, SE_i - standard\ deviation, \beta_{SE}, \beta_e - unknown\ parameters, v_i - random\ error.$

Testing whether the constant is equal to zero (H_0: β_{SE}= 0) is equivalent to the testing of distribution asymmetry and can be used as the measurement of the occurrence of the effect of the publication selection bias on the results referred to precision-effect test (PET) (Egger et al., 1997; Stanley, 2008; Stanley, Doucouliagos, 2012). Whereas, testing whether the β_e parameter is equal to zero (H_0: β_e = 0) shows the direction of the bias with the studied effect (Egger et al., 1997; Stanley, 2008).

However, like any regression model, the estimates can be biased when important explanatory variables are omitted. Therefore, we need to include moderator variables to control for the possible heterogeneity across studies. Finally we perform a meta-regression analysis, incorporating into the model 21 possible moderators that take into account the study heterogeneity.

Like in any regression model, the estimates of MRA's coefficients can become biased when important explanatory variables are omitted. MRA model (1) can be expanded to include variables, Z_k, that explain variation in estimates and other factors, and K_j, that are correlated with the publication selection process itself.

$$t_i = \beta_{SE} + \sum \gamma_j K_{ij} + \beta_e(1/SE_i) + \sum \alpha_k Z_{ik}/SE_i + v_i \quad (2)$$

where: K variables may affect the likelihood of being selected for publication. Z variables may affect the magnitude of the estimator. In the meta-analysis the equation for the FAT and PET tests is estimated by both random and fixed effects models.[1]

In order to confirm the results on the chart, which are often a subjective assessment of the researcher, the regression described by formula (1) was estimated. The results from the FAT test indicate that type I publication bias is present only in the case of assets structure, company size investigation (Table 3 – publication selection bias). The FAT tests in other categories fail to prove its presence. The PET tests' reject statistical difference of these estimates from zero. Adding moderator variables to Eq. (1) yields a weighted least-squares meta-regression model (FE – fixed effects) and method-of-moments (RE – random effects) of heterogeneity and publication bias. We present the results of Tau2 test for within variance of residuals (Table 3). For models estimated by Method of Moments we got Q statistics. The null hypothesis states that fixed effects model is correct. Q statistics for our models are large and their p-values are equal to zero. The real value of the actual effect probably varies between research, what means that the data are not consistent with the assumptions of fixed effects models.

Testing whether the constant is equal to zero is used as the measurement of the occurrence of the effect of the publication selection bias. We find that the intercepts in regressions for profitability, assets structure and company size are significant (Table 3 – publication selection bias). The inclusion of potential sources of heterogeneity removes publication bias just for the case of company size.

Potential explanatory variables included in meta-regression analysis are presented in Table 4. We include moderator variables to control for heterogeneity across studies. Table 3 presents the results of the reduced models, as during estimation, we observed that some moderator variables are not important in contributing to the potential source of heterogeneity, as they are not statistically significant.

We find now that precision coefficients in regressions for collateral $(0{,}85)$ is significant (Table 3 – publication selection bias + heterogeneity). Estimates for the β_e parameter show the direction of the bias. In case of collateral we observe a negative bias. More often cited studies report collateral estimates that are larger (on average 5e-06 lower). Furthermore, analysis with higher number of firms included are likely to report lower collateral estimates (on average 0,007 higher).

In summary, the results of the meta-analysis show the occurrence of the publication selection bias in the case of collateral. One reason for that can be wrong model specification, another reason may be connected with pressure for obtaining a statistically significant estimator.

Analysis of country level data

The objective of this part of the paper is to explore relation between collateral and bank credit in European countries. The sample was obtained from the database of the European Committee of Central Balance Sheet Data Offices (BACH / ESD, 2013) and encompasses European countries for the period 2000-2014. BACH (Bank for the Accounts of Companies Harmonized) is a database of aggregated and harmonized accounting data of non-financial companies in European countries, based on their national accounting standards. The database currently includes data for 11 countries (Austria, Czech Republic, France, Germany, Italy, Poland, Portugal, Slovakia, Spain and Belgium, Netherlands). The data sources for this database include financial statements (balance sheets and income statements) of individual non-financial corporations.

Based on Figures 8-12 we may see that macroeconomic effects are crucial as company financing methods differ significantly between countries. Equity is most prevalent among enterprises in Poland, Netherlands and Czech Republic while total debt is most widespread among enterprises in Austria, Portugal, Germany and Italy, where bank loans play a greater role. What we see in Table 5 is that at the country level tangibility, profitability, size of a companies and Interests

[1] The difference between the fixed effects and random effects estimates (for a weighted average estimates) can be the probable indicator of the effect of the selection of publications. This difference occurs because the less precise estimates are more biased in random effects models compared to fixed effects models. Random effects models reflect unobserved heterogeneity, which may be real or appears as the result of the methodology. Biase of the standard errors of estimates may also occur. It means that the more precise estimates may indicate on biease or inefficiency. Using random effects models can eliminate inefficiency or incorrect outliers. As a consequence of the foregoing we are using random effects and fixed effects models in this study

on financial debts/Total Assets are significant for bank loans in case of whole sample. Based on estimation of parameters, we note that collateral significantly determines the bank loan financing in the investigated countries, when considering the small and medium-sized companies. For both groups the impact is negative. The profitability of companies doesn't differentiate the use of bank credit to finance activities in the analyzed countries, regardless the size of firms. Interests on financial debts in small and large companies significantly differentiate the use of bank credit in countries. A similar conclusion was obtained for logarithm of total assets.

A case of Poland

Database used in the article was created on the basis of the financial statements of companies listed on the Warsaw Stock Exchange, Newconnect or the Central Table of Offers (CeTO), operating in the years 1998-2015. We focused on non-financial enterprises, which, according to the Central Statistical Office results in exclusion from the study firms operating (according to the Polish Classification of Activities, 2007) in section A (Agriculture, forestry, hunting and fishing), K (Financial and insurance activities) and O (public administration and defense, compulsory social security). In addition section T (Activities of households, households producing goods and providing services for their own needs) and Section U (extraterritorial organizations and bodies) were removed. Furthermore, some variables include outliers in only the upper values, so we truncate the sample at the 99 percentile to exclude these outliers. When variables include outliers in both the upper and lower values, we truncate at both the 0.5 and 99.5 percentiles of the sample.

Table 6 provides some summary statistics. As shown, the average share of total liabilities in the balance sheet total amounts is about 40%, which means that the Polish listed companies to a large extent finance with the foreign capital (Table 6). In the sample leverage ranges from 0 to 98%. Analyzing the chart of variation of leverage over time we see that the highest average amount of leverage was achieved in 2002, which was the result of significant increases in the stock market. A significant decrease in leverage in 2007 was a reaction to the restrictive monetary policy - a rise in interest EURIBOR3M and LIBOR3M, as well as the growing trend of market interest rates on bank loans, interest WIBOR3M. The increase in market interest rates on bank loans and interest WIBOR3M resulted in a decrease in debt lasting until the beginning of 2008. In 2011, an increase in leverage was observed in response to the decline in market interest rates on bank loans and interest rates in 2010. Restrictive monetary policy in 2000, 2004 and 2007 resulted in a decrease in leverage. On the other hand, the policy of low interest rates in 2003 and 2006 and in the years 2009-2010 (WIBOR3M and market interest rates on loans) caused an increase in leverage. This points to the fact that monetary policy determines the structure of financial companies.

