RESEARCH ARTICLE

Meta-study on the relationship between profitability and liquidity of enterprises in macroeconomic and institutional environment

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Abstract The main aim of the paper is to determine the relationship between profitability and financial liquidity of a company using meta-analysis. This method is based on a synthesis of many previous studies with the application of econometric tools. The results of the study show that, taking into account 16 economies, it is not possible to identify a common effect describing the relationship between the profitability of enterprises and their financial liquidity measured by the current liquidity ratio. The results of individual empirical studies that underlie the meta-analysis are diverse. This means that there are moderators of the strength and direction of this dependence associated with macroeconomic and institutional conditions. We attempted to separate them by means of meta-regression. This method involves the use of a regression model, where data are derived from both meta-analysis and external sources. We diagnosed two statistically significant moderators of the strength and direction of the relationship between profitability and liquidity. These are two factors: (i) private sector crediting and (ii) capital market development. Our paper contributes to the development of the existing knowledge by summarizing and binding previous individual empirical studies on the relationship between profitability and liquidity of enterprises and identifying factors affecting this relationship. This knowledge can assist financial managers in making more efficient decisions related to liquidity and working capital management.

Keywords Profitability · Liquidity · Working capital management · Cash management · Macroeconomics · Meta-analysis

JEL Classifications G32 · E02 · C80

Introduction

The company's short-term financial policy is focused on two main goals. The basic short-term financial objective of each company is to maximize the excess of revenues over costs. Ideally, the ability to generate profit, i.e. profitability should be coupled with the capacity to ensure short-term liquidity (Brealey 2016). The area covering decisions shaping the profitability and liquidity of the enterprise is referred to as working capital management. On the one hand, these decisions relate to the pricing policy and the realizable margins at the corresponding levels of working capital components (inventories, receivables and cash). On the

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other hand, they affect the turnover rate of current assets and link them to the maturity dates of current liabilities. Many authors argue that such short-term financial decisions are a key determinant of a company's success or failure (Jose 1996; Kroes and Manikas 2014; Smith 1980). In this context, the relationship between the profitability and liquidity of the enterprise becomes an important issue from the point of view of the efficiency of working capital management. The dominant direction of research in the literature on effectiveness of working capital management is the analysis of the relationship between profitability and components of the operating cycle of an enterprise (in particular the cash conversion cycle). An overview of the most interesting studies of this type along with their meta-analysis, was presented by Singh et al. (2017). The authors proved that, regardless of the conditions of functioning of the surveyed enterprises, the relationship between profitability and the cash conversion cycle was largely negative. This means that the more profitable the enterprise, the shorter the cash conversion cycle. The cash conversion cycle is one of the most popular measures of working capital management. The length of the cash conversion cycle is directly related to the company's payment capabilities. The longer the company is able to finance the cash conversion cycle, the longer the possible time interval between the payment of liabilities and the cash inflow from sales. This means that the cash conversion cycle significantly shapes the financial liquidity of the company (Brealey et al. 2016). Hence, in the literature, the second, slightly less popular research direction can be distinguished. It links the company's profitability with its liquidity. A list of selected empirical studies together with their results is included in Table 5. The general overview of the articles collected in Annex 1 shows that both the strength and the direction of the diagnosed relationships between profitability and liquidity are diverse. This means that, in addition to the factors shaping this relationship at the enterprise level, there may also be moderators resulting from the environment in which the company operates. External factors that may moderate the dependence of profitability and liquidity are undoubtedly the macroeconomic ones as well as those related to institutional environment specific to a country in which an enterprise operates. This is also confirmed by many previous empirical studies (Troilo 2018; Ukaegbu

2014). The main purpose of the article is to determine the relationship between profitability and financial liquidity of the company using meta-analysis. This method is based on a synthesis of many previous studies with the application of econometric tools. By means of meta-regression (this method involves the use of a regression model, where data are derived from both meta-analysis and external sources), we have also attempted to identify determinants of the strength and the direction of this dependence in the sphere of macroeconomic and institutional factors. Our paper contributes to the development of the existing knowledge by summarizing previous individual empirical studies on the relationship between profitability and financial liquidity. The identified macroeconomic and institutional moderators of this dependence can be used for further search for theories explaining changes in the strength and direction of the studied dependence. The paper has been divided into three parts. The first constitutes the theoretical background explaining the relationship between profitability and financial liquidity. It also presents previous findings regarding external factors that moderate this relationship. In the second part, the collected research material has been characterized, and the methods used for its analysis have been described. The third part aims to discuss the results obtained. The paper also provides a summary with a discussion, conclusions and recommendations for further research.

