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Efficiency Analysis of Restaurants in a Small Economy after the Implementation of Fiscal Cash Registers: The Case of Slovenia

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Background and purpose: The aim is to analyse the efficiency of small and medium-sized (SMEs) restaurant enterprises in Slovenia after the government's implementation of fiscal cash registers in January 2016. Strict financial supervision and the introduction of fiscal cash registers resulted in increased officially registered sales revenues, higher taxes, and more available and reliable financial data. No previous study has analysed restaurants' efficiency in the country, as, due to fiscal malpractice, accounting data have not provided a reliable source for accurate efficiency evaluation.
Design/Methodology/Approach: Efficiency was assessed using Data Envelopment Analysis (DEA), based on secondary-financial data provided by the national tax authorities. Data were gathered from 142 independently run restaurant SMEs in 2017.
Results: The average efficiency score of Slovene restaurant SMEs is 85%, which indicates that, on average, restaurants have to increase their efficiency level by 15% in order to improve their efficiency according to the most efficient (best-performing) units under comparison. Our research results indicate a relatively successful and comparable level of efficiency performance in comparison to those found in previous international studies. The results also reveal that the patterns of conducting business operations in terms of efficient management are relatively similar across the restaurant sector. Surprisingly, in terms of determining the influence of different groups of operational variables on restaurants' efficiency performance, the research results indicate that only operational financial variables (costs of goods sold, labour costs, and depreciation) influence efficiency performance, while managers' demographic characteristics (gender, age, education, years of experience) and restaurants' physical characteristics (size, number of competitors, location) have no statistically significant influence on restaurants' efficiency in achieving net sales revenues.
Conclusion: Secondary-financial data represent a valuable source of information for restaurant companies' efficiency analysis. The use of selected variables enables an internationally comparable benchmarking process and facilitates the improvement of restaurants' efficiency performance. It is suggested that future research include longitudinal data and focus on the systematic analysis of other variables (e.g., managers' psychographic characteristics) that might influence restaurants' efficiency performance.

Keywords: *DEA; efficiency measurement; restaurant industry; Slovenia*

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1 Introduction

This study analyses the productive efficiency of small and medium-sized (SME) restaurant businesses in Slovenia after the fiscal cash registers (fiscal devices) were introduced in January 2016 by the Slovenian government. Recently, a considerable body of literature has arisen around the theme of efficiency measurement. The literature has extensively reviewed efficiency practices for the lodging industry (Assaf & Angbola, 2014; Assaf & Barros 2013; Wu, Liang, & Song, 2010; Barros, 2005), but there is less evidence from the restaurant sector (Reynolds & Thompson, 2007; Roh & Choi, 2010) and even less from restaurant SMEs (Assaf, Deery, & Jago, 2011). Although there are several studies that attempt to solve these questions for developed economies, there is a lack of empirical findings for post-transitional economies. The post-transitional economies have undergone a transition from state ownership or workers' self-management to private ownership. The article presents the results of an empirical study on restaurants companies' efficiency for the Republic of Slovenia, a post-transitional economy, which has over the last two decades gone through the process of establishing a full market economy. Slovenia, a former socialist member state of the Socialist Republic of Yugoslavia was one of the most economically developed economies in South-eastern Europe (SEE). Although it comprised only about one-eleventh of Yugoslavia's total population, it was the most productive of the Yugoslav republics, accounting for one-fifth of its Gross Domestic Product (GDP).

Today Slovenia enjoys economic stability as well as a GDP per capita by purchase power parity at 83% of the European average (STAT, 2018). Statistical and financial data show that tourism is one of the most important parts of the Slovene national economy. In 2017, tourism offered employment to 13% of all employees in the country and contributed 12.7% to the Slovenian GDP (STAT, 2018; WTTC, 2018). The Food & Beverage (F&B) service sector is a vital and integral element of tourism and a significant economic activity (Kukanja, 2015). In 2016, there were 6,894 business entities (companies and sole proprietorships) operating in the F&B sector (5.56% of all business entities in Slovenia), employing a total of 16,722 employees (3.34% of all employees). The F&B service sector represents an essential part of the Slovene national economy. Its performance has significant impacts and spill-over effects that go well beyond customers' needs for food and beverage. Specifically, the F&B service sector has a multiplier effect on many economic activities and significantly boosts businesses that are losing their competitive advantage in the international marketplace (e.g., local food production).

An important subsector of the F&B service sector is the restaurant sector, which includes almost 43% of all F&B facilities in the country (STAT, 2018). According to the official statistical classification of economic activities (the NACE classification) in the European Union (EU), the restaurant sector is classified as I56.101 – Restaurant and Inns. In this study, we focus on the efficiency analysis of the Restaurant sector in Slovenia (I56.101), which is by far the largest and the most significant F&B subsector. This subsector is dominated by SMEs, with several industry-specific characteristics: the restaurants are mostly family-run businesses; on average, restaurants have 20 years of business activity; and the average number of employees is 8.7 per restaurant unit (Kukanja, 2015). Competition in this industry is severe, mainly because of the large number of small operators, the very low barriers to entry, and the price sensitivity of customers. Similar to other service industries, the restaurant industry is also highly sensitive to economic trends and changes in real household disposable income (Kosi & Bojnec, 2013).

Restaurant businesses are characterised by high levels of uncertainty and change (Kim, Li, & Brymer 2016). The industry is experiencing fast growth, pressures from globalisation, high competitiveness, and international trends. Together, these aspects significantly add to the current complexities and challenges in the industry. As noted by Parsa, Self, Njite, and King (2005), approximately 30% of all restaurant businesses in the USA end up failing, although this greatly depends on the density of restaurants in different postal (ZIP) areas of the country. The authors also found that larger restaurants and those with chain affiliation had a greater probability of success than small, quick-service operations.

