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PERFORMANCE RATIOS FOR MANAGERIAL DECISION-MAKING IN A GROWING FIRM

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Abstract. This paper investigates the impact of firms' growth rate on various financial and non-financial performance ratios. The study tests the hypothesis that variations in growth rates across firms relate to differences in the values of ratios of profitability, liquidity, current assets, and solvency, as well as the break-even point, revenue per employee, average costs, labour costs, capital costs, capacity utilization, productivity and efficiency. In order to estimate the impact of growth on financial and non-financial indicators while also accounting for unobservable individual effects of each firm, the study assesses several two-way fixed effect panel models with regression analysis. Authors show that knowing the impact of growth rates on financial and non-financial ratios gives managers of growing firms additional relevant information for making business decisions.

Keywords: performance ratios, growing firms, managerial decision making, Slovenia, panel data, regression analysis.

1. Introduction

This paper focuses on the dependence of financial and non-financial performance ratios and measures on firm growth. The study tests the hypothesis that variations in growth rates are associated with differences in the values of financial and non-financial ratios. The research objectives are to analyse the impact of growth rates on performance ratios and measures and to determine whether financial and non-financial ratios and measures could provide managers additional relevant information for making business decisions, when the impact of growth rates on performance ratios is known. In other words, the hypotheses are that target values of performance ratios change with regard to the growth rate of a firm (i.e., performance ratios of fast-growing firms are significantly different from those of slow-growing firms), and that target values of performance ratios could also be typical.

The study analyses the dependencies of several ratios and measures on firm growth rate, namely, the ratios of profitability, liquidity, current assets, and solvency, as well as the break-even point, revenue per employee, average costs, labour costs, capital costs, capacity utilization and productivity. All of these measures have target values-determined on the basis of financial and entrepreneurship theories-that managers and entrepreneurs seek to achieve through their decision-making. In order to test the hypotheses about the explanation power of firm growth on financial and non-financial ratios and measures, the present study uses regression analysis on a panel of Slovenian manufacturing firms during 2001–2005, taking into consideration firm size and industry membership, as well as firm profitability when appropriate.

The regression results also allow the authors to draw conclusions about the typical values of performance ratios that managers and entrepreneurs should target in making business decisions, while also taking into consideration the growth rate of the firm.

2. Theoretical framework

The theoretical foundation for this paper derives from the financial and entrepreneurial literature, with the former as a base for the linkage between firm growth and the size of its financial ratios, and the latter as a foundation for the relationship between firm growth and the size of its non-financial ratios, such as productivity and cost efficiency ratios.

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Financial ratios in relation to firm growth have often been subject to empirical analysis. However, the majority of the theoretical and empirical research focuses on the financial ratios as factors that explain firm growth, not as performance measures that can themselves be explained by firm growth. As such, financial ratios have been used for predictive purposes, such as predicting corporate failure, establishing credit rating, assessing risk and testing economic hypotheses in which inputs are financial ratios. Fagiolo and Luzzi (2006), for example, investigated the impact of liquidity ratios on the growth of Italian manufacturing firms and found the impact to be negative. Oliveira and Fortunato (2006) provided similar evidence for Portuguese manufacturing firms. The predictive significance of financial ratios has also been examined with reference to corporate bankruptcy. Beaver's (1966) early empirical evidence that certain financial ratios, most notably cash flow/total debt, give statistically significant signals well before actual business failure is now considered a classic study. Since then, several empirical studies of financial ratios-mainly liquidity and solvency-have shown these ratios' informational value for predicting business failure (Wilcox 1973; Laitinen 1995; overview in Balcaen and Ooghe 2006) and for predicting the impact of financial constraints on firm growth (Fazzari *et al.* 1988; overview in Carpenter and Petersen 2002).

On the other hand, only a few studies have investigated the reverse: the effect of firm growth rate on performance ratios and measures. Gupta (1969) was one of the first to examine the impact of growth, firm size and industry membership on financial ratios (capital output rate, leverage, liquidity and asset utilization velocity), based on US firm-level data. His study reported that activity ratios and leverage ratios decrease as the size of the corporation increases and increase with the growth of the corporation. Gupta also found that liquidity ratios rise with an increase in the size of the corporation and fall with an increase in growth rate, but he observed no significant relationship between growth and profitability. An overview of existing literature and empirical studies (Markman and Gartner 2002) provides similar findings regarding the correlation between firm growth and profitability.

On the other hand, Cinca *et al*. (2005) provided evidence that the differences in the value of financial ratios between firms can be explained by firm size and the country effect. Wald (1999) also confirmed the impact of the country effect and reported that, although firm profitability, long-term debt/assets ratios, size and growth are significantly correlated, considerable differences exist across countries. Firm size, industry membership and institutional environment are also important in using firm growth to explain the value of performance ratios.