Theoretical background

Concepts on relationship between profitability and liquidity

The relationship between the profitability and the financial liquidity of an enterprise is based on working capital decisions. The strategy that minimizes the risk of losing liquidity is the execution of a flexible short-term financial policy. This policy is characterized by a relatively high level of current assets in comparison to revenues from sales and a low share of current liabilities in financing these assets. This means that an enterprise wishing to pursue a flexible policy is forced to generate high volume of working capital. The disadvantage of this policy is the high cost associated with maintaining a high level of current assets. High costs also result from greater involvement

in financing current assets and, as a rule, more expensive long-term capital (equity plus long-term liabilities). This means that the more flexible the policy the enterprise runs by increasing its liquidity, the higher the enterprise's costs limiting its profitability (Kieschnick 2011). Limiting the level of current assets and increasing the share of current liabilities in their financing are the features of the company's restrictive short-term financial policy. On the one hand, it reduces the cost of maintaining current assets and the capital involved in their financing, on the other, it increases the risk of losing liquidity due to lower saturation of assets with liquid components in comparison with aforementioned flexible policy (Brealey et al. 2016). The features of two extreme short-term financial strategies underlie the first and best explored concept of the negative relationship between profitability and liquidity of the enterprise (profitability and liquidity trade-off). Smith (1980) began a discussion on the assumptions concerning this concept. He noted that the higher the company's profitability, the more difficult it was to maintain liquidity at the right level. As a result, he pointed out that there was a need to maintain a trade-off between levels of profitability and financial liquidity in the company. Research on this direction of financial decisions was also conducted by Myers and Majluf (1984). The authors proved that the company usually invested retained profits in projects with the highest possible rate of return. Therefore, it could be expected that enterprises with high profitability would embark on more investment projects. Ongoing investments would result in lower liquidity limiting the solvency of the enterprise. This thesis was developed by Ding (2013). Their research confirmed that enterprises focused on increasing financial liquidity are characterized by high sensitivity of investments in working capital in relation to alterations of cash flows. Investments in fixed assets turned out to be less sensitive. This means that enterprises demonstrating more cash flows (with higher profitability) often have no motivation to manage working capital, more willingly directing the capital they generate to the fixed assets investments. The positive direction of the relationship between profitability and liquidity results from the concept proposed by Opler et al. (1999). According to these authors, companies with low liquidity, invest all their profits in working capital. This results in an increase in the share in current assets of components

financed with equity and thus an increase in the level of liquidity. A positive link between profitability and liquidity was indicated as characteristic for enterprises with difficult access to external capital (entering the market, highly innovative, characterized by high operational risk). However, such authors as Deloof (2003), Raheman (2010) argued that it could also occur in other market conditions. Higher levels of working capital allow the company to increase sales, negotiate higher discounts for cash payment on purchase. As a result, the company increases its profit margins and improve profitability. The third concept regarding the relationship between liquidity and profitability of the company is based on an attempt to explain the simultaneous occurrence of positive and negative directions of this dependency. In view of this concept, the relationship between profitability and liquidity is nonlinear and can be represented by the Gentry curve similar in shape to the inverted U (Fig. 1). The determinant of the direction and strength of this dependence is the level of financial liquidity. Enterprises characterized by low liquidity invest retained profits primarily in increasing their payment capabilities. Therefore, along with an increase in profitability, liquidity increases as well (positive dependence). After exceeding a certain level of liquidity (characteristic for specific market conditions), the impact of liquidity on profitability becomes difficult to identify (no obvious relationship). Further investment in liquidity results in an increase in the level of current assets financed with equity. It generates higher costs of their maintenance and costs of financing. An increase in liquidity therefore causes a drop in profitability (a negative dependence) (Baños-Caballero 2012; Jaworski and Czerwonka 2018). This concept implies an assertion that there is the optimum level of liquidity for which the profitability of
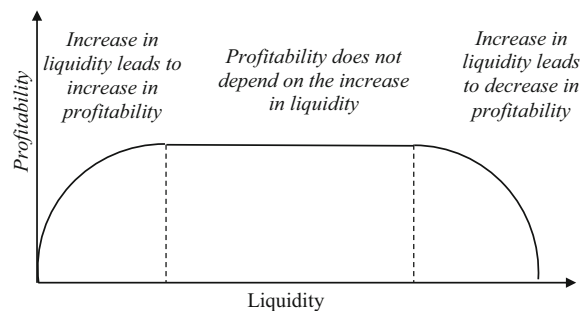

Fig. 1 Gentry's curve (Gentry 1976)

enterprise reaches its maximum value, which is not subject to any significant changes.