A dynamic econometric model has been estimated, describing how the long-term and short-term credit contracted by non-financial companies in Poland is affected by three categories of factors: macroeconomic (WIBOR3M and the real effective currency rate), microeconomic – associated with the internal financial situation and structural. Parameters were estimated using the robust system GMM (Generalised Methods of Moments) estimator 13 (see: Arellano & Bover, 1995; Blundell & Bond, 1998).

According to the static and dynamic theory of trade-off the companies maintain the optimal level of leverage, and quickly adapt to the aimed value in the case of any deviations. The theory of the hierarchy of sources of funding and market timing exclude the existence of an optimal debt ratio. Researchers verify the validity of these theories by estimation of coefficient of the speed of adjustment. A high value of coefficient confirms the validity of the theory of trade-off. Based on the literature, it was observed that the coefficient reaching a value above 20% is considered to be high. However, the authors suggest that the slow rate of adjustment does not indicate a rejection of the hypothesis according to which the companies have an optimal capital structure. This slow rate may result from the existence of high adjustment costs that exceed the costs of staying outside the optimum. In our study the estimate of coefficient for lagged dependent variable is 58.45%. It means that companies adjust its current level of leverage to the optimal value at a rate of 41.55% per year (which means that companies need 1.3 years to reduce half of the distance to the optimum leverage). In comparison with results obtained by other researchers it is relatively high rate. The high values, 34% and 46% were received, among others, by Flannery and Rangan (2006) and Cook and Tang (2010) respectively. Fama and French (2002) and Huang and Ritter (2005) interpret the obtained slow rate of adjustment to support the theory of the hierarchy of sources of funding.

The size of the company shows a positive correlation with the level of leverage. This confirms the assumption of the theory of trade-off, the more profitable companies have a larger share of foreign capital in total assets. Large enterprises finance investments through external sources, in particular the long-term bank loan and sale of securities. Firms that generate

higher revenues, having more bargaining power and better access to credit have lower credit margins and increased foreign capital in the capital structure. Smaller companies finance mainly with profits generated or contributions owners.

We find that debt decreases with increasing profitability and effective tax rate. The results confirm the validity of the theory of the hierarchy of sources of financing, according to which companies capable to generate high profits have a greater tendency to use equity than foreign capitals. High taxes result from the large revenues that reduce the need for debt.

Growing companies have a greater need of capital, and therefore rely on external financing. The increase in sales is not able to meet the financial needs due to the problem of gridlock. According to the theory of the hierarchy of sources of finance companies prefer debt issue than shares. Our results indicate a positive correlation between the level of leverage and growth opportunities, which confirms the validity of the theory.

Tangible fixed assets may be treated as a collateral. The higher share of fixed assets in total assets reduces the lender's risk and increases the access to external capital, which is consistent with the theory of trade-off. Agency costs and information asymmetry can cause that lenders require guarantees in the form of collateral on fixed assets, and therefore expected positive impact of this variable on the size of the debt ratio. The variable asset structure works with lags, as the basis for verification of the credit are the financial statements for the previous year.

Liquidity is defined as the company's ability to timely repayment of current liabilities. Companies with high liquidity have a greater ability to pay the debt and therefore should use the foreign capital as a main source of funding. We got a positive relation between the level of debt and liquidity, which testifies to the support of the theory of substitution.

Non-interest tax shield is an important factor affecting the capital structure. It arises as a result of the existence of other than interest on borrowed capital, items that reduce the tax base, such as depreciation. In our study, non-interest tax shield reduces debt, which indicates that companies use rather depreciation than the interest paid on the debt. The results are consistent with the theory of substitution. In turn, the interest tax shield has a positive impact on the level of leverage.

It is assumed that companies with high expenditure on research and development prefer equity financing. However, our results indicate a positive relationship between intangible assets and the debt ratio. According to the theory of signaling, a well-developing companies increase the involvement of foreign capitals to signal the good prospects for the future.

In the case of other explanatory variables used in the model, theories regarding the choice of the capital structure does not give a clear indication as to the direction of the expected impact on the level of debt. The negative impact of the inverted index bankruptcy on leverage points to the fact that companies having a higher probability of bankruptcy are less likely to benefit from the financing of foreign capital. This may involve the fact that the threatened with bankruptcy companies will not be able to repay its liabilities. The median leverage in the sector is an important determinant of the debt ratio. Companies operating in the same industry are affected by a similar environment: market fluctuations, the impact of state institutions or changes in the market of suppliers and customers, which indicates the existence of a positive relationship between the variables.

The survey was repeated for industrial and service companies separately. High rate of adjustment of the current level of debt to the optimal level for both industrial (35.83%) and service companies (41%) proves the existence of an optimal capital structure and rapid effort to achieve it, regardless of the industry. The results are just slightly different in terms of the factors that influence the choice of debt in these two sectors of the economy. In both subgroups the same variables occurred to be significant determinants of debt. However, for industrial companies growth opportunities and the share of intangible assets in total assets have a negative impact on the dependent variable. The negative relationship between the debt and growth opportunities, according to the theory of substitution, reflects that costs of the financial risk (including bankruptcy) increase with the expected growth of the company, forcing managers to reduce debt in the capital structure. For service companies the relation is consistent with the theory of the hierarchy of sources of funding. Summing up, the influence of most variables used in the model indicates to the theory of substitution in case of Polish listed companies, irrespective of the sector of the business.

Due to the fact that the size of the company may affect its access to capital markets, the risk of bankruptcy and economies of scale in contracting capital, a model was estimated for small and large companies separately. An important conclusion derived from the analysis is that large companies slowly adjust the current level of debt to the optimal size. The adjustment rate for large companies is only 23.54%, while in the case of small firms it is 44.55%. This is because large companies are

characterized by lower volatility of cash flow, and therefore meet lower costs associated with a deviation from an optimal debt. Although the adjustment process in large companies is slower than in small firms, based on the literature for both cases it is referred as fast.

It turns out that for large companies, as in the case of industrial firms, growth opportunities and the share of intangible assets in total assets are negatively correlated with the level of debt. This is because the highly developing smaller businesses have a greater financial needs, so they lend more. The increase in sales is not able to meet the financial needs of small businesses because of the gridlock. For large companies an increase in sales growth increase the possibility of self-financing, which reduces the need for external financing. In large companies, payment backlogs are of minor importance, and sales growth results in an increase in revenues from debt repayment. Another difference between small and large companies is the negative impact of collateral on the level of leverage in the case of large enterprises. Higher fixed assets increase the availability of external capital as they reduce the risk of the lender. Therefore, the positive impact of collateral on debt is expected. However, for large enterprises increase in fixed assets reduces the demand for foreign capital financing. For smaller companies assets held in year t-1 increase debt, as they constitute collateral. This is because the basis for verification of the creditworthiness is the financial statements for the previous year. Moreover, in the case of large companies, variable non-interest tax shield is irrelevant. This is due to the fact that large businesses borrow more in order to maximize tax benefits. Smaller companies receive tax savings mainly due to depreciation, rather than the interest paid on the debt. Despite minor differences in the estimates of parameters, the impact of most variables points to the application of the theory of substitution in Polish listed companies, regardless of company size.