Several studies have also dealt with the dependence of non-financial performance ratios, especially productivity, on firm growth. Available evidence (Englanger and Gurney 1994) supports the view that technological progress is a capital-using activity and is partly embodied in capital goods. Hence, because firm growth is a consequence of firm's investments, and new technologies and organizational changes usually accompany the investment, we expect firm growth to positively influence productivity. Empirical studies confirm this relationship (e.g., Haskel and Szymanski 1997).

3. Data and methodology

Our empirical analysis of the relationships between various financial and non-financial ratios and firm growth uses a panel of Slovenian manufacturing firms (NACE 15–37) over the period 2001–2005. The data source is the database of firms' financial statements collected by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (APLR). APLR collects, processes and communicates annual reports prepared by business entities, collection and processing of financial account statistics, publication of annual reports returned by companies and sole proprietors. It also carries out different kinds of statistical research.

When dealing with such an extensive database, founded on firms' accounting data, we must consider two important issues. The first is the deficiencies in the financial data reported to APLR. Because the reported data come from firms' official financial statements, they often do not reflect the actual incomes and expenses underlying the production process because firms use this reporting mechanism to reduce the company's tax burden. Second, there are some inconsistencies in the accounting data, e.g., manufacturing firms from the database are classified into industries according to their primary activity, even though, according to the NACE classification of activities, the majority of these firms are engaged in several activities in different industries. Therefore, the industry membership listed may not reflect the actual level of engagement of firms in various markets. In spite of its imperfections, the dataset presents a relatively good foundation for empirical investigation of the relationship of firm growth to several financial and non-financial ratios and measures.

In order to ensure that the cleanest possible data entered the analysis, we narrowed the dataset by excluding firms for which an industry was not defined, firms

with zero employees, firms with a negative value of equity or with zero sales revenues, and firms with zero assets or zero fixed assets. As a result, the database employed in the analysis contained a sample of 5,396 manufacturing firms and 13,854 observations with no missing values.

Firm growth is defined in terms of annual sales (GRtr). When no significant results appear within a model with sales growth as a regressor, the model also tests the firm's asset growth (GRa) as an explanatory variable. In Table 1 descriptive statistics for GRa and GRt are presented.

Table 1. Descriptive statistics of growth of sales (GRtr) and growth of assets (GRa)

	Obs	Mean	St. dev.	Min	Max
GRtr	13854	0.2280	1.5967	-0.9948	57.9707
GRa	13854	1.9108	50.2090	-0.9999	3161.483

Source: APLR and own calculations

The analysis deals with the relationship between firm growth and the ratios of profitability, liquidity, and solvency (the financial leverage ratios), as well as current assets (or asset turnover ratios), the break-even point, revenue per employee, average costs, cost ratios, factor costs (labour and capital costs), capacity utilization, productivity and efficiency.

Profitability ratios offer several different measures of the firm's ability to generate profits. The first measure of profitability is return on total assets (ROA), a ratio of the difference between total revenues and total costs to total assets that measures how efficiently firm assets are used in generating profits. Rate of return on equity, or ROE, is a bottom-line measure for the shareholders that measures the profits earned for each unit of assets invested in a firm's stock. The second measure of profitability is a ratio of the difference between total revenues and total costs to equity. The third measure of profitability, return on sales (ROS), measures profit as a percentage of total sales.

Liquidity ratios provide information about a firm's ability to meet its short-term financial obligations. The analysis includes two of the most frequently used liquidity ratios: current ratio (or working capital ratio) (CULI), a ratio of current assets to current liabilities, and quick ratio (QUICKL), a ratio of the difference between current assets and inventory to current liabilities. While the former measures the extent to which a firm can meet its short-term obligations, the latter measures the extent to which a firm can meet its short-term obligations without selling inventory.

Solvency (or financial leverage) ratios provide an indication of the long-term solvency of the firm. Unlike the liquidity ratios, which are concerned with short-term assets and liabilities, those ratios measure the extent to which a firm is using long-term debt. The analysis includes debt-to-equity ratio (DTK), defined as the ratio of total debt to total equity.

Current ratios (or asset turnover ratios) indicate how efficiently a firm utilizes its assets. The present study analyses several turnover ratios: days inventory, also called the inventory period (DIS); days sales outstanding, also called the average collection period (DSO); days payables outstanding, or the average days' credit (DPO); and the accounts receivable to accounts payable ratio (ARAP). Days inventory measures the average number of days goods remain in inventory before being sold and is calculated by dividing 365 days by the ratio of business costs to inventory (i.e., inventory turnover). The days sales outstanding (DSO) is the ratio of annual credit sales to business sales multiplied by 365; it measures the number of days that credit sales remain in accounts receivable before they are collected. Similarly, days payables outstanding (or average days' credit), the ratio of accounts payable to business revenue, measures the number of days before a firm meets its financial obligations to suppliers by paying accounts payable. The accounts receivable to accounts payable ratio, calculated by dividing days sales outstanding by days payables outstanding, also enters some of the estimated models as a dependent variable. The study also investigates the impact of firm growth on price of debt (PD), which is calculated by dividing financial costs by the sum of short-term (current) liabilities (credits), long-term liabilities (credits) and accounts payable.