Similarly, Lee, Hallak, and Sardeshmukh (2016) reported that approximately three-fifths of all restaurants in Australia earn an average net profit of just 2% after taxes, which makes survival rates in the industry extremely low. Thus, understanding restaurants' efficiency performance is critical for the success of the restaurant and tourism sector, as well as for the livelihood of regions and countries depending on tourism income to survive. Consequently, the need for SMEs' managers and business owners to have a strong knowledge of operational, marketing, and financial skills is arguably greater than ever before (Assaf et al., 2011).

Due to the importance of the restaurant sector in the national economy, it is essential for academics and practitioners to have more accurate information about restaurants' efficiency practices to determine how efficient they are. In the past, tax inefficiency in Slovene tourism (and especially the restaurant sector) represented a major fiscal problem (Kosi & Bojnec, 2013). It was not until 2015 that the government of Slovenia implemented a set of measures in order to assure an overview of cash transaction revenues. Based on the new cash transaction and fiscalisation act, fiscal cash registers were introduced in January 2016. As reported by the Financial Administration of the Republic of Slovenia (FURS), strict tax control resulted in an immediate increase of reported restaurant revenues

by 21.6% (FURS, 2017). The current study expands the existing body of literature by measuring the efficiency of restaurants based on accurate and reliable financial data officially provided by the national tax authorities. In previous studies (Reynolds & Biel, 2007; Roh & Choi, 2010), efficiency was mostly assessed based on managers' feedback and smaller samples of restaurant units, because, unlike the reports of large corporations, the official records of SMEs often remain private and inaccessible to researchers.

The present study is the first to explore restaurants' efficiency in Slovenia. The goal of this article was to analyse restaurant SMEs' productive efficiency using Data Envelopment Analysis (DEA). We, therefore, pose the following research questions (RQ):

- RQ1: Which input variables influence restaurants' efficiency performance?
- RQ2: How efficient are restaurants in Slovenia?

The methodological approach taken in this study is a mixed methodology (Johnson & Onwuegbuzie 2004), combining a systematic literature review, experts' opinion, field research, secondary data analysis, and econometric evaluation of efficiency quotients based on the DEA linear programming method. Using this approach, this study presents an important insight into restaurant SMEs' efficiency performance. As noted by Lee et al. (2016), academic approaches to efficiency measurement is essential, as entrepreneurs often do not possess sufficient financial and human resources for complex data and benchmarking analysis.

The overall structure of the study takes the form of five sections, including this introduction. Section 2 begins by laying out the theoretical dimensions of the research. Section 3 is concerned with the methodology, and in Section 4 research results are presented and discussed. Finally, the conclusion presented in the last section gives a summary and critique of the findings.

2 Theoretical background

2.1 Post-transitional economies

The theoretical claims that ownership matters and that the ownership structure has a strong influence on companies' efficiency performance and financial success have been most visibly confirmed in South-eastern Europe (SEE; also referred as 'the Balkans') and the Central and Eastern Europe (CEE) countries. The basic theoretical assumption behind privatisation was the claim that transitional economies needed to boost competitiveness and innovativeness among companies. The main issue of the new approach to the free-market economy in SEE and CEE was that it mostly neglected the importance of other institutions (academic, regulatory, and economic), which necessarily provide the minimum incentives for the active restructuring and long-term competitiveness of businesses. Therefore, in the period of transition, too many (political) reformers viewed the privatisation process as a goal *per se*, rather than as a means of achieving long-term economic and social benefits. Consequently, this process was most often conducted in haste without a proper regulatory and supervisory framework. In this view, Estrin, Hanousek, Kočenda, and Svejnar (2009) performed a study of mass privatisation effects in post-transitional economies and found that after two decades of privatisation, privately owned companies still do not perform significantly more efficiently. The authors also found that major sociological and economic differences exist within different post-transitional states.

To date, several studies (Bojnec & Xavier, 2004; Stubelj et al., 2017; Zaman Groff & Valentinčič, 2011) have investigated the transitional process in SEE and CEE countries. In Slovenia, efficiency has been measured using DEA in studies analysing the efficiency of farms (Bojnec & Latruffe, 2008; Bojnec & Latruffe, 2009), hospitals (Blatnik, Bojnec, & Tušak, 2017; Došenović Bonča, 2014), and hotels (Assaf & Cvelbar, 2010). Although extensive research has been carried out, no single study has analysed the efficiency of the restaurant industry in a post-transitional economy.

2.2 Traditional approaches to efficiency measurement

The term *efficiency* in economic theory was broadly defined by Farrell (1957) as the maximum output from a given set of inputs, assuming that all inputs and outputs are accurately measured. Based on Farrell's definition, service industries have historically utilised partial ratio analysis (a ratio of output measured in specific units and any input factor also measured in the same specific units) to analyse a company's efficiency and to benchmark its performance with competitors (Riley, 1999; Coelli, 1995). Given the labour-intensiveness of hospitality-related businesses, interest in productivity has predominantly focused on labour and its corollaries (e.g., service outcome per employee, labour hours, transactions per hour, etc.). While useful for specific intra-firm analyses, however, these partial-factor statistics measures have limited utility, as they reflect only specific operational attributes (i.e., revenue per available seat hour). In terms of benchmarking analysis, these methods have some major drawbacks, as most partial-factor ratios fail to account for potentially meaningful differences among food-service operations. For instance, labour cost percentage does not fully explain a company's labour utilisation, because it fails to consider advancement in technologies; physical changes in the facility; and other labour-related costs such as benefits, taxes and incentives. Therefore, conventional ratio approaches are limited, because they integrate too few operational characteristics to

portend an overall operational efficiency (Assaf, Barros, & Josiassen, 2010). This view is also supported by Joppe and Li (2016), who state that the use of a single input-to-output ratio to reflect overall performance should be treated with extreme interpretative caution.

