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Profitability and Efficiency of Forest Contractors in Slovakia—Comparison of Mountain and Lowland Regions

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Received: 19 February 2020; Accepted: 24 March 2020; Published: 26 March 2020

Abstract: The paper deals with analysis of the forest business sector in Slovakia and the evaluation of profitability and efficiency of forest contractors, with special focus on mountain and lowland regions. Evaluation of profitability was done by using selected indicators of financial analyses for a period of five years. Data envelopment analyses (DEA) was used as non-parametric approach for the assessment of efficiency. The sample size was 153 forest contractors. Data for 2012–2016 were processed. Results of the evaluation show that the profitability of Slovak forest contractors in the mountain regions is higher than the profitability of forest contractors in lowland regions. The results of the efficiency analysis were different due to the nature of the method; where relative efficiency was evaluated, the efficiency of single contractors was compared with the most efficient contractors from the lowland regions. Most of the evaluated units were, according to results of the efficiency analysis scale, ineffective, which implies that it may be beneficial for most contractors to reduce their turnover and thereby increase their relative efficiency. The results of the financial analysis also suggests that contractors have obsolete technical and technological equipment.

Keywords: forest contractors; financial analysis; profitability; efficiency; data envelopment analysis

1. Introduction

Competitive pressure and current globalization are forcing enterprises to reduce costs and increase efficiency of all production activities. The same applies to forestry. Requirements to increase efficiency in all sectors is leading even profit and non-profit organizations to cease to carry out some activities internally. Specialized organizations providing management services have been established. They specialize in the services and are able to perform them more efficiently and in higher quality. Outsourcing means a relationship of a company with external service provider for activities that would otherwise have been performed in-house, by own employees. Activities previously performed internally are transferred to an independent organization. In last four decades, business community has been interested in outsourcing more and more mainly due to increased importance of outsourcing task as a strategic management tool.

In forest management, a business sector providing forestry-related services (such as silviculture, timber harvesting, transport) to forest owners was created as well. Today the vast majority of forestry operations in Europe are performed by forestry contractors. Forestry services are mainly carried out by small and medium-sized enterprises, which employ up to 50 workers [1]. It results from the outsourcing theory that activities, which are non-core business of the enterprise, are usually bought as a service from external contractors. However, in case of forestry, main production activities e.g., silviculture and timber harvesting [2] in many European countries are carried out externally, by forestry contractors [3–6]. It is a peculiarity of this market, which is related to the specifics of forestry production.

Other reasons are e.g., the non-affordable investments in machineries and equipment and to the size of the owned land. The transition to contracting services in silviculture and timber harvesting out to private entrepreneurs has been one of the ways of costs reduction in forest management during last years. The creation of the business sector in the Slovak Republic began with the formation of ownership and use rights to forest land after 1990, therefore the forestry services market in Slovakia is relatively young. Nowadays in Slovak forestry, more than 90% of silvicultural and felling operations is carried out externally [7].

Discussion on and research of outsourcing started at the beginning of the 80s of the last century. This research primarily deals with the economic and financial analyses of forestry contractors. Mäkinnen [8] evaluated profitability of the timber transport business in Finland. In the study, he compared the situation before and after deregulation. Rummukainen et al. [9] presented in their paper challenges for forestry contractors in Finland, Germany, Poland and Romania. Penttinen et al. [10,11] analyze financial situation of wood harvesting contractors and economic prerequisites of forest machine enterprises. Soirinsuo [12] dealt with the growth and profitability of logging companies in Finland. He focuses on strategies needed for profitable growth more in detail. In recent years, also, researchers in Slovakia and Czech Republic have begun to deal with this issue in the field of forestry and wood industry. Paluš et al. [13,14] present knowledge on services market in Slovakia in terms of contractors providing silvicultural and felling operations and their customers. Based on case studies, they identify specifics of contracted services and factors influencing decision-making about services. Comparison of outsourced forest operations in Finland and Slovakia was realized by Ambrušová and Marttila [15]. Šmída and Dudík [16] quantified and analyzed the number of business entities currently operating in forestry sector in the Czech Republic. Profitability of forestry companies in the Czech Republic by indicators of financial analyses assessed Leva et al. [17].