Institutional and macroeconomic moderators of the relationship between profitability and liquidity

The three theoretical concepts that explain the relationship between profitability and financial liquidity of the enterprise, which were used in the field-specific literature, have been empirically verified many times. The most frequently diagnosed dependence is the negative dependence. This has been confirmed, for example, by Baser (2016), Nishanthini and Meerajancy (2015). Although it appears less frequently, positive dependence has been confirmed empirically (see Table 5). The same applies to the concept based on the Gentry's curve. For low liquidity levels, a positive relationship between profitability was diagnosed e.g. by Mitra and Nandi (2013). Eljelly (2004) proved that this relationship was highly negative for high liquidity values. Surveys by Awad and Jayyar (2013) have shown that for average liquidity levels, their statistical impact on profitability is negligible. Variation in the relationship between profitability and liquidity that exists in practice is a strong premise to state that there are factors that moderate the direction and strength of this dependency. To date, only a few authors have addressed this phenomenon. The existence of moderators of the relationship between profitability and financial liquidity can be derived from numerous studies on working capital management. The level of working capital is widely recognized as the basic determinant of financial liquidity (Brealey et al. 2016). An attempt to conduct a meta-analysis of the relationship between profitability and cash conversion cycle (CCC) undertaken by Singh et al. (2017) showed that this relationship was negative. This study included 46 scientific papers containing a total of 67 models describing this relationship. However, the authors noticed that depending on macroeconomic and institutional conditions, its strength varied. In some of the studies analysed, the relationship between profitability and CCC was not statistically significant. Consequently, the authors stated that there were variables that moderated the power of dependence between profitability and the cycle of cash conversion. Ukaegbu (2014) and Troilo et al. (2018) also came to similar

conclusions. The first study included companies from four African countries belonging to three different groups in accordance with the typology of African countries' industrial performance provided by UNCTAD. Among the variables explaining variation in profitability, in addition to CCC, Ukaegbu (2014) took into account GDP growth rate and a proxy variable for corporate governance. Both variables turned out to be statistically significant. Troilo et al. (2018) examined 416 thousand enterprises from 113 countries. As an element of estimating regression, they included variables concerning the legal system of the country. And they also found these variables' statistical significance. However, Chang (2018) did not detect variables moderating the relationship between profitability and CCC. He examined this dependence on a sample of enterprises from 46 countries and similarly to the aforementioned authors diagnosed the negative direction. Then, he divided the sample into countries with low and high GDP growth rate and inflation-it did not affect the research results. A similar effect was achieved by dividing the sample into developed and developing countries, and then into countries with a higher and lower level of investor protection. The conviction that institutional and macroeconomic factors influence the direction and strength of the relationship between the capital structure and its determinants at the enterprise level has already been confirmed in the literature. These factors also include profitability and financial liquidity (Hang 2018; Jaworski and Czerwonka 2019). The relation of market capitalization to GDP, GDP per capita, GDP growth, inflation rate, taxation level and the degree of investor protection constitute, among other things, the diagnosed moderators of the capital structure. As the capital structure is directly related to financial liquidity, and indirectly affects profitability, it is also worth checking the impact of these factors on the relationship between these two characteristics of the enterprise.

Research methods

Data and sample

Models presenting relationship between profitability and liquidity used by other authors were the sources of research into meta-analysis. We collected these

models from the articles obtained from electronic databases of scientific journals such as: Web of Science, Scopus, EBSCO, Emerald, ProQuest and RePeC. The keywords to search for relevant articles have included *profitability*, *liquidity* and *working capital management* in various combinations. The study includes articles that have met the following criteria:

- They used methods for studying the relationship between profitability and liquidity based on multiple linear regression models,
- The scope of the study was a minimum of 3 years within the time period of 1990–2018,
- The study concerned all enterprises, without dividing them into particular industries (public companies were preferred),
- Response and explanatory variables contained at least one of the formulas defined in Table 1.

