Is Gibrat's law valid for travel agencies and tour operators? Evidence from the Visegrad group countries*

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Abstract

The purpose of this paper is to investigate the validity of Gibrat's law for a sample of travel agents from the Visegrad group (V4) countries and to identify the size-growth relationship. Using a linear auto-regressive model and ordinary least squares estimator, we rejected the validity of Gibrat's law in the V4 countries (except Poland, where the results were mixed). The smallest firms tend to grow faster than their larger counterparts. Using quantile regression models, we concluded that the size-growth link differed depending on actual firm size. Before reaching minimum efficient scale (MES), there is a positive relationship between firm growth and firm size. This relationship is negative after reaching MES: the smaller firms grow faster than bigger ones. Gibrat's law tends to be valid in the population of firms that have reached MES. This shows that economies and diseconomies of scale could play a significant role in explaining the size-growth relationship of travel agents.

Keywords: Gibrat's law, Visegrad Group, firm size, firm growth, travel agents
JEL codes: L11, L25

Introduction

The tourism industry is part of a relatively young and dynamically expanding sector of the economy in the countries that faced strong restrictions before the fall of the Iron Curtain. After the economic transformation from a centrally planned economy to a market economy at the beginning of the 1990 s, which was accompanied by privatisation, market and trade liberalisation, and currency convertibility, the tourist industry opened up new opportunities and challenges. Opening the borders brought necessary changes in tourism demand in terms of both domestic outbound and inbound tourism. In response to these changes, the number of intermediaries in tourism started to multiply and tourism markets began to form in post-communist countries. Today, almost 30 years after the economic transformation, the tourism markets in these countries are established and mature. The baseline conditions were very similar in all countries. There are many questions here.

* Received: 25.01.2018, accepted: 12.02.2019, 2 revisions.

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What is the relationship between firm size and firm growth in this industry? According to Gibrat (1931), growth of a firm is a random effect independent of firm size. This idea is known as Gibrat's law or the law of proportionate effect. Gibrat's thinking emerged from the ideas of Jacobus Kapteyn, who was interested in skewed distributions especially in biology and assumed that this distribution was the result of a Gaussian process (Sutton 1997). Gibrat tested his idea with French manufacturing firms and the goodness of fit was strikingly positive. We wanted to know whether the growth of firms in the tourism industry is also independent of firm size, in accordance with Gibrat's law.

To date, a large number of studies have tested the validity of Gibrat's law. The empirical evidence is not uniform, and the results are mixed (for more details, see Nassar/Almsafir/Al-Mahrouq 2014). According to Teruel-Carrizosa (2010) and Daunfeldt and Elert (2013), there are differences in the relationship between firm size and firm growth among individual sectors of the economy. The industry context has significant factors determining the validity of Gibrat's law, mainly minimum efficient scale (MES), market competition rate, and the number of young firms in the industry. Due to industry characteristics, mainly lower MES, Gibrat's law is more likely to be valid in the service sector (Teruel-Carrizosa 2010). The results of empirical studies testing the validity of Gibrat's law in the tourism industry are not uniform. They have mainly focused on accommodation and restaurant establishments. Most of the studies concluded that smaller firms tended to grow faster than their larger counterparts (for example, Falk/Hagsten 2015 for hotels; Park/Jang 2010 for restaurants). However, the results of Piergiovanni, Santarelli, Klomp and Thurik (2003) indicated differences among individual tourism sub-sectors in testing the validity of Gibrat's law. Gibrat's law was rejected in three of the five sectors (hotels, restaurants, and cafés); for the others (cafeterias and campsites), firm growth was independent of firm size. This raises another question: Is Gibrat's law valid in the travel agency sub-sector?

Most previous studies investigated Gibrat's law using a linear regression model. A new study by Miralles-Quirós, Miralles-Quirós and Daza-Izquierdo (2017) revealed an inverted U form between firm size and firm growth in Brazilian commercial banking. That study indicated that quantile regression could reveal interesting findings. The possible non-linearity of the size-growth relationship is under-examined in empirical studies testing the ties in the tourism industry. Is this relationship also non-linear in the tourism industry?

The national specifics of individual markets and government policies in each country could play a critical role. Formal and informal institutions that can vary from country to country can be important factors affecting firm growth. Most studies have focused on the mature markets of developed countries, especially of the United States (Hall 1987; Distante/Petrela/Santoro 2018), Sweden (Daunfeldt/Elert 2013; Tang 2015), Spain (Fariñas/Moreno 2000; Calvo 2006), Italy

(Del Monte/Papagni 2003; Lotti/Santarelli/Vivarelli 2009), the United Kingdom (Dunne and Hughes 1994; Hardwick/Adams 2002) and France (Coad 2008; Levratto/Tessier/Zouikri 2010). Developing nations and growing markets have been neglected (Nassar et al. 2014). Only a few papers examined the validity of Gibrat's law in post-communist countries (for example, Faggio/Konings 2003; Fiala 2015; Hedija 2017). To our knowledge, only one study focused on the tourism industry in these countries (Ivandic 2015). In this paper, we want to extend the research in this area and examine the size-growth relationship among firms acting on a young market with a high level of institutional uncertainty that should affect the growth options.

