GROWTH, PROFITABILITY AND LIQUIDITY OF POLISH ROAD TRANSPORTATION COMPANIES

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Abstract

Fast growth of road transportation companies registered in Poland, whose fleet has become the largest in European Union has yet not received sufficient attention. Here relationships of profitability and financial liquidity and a company growth of sales for 2367 road transportation companies registered in Poland in period 2013 - 2017 are studied. The static, linear, symptomatic and mezoeconomic econometric model is proposed and the analysis is based on the moving quartile, Spearman rho and Kendall tau-b coefficients and multi-segment piecewise-linear approximation with Theil-Sen trend lines. The relationships between the growth of sales and considered factors are not uniform and depend on a factor rage. The results of this study postulate positive relationship between the profitability and the growth of sales in a given range for studied companies. The optimum financial liquidity to increase the growth of sales for road transportation companies registered has been identified. Managerial implications and advantages following from the applied analysis are given.

Key words: growth, profitability, financial liquidity, road transportation

1. INTRODUCTION

Since long determination of significant factors for firms' growth have been an interests of both researchers and decision makers (Gibrat, 1931; Massey et al., 2006; Masurel & Montfort, 2006; Baum et al., 2001). However, despite the first well recognized paper on growth of firms had been published in 1931 (Gibrat), the effective and universal formula for growth still remains elusive. According to the literature, this is primarily because the growth is not homogenous for different businesses (Massey et al., 2006), paths of growth may change over time (Masurel & Montfort, 2006) and so the growth is widely acknowledged to be a very complex and multifaceted process (Baum et al., 2001).

In this paper only one industry in one country is being studied, as to arrive to specific and industry relevant findings of the effect of different factors on the company's performance. The road transportation industry has been selected, because it is the largest services sector which plays significant role in any economy and it has

been insufficiently studied. Table 1 provides the carriage of goods by road by companies from selected countries, in thousand tones within the European Union territory. The scope of this study has been narrowed to Poland and to the period between 2013 and 2017 what stems from the fact that the road transportation companies registered in Poland became, in that period, undisputed leader in road transportation in European Union (EU). As disclosed in Table 1, selected companies grew, in a period between 2013 and 2017, on average 35.4% and delivered as much as 17.5% of all road carriages within EU in 2017. The following years, i.e. 2018 and 2019 are not subject of this study as the growth of Polish road transportation companies decreased.

Table 1. The carriage of goods by road by companies, in thousand tones within the European Union

	2013	2014	2015	2016	2017	Growth
Poland	247.594	250.931	260.713	290.749	335.220	35,4%
Germany	305.744	310.142	314.816	315.774	313.149	2,4%
Spain	192.597	195.767	209.390	216.997	231.109	20,0%
France	171.472	165.225	153.580	155.843	167.691	-2,2%
United Kingdom	139.703	135.393	150.101	155.042	153.939	10,2%
Other	654.113	662.400	677.372	840.697	719.505	10,0%
Total	1.711.223	1.719858	1.765.972	1.834.843	1.920.613	12,2%

Source: Eurostat (2019)

The sample for this study comprise 5,310 observations relating to 2,367 road transportation companies registered in Poland, among which are present both, small local companies and subsidies of large multinational transportation companies like DHL, FM Logistic, DPD, Raben, GLS, Hellman, Geodis and others. The data for this study have been obtained from Emerging Markets Information Service (EMIS). The static, linear, symptomatic and mezoeconomic model is proposed to quantify the impact of profitability and financial liquidity on the growth of sales of Polish road transportation companies in the considered period. Because of significant data dispersion robust statistical methods have been used in this study. The moving quartile analysis have been applied to determine the form of the relationship between the growth of sales and considered performance factors in their different ranges, Kendall tau-b to determine the importance of correlations and multi Theil Sen linear approximations to fit the obtained relations. The contribution to the extant literature are empirical relationships between the selected factors and the growth of road transportation firms. These relationships are different in different ranges of considered factors. The results, conclusions and suggestions have managerial implications for improved performance of transportation companies.