Although basic statistical measures are not a valid benchmark indicator for assessing a company's overall success, annual reports are especially valuable in identifying internal operational spikes and derogations from competitors. Another potential problem is that a large number of partial measures could be difficult to interpret if some indicators move in opposite directions over a given period (Assaf & Matawie, 2009). Due to practical constraints, the application of the ratio method has also been limited because of the possibility that different input ratios will produce different (and also contradictory) performance results (Fang & Hsu, 2014). Attempts to operationalise efficiency using the traditional measures have created confusion, inconsistency and even controversy, as they are limited by the failure to show that the productivity of individual units (e.g., restaurants) within a system should be evaluated relative to other units within that system (Assaf & Agbola, 2011; Fang & Hsu, 2014). Nevertheless, Reynolds and Biel (2007) state that the use of simple ratio measures is still the most common practice to evaluate operational performance in the restaurant industry, although these measures have been proven to provide limited and inconsistent benchmarking information.

The use of and focus on efficiency measurement has evolved dramatically since the mid-nineties. Building on Reynolds' (1998) definition of productivity as the effective use of resources to achieve operational goals, researchers and practitioners have acknowledged the importance of productivity measures that are more comprehensive than any single-factor indices. In this view, Donthu, Hershberger, and Osmonbekov (2005) advocated the need for more rigorous methodological approaches (presented below) in order to handle multiple inputs and outputs simultaneously. Ideally, these methods would substantially mitigate shortcomings associated with traditional measurement techniques.

2.3 Efficiency frontier approaches

Efficiency, in contrast, is based on the concept of a production possibility frontier (Barros, 2005). The production possibility frontier represents the maximum output attainable from each input level. Productive efficiency, therefore, refers to whether internal resources in the production process were used efficiently in order to produce operational service capacity effectively (Huang, Ho, & Chiu, 2014). With the knowledge of the frontier, the estimation of different types of efficiency, such as technical and allocative efficiency, is possible. With the former, the optimum is defined in terms of production possibilities, and the production of maximum outputs can be estimated from available inputs or the usage of minimum inputs required to produce the desired outputs. With the latter, one can estimate the use of inputs and the production of outputs in the right proportions regarding their prices. The technical and allocative efficiencies that are concerned with inputs lead to cost efficiency, whereas when concerned with outputs, they lead to revenue efficiency (Fried, Knox Lovell, & Schmidt, 2008). According to Assaf and Matawie (2009), the efficiency frontier analysis is described as an effective tool for identifying areas of cost containment and cost reduction. In contrast, Johnston and Jones (2004) argue that measuring efficiency within the service industry still presents a number of obstacles, since the conventional approaches were derived largely from manufacturing. They indicate that in the service industry, the customer is personally involved in the process of delivery, and, as a result, efficiency is not solely derived from the service provider's actions. Conversely, several authors (e.g., Park & Jang, 2010; Reynolds & Biel, 2007) have questioned the usefulness of such a complex approach based on different components of productive efficiency and analysed the basic (operational) reasons for restaurants' (in)efficiency.

Different holistic analysis techniques for efficiency measurement have been proposed in the literature (Coelli, 1995; Reynolds, 2003; Reynolds & Biel, 2007). The most common of these are DEA (presented below) and stochastic frontier analysis (SFA; a complex parametric technique that requires function specification of the cost of production). While still residing in the output-to-input ratio measurement domain, DEA solves many of the problems associated with the aforementioned measures by integrating multiple outputs and inputs simultaneously, and it is especially useful for the analysis of companies that are characterised by multiple resources and multiple services. This approach allows for both controllable (discretionary) and uncontrollable (nondiscretionary) variables, producing a single relative-to-best productivity index that relates to all units under comparison. Thus, DEA allows for the assessment of contingent productivity, which takes into account the performance of each restaurant, despite differing environmental or situational factors (Donthu et al., 2005). Mathematically, the DEA efficiency score is the ratio of the weighted sum of outputs to the weighted sum of inputs (Wei, 2001). In particular, the weights estimated for one unit are such that, when they are applied to corresponding outputs and inputs in the analysis, the ratio of weighted outputs to weighted inputs is less than or equal to 1. Since DEA seeks optimisation contingent on each separate unit's performance (also referred to as the unit's relative efficiency or productivity) in relation to the performance of all units, those with the greatest productivity have a score (P) of 1, suggesting 100% efficiency when compared with those in the competitive set. These optimal units lie on a multidimensional frontier – the efficiency frontier – which 'envelopes' the inefficient units and quantifies the ineffi-

ciency by a relative score of less than 100% for each inefficient unit. In addition, the DEA also provides a relational measure on each input and output for each inefficient unit. (Reynolds, 2003).

Therefore, companies that do not lie on this envelopment surface can be considered to be technically inefficient. Such companies have two possibilities for becoming more efficient. They can increase the output(s) without requiring more input(s), or they can produce the same level of output(s) with less input(s) (Coelli et al., 2005).

At the individual establishment level, DEA provides a rich diagnostic tool that helps the inefficient unit (restaurant) to identify how to allocate resources more efficiently in order to improve its productivity. Such an indicator also allows operators to use the best-performing units as the basis for their benchmarking evaluation, as recommended decades ago by Farrell (1957). The notion of benchmarking by using performance-related indices that focus on the best performers in the field and integrate exogenously fixed variables is principally significant for restaurant managers (Hua & Lee, 2014).