The aim of this work was an analysis of business sector in Slovakia and evaluation of profitability and efficiency of forest contractors with special focus on mountain and lowland regions. Evaluation of profitability was done by using selected indicators of financial analysis for a period of five years. Efficiency was evaluated by non-parametric method— data envelopment analysis.

2. Materials and Methods

In our research, I focused on profitability and efficiency analysis of companies, mainly Limited Liability Companies in the forestry service sector in Slovakia. I focused on contractors with this legal form because of availability of economic and financial data. In 2017, 1293 companies and 10,272 self-employed persons have been operated in the forestry sector [18]. Turnover of the business sector in Slovak forestry is in the amount of around 470 million EUR [19].

2.1. Data Sources

Data of selected contractors for financial and efficiency analysis were obtained from public register of financial statements. Totally a sample of 153 contractors (with main economic activities SK-NACE 02, which is Forestry and logging) was created and processed data for period of six years. To avoid the extreme values in the single years, the five-year averages from 2012 to 2016 were calculated for each variable. The value variation was eliminated through the calculation of the mean. The sample was divided into two subsamples: contractors from mountain regions (n = 126) and contractors from lowland regions (n = 27) according to the definition of mountain regions by Nižnanský [20]. Contractors from following NUTS III (according to the common Nomenclature of Territorial Units for Statistics, which is a geocode standard for referencing the subdivisions of countries for statistical purposes developed by European Union and thus only covers the member states of the EU in detail [21]) regions were in the first group: SK022 Trenčín region, SK031 Žilina region, SK032 Banská Bystrica region, SK041 Prešov region and SK042 Košice region. In the second group were contractors from following NUTS III regions: SK010 Bratislava region, SK021 Trnava region and SK023 Nitra region. Main features of variables included in the financial analysis are reported in Table 1.

Table 1. Main features of variables included in the financial analysis (€).

Variable	Mean	Standard Deviation	Min	Max
Mountain Regions				
Total revenues	734,778	1,952,554	0	16,080,719
Production	431,098	952,520	0	10,057,800
Total cost	720,431	1,903,582	130	15,094,779
Production consumption	415,866	977,952	130	9,473,421
Profit/Loss	14,347	86,864	−482,196	1,219,538
Total assets	281,064	688,661	−4779	8,199,809
Shareholders' equity	95,131	315,716	−293,629	4,333,601
Lowland Regions				
Total revenues	320,362	444,252	0	2,925,015
Production	247,717	373,259	0	2,876,080
Total cost	315,315	439,222	42	2,877,647
Production consumption	211,099	312,972	42	2,798,480
Profit/Loss	5048	21,186	−89,539	94,957
Total assets	179,286	268,781	0	1,758,632
Shareholders' equity	39,247	109,761	−128,889	651,398

Where: Total revenues include all revenues and incomes; Production includes revenue from sale of own products and services, changes in internal inventory and own work capitalized; Total cost include all cost and expenses; Production consumption includes consumed raw materials, energy consumption and consumption of other non-inventory supplies; Total assets include non-current assets, current assets and accruals; Shareholder's equity include share capital, capital funds, funds created from profit, net profit/loss of previous years and net profit/loss for the accounting period after tax.

2.2. Indicators of Financial Analysis

Financial management is based on financial analysis of the business performance. Profitability indicators of financial analysis were chosen to assess the financial position of the forest contractors. The following indicators of financial analysis have been selected: return on equity, return on assets, return on capital employed and profit margin.

Return on equity (ROE) shows the return of the invested capital. This indicator shows how the resources invested in the company were valorized. ROE is expressed by the following ratio:

$$\mathrm{ROE} = \frac{profit\ after\ taxation}{equity} \tag{1}$$

Return on assets (ROA) shows the total efficiency of business. ROA is expressed by the following ratio:

$$\mathrm{ROA} = \frac{P + I\ (1 - T)}{total\ assets} \tag{2}$$

where: P: profit after taxation; I: interest expenses; T: income tax rate.