6 Conclusion

In this study we analyze a collateral and bank credit relation. This study pursues two objectives: on one hand, we conduct a meta-analysis, we make comparison of results differentiating between publications and verify publication selection bias, on the other, we explore the determinants of bank loan financing based on the country level data and Polish firms level data.

The described study is the continuation of the previous meta-analyses of the authors (Białek-Jaworska, Dzik-Walczak, Nehrebecka, 2015). The benefit of this work is that, by aggregating results across a large number of investigations and exploiting between-study design variation, we point variables that modify them more precisely than could be done through qualitative review.

In the publications regarding bank loans, the publication selection bias was found for collateral estimates. When analyzing the determinants of bank loan financing based on the country level data we found that equity is most prevalent among enterprises in Poland, Netherlands and Czech Republic while total debt is most widespread among enterprises in Austria, Portugal, Germany and Italy, where bank loans play a greater role. At the country level collateral is significant for bank loans and the impact that we get is negative. Based on the empirical analysis of Polish firms we conclude that the long-term and short-term debt contracted by non-financial companies is affected by three categories of factors: macroeconomic, microeconomic and structural. We find that the impact of collateral on debt is positive, except for the subsample of large enterprises.

Bibliography

[1] Aghion P., Askenazy P., Berman N., Cette G., Eymard L. (2012), *CREDIT CONSTRAINTS AND THE CYCLICALITY OF R&D INVESTMENT: EVIDENCE FROM FRANCE,* Journal of the European Economic Association, 10(5), pp. 1001–1024.

[2] Alonso P.D.A., Iturriaga F.J.L., Sanz J.A.R., Vallelado Gonzalez E. (2005), *Determinants of Bank Debt in a Continental Financial System: Evidence from Spanish Companies*, The Financial Review, 40(3), pp. 305-333.

[3] Ang J., Peterson P. (1984), *The Leasing Puzzle*, The Journal of Finance, 39(4), pp. 1055-1065.

[4] Atanasova Ch. (2007), *Access to Institutional Finance and the Use of Trade Credit*, Financial Management, pp. 49-67.

[5] Atanasova C., N. Wilson (2003), *Bank Borrowing Constraints and the Demand for Trade Credit: Evidence from Panel Data*, Managerial & Decision Economics, 24(6/7)

[6] Beattie V., Goodacre A., Thomson S. (2000), *Operating leases and the assessment of lease – debt substitutability*, Journal of Banking and Finance 24, pp. 427-470.

[7] Beatty A., Liao S., Weber J. (2010), *Financial Reporting Quality, Private Information, Monitoring, and the Lease-versus-Buy Decision*, The Accounting Review American Accounting Association, Vol. 85, No. 4 DOI: 10.2308/accr.2010.85.4.1215, pp. 1215–1238.

[8] Berger A.N., Cowan A.M., Frame W.S. (2011), *The surprising use of credit scoring in small business lending by community banks and the attendant Effects on credit availability, risk, and profitability*, Journal of Financial Services Research 39, pp. 1-17.

[9] Bernanke B.S., Gertler M. (1995), *Inside the black box: the credit channel of monetary policy transmission* (No. w5146), National bureau of economic research.

[10] Berrospide J., Meisenzahl R., Sullivan B. (2012), *Credit Line Use and Availability in the Financial Crisis: The Importance of Hedging,* Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington.

[11] Białek-Jaworska A., Dzik-Walczak A., Nehrebecka N. (2015), *Determinanty finansowania działalności przedsiębiorstw kredytem bankowym: meta-analiza*, Bank i Kredyt, 46 (3), pp. 253 – 298.

[12] Białek-Jaworska A., Dzik-Walczak A., Nehrebecka N. (2015), *Transakcyjne i finansowe motywy wykorzystania kredytu handlowego: meta-analiza*, Wiadomości Statystyczne, 7.

[13] Białek-Jaworska A., Dzik-Walczak A., Nehrebecka N. (2015), *Kiedy firmy sięgają po leasing?*, Gospodarka Narodowa, 2

[14] Blasio G. (2005), *Does Trade Credit Substitute Bank Credit? Evidence from Firm-level Data*, Economic notes, 34(1), pp. 85-112.

[15] Boguszewski P., Kocięcki A. (2000), *Wpływ polityki pieniężnej na zachowania przedsiębiorstw w świetle danych GUS i badań ankietowych - wybrane zagadnienia*, Bank i Kredyt.

[16] Boot A., Thakor A., Udell G. (1991), *Secured lending and default risk: equilibrium analysis and policy implications and empirical results*, Economic Journal 101, pp. 458-472.

[17] Bougheas S., Mateut S., Mizen P. (2009), *Corporate trade credit and inventories: New evidence of a trade-off from accounts payable and receivable*, Journal of Banking and Finance 33, pp. 300-307.

[18] Bougheas S., Mizen P., Yalcin C. (2006), *Access to external finance: theory and evidence on the impact of firm-specific characteristics*, Journal of Banking and Finance 30 (1), pp. 199–227.

[19] Branson B.C. (1995), *An empirical reexamination of the leasing puzzle*, Quarterly Journal of Business and Economics, 34(3).

[20] Brown M., Kirschenmann K., Ongena S. (2010), *Foreign Currency Loans - Demand or Supply Driven?* Swiss National Bank, 2011/2.

[21] Brown M., Ongena S., Popov A., Yesin P. (2011), *Who needs credit and who gets credit in Eastern Europe?, Economic Policy,* 26 (65): 93-130 DOI: http://dx.doi.org/10.1111/j.1468-0327.2010.00259.x

[22] Callimaci A., Fortin A., Landry S. (2011), *Determinants of leasing propensity in Canadian listed companies*, International Journal of Managerial Finance, 7(3).

[23] Carbo-Valvrde S., Degryse H., Rodriguez-Fernandez F. (2011), *Lending Relationships and Credit Rationing: The Impact of Securitization*, Australasian Finance and Banking Conference.

[24] Chigurupati V.R., Hegde Sh.P. (2009), *Capital market frictions, Leasing and Investment*. Working Paper.

[25] Chu L., Mathieu R., Zhang P. (2008), *Why Firms Lease Short-Lived Assets: A Tax-Based Explanation*, Canadian Tax Journal.

[26] Cole R.A. (2011), *Bank Credit, Trade Credit or No Credit: Evidence from the Surveys of Small Business Finances*, Office of Advocacy, U.S. Small Business Administration.