Besides the conventional measures of business performance, the study investigates the impact of firm growth rate on other measures of business performance. The first is a relative break-even point (RBER), calculated as the ratio of total revenue to the break-even point (BEP). BEP measures the volume of sales at which a company's business revenues or sales just equal its costs. In order to test the impact of firm growth on cost ratios, the empirical investigation uses three independent variables: (i) cost per employee (TCL), which measures total costs per employees, (ii) business cost per employee (BCL), which measures business costs per employees, and (iii) total costs to total revenue (TCR), which is calculated by dividing total costs by total revenue.

The analysis also estimates the relationship between the firm's growth and its factor costs, namely, cost of

labour and capital. The ratio between annual gross wages and the average number of employees represents the price of labour (PRICEL), while the price of capital appears in the models in four different ways: (i) as the sum of depreciation and cost of financing relative to total capital (PRICEK1), (ii) as the sum of depreciation and cost of financing relative to the sum of fixed assets and inventory (PRICEK2), (iii) as the difference between total cost and cost of labour relative to total capital (PRICEK3), and (iv) as the difference between total cost and cost of labour relative to the sum of fixed assets and inventory (PRICEK4).

In order to investigate the relationship between growth and the measures of productivity and efficiency, we use as dependent variables: capacity utilization (CU), which is business revenue relative to fixed assets; labour productivity (PRODL), the ratio of business revenue to the average number of employees; and value-added per employee (VAL), the difference between business revenue and cost of goods, material, and services, divided by the number of employees. The analysis employs average revenue per employee (TRL), the ratio of total revenue to the average number of employees, as an alternative measure for labour productivity. Dummy variables are used for industry membership and firm size. The industry classification of the analyzed firms follows the 3-digit NACE classification of industries, whereas the size classification relates to the number of employees: micro firms, with 1–9 employees, small firms with 10–49 employees, medium firms with 50–249 employees, and large firms with more than 250 employees. Finally, a set of dummy variables representing time are used to investigate the influence of general changes in the business environment on growth rates of manufacturing firms in Slovenia.

The investigation consists of several two-way fixed effect panel models (Greene 2003, Chatterjee and Hadi 2006) in order to (i) assess the impact of firm growth on several financial and non-financial indicators, (ii) account for unobservable individual effects of each firm, i.e., all time-invariant, firm-specific characteristics, (iii) assess the impact of firm size, (iv) assess the characteristics of industry membership on the performance ratios, and (v) account for time-specific effects.

The fixed effect model $y_{it} = \alpha_i + \boldsymbol{\beta}\mathbf{X}_{it} + u_{it}$, where y_{it} is a particular financial or non-financial ratio of a firm i in time t; α_i represents individual unobservable effects; $\boldsymbol{\beta}$ is a vector of regression coefficients, and $\mathbf{X}_{it}$ is a matrix of firm-specific observable characteristics, including firm's growth – allows the intercepts to vary for each firm while slope coefficients are assumed to be constant across all firms. Firm size, industry membership and a set of time dummies enter the model in order to control for firm-specific characteristics and the characteristics of the environment in which they conducted business. When appropriate, the list of regressors also includes profitability, measured in terms of ROA, as a control variable.

The empirical investigation consists of several regressions based on the fixed effect model for each of the analyzed financial and non-financial ratios. The first stage includes in the model estimations only the dummy variables that control for firm size, industry membership and time for each of the analysed ratios. These results provide useful information about the share of variability explained solely by the dummy variables. The second stage estimates the linear relationship between the analysed ratios and growth. In the third stage of the estimation, the regression analysis considers the possibility of non-linear linkages by including quadratic forms of growth.

In the second and third stages of the analysis, the focus is on the relationships between sales growth and the financial and non-financial ratios and measures. When the estimated models exhibit statistically insignificant relationship between sales growth and the other measures, the models also test the impact of asset growth as a regressor. Where appropriate in the second and third stages, the list of regressors also includes profitability in terms of ROA in order to control for the impact of profitability on the financial and non-financial ratios and measures.