The rest of this paper is organized as follows: in Section 2 an existing literature on factors influencing growth of companies is being reviewed. In Section 3 research methodology and its different components like research design, sample of observations, data sources and variables used in the study are given. Section 4 presents results and analysis derived from the empirical data. Next the discussion of results is

being provided. The paper ends with conclusions, some managerial implications, limitations of this study and indications for future research.

2. LITERATURE REVIEW

The first well-recognized and oft-cited paper on growth factors was published by Gibrat in 1931. He developed the Law of Proportionate Effect, which states the growth of each company in each period is independent of its observable characteristics (Gibrat, 1931). According to this law, growth is unrelated to, inter alia, profitability and financial liquidity and so the companies have the same probabilities of achieving any particular growth rate in any period. As a result of concentration over time, some companies tend to enjoy an above-average growth rates, while others tend to decline or maintain the same size. Following Gibrat a significant body of literature on growth of the companies in different periods, industries and countries emerged. Although some researches claim firm growth rates are random, suggesting further they are best modelled as a random walk (Geroski et al., 1997), the vast majority of studies reject Gibrat law (Oliveira & Fortunato 2008).

As the issue of firms growth is of great interest to both researches and decision makers, the number of already studied or analysed growth factors is significant and continue to develop. Therefore, a good point to start literature review is to categorize already presented in the literature growth factors into several groups. This task has been already approached by Weinzimmer (1993), who divided growth factor into external and internal to the company. Internal factors, can be divided further into those relating to the company itself, over which management have no influence and factors resulting from management decisions.

Among discussed in the literature and in business practice firm growth factors, over which the management have control is the profitability. Hoy et al. (1992) postulate the existence of significant and negative relationship between the growth and the profitability of companies. The dependence that the growth of a firm and rising profits contradict each other is also given by Marris (1964). The management of companies therefore, select a preferred position, which is either expansion and lowered profits or the opposite of both. Several other scholars claim the opposite, i.e. the existence of positive relationships between the growth and the profitability of companies. They explain that companies without profits cannot grow in a sustainable way, or that profitable companies can redistribute a portion of profits to finance growth (Geroski et al., 1997; Claver et al., 2002; Samiloglu & Demirgunes, 2008; Asimakopoulos, 2009). Findings of other studies show that the relationship between the growth and the profitability of companies is insignificant (Weisbord, 1994; Markman & Gartner, 2002). Finally, several researchers consider a dynamic relationship between the growth and profits, i.e. they postulate that the current earnings endorse the growth rate of the firm in the following period, and that the current growth rate has a negative and statistically significant influence on the profits in the next period (Goddard et al. 2002).

Financial liquidity has been already a subject of a number of studies. Several scholars postulate liquidity has a positive and significant influence on growth of the

firms (Rahaman 2011; Musso and Schiavo 2008). This is primarily because higher liquidity levels are usually related to lower financing constraints and thus offer more possibilities to undertake profitable investments, which finally endorse the growth. Not all researches consider positive relationship between growth and liquidity. Anton (2018), contrary to other researchers claims, contemplated relationship is negative.

The literature of financial management considers liquidity as synonym of safety, indicating however, that high liquidity levels, especially in the form of current assets, is capital that could be used more productively by the companies (Wolf et al. 2016).

Other internal factors expected to affect the growth of companies, over which management has no control are legal form, which positively stimulate the growth of the companies (Davidsson and Wiklund 2001; Terjesen and Szerb 2008); location, which can positively influence the growth (Westhead and Storey 1996; Dahlstrand and Stevenson 2010), negatively (Glancey 1998) or may not affect the growth at all (Davidsson and Wiklund 2001) and ownership structure, which might be positive for the growth of the companies (Davidsson and Wiklund 2001). These factors are not consider here. In the literature, internal and controlled by management factors influencing company performance are: exporting (Terjesen and Szerb 2008), competitive aggressiveness (Baum et al. 2001), innovativeness (Lumpkin and Dess 2001), management training (Mulie and Raju 2015), new products introduction (Barbero et al. 2011), technological sophistication (Barbero et al. 2011) and corporate social responsibility (Xiping 2014) or trade accounts receivables levels (Korneta 2018).