[27] Cole R.A., Sokolyk T. (2016), *Who needs credit and who gets credit? Evidence from the Surveys of Small Business Finances*, Journal of Financial Stability, in Press, Accepted Manuscript

[28] Cole R.A., Dietrich A. (2012), *SME Credit Availability Around the World, Evidence from World Bank's Enterprise Survey, Paper presented at the 2012 FMA European Conference in Istanbul, Turkey held June 7-8, 2012. Available at: http://ssrn.com/abstract=2043624*

[29] Cook D.L. (1999), *Trade Credit and Bank Finance: Financing Small Firms in Russia*, Journal of Business Venturing, Vol.14.

[30] Coulibaly B., Sapriza H., Zlate A. (2013), *Financial Frictions, Trade Credit, and the 2008-09 Global Financial Crisis, Board of Governors of the Federal Reserve System*, International Review of Economics and Finance 26, pp. 25-38.

[31] Couppey-Soubeyran J., Hericourt J. (2011), *The relationship between trade credit, bank credit and financial structure: from firm-level non-linearities to financial development heterogeneity. A study on MENA firm-level data*, Documents de travail du Centre d'Economie de la Sorbonne.

[32] Danielson M.G., Scott J.A. (2004), *Bank Loan Availability and Trade Credit Demand*, The Financial Review 39(4), pp. 579-600.

[33] Deloof M., Lagaert I., Verschueren I. (2007), *Leases and debt: complements or substitutes? evidence from Belgian SMEs,* Journal of Small Business Management, Volume: 45 Issue 4, pp. 491-500.

[34] Demiroglu, C., James, C., Kizilaslan, A. (2012), *Bank lending standards and access to lines of credit*, Journal of Money, Credit and Banking, 44(6), pp. 1063-1089.

[35] Detragiache E. (1994), *Public versus private borrowing: a theory with implications for bankruptcy reform,* Journal of Financial Intermediation 3, pp. 327-354.

[36] Detragiache E., Tressel T., Gupta (2008), *Foreign Banks in Poor Countries: Theory and Evidence, Journal of Finance*, American Finance Association, 63(5), pp. 2123-2160.

[37] Dewaelheyns N., Van Hulle C. (2010), *Internal capital markets and capital structure: Bank versus internal debt*, European Financial Management, Vol. 16, Issue 3, pp. 345–373.

[38] Doucouliagos C. H., Stanley T. D. (2009), *Publication selection bias in minimum-wage research? A meta-regression analysis,* British Journal of Industrial Relations 47(2), pp/ 406-428.

[39] Duke J., Franz D., Herbert H, Toy D. (2002), *Firm-specific determinants of off-balance sheet leasing: A test of the Smith/Wakeman model*, Journal of Business and Management, *8*(4), pp. 335.

[40] Egger M., Smith G.D., Schneider M., Minder C. (1997), *Bias in meta-analysis detected by a simple, graphical test*, Bmj, 315(7109), pp. 629-634.

[41] Eisfeldt A.L., Rampini A.A. (2009), *Leasing, Ability to Repossess, and Debt Capacity*, Review of Financial Studies, 22 (4): 1621-1657. doi: 10.1093/rfs/hhn026.

[42] Filareto-Deghaye M., Severin E. (2007), *Determinants of the choice leasing vs bank loan: evidence from the French SME by KACM*, Revista Investigacion Operacional, 28(2), pp. 120-130.

[43] Finucane T.J. (1988), *Some empirical evidence on the use of financial leases*, The Journal of Financial reseaech, XI(4).

[44] Franzen L.A., Rodgers K.J., Simin T.T. (2009), *Capital Structure and the Changing Role of Off-Balance-Sheet Lease Financing,* http://www.frbatlanta.org/filelegacydocs/seminars/seminar_simin_101609.pdf , 2009

[45] Garcia-Appendini E., Montoriol-Garriga J. (2011), *Firms as Liquidity Providers: Evidence from the 2007-2008 Financial Crisis*, Journal of Financial Economics, Vol. 109 No. 1

[46] Ge Y., Qiu J. (2007), *Financial development, bank discrimination and trade credit*, Journal of Banking and Finance, 31(2), pp. 513-530.

[47] Grinblatt M., Titman S. (1998), *Financial Markets and Corporate Strategy*, Irwin-McGraw-Hill.

[48] Ghosh S. (2010), *Firm Characteristics, Financial Composition and Response to Monetary Policy: Evidence from Indian Data*, Journal of Indian Business Research, 2(4), pp. 198-215.

[49] Ghosh S., Sensarma R. (2004), *Does monetary policy matter for corporate governance? Firm-level evidence from India*, w: M. Hirschey, J. Kose, A. Makhija (ed.), *Corporate Governance*, Advances in Financial Economics, Vol. 9., Emerald Group Publishing Limited, pp. 327-353.

[50] Goodacre A. (2003), *Operating lease finance in the UK retail sector*, The International Review of Retail, Distribution and Consumer Research, vol. 13, no. 1, pp. 99-125, http://dx.doi.org/10.1080/0959396032000065373

[51] Graham J.R., Lemmon M.L., Schallheim J. S. (1998), *Debt, leases, taxes, and the endogeneity of corporate tax status*, The Journal of Finance, 53(1), pp. 131-162.

[52] Guariglia A., Mateut S. (2006), *Credit channel, trade credit channel, and inventory investment: Evidence from a panel of UK firms*, Journal of Banking and Finance, 30(10) pp. 2835–2856.

[53] Haan L., Sterken E. (2000), *Capital Structure, Corporate Governance, and Monetary Policy: Firm-Level Evidence for the Euro Area*, De Nederlandsche Bank, Research Memorandum WO&E No. 637/0032.

[54] Haan L., Sterken E. (2006), *The Impact of Monetary Policy on the Financing Behaviour of Firms in the Euro Area and the UK,* European Journal of Finance, Vol. 12, No. 5, pp. 401–420.

[55] Huang H. Shi X., Zhang S. (2011), *Counter-cyclical substitution between trade credit and bank credit*, Journal of Banking and Finance, 35, pp. 1859–1878.

[56] Hunter J.E., Schmidt F.L (1990), *Methods of meta-analysis: Correcting error and bias in research findings.* Newbury Park: CA: Sage.

[57] Huyghebaert N., Van de Gucht L., Van Hulle C. (2007), The Choice between Bank Debt and Trade Credit in Business Start-ups, *Small Business Economics*, 29(4), pp. 435-452.

[58] Jimenéz G., Ongena S., Peydró J., Saurina J. (2009), Monetary Policy and Credit Crunch: Identifying Simultaneously the Bank Lending and Balance Sheet Channels, http://www.eea-esem.com/files/papers/EEA-ESEM/2009/1304/JOPS%20CC%202009-02-12.pdf

[59] Jimenéz G., Ongena S., Peydró J., Saurina J. (2012), *Credit supply identyfying balance-sheet channel with loan applications and grantem loans*, AMERICAN ECONOMIC REVIEW, VOL. 102, NO. 5, AUGUST 2012 (pp. 2301-26)

[60] Jimenéz G., Ongena S., Peydró J., Saurina J. (2012), *Credit Supply versus Demand: Bank and Firm Balance-Sheet Channels in Good and Crisis Times*, European Banking Center Discussion Paper No. 2012-003.