The research excludes those studies in which the data provided did not allow for using meta-analysis techniques. As a result, 25 papers were included in the research sample. They covered 58 models characterizing the relationship between profitability and financial liquidity for 16 countries. The adopted research sample has been detailed in Table 5. The data characterizing the macroeconomic and institutional factors that may be the moderators of the relationship between profitability and liquidity have been taken from statistics available from the World Bank bases (www.worldbank.org). Table 2 contains their

summary. The value of individual macroeconomic and institutional indicators was calculated as the average over the period covered by a given empirical study (taking into account the availability of data). These indicators have been summarized in Table 6.

Meta-analysis and meta-regression

The identification of the relationship between profitability and financial liquidity resulting from the empirical research collected was based on meta-analysis. Meta-analysis is a method of statistical synthesis of individual studies that allows for presenting an aggregated image of a given phenomenon by combining collected results (Glass 1976). It is based on (Shelby and Vaske 2008):

- Estimating the size of the effect for each study,
- Calculation of the weighted average of the size of effects,
- Checking whether the average significantly differs from zero,
- Carrying out the homogeneity / heterogeneity analysis.

The size and direction of effect (effect size) for the CR explanatory variable were estimated using the *r-family* partial correlation coefficient (Hanji 2017; Suurmond 2017). To obtain effect sizes from *r-family* group it is possible to use one of three types of data: correlational data, partial correlational data or semi-partial correlational data. Suurmond et al. (2017) say

Table 1 Dependent and independent variables used in analysed papers (Models)

As proxy variables for:	Variable name	Abb	Formula
Profitability (dependent variable)	Return on assets	ROA	$\dfrac{\text{net profit}}{\text{total assets}}$
	Return on assets in operating level	ROA operating	$\dfrac{\text{operating profit}}{\text{total assets}}$
	Gross operating profit	GOP	$\dfrac{\text{total sale–cost of goods sold}}{\text{total assets–financial assets}}$
	Net operating profit	NOP	$\dfrac{\text{earning before interests, tax and depreciacion}}{\text{total assetss}}$
	Return on sale	ROS	$\dfrac{\text{operating profit}}{\text{total sale}}$
	Return on equity	ROE	$\dfrac{\text{net profit}}{\text{eqiuty}}$
Financial liquidity (independent variable)	Current liquidity ratio	CR	$\dfrac{\text{current assets}}{\text{current liabilities}}$

Source: own elaboration based on (Brealey et al. 2016)

Table 2 Macroeconomic and institutional moderators of relationship between profitability and working capital management

Factor		Measure/proxy
GDP	GDP	Natural logarithm of GDP (constant 2010 US$)
GDP per capita	GDP_CAP	Natural logarithm of GDP per capita (constant 2010 US$)
GDP growth	GDP_GROW	Annual % of GDP
Inflation	INFLAT	Annual % of consumer prices
Unemployment	UNEMPLOY	% of total labour force (modelled ILO estimate)
Taxation	TAX_REV	Tax revenue (% of GDP)
Availability of credit	CREDIT	Domestic credit to private sector by banks (% of GDP)
Degree of capital markets development	CAPITAL	Market capitalization of listed domestic companies (% of GDP)
Level of research and development expenditure	RD	Research and development expenditure (% of GDP)
Level of protection of creditors and debtors	LEGAL	Strength of legal rights index (0 = weak to 12 = strong)

Source: Own elaboration

that Pearson's *r* is used in meta-analyses, albeit, when the relationship between only two variables is analysed. When there are more explanatory variables than one and it is necessary to apply regression, then it is preferable to conduct meta-analysis with the use of (semi) partial correlation coefficients. For this reason, we have used the partial correlation, in accordance with the formula of *r-family* measure indicated by Hanji (2017):

$$r = \sqrt{\frac{t^2}{t^2 + df}} \qquad (1)$$

where *t* is the value of the Student's t-statistic and *df* the degrees of freedom.

Taking into account the data of the research subjected to meta-analysis made available by the authors, we used effect size calculations:

- Directly on the Student's t-statistic values,
- Having the given coefficient value (β) and standard error (SE) we used the transformation:

$$t_i = \frac{b_i}{SE_i} \qquad (2)$$

- Having *p-value*, we read *t* from the t-student distribution.