External factors expected to affect the growth of companies have also been identified and studied in the literature. External factors result from an environment, which provides the companies with the growth threats and opportunities (Davidsson 1989; Stevenson and Jarillo 1990), which are assumed to have the same effect on all firms in a particular location or industry. Audretsch and Mahmood (1994) confirmed that the growth of companies depends on the industry growth rate. Terjesen and Szerb (2008), Baum et al. (2001) Federico et al. (2012) claim the competition has positive influence on the growth of companies, whereas Kalleberg and Leicht (1991) and Birley and Westhead (1993) in due course of their studies found no relationship between competition and growth of the companies. Given considerable findings have been already presented in the literature on external growth determinants and due to relatively short period of time for our study, i.e. the studied period comprise only the time of economic expansion and does not comprise recession, the influence of external variables including interest rates, unemployment rates and so on, on the growth of companies is not considered here..

3. METHODOLOGY

The sample for our study comprises 5,310 observations relating to 2,367 road transportation companies registered in Poland in a 5-years period between 2013 and 2017. The variables used have been calculated based on figures obtained from Emerging Markets Information Service (EMIS). Since one of variables used in this study requires figures for two consecutive periods and because EMIS database have

not comprised financial statements of studied companies for each of the studied periods, the number of observations is reduced and amounts to 5,310. Table 1 provides variables used in the study, their acronyms and description of calculations.

Table 2. Variables used in the study

Variable	Acronym	Description
Growth of sales	GRS	The difference of year sales and prior year sales divided by prior year sales
Profitability	ROA	Ratio of net result to total of assets
Financial liquidity	LIQ	Ratio of short term assets and short term liabilities

A great variety of firm growth measures have been used in various studies. Nonetheless, according to Achtenhagen et al. (2010) around 50% of scientific studies employ sales revenues to measure firm growth, while around 30% number of employees. Remaining growth measures use market share, value added, earnings, total of assets, or the number of customers (Furlan et al., 2014). Aligned to the majority of scholars (Anton, 2018; Seungkyu and Jaejun, 2015) we use sales revenue to calculate the growth of firms, which is a good proxy for product or service acceptance in the market. Hence, this study assumes, the growth of sales is a measure of commercial success and therefore we conclude to quantify the growth by the growth of sales. Additionally, according to Mitchell (1994) this measure is usually highly correlated with other growth measures.

The first of studied independent variables is the profitability. The profitability is usually measured with return on equity (ROE), return on assets (ROA) and return on sales (ROS) ratios (Baah-Acquah et al., 2017; Tyagi and Nauriyal 2017, Korneta 2019). In this paper ROA has been employed as a proxy for the profitability of studied companies, primarily because it provides information on how the company uses efficiently it's all assets.

The second variable is the liquidity. This study uses current ratio as a proxy of liquidity. Current ratio is frequently used in various studies by other researchers (Anton 2018; Musso & Schiavo 2008). Stated ratio compares current assets, i.e. assets that will become liquid in 12 months with liabilities due for payment, also, within 12 months (Drury 1981).

Pursuant to selection of variables the descriptive statistics have been calculated and the relationships between studied variables visualized on the graphs. Visualization of the contemplated relationships has been achieved through the use of moving median to determine different relations between considered variables in different ranges. The median values of both variables have been calculated in a moving window containing data of 200 observations. The moving first and third quartile have also been calculated to quantify the distribution of data around the median. After identifying the relation between variables in different ranges, the Spearman rho and the Kendall tau-b coefficients have been calculated. Such approach has been already used in the literature (Krzyszkowski & Korneta 2019). Next, we applied to each range the Theil-Sen procedure to observations in this range and we fitted the relation

between variables by a straight line. Theil-Sen procedure is acknowledged to be the most popular nonparametric technique for estimating a linear trend (El-Shaarawi 2001). The objective of this method is to fit robustly a line to sample points by choosing the median of the slopes of all lines through pairs of points (Sen 1968; Theil 1950; Gilbert 1987). The Theil–Sen estimator is considerably more accurate than non-robust simple linear regression, especially for skewed and heteroskedastic data. Additionally, it should be noted, the Theil–Sen estimator provides better results than non-robust least squares method, even for normally distributed data (Wilcox 1998). Finally, through the use of aforementioned methods multi-segment piecewise-linear approximation to the relationships between considered variables have been obtained.