[61] Jimenéz G., Ongena S., Peydró J., Saurina J. (2013), *Monetary Policy and Credit Crunch: Identifying Simultaneously the Bank Lending and Balance Sheet Channels*, Bank of Spain mimeo.

[62] Koh J., Jang S. (2009), *Determinants of using operating lease in the hotel industry*, International Journal of Hospitality Management, Vol. 28.

[63] Lasfer M.A., Levis M. (1998), *The Determinants of the Leasing Decision of Small and Large Companies*, European Financial Management, 4(2), pp. 159-184.

[64] Leeth J.D., Scott J.A. (1989), *The incidence of secured debt: evidence from the small business community*, Journal of Financial and Quantitative Analysis, 24(03), pp. 379-394.

[65] Lin J.R., Wang Ch.-J., Chou D.-W., Chueh F.-Ch. (2012), *Financial constraint and the choice between leasing and debt*, International Review of Economics & Finance, vol. 27, issue C, pp. 171-182.

[66] Love M., Peria M. (2014)*, How Bank Competition Affects Firm's Access to Finance*, World Bank Econ Rev, doi: 10.1093/wber/lhu003.

[67] Love I., Preve L.A., Sarria-Allende V. (2007), *Trade credit and bank credit: Evidence from recent financial crisis*, Journal of Financial Economics, 83.

[68] Marston F., Harris R.S. (1988), *Substitutability of leases and debt in corporate capital structures*, Journal of Accounting, Auditing and Finance, 3(2), pp. 147-164.

[69] Marzec J., Pawłowska M. (2011), *Racjonowanie kredytów a substytucja między kredytem kupieckim i bankowym – badania na przykładzie polskich przedsiębiorstw*, Materiały i Studia NBP, Zeszyt 261.

[70] Mateut S., Mizen P., Ziane Y. (2011), *No Going Back: The Interactions Between Processed Inventories and Trade Credit*, Centre for Finance and Credit Markets, Working Paper 11/04.

[71] Myers S. C., Majluf N. S. (1984), *Corporate financing and investment decisions when firms have information that investors do not have,* Journal of financial economics, 13(2), pp. 187-221.

[72] Neuberger D., Räthke-Döppner S. (2013), *Leasing by small enterprises*, Applied Financial Economics, 23(7), pp. 535-549.

[73] Rauh J. D., Sufi A. (2012), *Explaining Corporate Capital Structure: Product Markets, Leases, and Asset Similarity, Oxford Journals, Arts & Humanities Social Sciences, Review of Finance, Vol. 16, Issue 1, pp. 115-155*

[74] Robicheaux S.H., Fu X., Ligon J.A. (2008), *Lease Financing and Corporate Governance*, Financial Review, 43(3), pp. 403-437.

[75] Rosenthal R., Rubin B.D. (1982), *Comparing effect sizes in independent studies*, Psychological Bulletin, 92, pp. 500-504.

[76] Sauerbrei W., Blettner, M. (2003), *Issues of traditional reviews and meta-analyses of observational studies in medical research. Meta-Analysis New Developments and Applications in Medical and Social Sciences*, Cambridge, MA: Hogrefe and Huber, pp. 78-98.

[77] Schallheim J., Wells K., Whitby R. (2013), *Do Leases Expand Debt Capacity?*, Journal of Corporate Finance, Volume 23, pp. 368–381.

[78] Sharpe S.A., Nguyen H.H. (1995), *Capital market imperfections and the incentive to lease,* Journal of Financial Economics, 39(2), pp. 271-294.

[79] Singh A. (2011), An empirical investigation of the lease-debt relation in the restaurant and retail industry, International CHRIE Conference-Refereed Track.

[80] Singh A. (2013), Is Leasing a Substitute or Complement to Debt? Evidence from the Restaurant and Retail Industry, Journal of Hospitality & Tourism Research, 37(2), pp. 155-183.

[81] Slotty C. (2009), *Financial constraints and the decision to lease: Evidence from German SME*, Johann-Wolfgang-Goethe-Universität Frankfurt am Main, Fachbereich Wirtschaftswissenschaften Finance and accounting, No. 205.

[82] Stanley T. (2005), *Beyond Publication Selection*, Journal of Economic Surveys, 19, pp. 309-345.

[83] Stanley T. (2008), *Meta-regression methods for detecting and estimating empirical effect in the presence of publication bias*. Oxford Bulletin of Economics and Statistics, 70, pp. 103-127.

[84] Stanley, T.D., Doucouliagos, H., Giles, M., Heckemeyer, J. H., Johnston, R. J., Laroche, P., Nelson, J. P., Paldam, M., Poot, J., Pugh, G., Rosenberger, R. S. and Rost, K. (2013), META-ANALYSIS OF ECONOMICS RESEARCH REPORTING GUIDELINES. JOURNAL OF ECONOMIC SURVEYS, 27: 390–394. doi:10.1111/joes.12008

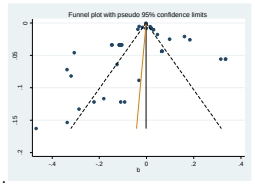
[85] Stanley T.D., Jarrell S.B.., *Meta-regression analysis: A quantitative method of literature surveys*, *Journal of Economic Surveys,* 1989, 3, pp. 161-170.

[86] Uesugi I., Yamashiro G.M. (2008), *The Relationship between Trade Credit and Loans: Evidence from Small Businesses in Japan*, International Journal of Business, 13(2).

[87] Yan A. (2006), *Leasing and Debt Financing: Substitutes or Complements?* The Journal of Financial and Quantitative Analysis, 41(03), pp. 709-731.

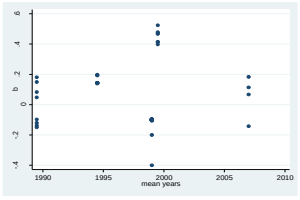
[88] Zawadzka D. (2009), *Determinanty popytu małych przedsiębiorstw na kredyt handlowy*, Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań

Figure 1. Collateral: relation between the parameter estimation and the inverse of the standard deviation



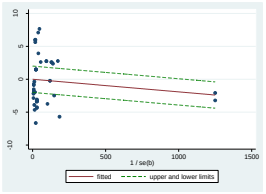
Source: own study based on the review of empirical literature

Figure 2. Collateral: change of estimated values in time



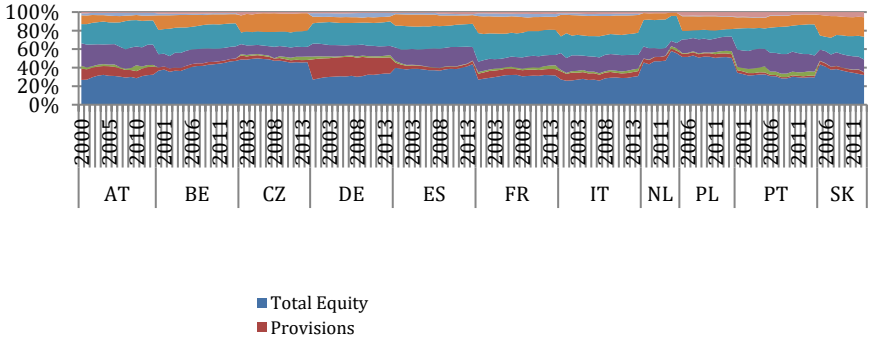
Source: own study based on the review of empirical literature.