2.4 DEA in restaurant efficiency studies

Since Donthu and Yoo (1998) first demonstrated its applicability in food service, DEA has been applied to several restaurant industry studies. Most studies have used DEA to evaluate multiunit restaurant efficiency (Assaf et al., 2011; Reynolds & Biel, 2007; Reynolds & Thompson, 2007; Fang & Hsu, 2014) and the food production industry (Assaf & Matawie, 2009). For example, Reynolds (2003) used DEA to evaluate the performance of a chain restaurant and suggested that the average efficiency score could be increased by as much as 22%. Reynolds and Thompson (2007) further assessed the multiunit restaurant efficiency score for a chain of 62 full-service restaurants and found that their average efficiency level was 82%. Reynolds and Biel (2007) analysed the efficiency score of 36 same-brand units of a casual theme restaurant chain in the USA, finding that only eight units were fully efficient, with the average efficiency score of all units in the sample at 86%. In their study, Roh and Choi (2010) assessed the efficiency of different brands within the same franchisor using DEA. The results indicated a low average efficiency (73%) and showed that the efficiency of each establishment and brand differed significantly from the others. Similarly, Assaf et al. (2011) used DEA to assess the efficiency and return to the scale of 105 Australian restaurants. The results revealed a low level of efficiency (approximately 46.17% on average) and highlighted the important impact of factors such as restaurant size and management experience on the efficiency results.

A different approach was implemented by Taylor, Reynolds, and Brown (2009) and Fang and Hsu (2014). These authors implemented DEA to multiple factor menu analysis in order to increase menu items' financial performance. In their study, Fang & Hsu (2014) also investigated differences between two frontiers using the metafrontier value for different dining periods (dinner and lunch) as well as for different menu items' efficiency. The results revealed that the efficiency of the metafrontier to DEA method increased profitability by 15% compared with the traditional (Kasavana & Smith, 1982) menu engineering method.

Battese, Rao, and O'Donnell (2004) addressed the issue of calculating the efficiency scores for companies that operate in different environments (e.g., different dishes served during lunch and dinner, different chefs' proficiencies, etc.) and thus should not be treated as a homogeneous frontier. They proposed the technology-gap ratio, and later O'Donnell et al. (2008) introduced the meta technology-gap ratio (MTR), which quantifies the efficiency of heterogeneous groups based on their distances from a common (or identical) frontier. As production frontiers may change in different time periods or even within a single unit analysis, the traditional (common) production frontier cannot be applied generally. This issue was later addressed by O'Donnell et al. (2008), who employed DEA to construct a metafrontier to DEA analysis (MDEA) by pooling all observations from all groups and by constructing various group frontiers in order to measure their efficiencies and MTRs relative to the metafrontier. The metafrontier DEA model is a complex academic model able to calculate comparable efficiencies for companies operating under different technologies. However, on a daily basis, it provides little information of practical value for restaurant managers (Assaf & Josiassen, 2016). As a result, different methodologies and different variables have been used in previous DEA studies.

3 Methodology

3.1 Variable identification

The application of DEA to the restaurant industry is particularly advantageous because the method accommodates both controllable (those within managers' purview) and uncontrollable (environmental) variables. The latter in particular are typically ignored in traditional (ratio) methods of productivity assessment due to the difficulty in making comparisons across units. While the number of potential variables is relatively limitless, the literature review suggests that some (e.g., revenue) are 'essential', while others offer provocative possibilities. Reynolds (2003) and Reynolds & Thompson (2007) proposed 'essential' groups of variables that have proved to be necessary for restaurants' efficiency analysis: financial, physical, and composite (reflecting both financial and physical variables). Regarding outputs, the critical variables are revenue, profit, guest/

employee satisfaction, and retention equity. Regarding inputs, financial measures that have proven to be important include labour cost, cost of goods sold, controllable fixed expenses, and uncontrollable expenses. Physical inputs that have proven to be important include service capacity (square footage or number of seats) and environmental characteristics (competitive conditions). According to Wöber (2007), all variables must be thoroughly preselected in accordance with industry specifics and the availability of reliable data. In Table 1, the selection of variables used in previous restaurant DEA studies is presented

The presented literature has highlighted the importance of several variables for the restaurant industry efficiency analysis. The generalisability of much of the published research on this subject is somewhat problematic, as, due to the lack of available information, researchers have often based their studies on several assumptions. For example, Reynolds and Thompson (2007) used sales as a surrogate for profitability, since they did not have access to profitability data. Reynolds (2004) used charged tips as a surrogate measure of customer satisfaction. Similarly, Reynolds and Thompson (2007) assumed that paid gratuities serve as an adequate measure of customer satisfaction and that back-of-the-house labour hours were relatively constant among all analysed units. The validity and usefulness of such a generalised approach were questioned by Lynn (2001). The major advantage of our study is that it avoids the problem of assumptions (surrogates). When considering which indicators should be included in the study, we attempted to take into consideration all variables that had been identified through the literature review (see Tab. 1). In the next step, several variables had to be excluded from the study, as they do not reflect practices relevant to the Slovenian restaurant industry (industry characteristics are summarised in the introductory chapter). The excluded variables are charged tips (tipping is not customary); same-brand and full-service restaurants (all restaurants are independent and/or privately owned); employee satisfaction (mostly family-run businesses).