4. Results

Tables 1-9 report the estimates of the models that show significant relationships between growth and the analysed ratios and measures. Where ROA, as a control variable, significantly impacts on the analysed ratio or measure, the results of a model with ROA among the regressors are presented. Where there is no statistically significant linkage between the analysed ratio or measure and sales growth, but there is a statistically significant relationship between the ratio or measure and asset growth, the table includes the results of the model with asset growth among the regressors.

4.1. Relationship between growth and measures of firm profitability

Table 2 shows the results of testing the relationship between growth and the three profitability measures. Sales growth significantly impacts on ROA and ROS. The relationship between the two ratios and sales growth is non-linear; the linear effect is positive and the quadratic negative.

Thus, sales growth increases profitability at a declining rate until the growth rate reaches the threshold, which is, on average, 29.4 percent growth rate for ROA and 40.25 percent for ROS. After reaching the threshold growth rate, any increase in sales growth decreases profitability. The relationship between ROE and firm growth (in terms of either sales or assets) was also tested, but no significant relationship was found. Similarly, the model that used ROE as a dependent variable was statistically insignificant.

4.2. Relationship between growth and the liquidity measures

Table 3 reports the results from the models that analysed the impact of firm growth on liquidity. The relationship between sales growth and the two liquidity measures (CULI and QUICKL) is non-linear, with an adjusted R^2 above 70 percent and the models statistically significant at negligible risk. The linear link is negative and the quadratic link is positive, so firm growth decreases liquidity but at a declining rate. The threshold at which the quadratic form turns over amounts to a 27 percent sales growth rate for CULI and around 35 percent for QUICKL. Apparently, firm growth faster than 27 percent or 35 percent, respectively, has a positive impact on liquidity. Profitability in terms of ROA also significantly increases liquidity.

4.3. Relationship between growth and solvency

The impacts of sales growth rate and asset growth rate on solvency, measured by debt-to-equity ratio (DTK), are statistically insignificant. In some cases, even the model as a whole is statistically insignificant. Evidently, firm growth does not explain the debt/equity ratio in Slovenian manufacturing firms.

4.4. Relationship between growth and "current assets" ratios

Table 4 shows the results of the analysis of the impact of growth rate on the "current assets" ratios. Models with days inventory (DIS), days sales outstanding (DSO), days payables outstanding (DPO) and the accounts receivable to accounts payable ratio (ARAP) as dependent variables are statistically significant, with the adjusted values of R^2 around 70 percent.

The relationship between firm growth and inventory in stock is negative at a declining rate, meaning that higher sales growth decreases DIS, but the decrease becomes smaller and smaller as sales growth increases.

Table 2. Fixed effects models for the dependence of profitability on the growth rate and control variables

	GRtr	GRtr^2	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob > F
ROA			yes	yes	yes	0.6146	1.97	0.0023
	0.0223***		yes	yes	yes	0.6018	5.50	0.0000
	0.0530***	–0.0009***	yes	yes	yes	0.6052	8.30	0.0000
ROS			yes	yes	yes	0.9958	1.18	0.2450
	0.0514***		yes	yes	yes	0.3910	4.19	0.0000
	0.0805***	–0.0010***	yes	yes	yes	0.3916	4.40	0.0000

Notes: *, **, *** denote statistical significance at 10.5 and 1 % level respectively

Table 3. Fixed effects models for the dependence of liquidity on the growth rate and control variables

	GRtr	GRtr^2	ROA	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob > F
CULI[(1)]				yes	yes	yes	0.6928	1.69	0.0157
	–0.0207***		0.1921***	yes	yes	yes	0.7376	2.81	0.0000
	–0.0594***	0.0011***	0.2031***	yes	yes	yes	0.7379	3.14	0.0000
QUICKL [(1)]				yes	yes	yes	0.7095	1.45	0.0643
	–0.0172***		0.1827***	yes	yes	yes	0.7521	2.95	0.0000
	–0.0423***	0.0006**	0.1898***	yes	yes	yes	0.7523	3.10	0.0000

Notes: [(1)] Values of the ratio limited; firms with ratio equal or lower to 15 are analysed
*, **, *** denote statistical significance at 10.5 and 1% level respectively

Table 4. Fixed effects models for the dependence of current assets on the growth rate and control variables

	GRtr	GRtr^2	ROA	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob>F
DIS[(2)]				yes	yes	yes	0.7038	0.86	0.6714
	–2.4828***			yes	yes	yes	0.7409	1.94	0.0040
	–9.3360***	0.2083***		yes	yes	yes	0.7427	4.21	0.0000
DSO[(2)]				yes	yes	yes	0.6433	2.15	0.0006
	–1.7884***		3.7718**	yes	yes	yes	0.7036	3.95	0.0000
	–9.0309***	0.2180***	5.891***	yes	yes	yes	0.7082	9.02	0.0000
DPO[(2)]				yes	yes	yes	0.6464	1.16	0.2628
	–5.0346***		–28.64***	yes	yes	yes	0.7085	4.96	0.0000
	–12.006***	0.2657***	–25.54***	yes	yes	yes	0.7100	6.42	0.0000
ARAP[3)]				yes	yes	yes	0.6305	0.89	0.6218
	–0.0123***		0.1236***	yes	yes	yes	0.6851	2.90	0.0000
	–0.0312***	0.0006***	0.1291***	yes	yes	yes	0.6855	3.19	0.0000