Return on capital employed (ROCE) is a financial ratio that measures profitability of the employed capital. Computing of ROCE requires to calculate EBIT—earnings before interest and tax and capital employed. ROCE is expressed by the following ratio:

$$ROCE = \frac{EBIT}{equity + L + D} \tag{3}$$

where: $EBIT$: earnings before interests and tax = operating income; L: long-term liabilities; D: long-term bank loans

Profit margin (PM) is a profitability ratio calculated as net profit divided by sales. PM is expressed by the following ratio:

$$\mathrm{PM} = \frac{profit\ after\ taxation}{sales} \tag{4}$$

2.3. Efficiency Analysis

Efficiency of forest contractors was evaluated by data envelopment analysis (DEA). The DEA approach was developed by Charnes et al. [22] being called Charnes-Cooper-Rhodes (CCR) model. This model produces an efficiency frontier based on the concept of Pareto optimum under the assumption of constant return to scale. Later, Banker et al. [23] developed the Banker-Charnes-Cooper (BCC) model that produces variable returns to scale efficiency frontier to measure the technical efficiency. DEA is nonparametric efficiency measurement technique based on linear programing methods [24], and is a widely accepted application of Pareto optimality, which considers the estimates of the relative efficiency of decision-making units [25]. Generally speaking, an input-oriented or an output-oriented model may be used to estimate relative efficiencies in the DEA model. Input orientation refers to the calculation of possible and simultaneous reductions of percentages for each input at a given output level, while output orientation refers to calculation of possible and simultaneous increased percentages for each output at a given input level [25]. DEA shows several advantages [26]. First, DEA allows handling multiple inputs and outputs (with different units) in a noncomplex way. Second, DEA does not require any initial assumption about a specific functional form linking inputs and outputs. In contrast, DEA results may be affected by the influence of external data, the deterministic environment and the sensitiveness to measurement error [26].

The input orientated CCR model (1) was formulated as follows [22,27]:

$$\begin{gathered} \max p_1 y_{1,o} + \ldots + p_n y_{n,o} \\ \text{subject to: } c_1 x_{1,o} + \ldots c_m x_{m,o} = 1 \\ p_1 y_{1,k} + \ldots + p_n y_{n,k} - c_1 x_{1,k} - \ldots - c_m p_{m,k} \leq 0 \ (k = 1 \ldots s) \\ c_1, c_2, \ldots c_m \geq 0 \\ p_1, p_2, \ldots p_n \geq 0 \end{gathered} \tag{5}$$

The input orientated BCC model (2) has following form [23,27], where $\boldsymbol{p_o}$ is the variable allowing identification of the nature of the returns of scale:

$$\begin{gathered} \max p_1 y_{1,o} + \ldots + p_n y_{n,o} - p_o \\ \text{subject to: } c_1 x_{1,o} + \ldots c_m x_{m,o} = 1 \\ p_1 y_{1,k} + \ldots + p_n y_{n,k} - c_1 x_{1,k} - \ldots - c_m p_{m,k} - p_o \leq 0 \ (k = 1 \ldots s) \\ c_1, c_2, \ldots c_m \geq 0 \\ p_1, p_2, \ldots p_n \geq 0 \end{gathered} \tag{6}$$

where: y—outputs, p—weights associated with outputs, x—inputs, c—weights associated with inputs, m—number of inputs, n—number of outputs, p_o—variable allowing identification of the nature of the returns of scale, s—number of evaluated units.

In the proposed model, the following input variables were included in the analysis: I1—cost of goods, I2—production costs (material and energy costs and service costs), I3—personnel costs, I4—other costs and O1 outputs—total revenues. The choice of input variables was made with respect to the main cost categories and to create as few number of input variables as possible because in case of high number of input/output variables, DEA shows the efficiency of a high number of evaluated units, which is the main disadvantage of this method.

The calculation of the efficiency of forestry contractors was carried out through the software EMS: Efficiency Measurement System version 1.3 [28].

3. Results

Profitability depends on both the revenue generated and the structure of the assets of the contractors, therefore the structure of revenues and costs as well as the structure of assets and consequently the profitability indicators were analyzed.