In the second phase, the pre-selected variables were presented to four academics (two restaurant industry experts and two financial experts) and four representatives of the restaurant industry. We discussed the proposed indicators with both the academics and practitioners, who gave us very useful feedback and helped us to strengthen the content validity of the study. According to them, the reasonable number of industry-specific input variables would be in three groups: official financial data from companies' annual profit and loss (P&L) statements, managers' demographic characteristics, and restaurants' physical characteristics. Due to the industry specifics, the experts proposed only the inclusion of operating activities (the operating section of P&L) as restaurants included in the study do not generate financial and/or other revenues (see also the preconditions presented in subchapter 2.2). Regarding output variables (e.g., guest satisfaction, loyalty) the main concern of the experts was their subjectivity; therefore, in order to answer RQ2, they suggested only the inclusion of financial variables. As previously suggested by Reynolds and Biel (2007), net sales revenues were included in the study. Namely, a potentially negative output value in DEA (e.g., one restaurant's negative profit) might project this inefficient unit onto the efficient frontier as a radial expansion and make the mix of efficiency results even more negative. The omission of profit as an output variable from the analysis was also due to the lack of correlation with selected input variables (as presented in chapter 4).

3.2 Data collection and sample description

Given the research objective, data were collected from the financial statements of 142 restaurant SMEs located throughout Slovenia. Secondary-financial data were obtained from the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES, 2018). Since the identification of a competitive set is crucial for benchmarking (Barrows, Vieira, & DiPietro, 2016), we focused only on those facilities that operate with similar and comparable operational variables across units (market characteristics are presented in the introduction). Our research is, therefore, predicated on the following preconditions: independently run SMEs with similar technical characteristics officially classified as restaurants, inns, or snack facilities; independently run restaurants (i.e., not part of a franchise chain, not part of a hotel, and not run under a management contract); compulsory food offering; and restaurant business is the only source of income in the restaurant companies' financial statements. The last of these conditions, in particular, presented a significant challenge to identifying appropriate sample companies, as several restaurants diversify their business activities, which are aggregated in common financial statements. Another issue was the fact that the official (NACE) records are not completely in accordance with the national classification system and the market situation (e.g., companies are officially registered for several business activities, seasonal restaurants are registered as full-time businesses, closed facilities are not automatically deleted from the central register, etc.). To ensure that all restaurant units included in the study matched the research criteria, randomly selected businesses (n=860) were pre-checked by ten interviewers in field research during the winter and spring of 2017. If the restaurant appeared to match the research criteria and the manager agreed to participate in the study, the manager was asked to participate in a semi-structured interview by providing basic information about him or herself and the restaurant. The final analysis is, therefore, based on 142 independently operated restaurants located throughout the country. Managers' and restaurants' characteristics are presented in Table 2.

Table 1: Variables used in DEA studies analysing restaurants' efficiency (2004–2017). Source: own

Author(s)	Sample	Input variables		Output variables
		Controllable	Uncontrollable	
Reynolds (2004)	Same brand midscale restaurants (n=38)	Front-of-the-house hours worked during lunch/dinner, average wage	No. of competitors within a two-mile radius, seating capacity	Lunch/dinner sales, charged tips percentage, charged tips for dinner as a percentage of charged dinner sales
Reynolds & Thompson (2007)	Chain full-service USA restaurants (n=62)	Training, no. of servers, no. of working hours	Server wage, no. of seats, square footage, no. of units in state, operating years, parking, stand-alone facility, no. of competitors	Daily sales, tip percentage, turnover
Reynolds & Biel (2007)	Same-brand casual theme restaurants (n = 36)	Cost of goods sold, labour cost, employee satisfaction	Rent, taxes and insurance, number of seats, square footage	Controllable income (profit), operating revenue, guest satisfaction, retention equity
Giménez-García, Martínez-Parra & Buffa (2007)	Spanish fast-food chain (n=54)	Wait and kitchen staff, no. of seats, no. of server counters	Location, average bill amount, no. of competitors	Sales, quality index
Taylor et al. (2009)	Full-service restaurants (n= 3)	Preparation method, no. of purveyors	No. of stations	Gross profit, popularity
Roh & Choi (2010)	Three same brand restaurants (n = 136)	Fixed input variables: total size, hall size, kitchen size, no. of seats, no. of tables, total employees, service staff, kitchen employees, monthly salary, monthly rent, overhead expenses		Average monthly sales, average monthly net income
Assaf et al. (2011)	Australian restaurants (n=105)	No. of full-time employees, food expenses, beverage expenses	No. of seats	Total food sales, total beverage sales
Reynolds & Taylor (2011)	Data were replicated from Taylor et al. (2009)	Preparation method, no. of purveyors	No. of stations	Gross profit, popularity
Fang & Hsu (2014)	Same-brand units of a chain restaurant (n=2)	Fixed input variables: labour cost, food cost, number of purveyors		Gross profit, popularity

Table 2: Managers' demographic and restaurants' physical characteristics. Source: own

Variables		Frequency (s)	Percentage (%)
Gender	Female	56	39.5
	Male	86	60.5
Age	16-25	4	2.8
	26-35	19	13.3
	36-45	46	32.3
	46-55	52	36.6
	more than 55	21	14.7
Years of experience	0-10	17	12.0
	11-20	35	24.6
	21-30	54	38.0
	more than 31	36	25.3
Level of education	Primary school	9	6.3
	Vocational or secondary school	78	54.9
	Higher education	55	38.7
Ownership structure	Manager	16	11.2
	Owner and manager	126	88.7
Number of employees	1-5	52	36.6
	6-10	60	42.2
	11-20	27	19.0
	more than 20	3	2.1
Number of competitors	0	27	19.0
(within 1 km radius)	1-2	42	29.4
	3-4	34	23.9
	5-6	20	14.1
	more than 7	19	14.0
Years of business activity	1-2	11	7.7
	3-6	35	24.6
	7-10	10	7.0
	11-15	12	8.5
	16-20	19	13.3
	21-30	33	23.2
	31-50	15	10.5
	more than 50	7	4.9
Restaurant size (m^2)	1-100	29	20.4
	101-200	58	40.8
	201-300	28	19.7
	301-400	8	5.6
	401-500	9	6.3
	more than 500	8	5.6