Table 5 shows the results of effect size calculations. The calculation of the weighted-average effect size is based on the random-effect model. This is the model used when the actual effect may vary depending on study (Hanji 2017). The intervals of 95% confidence

have been estimated for the calculated average. If the beginning and end of the interval lies on the same side of zero, this means that the average effect size is significantly different from zero. The Z test was used to verify the results: *p*-value less than the assumed significance level means that the average effect size differs significantly in statistical terms from zero (Littell 2008). The last stage of meta-analysis is the identification of homogeneity / heterogeneity. We have accomplished this with two statistical tests: Q and I^2. In the first test, a small value of *p*-value indicates the presence of significant heterogeneity of the compiled study results. I^2 is a measure of heterogeneity. It can be read from Q statistic. It determines the percentage of variation in the estimation of effects resulting from heterogeneity. The higher its value, the higher the heterogeneity (Littell et al. 2008). Meta-regression is a method based on linear multiple regression allowing for the explanation of the heterogeneity diagnosed during meta-analysis. The factors that can moderate the strength and direction of dependencies between variables included in meta-analysis are explanatory variables in meta-regression (Ahmed and Courtis 1999). Moderators are included in the random effects model, resulting in a mixed effects model (Viechtbauer 2010). In our study, we have adopted effect sizes for the CR variable as a response variable. We have used macroeconomic and institutional indicators as explanatory variables which characterize the economies of specific countries examined in the meta-analysis. They have been

defined in Table 2. We checked the models obtained by means of meta-regression using the QM test of moderators. This test is based on χ statistics and makes it possible to determine whether a given model is statistically significant (Viechtbauer 2010). We have made all the calculations in a metafor package in the R program.

Study results

The results of meta-analysis based on 58 collected models between profitability and the current liquidity ratio have been summarized in Table 3. It contains the parameters of the effect-size indices from Table 5 (mean effect-size, confidence interval and tests for its heterogeneity). The spread of confidence intervals and the Z test indicate that there is no reason to reject the hypothesis that the average effect size characterizing the relationship between the variables tested does not differ statistically from zero (p-value greater than 0.05). This means that for the research material collected one cannot identify the joint direction and strength of relationship between profitability and financial liquidity of enterprises. Values of Q statistics (p-value < 0.0001) and a heterogeneity measure $I^2 = 95.56\%$ indicate high heterogeneity of effect sizes in the collected research sample. One of the possible causes of heterogeneity may be the occurrence of external moderators of the relationship between profitability and financial liquidity of enterprises. Accepting macroeconomic and institutional factors as explanatory variables, we have performed meta-regression, the results of which have been presented in Table 4. We have estimated the parameters of model 1 taking into account all the variables that may influence the relationship between profitability and liquidity in view of previous theoretical

analyses. Then, by eliminating next and next non-significant variables, we have estimated the parameters of model 2 containing only statistically significant explanatory variables. The whole model is also statistically significant (p-value for the QM test of moderators is below 0.0001). This indicates that the relationship between profitability and liquidity is influenced positively by the level of private sector crediting and negatively by the development of the capital market.

Discussion and conclusion

The results of the meta-analysis carried out show that taking into account 16 national economies, a common effect describing the relationship between the profitability of enterprises and their financial liquidity as measured by the current liquidity ratio cannot be identified. On this basis, it can be concluded that all three theories describing this relationship appearing in the literature are diagnosed in practice at a similar frequency. Taking into consideration the conclusion formulated by Chang (2018) and Singh et al. (2017) that there is common negative direction of the relationship between profitability and the cash conversion cycle, leads to the hypothesis about lack of simple correlation between financial liquidity and the length of the cash conversion cycle. The confirmation of this thesis would require additional research aimed at diagnosing dependencies between the CR and CCC measures. We have diagnosed two statistically significant moderators of the strength and direction of the relationship between profitability and liquidity in the meta-regression process. These are two factors: macroeconomic—credit provision in the private sector and institutional-capital market development. The high heterogeneity of the collected research material

Table 3 Meta-analysis of relationship between profitability and liquidity (random-effect model)

Meta-studied variable	studies	Mean effect	CI Lower limit	CI Upper limit	Test Z		Q-statistic		I^2 (%)
					stat	p-value	stat	p-value	
CR	58	0.0004	− 0.0303	0.0311	0.0246	0.9804	599	< 0.0001	95.56