This study aims to investigate the validity of Gibrat's law for travel agencies and tour operators from the Visegrad group (V4) countries and to identify the size-growth relationship with particular attention to the non-linearity.

We focus on the growth potential of travel agents in selected post-communist countries. The travel agents sub-sector has a relatively low MES and therefore a higher probability for the validity of Gibrat's law (Daunfeldt/Elert 2013). According to the theory of active and passive learning, the new small firms accelerate their growth more than larger ones to achieve MES, and small firms tend to grow faster than their larger counterparts (Lotti et al. 2009). To obtain more robust conclusions, we examine the size-growth relationship in selected post-communist countries that underwent an economic transformation from centrally planned economies to market economies in the early 1990 s. The starting conditions were very similar in each country, but the pace of transformation and the development of formal and informal institutions differed (Holman 2000). The speed of transition to mature markets may vary in each country, as well as the final state. The article also compares conclusions for each V4 country.

This paper is organised as follows: section 1 deals with the literature review, section 2 describes the applied data and methodology, and section 3 shows the empirical results, discusses the achieved results, and compares these with findings of previous studies. The last section, titled Conclusions, focuses on a concise recapitulation of the main findings and provides suggestions for further research.

Firm growth and firm size relationship

Gibrat's law, which is also known as the law of proportionate effect, concerns the relationship between firm size and firm growth. It states that firm growth is a random effect, independent of company size. In other words, the probability of proportionate change in size is the same for all firms in a given industry and is independent of the initial size of the firm (Sutton 1997; Lotti et al. 2009).

However, economic theory does not provide clear arguments for the confirmation of Gibrat's law, and the results of empirical studies testing the relationship between firm growth and firm size are not uniform.

Most papers examining the relationship between firm size and firm growth rejected the validity of Gibrat's law, typically presenting the finding that small firms grew faster than their larger counterparts (for example, Almus/Nerlinger 2000; Oliveira/Fortunato 2006; Calvo 2006; Coad 2008; Teruel-Carrizosa 2010; Fiala/Hedija 2015). However, there are papers accepting the validity of Gibrat's law (for example, Buckley/Dunning/Pearce 1984; Pfaffermayr/Bellak 2002; Del Monte/Papagni 2003; Leitão/Serrasqueiro/Nunes 2010) or presenting mixed results (Lotti et al. 2009; Daunfeldt/Elert 2013). Detailed reviews of the empirical literature can be found in Santarelli, Klomp and Thurik (2006) and Nassar et al. (2014). There could be multiple causes for variations in the results, especially the examined industry itself and its specific characteristics (such as the production MES, the age of the industry, and degrees of uncertainty) and the examined country and its formal and informal institutions.

The economic literature does not present any unambiguous explanation for a size-growth link. On the one hand, large companies can achieve economies of scale and scope that increase their competitiveness; thus large firms could grow faster than smaller ones. On the other hand, the theory of active and passive learning offers an argument for the higher growth rate of small firms. This theory postulates that new (small) firms accelerate their growth faster than larger ones to achieve MES (Lotti et al. 2009). Smaller firms are also more active and effective in the area of innovation (Van Dijk/Hertog/Menkveld/Thurik 1997; Calvo 2006) and are more flexible and less risk-averse than their larger counterparts, and these factors are usually presented as another reason for their higher growth rate (Moreno/Casillas 2007). However, in the long run, market forces form the industry into a steady state, primarily when the individual sectors consist of a relatively homogenous population of active companies relative to the needs of the industry, with similar growth rates, in accordance with Gibrat's law (Lotti et al. 2009).