In the next step, restaurant companies' annual financial reports, which in Slovenia are by law in the public domain, were analysed. In our study, we have focused on the fiscal year 2016. Namely, in 2016, after the implementation of tax registers, the National Financial Administration (FURS) identified an expected increase in restaurants' operating revenue by 21.6%. As there had been no major market turbulence and the average growth of restaurants' revenues in the period from 1994 to 2015 was 6.62% (Kukanja & Planinc, 2016), this increase was the logical result of strict financial supervision. It can, therefore, be assumed that any prior research based on financial data (financial reports or managers' feedback) would not present a clear picture of the industry's (in)efficiency. In this view, it is important to highlight that all primary data (managers' demographic and restaurants' physical characteristics), as well as the secondary data (financial data obtained from financial reports) included in our study, are cross-sectional.

4 Results and discussion

In the first step, descriptive statistics were used to analyse respondents' demographics and restaurants' physical characteristics. The SPSS software was used for the analysis of the results. Table 2 illustrates managers' and restaurants' characteristics.

As can be seen from the table above, the majority of respondents were slightly less than 45 years of age on average, and the sample was composed of a majority of male managers (60.5%). The highest number of managers had completed secondary (vocational) education (54.9%); 38.7% of managers had acquired a high school education; 6.3% had only finished elementary school. On average, managers had 21 years of experience in the industry.

In addition to demographic data, restaurants' physical characteristics were also analysed. The results show that the majority of restaurants (42.2%) employed from 6 to 10 employees, followed by restaurants employing 1 to 5 employees (36.6%), while only three restaurants (2.1%) employed more than 20 workers. On average, the restaurants had less than 20 years of business activity (19.9 years), coinciding with managers' (owners') average years of experience (21 years). Following Reynolds (2004), managers were asked to indicate the number of competitors within a 1 km radius. The results reveal a relatively uniform distribution of responses regarding the number of competitors. The majority of managers (29.4%) indicated 1 to 2 competitors, 19.0% of managers identified no competition, and 14.0% of managers identified more than 7 competitors within a 1 km radius. The average restaurant size was 242.6 square metres.

The first RQ in this study sought to determine which input variables influence restaurants' efficiency performance. Answering this question, we also ensured that each input was correlated to the output (see Tab. 3), as previously suggested by Assaf et al. (2011), Reynolds (2003), and Roh and Choi (2010). To begin this process, the proposed groups of variables were used as potential input variables. Regarding the financial variables (financial data were obtained by AJPES), all main operating costs included in the standardised P&L were included in the analysis. We included all operating costs' main accounts (costs of goods, material and services, labour costs, write-downs) with associated sub-accounts.

Based on the correlation analysis presented in Table 3, it is clearly evident that only operational financial variables had positive correlations ($p < 0.01$) and were, therefore, suitable for the subsequent DEA application. Surprisingly, all other variables proved not to be statistically significant.

The most obvious finding to emerge from the analysis is that demographic and physical characteristics were not statistically correlated to net sales revenues. As this result was rather unexpected and difficult to explain (all data were double checked), experts were asked to suggest other reasons for the outcome. In the experts' opinion, a possible explanation for this might be related to restaurants' market characteristics. Namely, restaurant companies operate in a monopolistic competition (restaurants offer similar products, barriers to entry and exit in the industry are low, demand is highly elastic, and the decisions of any one company do not directly affect those of its competitors). Therefore, a possible explanation for this might be that managers are using similar management practices, which have eliminated the influence of other (individual) characteristics. According to experts, some other predictors, such as managers' decision-making styles, marketing strategy, quality policy, etc., could also influence the identified financial variables (e.g., high-quality and more expensive goods; professionally trained labour resulting in higher labour costs; state of the art interior resulting in higher cost of depreciation etc.).

Nevertheless, further work needs to be done to establish whether the potentially similar patterns of exercising business operations in terms of efficiency management are the result of managers' adaptation to the homogeneous market characteristics. According to scholars, another possible source of uncertainty is the methodological approach used in previous DEA studies. Namely, a thorough review of the studies presented in Table 1 reveals that the vast majority of authors did not provide any necessary evidence of statistical correlation (Coelli, 1995; Wei, 2001) between inputs and outputs before performing DEA. The only exceptions were the studies of Reynolds and Biel (2007), Reynolds and Taylor (2011), Roh and Choi (2010), and Taylor et al. (2009).

To answer RQ2, DEA was performed using DEAP Version 2.1 software. The input-oriented DEA model, which calculates a maximum proportional reduction in inputs, while holding the level of outputs constant (Fernandez & Becerra, 2015), was employed, as suggested by Coelli (1995) and Reynolds & Biel (2007). Radial efficiency

Table 3: Correlation coefficients between inputs and output. Source: own
*Note: ** Correlation is significant at the 0.01 level (2-tailed).*