Notes: [(2)] Values of the ratio limited; only firms with ratio equal or lower to 720 are analysed
[(3)] Values of the ratio limited; only firms with ratio equal or lower to 5 are analysed
*, **, *** denote statistical significance at 10.5 and 1% level respectively

The relationship turns over at a growth rate of 22 percent so, when the growth rate exceeds 22 percent, the connection becomes positive. ROA does not seem to influence the inventory stock days.

A similar non-linear relationship to sales growth is also found with average collection period (DSO) and average days' credit (DPO). In both cases, the linear link is negative, and the quadratic link is positive. Thus, DSO and DPO decrease with sales growth, with declining marginal decreases.

The threshold growth rate after which the relationship becomes positive amounts to 20 percent for DSO and 22 percent for DPO. In both cases, profitability significantly affects the analysed ratios, although the impact is positive in the case of average collection period and negative in the case of average days' credit. Evidently, more profitable firms take less time to meet their liabilities and have to wait longer to collect their receivables.

The ratio between accounts receivable and accounts payable (ARAP) is also non-linear; it is first negatively affected by sales growth, but it is positively affected after a threshold of 26 percent growth rate. ROA significantly increases the ratio of accounts receivable to accounts payable, meaning that more profitable firms have more claims in relation to liabilities than less profitable firms do.

The relationship between price of debt (PD) and firm growth (in terms of either sales or assets) is non-linear, with negative linear and positive quadratic links. However, the model with PD as a dependent variable has an extremely low value of F-statistics and statistical insignificance as a whole. Clearly, large deficiencies exist in the model specifications (and perhaps also in the applied method), causing the insignificance of the model as a whole on the one hand and a very high adjusted R^2 on the other. Deeper investigation of the analysed ratio will be required in the future.

4.5. Relationship between growth and average revenue per employee

Table 5 shows that the relationship between growth and average revenue per employee (TRL) is linear and positive. However, the explanatory power of the model is weak since the model explains only 40 percent of the variability in revenue per employee, although the model is statistically significant as a whole. The relationship is statistically significant at the 5 percent level. The significance of the growth impact decreases when profitability in terms of ROA is included in the model. However, the results indicate that faster-growing firms can be expected to earn higher average revenues per employee.

4.6. Relationship between growth and relative break-even point

The relative break-even point, defined as the ratio of revenue to break-even revenue (RBER), does not seem to be influenced by growth rate in terms of either sales or assets. On the other hand, there is a significantly

positive linkage between RBER and ROA. In general, models with a relative break-even point are significant as a whole only when ROA is specified among the regressors; they tend to be completely insignificant otherwise. Firm growth is apparently not a determinant of relative break-even point.

4.7. Relationship between growth and the cost ratios

Table 6 presents the role of firm growth as a determinant of cost ratios. The analysed cost ratios are costs per employee (TCL), business costs per employee (BCL) and the ratio of total costs to total revenue (TCR).

TCL and BCL have no significant relationship with sales growth, but the models reveal that asset growth influences both of these ratios. In both cases, the model's explanatory power accounts for approximately 40 percent of the variability, with models being significant at negligible level. Total costs per employee are also significantly higher in more profitable firms, although the significance is weak; this does not hold for average business costs per employee.

Sales growth significantly influences the ratio of total costs to total revenue (TCR); the link is linear and positive, which means that firms with higher sales growth also have a higher ratio between costs and revenues. On the other hand, higher profitability in terms of ROA increases efficiency, leading to significantly smaller cost-to-revenue ratios. The model as a whole is statistically significant at a negligible level only when ROA is included among the explanatory variables.

4.8. Relationship between growth and measures of factor costs

Table 7 displays the results for the relationship between factor costs and growth. Price of labour (PRICEL) does not seem to be affected by either sales growth or asset growth, although the model as a whole is statistically significant and has a relatively large explanatory power (around 75 percent). This explanatory power derives mostly from the dummy variables, which is expected since wage policy is supposed to be firm- and industry-specific within the limitations imposed by the institutional environment. The effect of profitability on wage policy was not found to be significant either, which is in keeping with the fact that wages are costs and, as such, they do not depend on profitability.