As concluded in many previous studies, the confirmation of Gibrat's law depends on many factors that could be industry-specific and country-specific depending on the situation in each industry and each country or region. The age of the industry, uncertainty, the production MES, industry size, and competition in the sector are among the most frequently mentioned factors (Coad 2008; Lotti et al. 2009; Daunfeldt/Elert 2013). From a theoretical point of view, Gibrat's law is more likely to be valid in mature and smaller industries, sectors with a higher degree of uncertainty, industries with less competition, and industries with a low or conversely very high MES. There is a higher probability that Gibrat's law will be supported in older sectors, as small firms in such sectors tend to exhibit a lower average growth rate, a situation that is influenced by a lower level of opportunity in these industries. The situation in older sectors is stabilised and does not offer opportunities for new firms to generate additional profits. Gibrat's law is more likely to be confirmed in industries with a high degree of uncertainty, as this uncertainty could make it more complicated for new firms to enter into the industry and could prevent new investments. A higher degree of uncertainty is connected with higher risk. Kan and Tsai (2006) found that the decision to become self-employed is negatively affected by risk-aversion. With a small number of entrants, the industry matures with a stable growth rate of existing firms. Besides, a very high MES could result in large entry barriers. On the other hand, a very low MES could be the reason for the validity of Gibrat's law since small firms are not forced to grow faster than large firms. Concentration (degree of competition) in the industry is another factor affecting the validity of Gibrat's law through the barriers that prevent the entry of new small firms into the sector. According to Daunfeldt and Elert (2013) the behaviour of firms with monopoly power that could prevent the entry of new firms, making it less likely that small firms will experience faster growth than large firms in these industries.

The studies by Teruel-Carrizosa (2010), Daunfeldt and Elert (2013), and Hedija (2016) confirm this statement. Teruel-Carrizosa (2010) examined the size-growth relationship for manufacturing and service industries in Spain. Generally, Gibrat's law was not confirmed, but they showed that the impact of the firm size on the company growth rate varied according to the examined industry. Small companies in the service industries grew at a slower rate than small companies in manufacturing due to the fact that firms in manufacturing must achieve a higher MES in order to be efficient (Teruel-Carrizosa 2010).

In addition, Daunfeldt and Elert (2013) confirmed that industry-specific factors could play an important role in testing the validity of Gibrat's law. Using a large sample of Swedish companies and examining the size-growth link in 632 industries, the authors concluded that Gibrat's law was more likely to be valid in sectors characterised by a low MES, a small share of companies located in metropolitan areas, a high degree of group ownership, high market concentration, and a higher average age of firms in the industry. Hedija (2016) came to similar conclusions for the Czech Republic. After testing the validity of Gibrat's law for 14 sectors, Hedija rejected the validity of Gibrat's law in 12 of them in which the concentration rate, the size of the industry, and MES were identified as key factors explaining the validity of Gibrat's law in selected industries.

If we summarise the conclusions of the above-mentioned studies, we can say that the following factors influence the validity of the Gibrat's law: (1) minimum efficient scale of production, (2) industry age, (3) market concentration, and (4) industry size. Gibrat's law was more likely to be rejected in industries with a high MES and a higher number of companies. On the other hand, Gibrat's law was more likely to hold in industries characterised by a high market concentration and higher age.

In recent years, some empirical studies have emphasised that the size-growth relationship could not be linear and that it could differ in size distribution. Economies and diseconomies of scale could play a critical role. According to conventional firm theory, as the sizes of the firms grows, they achieve economies of scale. However, if they reach MES, diseconomies of scale are achieved in the populations of these firms (Bentzen/Madsen/Smith 2012). Nevertheless, the findings of empirical studies that also tested for non-linearity are not conclusive and vary depending on the country and industry analysed. Bentzen et al. (2012) examined the relationship between firm size and growth in Denmark and concluded that larger firms tended to grow faster than the smaller ones and the relationship varied only slightly according to the quantiles of firm size. From the presented results, it is evident that the relationship may differ in each sector of the economy. Miralles-Quirós et al. (2017) confirmed this in their study. They showed a significant relationship between the size and growth in Brazilian commercial banking, but it varied from positive to negative between the first and the third quartile.

Some studies have examined the firm size-growth link in tourism and its selected segments; their conclusions were not uniform. However, the majority of studies confirmed the tendency of small firms to grow faster than large firms. Rufín (2007) rejected the validity of Gibrat's law in Spain's tourism industry and confirmed a negative dependence relationship between initial firm size and firm growth. The studies by Falk and Hagsten (2015) examining the size-growth relationship in Sweden's hotel industry brought similar findings. Ivandic (2015) tested the validity of Gibrat's law using a sample of Croatian hotels; Serrasqueiro and Nunes (2016) used data from small and medium-sized Portuguese hotels. All these studies confirmed the more rapid growth of smaller hotels. On the other hand, Piergiovanni et al. (2003) focused on selected sectors in Italian hospitality and concluded that Gibrat's law held in two of the five examined ones. Gibrat's law was valid for campsites and cafeterias and was rejected for hotels, cafés, and restaurants where the smaller firms grew faster than their larger counterparts did. Alonso-Almeida (2013) presented the results for Spain and showed that firm size was an essential factor for firm growth in travel agencies and accommodation sub-industries. Park and Jang (2010) also took into account the potential non-linearity of the size-growth relationship. They examined the US restaurant industry and concluded that smaller restaurant firms grew faster than larger ones, but the growth rate was nonlinear and decreased as firm size increased.