*Statistical significance at the level 0.1

**Statistical significance at the level 0.05

***Statistical significance at the level 0.01

Source: own elaboration

Table 4 Results of meta-regression on macroeconomic and institutional moderators of the relationships between profitability and financial liquidity

	C	CR
Model	1	2
Const	− 0.0504	− 0.0680***
	(0.4967)	(0.0234)
GDP	0.0184	
	(0.0181)	
GDP_CAP	− 0.0688***	
	(0.0254)	
GDP_GROW	− 0.0080	
	(0.0155)	
INFLAT	− 0.0018	
	(0.0011)	
UNEMPLOY	0.0118**	
	(0.0052)	
TAX_REV	− 0.0044**	
	(0.0022)	
CREDIT	0.0040***	0.0028***
	(0.0006)	(0.0005)
CAPITAL	− 0.0025***	− 0.0009**
	(0.0006)	(0.0004)
RD	0.2194**	
	(0.1084)	
LEGAL	− 0.0066	
	(0.0057)	
R^2 (%)	78.56	46.13
I^2 (%)	80.90	91.94
Test of Moderators QM (p-value)	104.5	29.6
	(< 0.0001)	(< 0.0001)
Number of studies	52	55

(SE in parenthesis)

*Statistical significance at the level 0.1

**Statistical significance at the level 0.05

***Statistical significance at the level 0.01

Source: own elaboration

indicates, however, that there may be other (e.g. industry) factors that may affect the studied dependence. This observation coincides with the findings of Singh et al. (2017), Troilo et al. (2018) and Ukaegbu (2014), but it does not confirm the diagnosis of Chang (2018). The explanation of the cause-and-effect relationship between two diagnosed factors shaping the strength and direction of the relationship between profitability and financial liquidity can be based on the existing theories describing this dependency

supplemented with elements of the capital structure theory (more: Jaworski and Czerwonka 2019). As regards the first factor, the higher degree of credit provision in the private sector, the easier it is for enterprises to access credit facilities. Liquidity can therefore be financed with external capital in an easier way. This capital, supplemented with one's own funds, is also the source of financing increasingly profitable investments. This means that the profitability of enterprises operating in these conditions will

grow together with growing liquidity. As a result, for countries with high credit availability, the relationship between profitability and liquidity will be positive and will grow together with the availability of credit options. The theory formulated by Deloof (2003) and Raheman et al. (2010) best explains this phenomenon. For economies with low access to credit facilities one should also expect an increasingly stronger, although negative relationship between profitability and liquidity in this case. In this instance, the relationship is best described by the profitability and liquidity trade-off theory.The development of the capital market increases investment possibilities of enterprises. This means that the more developed capital market, the more profitable investments are available. Enterprises are not motivated to increase financing of liquidity by involving the funds generated with investments that are more profitable. This means that for economies with a developed capital market, the dependence of profitability and liquidity will be negative (profitability and liquidity trade-off theory). With the declining development of the capital market, this dependence will become less and less important. In countries with underdeveloped capital markets, investment opportunities of enterprises are decreasing, so there is more willingness to invest in liquidity. It means that positive and growing relationship between profitability and liquidity prevails (theory of positive dependence of profitability and liquidity). As regards both diagnosed moderators, it is also possible to indicate economies for which the strength of dependence between profitability and liquidity oscillates around zero. This means that for countries with average access to credit facilities and the average development of the capital market, the theory best explaining the studied dependence is the theory based on the Gentry curve. The main limitations of our study seem to be taking into account only the companies that have been listed on the stock exchange and a small number of countries represented by the surveyed entities. However, the collective research made it possible to carry out statistical and econometric analyses and thus obtain interesting results. The research we collected was based on the relationships observed in 4670 business entities. The results that we have managed to achieve in this way may become a contribution to theoretical research in the discussed relationships. We intend to continue this work.