4. RESULTS

Table 3 shows the descriptive statistics for all variables used in this study. The probability distribution of GRS of road transportation Polish companies is shown in Figure 1.

Figure 1. The probability distribution of GRS expressed in percent for 2,367 Polish road transportation companies in the period 2013-2017. Only the range [-0.75, 1.05] is shown for clarity what corresponds to 95% of companies
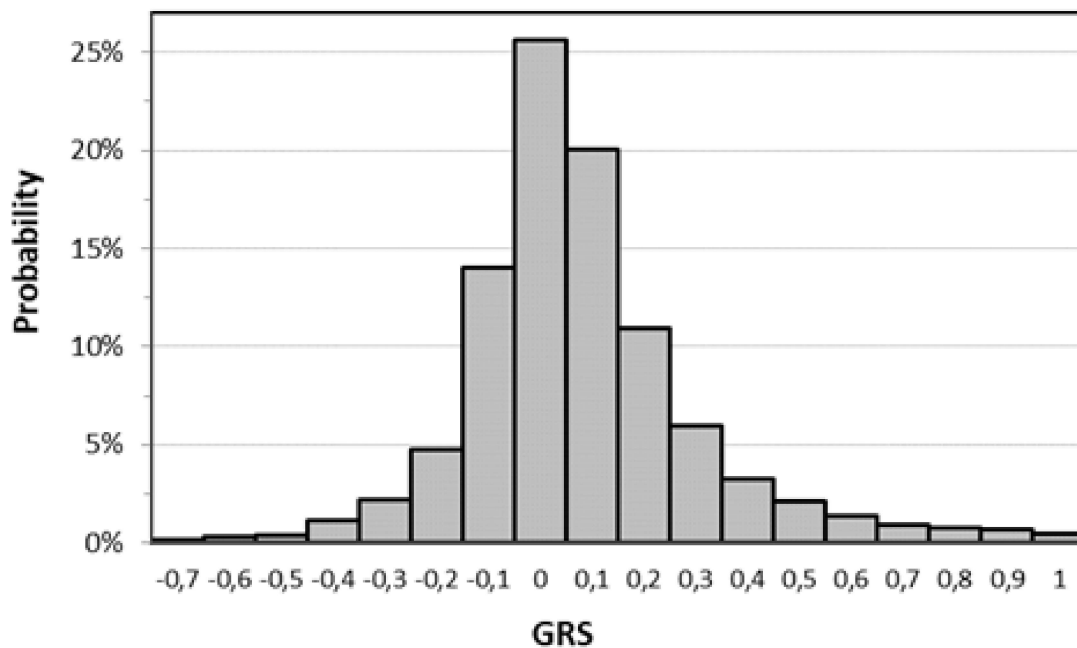
One can notice that the most of GRS is concentrated near 0 what is also expressed by the large kurtosis, disclosed in Table 3. On average, the companies included in studied sample exhibit a high mean growth of sales of 1.089 and low median 0.053 per year over studied period. This and the large skewness indicates that there are small number of firms with very large growth of sales (GRS). In particular,

1859 out of 5310 GRS observations were negative (negative mean value of 0.128); 3439 observations are positive (mean value of 1.75) and the remaining 12 observations in this sample are nil. Great differences between min and max and high standard deviations for ROA indicate large distribution of ROA variable. High LIQ values display high working capital levels of the road Polish transportation companies.

Table 3. Descriptive statistics of 5,300 observations relating to Polish road transportation companies in the period 2013-2017. Variables are defined in table 2

Variable	Mean	SD	Median	Min	Max	Skewness	Kurtosis
GRS	1.089	23.034	0.053	-1	1067	38.33	1625.08
ROA	0.081	1.111	0.055	-61	37	-19.61	2098.15
LIQ	2.35	20.217	1.301	0	1444	68.6	4882.65

Source: own elaboration

Table 4 provides results of statistical tests of relations between GRS and selected independent variables, i.e. the Spearman rho and the Kendall tau-b with p-values (one side). Additionally, Theil-Sen slopes (m) and intercepts (b) have been presented in all segments of the obtained multisegment piecewise-linear approximation.