3.1. Revenues and Cost Structure

They are differences in the revenues and cost structure of contractors in mountain regions on one side and contractors in the lowland regions on other side. Revenues from the providing of forestry services, as the main activity, have the share of 55% of the total revenues of contractors in mountain regions and even 72% of the total revenues of contractors in lowland regions. It means, that contractors in mountain regions conduct trade activities (mainly buy wood on the stump and after harvesting sell logs) to a higher extent than contractors in lowland regions of Slovakia. With this fact related, that 85% of added value is created in sales (Table 2).

Table 2. Revenue and cost structure of contractors (mean for 2012–2016).

Variable	Mountain Regions		Lowland Regions	
	€	%	€	%
Total revenues	**87,585,558**		**8,713,885**	
Revenue from the sale of merchandise	37,211,789	42.49%	2,227,143	25.56%
Production	48,541,612	55.42%	6,242,460	71.64%
Total cost	**85,875,389**		**8,576,578**	
Cost of merchandise sold	30,263,152	35.24%	1,210,311	14.11%
Production consumption	47,325,507	55.11%	5,488,574	63.99%
Personnel expenses total	2,951,277	3.44%	1,155,518	13.47%
Depreciation	2,751,831	3.20%	450,530	5.25
Interest expense	234,156	0.27%	64,291	0.75%
Added value	**8,164,742**		**1,770,719**	
Added value of sale	6,948,637	85.11%	1,016,833	57.42%
Added value of production	1,216,105	14.89%	753,886	42.58%

3.2. Assets and Liabilities Structure

Asset structure significantly influence company growth and profitability. The total assets of the contractors are 38% (mountain regions), respectively 56% (lowland regions) of annual returns, suggesting their low capitalization. Contractors from lowland regions have higher share of fixed assets than contractors from mountain regions as well as higher share of liabilities (Table 3).

Table 3. Assets structure of contractors (mean for 2012–2016).

Variable	Mountain Regions		Lowland Regions	
	€	%	€	%
Total assets	**33,502,810**		**4,876,589**	
Fixed assets	13,238,145	39.51%	2,228,800	45.70%
Current assets	19,923,250	59.47%	2,568,278	52.67%
Equity	11,339,662	33.85%	1,067,525	21.89%
Liabilities	21,574,911	64.40%	3,780,283	77.52%

3.3. Profitability of Forest Contractors

Profitability of forest contractors was evaluated by ratio indicators of the financial analyses. Values of single profitability indicators for the five-year period are presented in Table 4. Contractors from mountain regions were more profitable based on the results of all indicators of the financial analysis.

ROE in the amount of 50%, respectively 39% shows a very high return of capital invested by company owners and high valorization of the resources invested in the company. Similar results show the indicator ROCE—which indicates that contractors use long-term capital—at a low level. This fact suggests the undercapitalization of contractors and their lack of technical and technological equipment.

The profitability of business of contractors in mountain regions—expressed by ROA—is higher than efficiency of contractors in lowland regions. This is due to higher business efficiency on the one hand, and lower asset value on the other hand. It could be a topic of discussion, whether it is sustainable in the long term.

Profit margin measures how much out of every euro of sales a company actually keeps in earnings. In case of contractors from mountain regions it was 1.27% and 0.76% in case of contractors from lowland regions. Values of this ratio indicator are low and point to the bad situation of contractors in Slovakia.

The results of the financial analysis are affected by the total value of assets, which is very low compared to the total revenues they achieve annually, as well as contractors' property structure. The results of the financial analysis also point to the fact that contractors have obsolete technical and technological equipment and invest less in their equipment.

Table 4. Profitability of contractors (mean for 2012–2016).

Indicator	Mountain Regions	Lowland Regions
Return on equity	49.59%	39.06%
Return on assets	3.81%	2.34%
Return on capital employed	36.46%	30.12%
Profit margin	1.27%	0.76%

3.4. Efficiency of Forest Contractors

The average efficiency assuming a constant return to scale was 63.48%, only 1.8% of the evaluated units were effective. Assuming variable return to scale, the average efficiency was 79.92% and 12.1% of the evaluated units were effective (Table 5). As stated e.g., Bogetoft et al. [29], Nyrud and Baardsen [30], Sekot and Hoffmann [31], this assumption of return to scale is less discriminatory and the boundary curve better encircles the production possibilities of forest land management. In general, obtained results of the evaluation have shown that the efficiency of forest contractors in the mountain regions is lower than the efficiency of forest contractors in other Slovak regions. These results are the opposite of the profitability analysis.