Input category	Variables	Output – Net sales revenues (Correlation coefficients)
Financial variables	Acquisition cost of goods and material sold and costs of material	982**
	Costs of services	918**
	Labour costs	.874**
	Depreciation	.871**
Demographic variables	Gender	-.179
	Age	.085
	Education	.159
	Years of experience	.067
Physical variables	Size	.187
	No of competitors	.067
	Location	-.003

measures were taken using the DEA-CCR model (named after the authors of the model: Charnes, Cooper, and Rhodes). This model provides an objective method to structure various measures into a single (aggregate) meaningful performance score of technical efficiency (Roh & Choi, 2010), which leads to the unit-efficiency scores described in the following section. The CCR model presumes constant returns to scale (CRS), which means that an increase in inputs results in a proportionate increase in the output levels. Seiford (1996) referred to this practice as 'relative efficiency', since a unit's variables are calculated to maximise the efficiency ratio, followed by comparing them to similar ratios of the best performing units. Since the Slovene restaurant industry is characterised by strong competition (monopolistic behaviour) in the market, it was appropriate to employ the CCR model (Coelli et al. 2005). An input-oriented model was used, since in such a competitive environment, the companies are input oriented, because the output is endogenous, while inputs are exogenous (Barros, 2005). In addition, we also wanted to assess how companies can reduce their production costs. Input orientation is important because, according to Oliveira et al. (2013), the results of such models are a measure of competitiveness. Building on the correlation results from Table 3, the final set of variables included four operational input variables and one output variable. The selected financial variables also represent the key input elements (also referred to as 'requisite assets') of any restaurant production process (labour, direct materials, production assets). The items in the preceding parentheses are expressed in financial terms as labour cost, cost of goods sold, and depreciation, respectively. The majority of restaurants are privately owned, and therefore their managers do not have to pay rents. As the restaurant business is the managers' only source of income, net sales revenues were used as an output variable to complete DEA.

The results indicate that only 23 of all the units were fully efficient (showing scores of 100%), while the average efficiency score of all units in the sample was 85%, which indicates that on average restaurants included in our sample are 15% away from achieving their maximum efficiency. In other words, the restaurants could cut 15% of the selected inputs without decreasing their output (net operating revenues). In Figure 1, the efficiency scores of restaurants are presented.

The lowest-scoring restaurant had an efficiency score of 0.56 (or 56%), while 51 restaurants were above the average efficiency score (85%), and 68 restaurants were below the average efficiency score. Our analysis also revealed that, in most restaurants, the cost of goods and cost of part-time employees (expressed as the cost of services) are well-managed and provide little room for improvement. When analysing underperforming restaurants, it is evident that the principal areas of potential efficiency enhancement are depreciation and labour costs. Comparing the two results, it can be seen that the underperforming restaurants could, on average, reduce their depreciation costs by more than 36% and their labour costs by more than 23% and they would still achieve the same level of net sales revenues and, consequently, they would move closer to the efficiency frontier, thereby becoming more efficient.

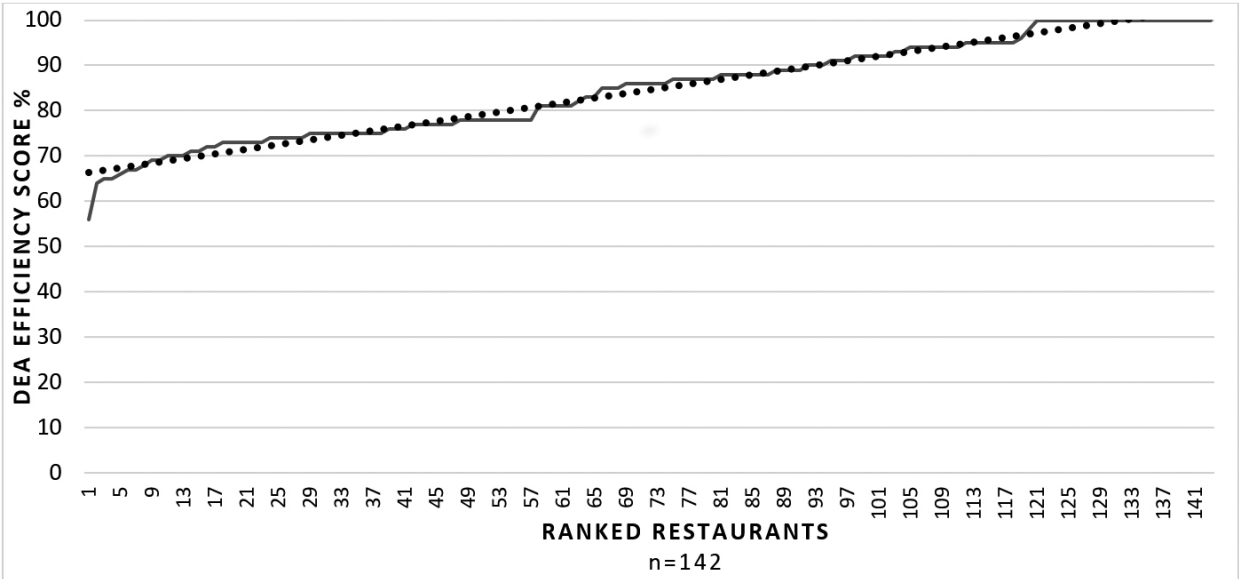

Figure 1: DEA efficiency scores of 142 restaurants, with the average efficiency level at 85%. Source: own
Note: ranked in ascending order, dotted line presents the metafrontier

5 Discussion

This article has addressed the issue of efficiency measurement for the Slovenian restaurant industry. In this regard, we followed two main objectives. First (RQ1), we aimed to determine which input variables have a statistically significant influence on restaurants' efficiency performance, and second (RQ2), due to the specific economic development the aim was to determine restaurants' efficiency based on reliable financial data. The article has meaningful value added, as not many empirical studies have been done so far in this field, at least not for post-transitional economies.

This study has raised critical questions about the nature of restaurant efficiency management. The single most striking observation to emerge from the data comparison was the lack of statistical correlation between managers' demographic and restaurants' physical characteristics and restaurants' net sales revenues (see Table 3). Given all that has been mentioned so far, one may suppose that managers' education, professional training and years of experience, as well as the restaurants' size, location, and competition, do not have any influence on restaurants' profitability and efficiency performance. In this view, considerably more work will need to be done to determine the importance of different variables on restaurants' efficiency performance. The fact that the industry is made up largely of SMEs that are mostly managed by restaurant owners poses major challenges in relation to increasing the overall efficiency of the restaurant industry.