Table 4. Results of statistical tests of relations between GRS and studied variables with Theil-Sen slopes (m) and intercepts (b) of trend lines in each segment of multi-segment piecewise-linear approximation. p-values are one side values

	Spearman		Kendall		Theil-Sen	
	coefficient	p	Tau-B	p	m slope	b intercept
ROA						
< -0.1634	-0.0171	0.4177	0.0297	0.2949	0.0171	-0.0529
[-0.1634,0.2517]	0.1916	<0.0001	0.1291	<0.0001	0.4633	0.02
> 0.2517	0.0568	0.1246	0.0544	0.051	-0.0314	0.1445
LIQ						
< 1.0673	0.2111	<0.0001	0.1433	<0.0001	0.1733	-0.0805
[1.0673,1.2687]	-0.034	0.168	-0.0233	0.1619	-0.1572	0.2722
[1.2687,2.9654]	-0.0643	0.0011	-0.0433	0.0010	-0.0222	0.1009
> 2.9654	0.0048	0.46	0.0033	0.45	-0.0003	0.0359

Source: own elaboration

Following methods described in the methodology section, the moving quartile and the multi-segment piecewise-linear approximation to the relation between ROA and GRS have been determined. As disclosed in the figure 2, contemplated relationship should be divided into three different segments and approximated with 3

straight trend lines. The first segment comprise ROA observations below -0.1634. The Theil-Sen trend line is almost horizontal, which indicates no relationship between ROA and GRS in this range. The Spearman rho-coefficient and the Kendall tau-b confirmed that this relationship is not statistically significant (p-values significantly over 0.05). The second segment comprise the vast majority of studied observations, i.e. 4,706 out of 5,310, hence accounts for 0.886 of our sample. The relation between ROA and GRS in this range is well fitted with the Theil Sen straight line with the slope of 0.4633 and the intercept of 0.02. This large positive slope confirms the relationship between ROA and GRS is positive and statistically significant. Results obtained with Theil-Sen method are supported with the Spearman rho-coefficient and the Kendall tau-b, which amounted to 0.1916 and 0.1291 respectively with very low p values confirming their statistical significance. Very low, close to nil value of Theil-Sen straight line slope and p values of the Spearman and the Kendall coefficients above 0.05 indicate no statistically significant relationship between ROA and GRS for the last segment with ROA values above 0.25.

Figure 2. The relation between GRS and ROA with the moving quartile and the multi-segment piecewise-linear Theil Sen approximation
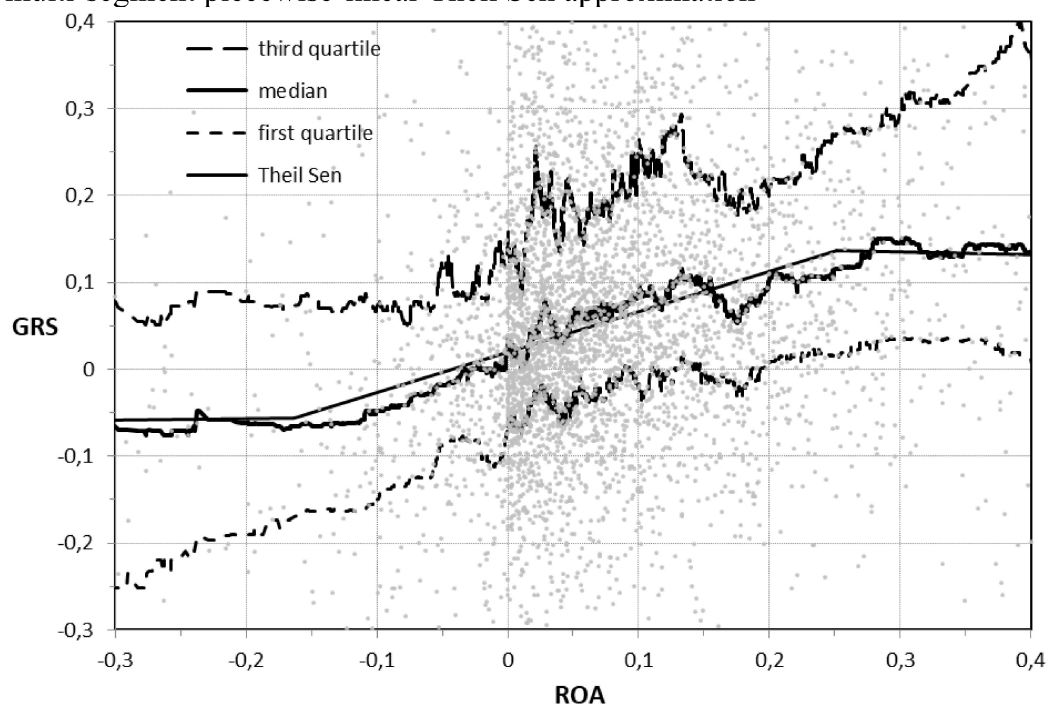