The price of capital is defined in four different ways, as described above. All models are statistically significant at negligible risk with relatively high explanatory power. Regardless of the definition of the price of capital, profitability negatively affects capital price so, clearly, more profitable firms face a lower price of capital. The impact of sales growth is statistically significant only in the case of capital price PRICEK1 (the sum of depreciation and cost of financing relative to total capital)

Table 5. Fixed effects models for the dependence of revenue per employee on the growth rate and control variables

	GRtr	$GRtr^2$	ROA	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob > F
TRL				yes	yes	yes	0.3283	73.50	0.0000
	629.95**			yes	yes	yes	0.4000	49.21	0.0000
	518.92*		4970.9***	yes	yes	yes	0.4007	47.72	0.0000

Notes: *, **, *** denote statistical significance at 10.5 and 1 % level respectively

Table 6. Fixed effects models for the dependence of costs on the growth rate and control variables

	GRtr	GRfa	ROA	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob > F
TCL				yes	yes	yes	0.3089	78.62	0.0000
		–20.2886**	2328.36*	yes	yes	yes	0.3895	50.91	0.0000
BCL				yes	yes	yes	0.3236	79.57	0.0000
		–13.2844*		yes	yes	yes	0.4039	54.61	0.0000
TCR				yes	yes	yes	0.9721	0.75	0.8191
	0.1590***		–0.5098***	yes	yes	yes	0.6188	2.18	0.0006

Notes: *, **, *** denote statistical significance at 10.5 and 1 % level respectively

Table 7. Fixed effects models for the dependence of factor prices on the growth rate and control variables

	GRtr	GRtr^2	ROA	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob>F
PRICEL				yes	yes	yes	0.7794	2122.5	0.0000
	–4.5663			yes	yes	yes	0.7515	1299.0	0.0000
	–5.7965		55.077	yes	yes	yes	0.7515	1247.2	0.0000
PRICEK1				yes	yes	yes	0.4922	1.13	0.2987
	0.0073***		–0.1542***	yes	yes	yes	0.7718	60.11	0.0000
	0.0007	0.0002***	–0.1523***	yes	yes	yes	0.7724	58.88	0.0000
PRICEK2				yes	yes	yes	0.6870	2.02	0.0016
PRICEK3				yes	yes	yes	0.5908	0.89	0.6227
	0.0629***		–1.3405***	yes	yes	yes	0.8522	184.90	0.0000
	0.1711***	–0.0032***	–1.3711***	yes	yes	yes	0.8569	194.13	0.0000
PRICEK4				yes	yes	yes	0.3271	0.16	1.0000

Notes: *, **, *** denote statistical significance at 10.5 and 1 % level respectively

and PRICEK3 (the difference between total cost and cost of labour relative to total capital). In the case of PRICEK1, the link is linear and positive, and the quadratic term was not statistically significant. Sales growth and PRICEK3 are related non-linearly, with a positive linear link and a negative quadratic link, meaning that firms with faster-growing sales generally face a higher price of capital. However, the marginal effects of sales growth on capital price are decreasing; the relationship turns over at a sales growth rate of 26 percent, so the relationship between price of capital and growth rate is positive at sales growth of 26 percent or more.

For PRICEK2 and PRICEK4, sales growth does not significantly impact on the capital price. In fact, there is a statistically significant linkage of these two ratios to asset growth. This significance, however, derives from the PRICEK2 and PRICEK4 definitions themselves and, as such, cannot be a foundation for any firm conclusion about the relationship between growth and these two ratios.

4.9. Relationship between growth and the productivity and efficiency measures

Finally, Table 8 shows the relationship between growth and the productivity measures. The impact of growth on its capacity utilization (CU), productivity of labour (PRODL) and value-added per employee (VAL) is not statistically significant, but all of the ratios reveal significant dependence on asset growth.

The relationship of labour productivity (PRODL) with asset growth is negative and linear, so employees in more investment-oriented firms are likely to be less productive compared to those in firms with slower asset growth. On the other hand, the analysis shows a significantly positive link between labour productivity and profitability in terms of ROA. Very similar conclusions can be drawn about value-added per employee (VAL). The linkage between utilization of production capacities (CU) and asset growth is significant and strong.

However, since this relationship derives from the definition of CU itself, the relationship can be taken only as a statistical dependence, not as an indicator of any economic relationship.

4.10. Relationship between growth and firm size and industry membership

Each of the models presented in Tables 2 to 8 include dummy sets regarding firm size, industry membership and time. The statistical (in)significance of the estimated dummy variables' regression coefficients establish whether the investigated ratios are specific to firm size, industry-specific or time-specific. Table 9 reports the (in)significance of dummy variables from results obtained by running fixed effects regressions for the analysed ratios.