Most of the existing studies testing Gibrat's law in the tourism industry rejected its validity and concluded that small firms in this industry tend to grow faster than large ones. However, it has been shown that the conclusions vary in subsectors according to industry specifics, specifically MES, competitive environments, uncertainty, and the age and size of the industry. The law has been mainly tested in developed countries with long traditions in the market economy, mature markets, and well-established market institutions. There are no clear results for firms acting on young markets with high levels of institutional uncertainty that could affect growth.

Methodology

Sample and data

The analysis was based on panel data from the Amadeus database containing comparable financial information for around 21 million companies across Europe. We obtained the data for tour operators and travel agencies using the Statistical classification of economic activities NACE Rev. 2 (NACE) and the group 79.1 Travel agency and tour operator activities for the Visegrad Group countries (Czech Republic, Hungary, Poland, and Slovakia) from 2009 to 2016. We focused only on companies and not sole proprietorship since the Amadeus database contained financial data mainly for companies. To include only active companies, we excluded companies that had sales of less than 2,000 euro per year in the examined period (in prices of 2015). The final sample contained the data of 4,367 travel agencies and tour operators from the V4 countries.

We used an unbalanced panel that contained, on average, the data of 709 firms in the Czech Republic, 560 firms in Slovakia, 865 in Hungary, and 356 in Poland. These firms represented, on average, 17 percent of all active firms in each year in the Czech Republic, 61 percent in Slovakia, 70 percent in Hungary, and 9 percent in Poland. Although companies in all four examined countries are required by law to publish financial data, inconsistencies in supervising compliance and varying fines led to a range of companies that respect this obligation in each country.

For comparison, we investigated the validity of Gibrat's law for two samples. The first sample, titled the 'full sample', comprised of all companies. The second sample, titled 'established companies', consisted only of companies that had been in the industry for at least five years by 2009, stayed in business throughout the study period, and did not change their primary economic activity according to NACE). The number of firms included in both samples is shown in Tables 1 and 2. Removing the start-up firms and firms that left the market enabled us to monitor the development of mature companies in the industry. The development of start-up companies and companies terminating their existence is specific, as start-up companies tend to be smaller and their initial growth is very dynamic, while firms in liquidation mostly report a decline in activity or minimum activity regardless of size. Empirical studies (for example Daunfeldt and Elert 2013) show that Gibrat's law is more likely to be valid in mature industries.

Data analysis

The validity of Gibrat's law is verified using the linear auto-regression model proposed by Daunfeldt and Elert (2013):

$$lnS^i_{jt} = \alpha_{j0} + \alpha_{j1} . \ln S^i_{j(t-1)} + \theta_{jt} . T_t + u_{jt} . \quad (1)$$

Where S^i_{jt} is the size of the i-th firm of the j-th industry in time t, $\theta_{jt} . T_t$ is a vector of time-specific fixed effects. The values of parameter α_{j1} indicate whether Gibrat's law is valid.

Daunfeldt and Elert (2013) proved the validity of Gibrat's law in individual industries using the five-digit NACE classification for the industries. In this study, we tested the validity of Gibrat's law for travel agencies and tour operator activities (NACE 79.1). We extended the model above and added sector (the four-digit NACE classification) as one of the explanatory variables allowing us to filter out the differences between sub-sectors:

$$lnS_{it} = \alpha_0 + \alpha_1 . \ln S_{i(t-1)} + \alpha_2 . country_i + \alpha_{3t} . T_t + \alpha_4 . NACE_i + \alpha_{5t} . T_t . NACE_i + u_t . \quad (2)$$

Where S_{it} is the size of the i-th firm in time *t*, *countryi* is the set of dummy variables for countries, $NACE_i$ is the dummy variable for the industry of the i-th firm using the four-digit NACE classification (79.11 Travel agency activities, 79.12 Tour operator activities), $\alpha_{3t} . T_t$ is the vector of the time-specific fixed effects, $\alpha_4 . NACE_i$ is the vector of industry-specific fixed effects, and $\alpha_{5t} . T_t . NACE_i$ is a vector of time- and industry-specific fixed effects. The value of parameter α_1 indicates if Gibrat's law is valid or not. Gibrat's law holds if $\widehat{\alpha_1}$ is equal to one. A value smaller than one implies that small firms grow faster than larger ones and a value higher than one implies that large firms grow faster than small ones.

Real sales expressed in local currency units were used as an indicator of firm size. Sales, assets, and the number of employees are among the most frequently used measurements of firm size in empirical studies (Nassar et al. 2014). We chose sales as it was the most flexible indicator of the three, reacting faster to changes and without threshold values. The indicator 'real sales' includes real annual revenues from the sales of products, goods, and services in thousands of euro. To calculate actual sales, we took a harmonised consumer price index published by Eurostat, and we used 2015 as the base period. To estimate the parameters of the model, we used ordinary least squares (OLS) regression with heteroscedasticity and autocorrelation robust standard errors.