Declaration

Appendix

(See Tables 5 and 6)

Table 5 Description of Studies Included in the Meta-Analysis (models of one author in one line)

No	Paper	Country	Time range of the study	Enterprises included in the study	Number of enterprises in the research sample	Source of the data (no of table and page)	Profitability measure	Number of models	Effect size CR1	Effect size CR2	Effect size CR3	Effect size CR4	Effect size CR5
1	Eljelly (2004)	Saudi Arab	1996–2000	Listed	29	t. 4, p. 55	ROS operating	1	−3.6300				
2	Dursun Or (2010)	Turkey			49		ROA	2	−6.6071	−7.4454			
3	(2009)	RPA	1999–2007	Manufacturing Listed	319	t. 2, pp. 112–113	NOP	1	−4.4300				
4	Raheman et al. (2010)	Pakistan	1998–2007	Manufacturing Listed	204	t. 4, P. 158	ROA operating	5	0.7707	0.8413	0.6188	0.6046	0.9173
5	Arunkumar & Radharamanan (2011)	India	2005–2010	Manufacturing Listed	1198	t. 5, p. 74	GOP	1	0.7824				
6	Charitou (2012)	Indonesia	1998–2010	Listed	56	t. 3, p. 845	ROA operating	1	−0.8880				
7	Perković (2012)	Bosnia and Herzegovina	2005–2009	Manufacturing Listed	131	t. 5, p. 130	GOP	1	0.7290				
8	Saldanli (2012)	Turkey	2001–2011	Manufacturing Listed	54	t. 2, p. 173	ROA	1	−7.7168				
9	Vahid (2012)	Iran	2006–2009	Listed	50	t. 3, p. 1317	NOP	4	3.9739	3.9739	3.9739	3.9739	
10	Akoto (2013)	Ghana	2005–2009	Manufacturing Listed	13	t. 2, p. 377	ROE	1	3.453				
11	Alavinasab & Davoudi (2013)	Iran	2005–2009	Listed	147	t. 1, p. 6	ROA operating	1	0.105				
12	Alavinasab & Davoudi (2013)	Iran	2005–2009	Listed	147	t. 2, p. 6	ROE	1	0.0331				
13	Aregbeyen (2013)	Nigeria	1993–2005	Manufacturing Listed	48	t. 3a, p. 529	GOP	4	−1.3800	−1.2500	−1.2500	−2.8200	
14	Aregbeyen (2013)	Nigeria	1993–2005	Manufacturing Listed	48	t. 3b, p. 531	NOP	4	−2.6400	−2.4000	−2.2100	−2.5200	
15	Aregbeyen (2013)	Nigeria	1993–2005	Manufacturing Listed	48	t. 3c, p. 531	ROA operating	4	−3.6800	−3.6800	−4.0100	−3.7900	
16	Pratheepan (2014)	Sri Lanka	2003–2012	Manufacturing Listed	55	t. 4, p. 7	ROA	1	−0.5378				
17	Hoang (2015)	Vietnam	2009–2014	Manufacturing Listed	98	t. 3, p. 786	ROA	4	3.5333	3.3627	3.3299	2.9036	

Table 5 continued

No	Paper	Country	Time range of the study	Enterprises included in the study	Number of enterprises in the research sample	Source of the data (no of table and page)	Profitability measure	Number of models	Effect size CR1	Effect size CR2	Effect size CR3	Effect size CR4	Effect size CR5
18	Majanga (2016)	Malawi	2007–2015	Manufacturing Listed	12	t. 3, p. 5	ROI	1	–0.7010				
19	Rehman (2015)	Saudi Arabia	2008–2012	Listed	99	t. 8, p. 169	ROA	1	3.5404				
20	Rehman (2015)	Saudi Arabia	2008–2012	Listed	99	t. 9, p. 170	ROE	1	1.8824				
21	Keskin & Gokalp (2016)	Turkey	2009–2013	Listed	17	t. 4, p. 21	ROA	4	0.0600	–1.3200	–0.1800	–1.3600	
22	Cristian & Raisa (2017)	Romania	2003–2014	Listed	50	t. 4, p. 428	ROA	1	5.8571				
23	Işık (2017)	Turkey	2005–2012	Manufacturing Listed	153	t. 5, p. 696	ROA	1	0.9091				
24	Latha & Rao (2017)	India	2012–2016	Listed	67	t. 5, p. 1296	NOP	1	–0.3780				
25	Nanda & Panda (2018)	India	2000–2015	Listed	173	t. 2, 4, p. 74, 76	ROA	2	2.5811	1.9695			
26	Nanda & Panda (2018)	India	2000–2015	Listed	173	t. 3, 5, p. 75, 77	ROS	2	–1.9695	–1.6503			
27	Shrivastava, Kumar, & Kumar (2017)	India	2003–2012	Listed	1172	t. V, p. 579	ROA operating	4	5.8571	4.7500	5.6250	6.2857	
28	Alarussi & Alhaderi (2018)	Malaysia	2012–2014	Listed	120	t. 3, p. 450	ROE	1	0.1100				
29	Jaworski & Czerwonka (2018)	Poland	1998–2016	Listed	345	t. 4, p. 331	ROA	1	2.1797				
30	Kusuma & Dhiyaullatief Bachtiar, (2018)	Indonesia	2010–2014	Listed	11	t. 4, p. 83	ROA	1	–2.6913				