Figure 3. Galbraith plot for the effect of collateral on bank credit financing



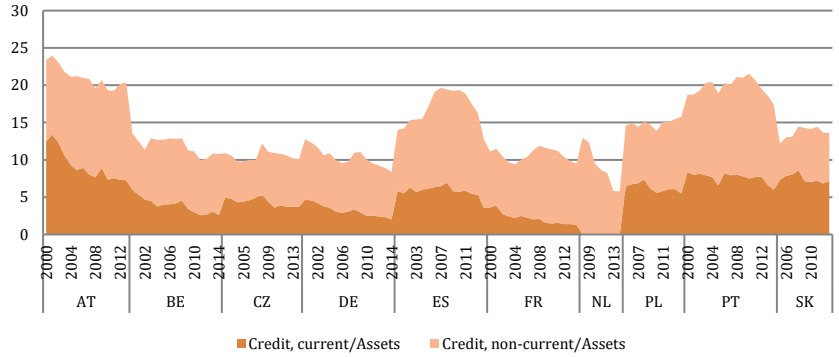
Source: own study based on the review of empirical literature.

Figure 4. Weight of each source of financing on total liabilities



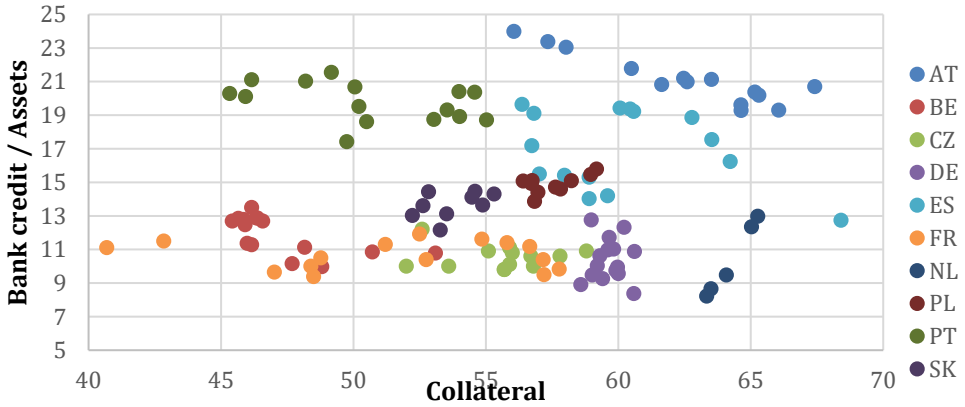
Source: Own Study Based on Bach Database.

Figure 5. Bank credit on total assets



Source: own study based on BACH DATABASE.

Figure 6. Bank credit and Collateral relation



Source: own study based on BACH DATABASE.

Table 1. List of articles included in the last phase of the meta-analysis

Authors and title	Years of research	Country	Publications
Alonso et al. (2005) Determinants of Bank Debt in a Continental Financial System: Evidence from Spanish Companies	1991-1996	Spain	The Financial Review, Eastern Finance Association
Białek, Dzik-Walczak, Nehrebecka (2014)	1995-2011	Poland	Materiały i Studia National Bank of Poland
Boguszewski, Kocięcki (2000) Wpływ polityki pieniężnej na zachowania przedsiębiorstw w świetle danych GUS i badań ankietowych - wybrane zagadnienia	1994	Poland	Bank i Kredyt
Bougheas et al. (2006) Access to external finance: theory and evidence on the impact of firm-specific characteristics	1990-1999	Great Britain	Journal of Banking and Finance
Brown et al. (2011)	2003-2007	Bulgaria	Economic Policy
Berrospide, Meisenzahl, Sullivan (2012), Credit Line	2006-		FEDS Working Paper

Use and Availability in the Financial Crisis: The Importance of Hedging	2008		
Cole, Sokolyk (2016) Who needs credit and who gets credit? Evidence from the surveys of small business finances.	1993, 1998, 2003	USA	Journal of Financial Stability
Cole., Bank Credit, Trade Credit or No Credit: Evidence from the Surveys of Small Business Finances (January 14, 2011). Available at SSRN: http://ssrn.com/abstract=1540221 or http://dx.doi.org/10.2139/ssrn.1540221	1993, 1998, 2003	USA	Office of Advocacy, U.S. Small Business Administration
Cole, Dietrich (2012) SME Credit Availability Around the World, Evidence from World Bank's Enterprise Survey	2006-2011	80 countries	World Bank's Enterprise Survey
Cook (1999) Trade Credit and Bank Finance: Financing Small Firms in Russia	1995	Russia	Journal of Business Venturing
Demiroglu et al. (2012) Bank lending standards and access to lines of credit	1996-2004		Journal of Monetary, Credit and Banking
Dewaelheyns, Van Hulle (2010) Internal capital markets and capital structure: Bank versus internal debt	1997-2001	Belgium	European Financial Management
Ghosh, Sensarma (2004) Does monetary policy matter for corporate governance? Firm-level evidence from India.	1992-2002	India	Advances in Financial Economics
de Haan, Sterken (2000)	1990-1997	EU, Great Britain	De Nederlandsche Bank, Research Memorandum WO&E
de Haan, Sterken (2006)			European Journal of Finance
Huyghebaert, Van de Gucht, Van Hulle (2007), The Choice between Bank Debt and Trade Credit in Business Start-ups	1988-1991	Belgium	Small Business Economics
Jiménez, Ongena, Peydró, Saurina (2010), Credit supply identifying balance-sheet channel with loan applications and grantem loans,	2002-2008	Spain	European Central Bank Working Paper
Jimenéz et al. (2010)	2002-2008	Spain	AMERICAN ECONOMIC REVIEW
Jimenéz, Ongena, Peydró, Saurina, (2012) Credit Supply versus Demand: Bank and Firm Balance-Sheet Channels in Good and Crisis Times	2002-2010	Spain	European Banking Center Discussion Paper
Jimenéz, Ongena, Peydró., Saurina, (2009), Monetary Policy and Credit Crunch: Identifying Simultaneously the Bank Lending and Balance Sheet Channels	1992-2006	Spain	Bank of Spain mimeo
Love, Peria (2014)	2002-2010	80 countries	World Bank Econ Rev
Aghion, Askenazy, Berman, Cette, Eymard (2012)	1993-2004	France	Journal of the European Economic Association

Source: own study based on the review of empirical literature.

Table 2. Summary statistics for the effect of collateral on bank loan financing

Variable	The direction of impact	# regressions	Mean	Median	SE	Minimum	Maximum
Fixed Assets / Total Assets	+	27	0,089	0,139	0,202	-0,401	0,524
	-	15					
	Not significant	12					

Source: own study based on the review of empirical literature.