An ordinary least squares (OLS) regression is based on the conditional mean of the distribution of the dependent variable. Nevertheless, the examined relationship could differ according to the dependent variable distribution. We also applied the quantile regression proposed by Koenker and Bassett (1978) which enabled us to estimate the existing relationship between the dependent and independent variables for different quantiles of the distribution of the dependent variable.

$$lnS_{it} = \alpha_{0\theta} + \alpha_{1\theta} . \ln S_{i(t-1)} + \alpha_{2\theta} . country_i + \alpha_{3\theta t} . T_t + \alpha_{4\theta} . NACE_i + \alpha_{5\theta t} . T_t . NACE_i + u_{\theta t} . \quad (3)$$

Where $\theta = 0.25$, 0.5 and 0.75 are the quantiles being analysed. To estimate the parameters of the model, we used quantile regression (QR) with heteroscedasticity and autocorrelation robust standard errors.

To confirm or reject Gibrat's law, we tested the null hypothesis $H0{:}(\widehat{\alpha_1}) = 1$ versus $H1{:}(\widehat{\alpha_1}) \neq 1$ using the F-test. The descriptive statistics of both used samples are shown in Tables 1 and 2.

Table 1. Summary statistics for full sample: log sales

Year	Number of firms	Mean	Median	Standard deviation	Number of firms	Mean	Median	Standard deviation
	Czech Republic				**Hungary**			
2009	686	5.300	5.493	2.019	732	4.752	4.723	1.856
2010	774	5.230	5.362	2.042	791	4.737	4.767	1.915
2011	792	5.144	5.321	2.074	788	4.554	4.584	1.918
2012	785	5.129	5.240	2.033	886	4.534	4.524	1.956
2013	784	4.959	5.038	2.070	936	4.521	4.584	1.936
2014	649	4.954	4.963	2.076	945	4.536	4.587	1.917
2015	749	5.001	5.011	2.127	924	4.688	4.700	1.893
2016	455	4.890	4.850	2.147	916	4.777	4.798	1.847
	Poland				**Slovak Republic**			
2009	288	6.399	6.525	1.683	402	4.920	4.770	1.991
2010	358	6.176	6.477	1.820	470	4.838	4.708	2.033
2011	384	6.058	6.295	1.858	522	4.694	4.620	2.056
2012	431	5.836	5.985	1.933	569	4.638	4.428	2.006
2013	413	5.885	6.141	1.950	608	4.587	4.412	1.949
2014	317	6.279	6.496	1.790	665	4.376	4.094	1.955
2015	406	6.032	6.122	1.901	619	4.415	4.143	1.982
2016	248	6.434	6.599	1.871	626	4.460	4.156	1.937

Source: Database Amadeus, own computation

Table 2. Summary statistics for established firms: log sales

Year	Number of firms	Mean	Median	Standard deviation	Number of firms	Mean	Median	Standard deviation
		Czech Republic				**Hungary**		
2009	493	5.559	5.914	2.029	524	4.893	4.851	1.892
2010	514	5.552	5.790	2.031	554	4.756	4.782	1.988
2011	498	5.489	5.737	2.081	500	4.661	4.679	2.001
2012	471	5.495	5.658	2.041	523	4.622	4.550	2.037
2013	437	5.382	5.462	2.083	503	4.727	4.668	1.993
2014	360	5.334	5.411	2.074	479	4.707	4.683	2.025
2015	386	5.425	5.407	2.152	483	4.872	4.836	1.979
2016	230	5.417	5.151	2.202	467	4.900	4.842	1.951
		Poland				**Slovak Republic**		
2009	219	6.588	6.693	1.566	250	5.411	5.398	1.972
2010	241	6.488	6.642	1.652	264	5.301	5.327	2.116
2011	246	6.168	6.471	1.874	258	5.268	5.258	2.173
2012	246	6.151	6.268	1.859	254	5.392	5.315	2.079
2013	224	6.263	6.486	1.884	247	5.383	5.200	2.060
2014	170	6.576	6.659	1.711	248	5.143	4.861	2.116
2015	205	6.300	6.301	1.811	221	5.162	5.153	2.209
2016	128	6.684	6.868	1.771	211	5.280	4.981	2.190

Source: Database Amadeus, own computation

Results and discussion

With the use of equations 2 and 3, we tested the validity of Gibrat's law for the V4 countries. We examined the relationship between firm size and firm growth for all V4 countries, controlling for the country. We also included a time-specific fixed effect that captured the time-variant heterogeneity in growth rates, and an industry-specific fixed effect and an industry-specific and time-specific fixed effect capturing the industry-variant heterogeneity in growth rates. Taking into account the objections of Lotti et al. (2009) and Daunfeldt and Elert (2013) about the market selection process, we tested the relationship for two samples of firms: the full sample and established companies. According to these authors, including all the companies in the estimation might obscure the link between size and growth rate since smaller firms have higher exit rates than larger ones.