Table 5. Efficiency of contractors by the data envelopment analysis (mean for 2012–2016).

Indicator	Mountain Regions	Lowland Regions	Total
CCR model	63.19%	64.75%	63.48%
BCC model	79.67%	81.04%	79.92%

By comparing the efficiency under the assumption of constant return to scale and the efficiency under the assumption of variable return to scale, we can determine the scale efficiency. In this case, most of the evaluated units were scale ineffective—98.1% of the evaluated units. Most of them (94.7%) operate in the field of decreasing return to scale and only 3.4% of them operate in the field of increasing return to scale. This implies that it would be beneficial for most contractors to reduce their turnover and thereby increase their relative efficiency.

4. Discussion

After restitution of forest properties, many forest owners have been unable—due to significant undercapitalization—to effectively manage their forests. Market economy and social changes have

opened up spaces for entrepreneurial activity in forestry and allowed the creation of new businesses in Slovak forestry. Another significant driver for the development of the business sector in Slovak forestry has been the transition of the largest forest enterprise in the Slovakia State Forest to the outsourcing of forestry services. The transition in State forest enterprise was realized in a relatively short time. There was insufficient time to form the labor market. Most of the company's employees have been moved to the external environment and became business partners of the company [32]. These facts result in a weakly developed business sector in Slovakia's forestry sector, which is undercapitalized and low competitive. The total value of assets of the contractors are around 40% of value of annual returns. The situation is worse in mountainous areas. All these aspects influenced the results of financial analysis of the contractors.

Forestry is one of the sectors of the economy with high accident rate and morbidity [18]. It is caused by the nature of the work in the forests, the climatic conditions of the workplaces, the terrain and the influence of the technique. Given these facts and the conditions in the labor market, the form of self-employed persons and small businesses with a minimum number of employees prevails in forestry.

There are differences in revenue and cost structures between contractors in mountain areas and lowland areas. Contractors in mountainous areas have a higher share of revenues from trade activities than contractors from lowland areas, which may mean that the worse production conditions (steeper slopes, lower density of forest roads) compensate for the diversification of activities, in particular towards commercial activities.

This fact probably also affects the structure of assets, where there are also differences between contractors from mountain areas and contractors from lowland areas. Contractors from lowland regions have a higher share of fixed assets than contractors from mountain regions—as well as higher share of liabilities—that is likely to be associated with a greater diversification of activities towards business activities for contractors in mountain areas.

Higher diversification of activities and focus on business activities also affected the profitability of individual contractors. In some countries, forest logging operations tend to become part of a set of land management activities based on multi-service companies, a situation that is quite radically changing the sector's organization. A part-time working organization has relevant impacts on overall profitability and efficiency of the sector. Profitability of business of contractors in mountain regions, expressed by ROA, is higher than efficiency of contractors in lowland regions. This is due to higher business efficiency on the one hand and lower asset value on the other hand. It could be a topic of discussion, whether it is sustainable in a long time or not.

In general, the profitability of forest contractors was higher in rural and less developed regions than in industrial centers such as Bratislavský, Trnavský or Košický region. This is probably related to labor availability and labor costs, which are different in less developed regions and in industrial centers.

The results of the efficiency analysis by non-parametric methods were different, due to the nature of this method, where relative efficiency is evaluated, it means that efficiency of single contractors is compared with the most efficient contractor, who were from lowland regions. There are a few contractors that are relatively highly efficient; on the other hand, most service providers achieve average and below-average levels of relative efficiency, which is probably related to the aforementioned forestry market problems in Slovakia.

Most of the evaluated units were according to results of the efficiency analysis scale ineffective, which implies that it would be beneficial for most contractors to reduce their turnover and thereby increase their relative efficiency. This is probably related to the nature of the forestry services market in Slovakia, where in particular commercial companies get a larger contract from the forest manager and divide it among subcontractors. Efficiency analysis through the DEA method has shown that this is not an effective way of business strategy and in most of the evaluated subjects, a reduction in turnover would bring their higher efficiency. Scale efficiency can be largely influenced by the so-called one-man business companies, which are due to tax and levy aspects aimed at maximizing profit, which after tax

is the income of the business owner. These entities show a high efficiency at a relatively low turnover and thus create a highly effective reference framework for other entities.