Turning to RQ2, research results indicate that the average level of efficiency is 85%. Efficiency results of our study are mostly in line with the findings of previous international studies (see Tab. 1). For example, Fang and Hsu (2014) identified the average scores of two same-franchise restaurants in the USA as 87% (lunch) and 89% (dinner). Similarly, Reynolds & Biel (2007) reported that the average efficiency score of corporate-owned, same-brand casual theme restaurants in the USA was 86%; in a similar study, Reynolds & Thompson (2007) identified the average score as 82%. By analysing three brands' restaurants operating under the same franchisor in the USA, Roh and Choi (2010) concluded that their average efficiency score is 73%.

In contrast, Assaf et al. (2011) reported that Australian restaurants operate with an average efficiency score of 46.17%, which is not in line with other studies. The authors suggest that, among other things, the reason might also lie in differences in methodologies and data. The comparison of our results with those of other international studies reveals that restaurants in Slovenia are relatively successful (in terms of efficiency scores). Although we found a comparable level of efficiency performance, the results suggest that a substantial decrease in cost could be obtained if managers were to improve their current performance practices. Namely, when analysing the underperforming restaurants, it is evident that the principal areas of potential efficiency enhancement are depreciation and labour costs (see Tab. 2). A possible explanation for these results might also be the fact that restaurants are using their production assets (e.g., state-of-the-art interior, superior inventory, renowned chefs, professionally trained staff, etc.) as a source of competitive advantage. It is possible, therefore, that these production elements also present the key marketing

attributes (referred to in marketing terminology as 'Physical evidence' and 'People') that are used to outperform the competition in the long term. According to Sedmak (2011), in the restaurant industry, a specific marketing attribute is often used as the restaurant's unique selling proposition (USP) which enables a successful differentiation from competitors. Therefore, further long-term studies taking these variables into account are needed.

The major advantage of our study is that it avoids the problem of assumptions (surrogates) and self-reported (subjective) financial data. Previous attempts at restaurant industry assessment mainly focused on industry reports (Roh & Choi, 2010) and managers' feedback (Reynolds, 2004; Reynolds & Thompson, 2007). According to authors' knowledge, the current study is the first to introduce reliable and internationally comparable financial indicators, providing a more comprehensive and comparable assessment of restaurant efficiency based on P&L analyses.

The results of this study could benefit the industry (practice) and academia (theory) in several ways. First, we have provided restaurant managers with an opportunity to assess their level of performance against other competitors. Second, accurate efficiency measurement based on official financial data can provide a significant competitive advantage (one that is useful in a variety of applications, from operational optimisation to employee performance management). Third, scholars were given the opportunity to compare the results of our study to operators in different economies, especially the transitional ones. In sum, these results should draw the attention of researchers and managers for the potential improvements in restaurants' performance, in terms of both effective utilisation of inputs and financial (revenue) performance. According to Hua and Lee (2014), this is one of the critical purposes of effective benchmarking – to gain a greater understanding of how one's operation compares with others, as well as to be able to achieve greater results. Identifying and learning from the best performers undoubtedly benefits the entire industry.

In terms of future implications for policymakers and society, it is crucial that efficiency and benchmarking analyses be based on publicly available and reliable sources of information: effective sharing of reliable information is essential for monitoring the economic development of different businesses, societies, and national economies.

While interesting, this study has several limitations. According to Assaf and Josiassen (2016), DEA is very sensitive to outliers, which can influence the optimal frontier. Therefore, it is necessary to carefully check the empirical data prior to conducting an analysis. Outliers are also more common when companies in the sample have different operating environments (Cooper et al., 2011). These limitations call for particular attention when selecting the sample suitable for the analysis.

As DEA is a non-parametric method, no goodness-of-fit indices information is available as in other more traditional statistical techniques (ibid.). Secondly, as there is no general, industry-wide acceptable method regarding the inclusion of variables, we focused on financial indicators. However, the inclusion of other variables (e.g., guest and employee satisfaction) might also help us to establish a greater degree of accuracy on this matter. The major limitation of this study is the limitation to one year of operational data of Slovene SMEs. Therefore, the investigated relationships could differ from country to country due to industrial composition, economic status, corporate governance rules and industry regulations.

More research is needed to better understand the efficiency of restaurant SMEs, especially in terms of determining the best performing practices. What is now needed is an in-depth analysis of management practices between the best and worst efficiency performers in both, post-transitional and traditional (Western-European) economies. A longitudinal, cross-national study with a substantially larger dataset could also provide the necessary impetus for managers to more accurately focus on optimising the requisite assets, ultimately leading to more profitable operations. A follow-up qualitative study (e.g., interviews with restaurant employees) could also provide additional information. Further, utilising efficiency studies on ongoing performance evaluation could be extremely beneficial. Given the growing importance of both financial and non-financial disclosures, it is suggested that future studies could incorporate a set of non-financial (e.g., corporate social responsibility (CSR), innovation, etc.) measures of performance (Tarigan & Widjaja, 2012). Another possible area of future research would be to investigate which other predictors (e.g., managers' psychographic characteristics and management skills, such as planning, time management, problem-solving, communication skills, etc.) influence restaurants' efficiency and financial success. Finally, performing a similar study on different service industries (e.g., family-run hotels, agricultural tourism, etc.) could also significantly contribute to the existing body of research and help to systemise various efficiency and profit drivers with capacity constraints.

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