Figure 3 provides the graph of the relation of the growth of sales GRS and the financial liquidity LIQ. Although the optimal growth value of LIQ is around 1, for which median of GRS is almost 0.15 and third quartile around 0.4, the contemplated relationships were approximated with 4 segments. The first segment comprise LIQ observations below 1.07 and is the only segment with positive relationships between considered variables. The Spearman rho-coefficient and the Kendall tau-b confirmed

Theil Sen results, while p values approximated to nil confirmed the results are statistically significant. The following segment, comprising LIQ observations in a range between 1.06 and 1.27, is approximated with fast decreasing Theil Sen trend line.

Figure 3. The relation between GRS and LIQ with the moving quartile and the multi-segment piecewise-linear Theil Sen approximation
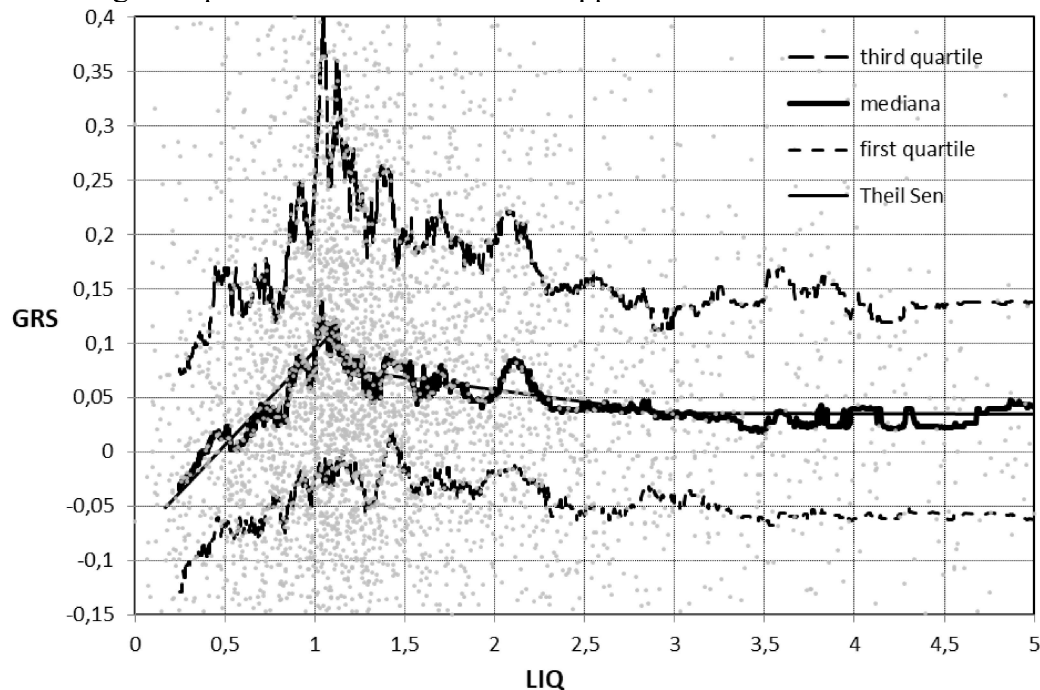
The Spearman and the Kendall coefficients confirmed this negative trend, but results of these tests are not statistically significant. The trend in the following two segments is also negative, however the strength of this relationship gets weaker, which is visible by slopes of Theil Sen trend lines which are -0.0222 and -0.0003 respectively.