Forestry contractors in Slovakia are insufficiently equipped with modern technologies. The main causes of this problem are high purchase costs and lack of funds for their renewal, which results in lower quality of provided services and lower added value. The low level of innovation investments—despite the high innovation potential in the sector—is also confirmed by Štěrbová [33] and Štěrbová et al. [34]. Staník [32] also confirms that contractors work with machines they bought or rented from state enterprise forests in 2003 and 2004, and that the renewal of these machines is very rare. Forestry contractors who have received support on technology e.g., from the Rural Development Program of the Slovak Republic from 2014–2020 were therefore probably more efficient.

The main problems of the forestry services market in Slovakia are mainly low prices for the work provided, lack of skilled workers in the labor market (mainly due to low wages and demand for labor in other sectors), preference of contractors according to the price offer regardless of the quality of the performed services, insufficient support from the state, especially when there is a need to make specific investments. It can be stated that the forestry services market in Slovakia is in crisis.

In the future, we can expect increasing environmental pressure on the forestry services market and the related increase in the prices of work performed. As one of the possible solutions to the above-mentioned problems and also to increase the efficiency of forest contractors is the sale of wood on the stump by forest owners to a greater extend. At present, the share of wood sales on stump is only around 3 to 5% of the total sales of raw wood in Slovakia [35]. Some forest owners have the problem with outsourcing of harvesting activities and sale wood on stump. On the other side, contractors can better organize the logging process and the sale of raw timber. This issue would enable contractors to generate higher added value and thus increase their efficiency. Another possibility of increasing the efficiency of service providers is the diversification of activities, in which contractors would expand the portfolio of services e.g., providing services in agriculture, or in rural tourism. Of course, the efficiency of some contractors has already been affected by this fact; it was not possible to evaluate the available data.

5. Conclusions

To determine the profitability and efficiency of business sector in Slovakia was the main aim of this study. Based on the results of financial and efficiency analysis, the following statements can be concluded, as follows:

- There are great differences in profitability among contractors from mountain regions and contractors from lowland regions; it is caused by different share of trade activity, different labor costs in lowland and mountain regions and production conditions.
- Profitability of forest contractors in general depends on trade activity. Based on vertical analysis of financial data, we found that 85%, respectively 57% of added value is created by trading activities. In other words, contractors who had a higher share of income from trade activities were more efficient and profitable.
- The results of the financial analysis also point to the fact that contractors have obsolete technical and technological equipment and invest less in their equipment.
- The efficiency analysis showed different results, due to the nature of this method. Most of the evaluated units were according to results of the efficiency analysis scale ineffective, which implies that it would be beneficial for most contractors to reduce their turnover and thereby increase their relative efficiency.
- Contractors from mountain regions have lower share of personal cost on total costs as well as lower share of fixed assets on total assets; this indicates that they use other companies and self-employed persons as sub-contractors.

- Contrariwise contractors from lowland regions have much higher share of personal cost on total costs as well as higher share of fixed assets on total assets; it indicates that they invest more in the equipment and employ more employees.
- The efficiency of forest management in Slovakia is largely dependent on the efficient outsourcing of forestry services. The providing of forestry services at the lowest possible prices and with insufficient technological equipment is probably reflected in the profitability and efficiency of forest contractors and is not long-term sustainable.
- In order to improve the situation of forest contractors, a number of measures need to be implemented, such as support the purchase of new and modern technology, nature-friendly forest management, diversification of activities and others from public funds. The situation is comparable in both mountain and lowland regions of Slovakia. It may also be necessary to change the business model of forest management and to sell wood on the stump to a greater extent.

Funding: This research was funded by the Slovak Research and Development Agency, grant number *APVV-15-0487* Research on efficiency of forestry services outsourcing.

Conflicts of Interest: The author declares no conflict of interest. The funder had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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