Over time, learning (either passive or active) and market selection processes 'clean' the original population of companies, and the markets tends to behave according to the Gibrat's law. This idea was confirmed by Lotti et al. (2009) and

Fiala (2015). In line with these objections, the relationship between firm size and firm growth rate was examined both for all firms and on the sample of established companies. The results are shown in Table 3.

Table 3. V4 countries – Gibrat's law validity estimation

	Full sample				Established companies			
	(OLS)	(p25)	(p50)	(p75)	(OLS)	(p25)	(p50)	(p75)
$\ln.S_{t-1}(\alpha_1)$	0.944*** (0.004)	1.021*** (0.002)	0.993*** (0.001)	0.950*** (0.002)	0.979*** (0.004)	1.028*** (0.002)	1.003*** (0.002)	0.980*** (0.002)
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t.NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.238 (0.180)	-0.486*** (0.069)	-0.044 (0.114)	0.601*** (0.084)	-0.056 (0.163)	-0.574** (0.271)	-0.103*** (0.009)	0.361*** (0.031)
R^2	0.8925	-	-	-	0.9279	-	-	-
Pseudo R^2	-	0.7400	0.7672	0.7475	-	0.7868	0.8163	0.8061
N	15054	15054	15054	15054	8720	8720	8720	8720
F-test	249.63	133.09	21.54	847.20	32.16	162.69	5.26	97.34
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0219	0.0000

*Notes: ***significant at the 1 percent level, **significant at the 5 percent level, *significant at the 10 percent level, robust standard errors in brackets, F- test of H0: $\widehat{\alpha_1}$ =1.*

Source: Database Amadeus, own computation.

The columns of the table titled OLS present the results of the OLS estimator; columns titled p25, p50 and p75 the results of the QR estimator. The key indicator for testing the validity of Gibrat's law is the value of parameter α_1. As noted above, Gibrat's law is confirmed if $\widehat{\alpha_1}$ is equal to one. The F-test was used to prove the null hypothesis that $\widehat{\alpha_1} = 1$.

Using the sample of all firms and the OLS estimator, we can reject the validity of Gibrat's law at 1 percent significance level (($\widehat{\alpha_1} \neq 1$). In our case $\widehat{\alpha_1} < 1$, which indicates that small firms grow faster than their larger counterparts in V4 countries and implies a significant inverse relationship between firm size and firm growth. These conclusions are not a surprise and are in line with the findings of most studies testing this relationship in the tourism industry (for example, Piergiovanni et al. 2003; Alonso-Almeida 2013).

We then employed the QR estimator on the same data to estimate of $\widehat{\alpha_1}$ to vary according to the quantiles of firm size. As shown in Table 3, the value of $\widehat{\alpha_1}$ decreases along the size distribution from 1.021 for the 0.25 quantile to 0.993 for the median and to 0.950 for the 0.75 quantile. This implies that the size-growth link varies depending on the firm size. It changes from positive to negative with the growing size of the firm. Using size distribution, first in the population of small firms the larger firms grow faster than the smaller ones, and with the increasing size of the firms, the smaller firms grow more quickly than their larger counterparts. These results, confirming the changing size-growth relationship in the size distribution of firms, vary from the conclusion of Bentzen et al. (2012) testing the ties for Danish firms. However, the Bentzen study did not examine the tourism industry separately. On the other hand, our results follow the findings of Miralles-Quirós et al. (2017) testing the size-growth link in Brazilian commercial banking.

Our findings indicate that in general economies and diseconomies of scale could play a critical role in explaining the relationship between firm size and firm growth. These results are in accordance with conventional firm theory with economies of scale for smaller firms and with some diseconomies of scale as they grow larger (Bentzen et al. 2012). Due to economies of scale, the larger firms grow faster than smaller ones; after attaining MES, diseconomies of scale start to prevail, resulting in the faster growth of smaller firms as compared to their larger counterparts.

The results for the sample of 'established companies' were very similar to those of the 'full sample'. Using the OLS estimator, $\widehat{\alpha_1} > 1$ and F-test results show that the validity of Gibrat's law can be rejected at 1 percent level of significance. Applying a quantile regression approach, we can conclude that relationships between firm size and firm growth vary in size distribution and they change from positive to negative with the growing size of the firms. The validity of Gibrat's law for the population of firms around the median cannot be rejected at the 1 percent level of significance. This indicates that the Gibrat's law tends to be valid in the community of firms that have reached MES. MES can be determined in several ways; one of the most straightforward and frequently used methods is employing the size of the median firm in the industry (Daunfeldt and Elert 2013).