5. DISCUSSION

The results of this study show that the relationship between profitability (ROA) and growth of sales (GRS) differ for the consecutive ROA ranges. For ROA values below -0.16 there is no relationship between ROA and GRS. In the largest the second range [-0.16,0.26] comprising over 86% of observations, studied relationship is positive and statistically significant. The slope of approximated trend line is 0.4633. For the highest ROA values the obtained results indicate no statistically significant relationship. Since the second largest segment comprising the bulk of observations it should be consider as representative for the studied industry. The first and the third segments, comprise rare (marginal) observations, should be studied independently.

Hence, this study joins the large discussion among scholars on the growth and the profitability postulating their positive relationship. Such findings are important for road transportation industry. This industry conversely to others is less reliant on research and development expenditure, as it provides services instead of manufacturing products. Secondly significant portion of services is done between business to business transactions, which again, conversely to other business to customer transactions require less spending on advertising campaigns. Obviously, transportation industry requires investments, like for example in systems, trainings of employees and so on, however not as much as several other industries. The profits therefore can finance the growth. Accordingly, due to the characteristic of studied industry it seems justified that the companies from our sample require profits in order to grow. Hence, the following postulate of this paper is that there is the positive relationship between the profitability and the growth of studied companies. The findings of this study are in agreement with postulated results of Geroski et al. (1997), Claver et al.(2002), Samiloglu and Demirgunes (2008) and Asimakopoulos et al. (2009).

Despite the majority of scholars claiming the positive relationship between liquidity levels and the growth and other scholars claiming the opposite, empirical results of this study confirmed the existence of sharp optimum level of the liquidity for growth of studied companies. Hence, for the studied industry, the relationship between the liquidity and growth of sales is not monotonous and should not be approximated with one single trend line. The optimum liquidity level identified for, willing to grow, road transportation companies registered in Poland, is around 1.07. Hence, the results of this study endorse findings of Rahaman (2011) and Musso and Schiavo (2008) up to the current ratio of 1.07, while above that threshold are aligned to research results obtained by Anthon (2018).

6. CONCLUSIONS

In this paper the mutual relationship between the growth of sales and profitability and financial liquidity for 2,367 road transportation companies registered in Poland for the 5-years period between 2013 and 2017 have been studied. In this paper the Spearman rho and the Kendall tau-B coefficients have been employed. Additionally, the multi segment Theil-Sen method to properly fit studied relationships with relevant trend lines has been used.

The results of this study indicate the positive relationship between the profitability and the growth of sales of studied road transportation companies. This might result from the fact, that studied companies, relative to other industries, require less investment on research and development or marketing, hence, discussed in the literature trade-off between the growth and the profits is not observed for studied sample. Based on the empirical results it might be concluded that profits boost the growth of sales.

The results of this study indicated the optimum liquidity level to endorse the growth of sales, which is around 1, if measured with current liquidity ratio. The firms, which uphold liquidity levels below 1.07 and increase it, could expect the growth of

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sales. Once stated threshold is exceeded the growth of sales decreases, initially vary sharp and next slowly.

Since management have control of both of studied variables, i.e. profitability and liquidity, the results of this paper can be interesting to decision makers. Hence the management of transportation companies should consider postulates of this study, while planning of the growth process.

Given inconsistency of findings presented in the literature on the growth factors the specific findings of this study add up to a wide literature on the firm's growth factors for transportation companies registered in Poland. Since these companies poses the largest fleet and account for around 17,5% of all road carriages within European Union market, the results might be considered relevant for the European Union market.

There are several limitations of this study that should be recognized. First, only 2 selected growth factors have been studied. As a consequence further research is needed in order to understand how other factors influence the performance of road transportation companies. Secondly, the study period is relatively short, in particular it includes the time of economic expansion, whereas does not include recession. Finally it would be interesting to extend this study to road transportation companies in other countries both inside and outside EU.

7. REFERENCES

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