Source: Own elaboration

Table 6 Average macroeconomic and institutional indicators for selected countries

No	Paper	Country	GDP	GDP_CAP	GDP_GROW	Inflat	Unemploy	Tax_rev	Credit	Capital	RD	Legal
1	Eljelly (2004)	Saudi Arab	26.63	9.82	1.65	−0.31	5.75		24.49			2.00
2	Den & Oruc (2009)	Turkey	27.00	9.03	4.43	49.45	8.54	15.24	19.11	24.56	0.52	3.00
3	Erasmus (2010)	RPA	26.30	8.71	2.64	8.15	23.82	23.77	62.09	167.24	0.79	5.00
4	Raheman et al. (2010)	Pakistan	25.61	6.81	4.64	5.59	6.90	10.67	25.28	25.25	0.26	3.00
5	Arunkumar & Radharamanan (2011)	India	27.94	7.05	8.48	7.96	4.01	10.90	46.90	93.42	0.83	6.00
6	Charitou (2012)	Indonesia	27.05	7.82	3.33	12.26	8.35	12.01	25.13	29.93	0.07	4.75
7	Perković (2012)	Bosnia and Herzegovina	23.52	8.38	4.42	0.00	25.80	20.44	47.97		0.02	7.00
8	Saldanli (2012)	Turkey	27.23	9.18	4.64	16.81	10.01	18.53	26.27	27.53	0.66	3.00
9	Vahid (2012)	Iran	26.77	8.67	4.47	16.93	11.09	6.43	48.33	13.54	0.51	2.00
10	Akoto (2013)	Ghana	24.00	7.06	6.12	14.46	6.40		14.45	7.68	0.23	7.00
11	Alavinasab & Davoudi (2013)	Iran	26.74	8.65	4.42	16.23	11.29	6.47	46.56	14.14	0.54	2.00
12	Aregbeyen (2013)	Nigeria	25.85	7.23	5.45	23.51	6.36	1.77	12.71	21.10	0.22	6.25
13	Pratheepan (2014)	Sri Lanka	24.63	7.83	6.70	9.66	6.10	12.78	31.55	22.92	0.15	2.00
14	Hoang (2015)	Vietnam	25.56	7.27	5.78	8.97	2.15	20.63	101.96	22.66	0.28	7.00
15	Majanga (2016)	Malawi	22.69	6.12	5.85	14.66	6.50	14.88	11.55			6.00
16	Rehman (2015)	Saudi Arabia	27.03	9.89	4.85	5.77	5.46		38.58	60.60	0.56	2.00
17	Keskin & Gokalp (2016)	Turkey	27.46	9.35	5.48	7.53	9.78	18.67	45.88	31.09	0.88	3.00
18	Cristian & Raisa (2017)	Romania	25.82	8.98	3.39	6.71	6.92	17.35	30.41	11.71	0.45	10.00
19	Işık (2017)	Turkey	27.36	9.28	5.10	8.63	9.76	18.50	34.75	31.67	0.76	3.00
20	Latha & Rao (2017)	India	28.40	7.41	5.85	7.32	3.54	10.92	52.11	69.61	0.62	6.00
21	Nanda & Panda (2018)	India	27.98	7.07	7.06	6.73	3.88	10.16	43.77	76.66	0.77	6.00
22	Shrivastava, Kumar, & Kumar (2017)	India	27.95	7.05	7.87	7.34	3.90	10.53	45.33	78.69	0.80	6.00
23	Alarussi & Alhaderi (2018)	Malaysia	26.42	9.21	5.39	2.30	2.99	15.25	118.12	146.32	1.18	7.00
24	Jaworski & Czerwonka (2018)	Poland	26.78	9.32	3.73	3.35	12.32	16.81	36.94	27.59	0.69	7.00
25	Kusuma (2018)	Indonesia	27.47	8.13	5.80	5.51	6.57	11.04	29.28	44.69	0.08	4.75

Source: own compilation based on worldbank.org

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