We then tested the validity of Gibrat's law separately for each V4 country. The estimation results of equations 2 and 3 for all four countries, i.e., the Czech Republic, Hungary, Poland, and Slovakia, are presented in Tables 4 to 7, respectively. The displayed results are very similar for three of the four V4 countries: the Czech Republic, Hungary, and Slovakia. Poland seems to be different in some respects.

Using the OLS estimator and the 'full sample', we rejected the null hypothesis for all four V4 countries. As presented below in Tables 3 to 6, $\widehat{\alpha_1} < 1$ for all four examined countries. This indicates that smaller firms grow faster than their larger counterparts do, and that company growth rate is dependent on the firm size. Gibrat's law is violated at the 1 percent significance level. Using the QR estimator, we can confirm the changing relationship between firm size and firm growth in size distribution in all four countries (the value of $\widehat{\alpha_1}$ decreases along the size distribution). We cannot reject the validity of Gibrat's law for Poland for the population of firms around the median.

The results for Poland are also different from the other three V4 countries for the 'established companies' sample. Using the OLS estimator, we reject the null hypothesis on the validity of Gibrat's law for the Czech Republic, Hungary, and Slovakia. For those countries, the QR estimator results confirm the conclusion that the size-growth link differs around the size distribution and Gibrat's law tends to be valid for the population of companies around the median. The conclusions for Poland are different. The results of the F-test indicate that we cannot reject the validity of Gibrat's law using the OLS estimator, and on the other hand, we reject the validity for individual quantiles around size distribution. The explanation could be the fact that the MES corresponds preferably to the average size of firms in the sample than to the median firm in the case of Poland. The Polish travel agents surveyed are on average larger than those of the other V4 countries and the average size of the firm is lower than the median. Gibrat's law is valid for the population of companies approaching the MES, which of course is not a median in the Polish companies. However, the conclusions for Poland need to be interpreted carefully because the final sample of Polish companies contained only 9 percent of the population of firms. This may be problematic for the representativeness and generalisation of conclusions for the entire population of companies. If we apply the formula for calculating sample sizes for finite populations (see Israel 1992) for Poland and use 95 percent confidence level and 5 percent margin of errors, the minimum sample size is around 9 percent of the population. Our sample is therefore at the edge.

Table 4. Czech Republic – Gibrat's law validity estimation

	Full sample				Established companies			
	(OLS)	(p25)	(p50)	(p75)	(OLS)	(p25)	(p50)	(p75)
$ln.S_{t-1}$ (α_1)	0.953*** (0.006)	1.022*** (0.003)	0.994*** (0.002)	0.955*** (0.000)	0.971*** (0.007)	1.024*** (0.004)	1.000*** (0.003)	0.979*** (0.003)
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t.NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.201 (0.181)	-0.489** (0.242)	-0.031 (0.111)	0.581*** (0.000)	-0.025 (0.162)	-0.549** (0.238)	-0.087** (0.039)	0.368* (0.212)
R^2	0.9088	-	-	-	0.9239	-	-	-
Pseudo R^2	-	0.7649	0.7903	0.7641	-	0.7975	0.8234	0.8028
N	4195	4195	4195	4195	2606	2606	2606	2606
F-test	63.89	44.65	6.21	76.80	17.27	34.73	0.01	42.01
p-value	0.0000	0.0000	0.0127	0.0000	0.0000	0.0000	0.9056	0.0000

*Notes: ***significant at the 1 percent level, **significant at the 5 percent level, *significant at the 10 percent level, robust standard errors in brackets, F- test of H0:* $\widehat{\alpha_1}$ *=1.*

Source: Database Amadeus, own computation.

Table 5. Hungary – Gibrat's law validity estimation

	Full sample				Established companies			
	(OLS)	(p25)	(p50)	(p75)	(OLS)	(p25)	(p50)	(p75)
$ln.S_{t-1}$ (α_1)	0.933*** (0.007)	1.017*** (0.003)	0.995*** (0.003)	0.950*** (0.003)	0.981*** (0.006)	1.024*** (0.004)	1.004*** (0.003)	0.978*** (0.003)
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t.NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.284*** (0.054)	-2.684*** (0.051)	-2.570*** (0.000)	-2.374*** (0.000)	-0.127 (0.096)	-0.513 (0.159)	-0.076* (0.042)	0.211*** (0.045)
R^2	0.8610	-	-	-	0.9247	-	-	-
Pseudo R^2	-	0.7172	0.7356	0.7115	-	0.7702	0.8016	0.8028
N	5421	5421	5421	5421	3257	3257	3257	3257
F-test	95.09	23.11	4.11	357.34	9.13	35.25	1.89	66.18
p-value	0.0000	0.0000	0.0427	0.0000	0.0026	0.0000	0.1691	0.0000

*Notes: ***significant at the 1 percent level, **significant at the 5 percent level, *significant at the 10 percent level, robust standard errors in brackets, F- test of H0:* $\widehat{\alpha_1}$ *=1.*

Source: Database Amadeus, own computation.