Out of the 24 financial and non-financial ratios and measures we analysed, one or more of the size dummy regression coefficients are significant for 9 ratios. Only price of labour (PRICEL) is significantly different for all four size classes of firms, with price of labour highest in the micro-firms and lowest in the largest firms. For the other ratios with significant size dummy coefficients, small (and sometimes medium-sized) firms are usually the ones that have significantly different values in the ratios in comparison to other size classes.

Table 8. Fixed effects models for the dependence of capacity utilization and productivity on the growth rate and control variables

	GRa	GRa^2	ROA	Dummy size	Dummy industry	Dummy year	R^2 adj.	F-stat	Prob > F
CU				yes	yes	yes	0.5964	0.22	1.0000
	–0.7370***			yes	yes	yes	0.5226	7.62	0.0000
	–0.7371***		6.9154	yes	yes	yes	0.5225	7.34	0.0000
	–2.4770***	0.0007***		yes	yes	yes	0.5293	12.32	0.0000
	–2.4776***	0.0007***	7.3984	yes	yes	yes	0.5293	11.87	0.0000
PRODL				yes	yes	yes	0.3128	77.69	0.0000
	–20.1749**			yes	yes	yes	0.4011	52.49	0.0000
	–20.1781**		3470.83**	yes	yes	yes	0.4015	50.67	0.0000
VAL				yes	yes	yes	0.2439	204.90	0.0000
	–823.15***		90095.5***	yes	yes	yes	0.1810	132.80	0.0000

Notes: *, **, *** denote statistical significance at 10.5 and 1 % level respectively

Table 9. Significance of included dummy sets

Ratio	Size dummy	Industry dummy set	Time (year) dummy set
ROA	not sig.	not sig.	sig.
ROE	not sig.	not sig.	not sig.
ROS	not sig.	not sig.	sig.
CULI	sig. “small” and “medium”	sig. NACE 17 and 19	sig.
QUICKL	sig. “small”	not sig.	sig.
DTK	not sig.	not sig.	not sig.
DIS	not sig.	sig. NACE 19	not sig.
DSO	sig. “large”	not sig.	sig. year 2005
DPO	not sig.	sig. NACE 18	sig.
ARAP	not sig.	sig. NACE 17	sig. year 2004
PD	not sig.	sig. NACE 17	sig.
TRL	sig. “small”	not sig.	sig.
RBER	not sig.	not sig.	not sig.
TCL	sig. “small”	not sig.	sig.
BCL	not sig.	sig. NACE 30	sig.
TCR	not sig.	not sig.	sig.
PRICEL	sig.	sig. NACE 30 and 32	sig.
PRICEK1	sig. “small”	not sig.	sig.
PRICEK2	not sig.	not sig.	not sig.
PRICEK3	sig. “medium”	not sig.	sig.
PRICEK4	sig. “small”	not sig.	not sig.
CU	not sig.	not sig.	not sig.
PRODL	not sig.	not sig.	sig.
VAL	not sig.	not sig.	sig. year 2005

Small firms, for example, have a 0.07 higher current liquidity ratio (CULI), an almost 13,000-EUR lower cost per employee (TCL) and a more than 14,000-EUR lower revenue per employee (TRL) in comparison to micro-firms. Large firms are significantly different from other size classes in average collection period (days sales outstanding – DSO); the average collection is 20 days shorter that that of micro-firms.

Estimates of the industry dummy variables' regression coefficients are rarely significant. This has several possible explanations. First, the values of the ratios might not be industry-specific, which is doubtlessly true for some ratios that are expressed in terms of industry average (relative break-even point, capacity utilization ratio, etc.). Second, the insignificance of the industry dummy variables might be due to the classification of firms into industries based upon statistical standards, that is, according to the firms' primary business activities and according to the "production principle".

Third, firms within 3-digit NACE industries might be too heterogeneous in terms of production process, technology, and buying and selling markets to show any industry-specific effects. Nevertheless, as Table 9 shows, the ratios and measures are significantly different in some industries from those in other industries. These industries belong to the labour-intensive manufacturing sector (NACE 17 and NACE 18 – Manufacture of textiles and textile products and NACE 19 – Manufacture of leather and leather products) and to the sectors that produce computers and audio-video equipment (NACE 30 – Manufacture of office machinery and computers and NACE 32 – Manufacture of radio, television & communication equipment & apparatus).

The time dummy regression coefficients are significant for 13 out of the 24 ratios and measures we analysed and significant for at least some years for another three. We expected the time dummies to be significant for ratios that are influenced by price movements. We were more surprised by the significance (negative) of the time dummies in the models with liquidity ratios (CULI and QUCKLI), days sales outstanding (DSO), days payables outstanding (DPO) and the ratio between accounts receivable and accounts payable (ARAP) as dependent variables. These results indicate that manufacturing firms' ratios and measures are influenced by changes in the business environment and that liquidity and payment discipline are increasing in Slovenian manufacturing firms.