Table 3. Linear regression results for publication selection bias

Variables	b (se)	
Publication selection bias		
1/se	-0,1139*** (0,0362)	
constant	2,1118*** (0,5891)	
Publication selection bias + heterogeneity		
Model	FE	RE
Publication bias (K-variables)		
Constant	0,7868*** (0,1682)	0,8496*** (0,2086)
No. of firms	-5.44e-06*** (9.90e-07)	-5.63e-06*** (1.07e-06)
Study citations	0,00678** (0,0034)	0,0071*** (0,0033)
Genuine empirical effects (Z-variables)		
1/se	-0,1085*** (0,0096)	-0,1106*** (0,0107)
Sector fixed-effects /se	0,1445*** (0,0335)	0,1392*** (0,0323)
N	46	46
F (H_0: *K* variables are jointly not significant)	F(2, 41) = 17.31 Prob > F = 0.0000	F(2, 41) = 16.24 Prob > F = 0.0000
Test for residual between-study variance (of *tau2*=0)		Q_res (41 df) = 1001.21 Prob > Q_res = 0.0000

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Mean error values are enclosed in round brackets.

Source: own study based on the review of empirical literature.

Table 4. Potential Explanatory Variables for Meta-Regression Analysis

Variables	Definition
Data Characteristics	
Panel data	1 if panel data are used (cross-sectional data are the base)
Time span	The number of years of the data used
No. of firms	Sample size/time span
Average year	Average year of the data used
Year of publication	Year when an article was published
Large	1 if large enterprises are investigated
Capital groups	1 if capital groups are investigated
Estimation Characteristics	
Differences	1 if the regression is estimated in differences
Year fixed-effects	1 if year fixed-effects are included
Sector fixed-effects	1 if sector fixed-effects are included
OLS	1 if OLS used for estimations (random effects, GMM, WLS, and others as a base)
Macro	1 if macroeconomic conditions variables are included
One-step estimations	1 if coefficients are estimated in one-step
Specification Characteristics	
Firm size	1 if the specification controls for firm size (sector competition)
One country	1 if one country firms are included in the regression

Lagged spillover	1 if the coefficient represents lagged foreign presence
Europe	1 if European countries are investigated
Publication Characteristics	
Publication date	The publication year of the study
Published	1 if the study was published in a peer-reviewed journal
Study citations	Study citations in Google Scholar per age of the study, as of May 2016
Journal rank	1 if the study published in high journal rank, 2013 ISI impact factor
Working paper	1 if research is a working paper

Source: own study based on the review of empirical literature.

Table 5. Country data level analysis of bank loans

Variable	Whole sample		Small firms		Medium firms		Large firms	
	RE	GLS	RE	GLS	RE	Random-effects linear models with an AR(1) disturbance	RE	Random-effects linear models with an AR(1) disturbance
Collateral (*Fixed Assets / Total Assets*)	-0,187 (0,035) [-5,3]	-0,124 (0,038) [-3,3]	-0,041 (0,069) [-0,6]	-0,170 (0,057) [-3,0]	-0,269 (0,063) [-4,3]	-0,180 (0,054) [-3,4]	0,014 (0,053) [0,3]	-0,045 (0,042) [-1,1]
Profitability *(ROA = Net Income / Total Assets)*	-0,489 (0,130) [-3,8]	-0,225 (0,095) [-2,4]	0,122 (0,300) [0,4]	-0,085 (0,234) [-0,4]	-0,429 (0,242) [-1,8]	0,067 (0,192) [0,4]	-0,181 (0,163) [-1,1]	0,038 (0,131) [0,3]
Interests on financial debts/ Total Assets	0,743 (0,421) [1,8]	1,325 (0,370) [3,6]	1,844 (0,638) [2,9]	1,423 (0,441) [3,2]	-0,176 (0,654) [-0,3]	0,052 (0,496) [0,1]	0,696 (0,585) [1,2]	2,237 (0,486) [4,6]
Size (*Logarithm of Total Assets*)	-0,553 (0,336) [-1,7]	-0,961 (0,366) [-2,6]	-1,386 (0,589) [-2,4]	-3,121 (0,633) [-4,9]	1,522 (0,618) [2,5]	0,263 (0,683) [0,4]	-1,177 (0,486) [-2,4]	-0,651 (0,520) [-1,3]
Constant	37,341 (7,054) [5,3]	39,089 (7,893) [5,0]	45,209 (12,014) [3,8]	84,714 (12,890) [6,6]	6,552 (10,833) [0,6]	22,717 (12,577) [1,8]	33,412 (9,923) [3,4]	23,450 (10,193) [2,3]
N	143							
Diagnostic	Statistical tests	p-value	Statistical tests	p-value	Statistical tests	p-value	Statistical tests	p-value
Test for panel-level heteroskedasticity	151.33	0.0000	158.15	0.0000	2.13	0.9952	-84.94	1.0000

Test for panel-level autocorrelation	29.476	0.0003	13.669	0.0041	52.296	0.0000	-0.034	0.9731
Test of cross sectional independence	1.816	0.0694	0.802	0.4225	0.666	0.5057	8.147	0.0171

Mean error values are enclosed in round brackets, t Student – in square brackets.

Source: own study based on BACH DATABASE.

Table 6. Description of variables used in the debt of polish enterprises model

Variable	Definition
Debt1	(Long-term debt+ Short-term debt) / Total assets
Debt2	Short-term debt / Total assets
Debt 3	(Long-term debt+ Short-term debt) / (Total debt+Equity-Revaluation reserve)
Firms' characteristics	
Company size	Logarithm of revenues
Profitability	EBIT/ total assets
Collateral	Tangible assets/total assets
Non-interest tax shield	Depreciation/total assets
Interest tax shield	Interest/total assets
Intangible assets	Intangible assets /total assets
Growth opportunities	(Revenue from sales (t) – Revenue from sales (t-1)) / Revenue from sales $(t-1)_1$
Current ratio measure	Current assets/Short-term liabilities
Quick ratio measure	Current assets and inventories/Short-term liabilities
Effective tax rate	The current part of income tax/profit before tax
Inverted index bankruptcy	Nehrebecka, Dzik (2016)
Grants	Binary variable, takes 1 if firm got grants
IAS	Binary variable, takes 1 if firm have set of basic accounting records which are prepared and audited in line with IAS
Macroeconomic variables	
GDP	The growth of Gross Domestic Product
WIBOR3M	3-month WIBOR interest rate
REER	Effective rate of exchange

Tabel 7. Descriptive statistics of variables used in the model

Variable	Mean	Std. dev	Q1	Median	Q3	Min	Max
Debt	0,3928	0,2137	0,2240	0,3814	0,5493	0,0000	0,9821
Revenues	536923	2769538	22256	79039	255306	0,0000	79000000
Profitability	0,0691	0,0846	0,0015	0,0465	0,0965	0,0000	0,7770
Collateral	0,2661	0,2218	0,0729	0,2224	0,4102	0,0000	0,9673
Non-interest tax shield	0,0363	0,0334	0,0136	0,0294	0,0489	0,0000	0,4537
Interest tax shield	0,0066	0,0105	0,0000	0,0000	0,0101	0,0000	0,0354
Intangible assets	0,0312	0,0796	0,0008	0,0048	0,0198	0,0000	0,8654
Growth opportunities	0,1630	0,3772	-0,0537	0,0942	0,2989	-0,4331	1,1907
Current ratio measure	2,2986	1,9178	1,1179	1,5883	2,6870	0,5611	8,3258
Effective tax rate	0,0669	0,1103	0,0000	0,0000	0,1480	0,0000	0,3420
Inverted index bankruptcy	1,0447	2,2484	0,3887	1,0000	1,8662	-4,6108	6,1899
Median sector debt	0,3737	0,0949	0,3089	0,3552	0,4397	0,2477	0,6204

Table 8. Debt determinants – model estimation results.

Explanatory variable	Trade-off theory	Pecking order theory	Base model (Debt 1)	Models with effect of the sector		Models with effect of the size		Robust models	
				Manufactury	Services	Small	Large	Debt 2	Debt 3
Debt in t-1			0,5845 *** (0,0021)	0,6417 *** (0,0087)	0,5900 *** (0,0040)	0,5545 *** (0,0057)	0,7646 *** (0,0063)	0,4236 *** (0,0028)	0,5855 *** (0,0035)
Firms' characteristics:									
Company size	+	-	0,0071 *** (0,0003)	0,0122 *** (0,0005)	0,0063 *** (0,0004)	0,0041 *** (0,0007)	0,0135 *** (0,0017)	0,0104 *** (0,0002)	0,0081 *** (0,0004)
Profitability	+/-	-	- 0,1169 *** (0,0076)	- 0,1219 *** (0,0184)	- 0,1747 *** (0,0109)	- 0,0445 *** (0,0178)	- 0,2777 *** (0,0123)	- 0,0887 *** (0,0081)	- 0,1383 *** (0,0070)
Collateral	+	-	0,1141 *** (0,0044)	0,0736 *** (0,0110)	0,0869 *** (0,0047)	0,0620 *** (0,0087)	- 0,0323 *** (0,0099)	0,0277 *** (0,0039)	0,0971 *** (0,0042)
Non-interest tax shield	-		- 0,3252 *** (0,0205)	- 0,3911 *** (0,0740)	- 0,1950 *** (0,0167)	- 0,1605 *** (0,0432)	0,0068 (0,0452)	- 0,1145 *** (0,0180)	- 0,2587 *** (0,0209)
Interest tax shield			1,9304 *** (0,0322)	2,3922 *** (0,0862)	1,6665 *** (0,0575)	1,6955 *** (0,1044)	1,6507 *** (0,0680)	2,6585 *** (0,0417)	1,4653 *** (0,0383)
Intangible assets			0,2169 *** (0,0111)	- 0,0871 *** (0,0407)	0,0682 *** (0,0142)	0,2219 *** (0,0234)	- 0,0872 *** (0,0324)	0,2024 *** (0,0114)	0,1607 *** (0,0103)
Growth opportunities	-	+	0,0358 *** (0,0015)	- 0,0124 *** (0,0055)	0,0760 *** (0,0021)	0,0197 *** (0,0027)	- 0,0119 *** (0,0068)	0,0827 *** (0,0014)	0,0481 *** (0,0012)
Current ratio measure	+	-	0,0029 *** (0,0002)	0,0052 *** (0,0006)	0,0055 *** (0,0003)	0,0031 *** (0,0006)	0,0156 *** (0,0011)	- 0,0008 *** (0,0002)	0,0025 *** (0,0004)
Effective tax rate			- 0,0934 *** (0,0044)	- 0,0509 *** (0,0062)	- 0,0433 *** (0,0057)	- 0,0631 *** (0,0108)	- 0,0282 *** (0,0072)	- 0,0696 *** (0,0044)	- 0,0698 *** (0,0038)
Inverted			-	-	-	-	-	-	-

index bankruptcy	0,0032	*	0,0017	*	0,0045	*	0,0072	*	0,0018	*	0,0031	*	0,0035	*									
	(0,0003)		(0,0003)		(0,0003)		(0,0005)		(0,0003)		(0,0002)		(0,0002)										
Investment rate	0,0079	*	0,0135	*	0,0026	*	-0,0106	*	0,0033	*	-0,0047	*	0,0080	*									
	(0,0010)	*	(0,0036)	*	(0,0009)	*	(0,0019)	*	(0,0021)	*	(0,0009)	*	(0,0012)	*									
Median sector debt	0,2769	*		*	0,1938	*	0,2540	*	0,1366	*	0,2847	*	0,3200	*									
	(0,0057)	*		*	(0,0071)	*	(0,0248)	*	(0,0119)	*	(0,0052)	*	(0,0059)	*									
Grants	-0,0092	*	-0,0194	*	-0,0197	*	-0,0080	*	-0,0197	*	0,0092	*	-0,0057	*									
	(0,0020)	*	(0,0024)	*	(0,0053)	*	(0,0054)	*	(0,0029)	*	(0,0011)	*	(0,0019)	*									
IAS	0,0273	*	0,0215	*	0,0170	*	-0,0152	*	0,0322	*	0,0256	*	0,0168	*									
	(0,0014)	*	(0,0030)	*	(0,0022)	*	(0,0051)	*	(0,0022)	*	(0,0013)	*	(0,0016)	*									
Macroeconomic variables																							
GDP	0,0027	*	0,0053	*	-0,0008		0,0008		0,0037		0,0049	*	0,0030	*									
	(0,0002)	*	(0,0005)	*	(0,0005)		(0,0008)		(0,0005)		(0,0002)	*	(0,0002)	*									
ΔWIBOR 3M	-0,0019	*	-0,0032	*	-0,0024	*	0,0000		-0,0009	*	-0,0029	*	-0,0015	*									
	(0,0001)	*	(0,0002)	*	(0,0003)	*	(0,0003)		(0,0003)	*	(0,0001)	*	(0,0001)	*									
REER	-0,0012	*	-0,0023	*	-0,0008	*	-0,0022	*	-0,0012	*	-0,0026	*	-0,0013	*									
	(0,0001)	*	(0,0002)	*	(0,0002)	*	(0,0002)	*	(0,0002)	*	(0,0001)	*	(0,0001)	*									
Constant	0,0510	*	0,1680	*	0,0645	*	0,2267	*	-0,0216		0,1940	*	0,0442	*									
	(0,0094)	*	(0,0176)	*	(0,0204)	*	(0,0207)	*	(0,0294)		(0,0084)	*	(0,0099)	*									
Test statistic (p-value)																							
Test	-9,1414		-6,0252		-6,1344		-6,2285		-7,1728		-9,6354		-8,6573										
	(0,0000)		(0,0000)		(0,0000)		(0,0000)		(0,0000)		(0,0000)		(0,0000)										
Arellano-Bond Test for the first-order autocorrel	1,2471		0,2628		1,4605		1,3520		0,3436		0,5665		1,1904										
	(0,2124)		(0,7927)		(0,1442)		(0,1764)		(0,7312)		(0,5711)		(0,2339)										

ation							
Arellano-Bond Test for the second-order autocorrelation	344,2584 (0,5765)	157,3900 (0,9804)	187,2700 (0,6416)	179,3050 (0,7832)	197,2016 (0,4424)	341,88 (0,6117)	344,51 (0,5727)