5. Conclusions

The results of the analysis indicate that profitability, liquidity, "current assets," average revenue per employee, cost, price of capital, and productivity are related to firm growth in the Slovenian manufacturing industry. On the other hand, no such relationship was found between firm growth and return on equity, solvency, price of debt, relative break-even point or cost of labour. Thus, managers and entrepreneurs may find some ratios and measures can be useful in decision-making, while others are not. The break-even point appears to be an unreliable managerial tool for planning and analysing the growth of the firm, and labour cost is not influenced by profitability.

Among those ratios and measures that are influenced by firm growth there are large differences. Higher firm growth leads to higher average revenue per employee, total costs-to-total-revenue ratio, and price of capital, and to lower costs per employee, business costs per employee, labor productivity and value-added per employee. Some measures of business performance have typical minimum and maximum values; for example, return on assets increases with firm growth at a declining rate until it reaches the threshold of about 30 percent growth rate, and return on sales increases with growth at a declining rate until it reaches the threshold of about 40 percent growth rate. The current liquidity ratio reaches its minimum value at an average growth rate of 25 per cent, and the quick liquidity ratio does so at 35 percent. Some measures have thresholds, such as the inventory in stock ratio, the average days payables outstanding, the average collection period, and the ratio of accounts receivable to accounts payable, which reach their minimum values at around 22 percent, 22 percent, 20 percent, and 26 percent of growth rate, respectively. On average, faster-growing firms face a higher price of capital than slower-growing firms do, and capital price reaches its maximum value at about a 26 percent growth rate.

These findings suggest that, if a firm grows relatively quickly, it must make decisions that will increase revenue per employee and profitability, and lower employee costs. However, higher growth is also related to lower productivity and lower capacity utilization, indicating that production is organized in a less efficient manner when firms are trying to grow faster, resulting in a higher cost of capital. Higher growth (25-35 percent, including inflation) decreases the liquidity ratios but increases the inventory turnover and decreases the number of days that credit sales remain in accounts receivable. If a firm's growth rate is larger

than 35 percent, the average revenue per employee will increase and the cost per employee, the productivity, and capacity utilization will decrease. However, when a firm is growing faster, buyers of its products and services need more and more days to pay their bills, which increases accounts receivable and, consequently, the liquidity ratios and the number of days of inventory on hand. A fast-growing firm is also less and less able to deal with the high costs of capital that are crucial for its growth.

The influence of firm growth on labour cost and cost of debt indicates that relatively high growth is not associated with increasing prices of these factors because of a higher demand for production factors. Thus, firm growth does not affect production factors' markets to the extent at which it would influence their prices.

The analysis found no relationship between firm growth and solvency and return on equity. Because both solvency and return on equity are important indicators of the owners' position in a firm, this result shows that the position of an owner might not depend on the firm's speed of growth. A general conclusion is that owners do not benefit from higher growth rates from either the point of view of return on investment or from the ownership security point of view, despite the fact that higher growth increases profitability.

Measures of productivity and capacity utilization are not related to sales growth, but they are related to asset growth. Because sales growth is a reflection of short-term firm growth, and asset growth is a reflection of long-term firm growth, productivity and capacity utilization are, to a large extent, influenced by investments that increase growth and by the capital-labour ratio, which indicates that technology tends to be employed in fast-growing firms. More investment-oriented firms have lower productivity than less investment-oriented firms do because the investment-oriented firms are increasing the number of employees and other variable production factors very quickly in the short run, which decreases their capital-to-labour ratio. This finding is reasonable because labour cost is independent of sales growth, while the cost of capital depends on sales growth at an increasing rate. For this reason, the price of capital increases relative to labour cost as a firm grows faster in the short run, which leads to long-run growth that is oriented toward less capital-intensive production. However, if a firm's growth is very high, it must increase utilization of capital employed.

Using performance ratios for managerial decision-making generates two important questions: i) Are performance ratios comparable on the industry level or on the level of manufacturing sector as a whole? ii) Is the size structure of the economy or industries important for making decisions based on information about performance ratios? The results of the study indicate that, in the decision-making process, managers should first consider differences in labour cost, which is higher in small firms and lower in large firms. In addition, while large firms (in terms of number of employees) are less efficient at collecting accounts receivable than small firms are, small firms have lower liquidity, lower revenue per employee and lower costs per employee. Only a few of the performance ratios we analysed appear to be industry-specific; industry membership of a firm is important in the case of labour cost, the current liquidity ratio, days inventory in stock, days payables outstanding, the ratio of accounts receivable to accounts payable, the cost of debt, and business cost per employee. Therefore, managers should take into consideration the characteristics of their industry and their rivals when making business decisions related to these ratios and measures.

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