Table 6. Poland – Gibrat's law validity estimation

	Full sample				Established companies			
	(OLS)	(p25)	(p50)	(p75)	(OLS)	(p25)	(p50)	(p75)
$\ln.S_{t-1}$ (α_1)	0.962 (0.011)	1.033*** (0.006)	1.001*** (0.004)	0.957*** (0.006)	0.990*** (0.011)	1.034*** (0.006)	1.011*** (0.005)	0.987*** (0.006)
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t.NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.228*** (0.087)	-0.339*** (0.061)	0.021 (0.047)	0.505*** (0.073)	0.004 (0.099)	-0.344*** (0.087)	-0.083* (0.043)	0.242*** (0.067)
R^2	0.9004	-	-	-	0.9325	-	-	-
Pseudo R^2	-	0.7643	0.7730	0.7401	-	0.8015	0.8138	0.7914
N	1957	1957	1957	1957	1253	1253	1253	1253
F-test	12.82	34.80	0.04	46.78	0.76	30.81	5.89	4.91
p-value	0.0004	0.0000	0.8463	0.0000	0.3829	0.0000	0.0153	0.0269

*Notes: ***significant at the 1 percent level, **significant at the 5 percent level, *significant at the 10 percent level, robust standard errors in brackets, F- test of H0: $\widehat{\alpha_1}$ =1.*

Source: Database Amadeus, own computation.

Table 7. Slovak Republic – Gibrat's law validity estimation

	Full sample				Established companies			
	(OLS)	(p25)	(p50)	(p75)	(OLS)	(p25)	(p50)	(p75)
$\ln.S_{t-1}$ (α_1)	0.937*** (0.007)	1.016*** (0.004)	0.986*** (0.002)	0.943*** (0.004)	0.977*** (0.008)	1.032*** (0.005)	1.001*** (0.004)	0.973*** (0.004)
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T_t.NACE fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.355*** (0.061)	-0.256*** (0.059)	0.137*** (0.034)	0.628*** (0.043)	0.110 (0.073)	-0.328*** (0.053)	0.046 (0.039)	0.392 (0.051)
R^2	0.8811	-	-	-	0.9123	-	-	-
Pseudo R^2	-	0.6843	0.7360	0.7351	-	0.7462	0.7938	0.7947
N	3481	3481	3481	3481	1604	1604	1604	1604
F-test	82.66	17.45	33.03	212.81	8.35	43.76	0.11	38.82
p-value	0.0000	0.0000	0.0000	0.0000	0.0042	0.0000	0.7349	0.0000

*Notes: ***significant at the 1 percent level, **significant at the 5 percent level, *significant at the 10 percent level, robust standard errors in brackets, F- test of H0: $\widehat{\alpha_1}$=1.*

Source: Database Amadeus, own computation.

Conclusions

The purpose of this study was to test the validity of Gibrat's law for travel agencies and tour operators from the Visegrad group countries, i.e., the Czech Republic, Hungary, Poland and Slovakia, and to identify the size-growth relationship. We used a rich sample of 4,367 travel agencies and tour operators from the V4 countries for the period between 2009 and 2016. To test the validity of Gibrat's law, we used a linear auto-regression model and sales as the indicator of firm size. To account for possible changes in the size-growth relationship in the size distribution of firms, we used a traditional ordinary least square estimator and also quantile regression models. To minimise the impact of the new entrance, we examined the relationship between firm size and firm growth using two different samples of firms. The full sample consisted of all companies in the travel agents industry, and the sample of established firms contained well-established companies that were on the market throughout the survey period.

This study provides new insights into the relationship between company size and growth for the subsector of travel agencies and tour operators in the relatively new markets of post-communist countries. The results did not confirm the validity of Gibrat's law validity on the aggregate level on the sample of all companies or for established companies. This could indicate that the V4 countries are not yet fully mature.

However, the detailed research reveals that the size-growth relationship differs in firm size distribution. We identified a significant relationship between firm size and firm growth that varied depending on the firm size. It changed from positive to negative as the size of the firm grew. These findings proved to be valid for both of the test samples of companies: all companies and established companies in the industry. When the example of established firms was used, there was a tendency to converge to Gibrat's law validity for firms around the median size; this conclusion was confirmed on the country level.

Our results also showed that the relationship between firm size and firm growth in the segment of travel agencies and tour operators varied similarly in the individual V4 countries. Using the linear auto-regressive model and ordinary least squares estimator, we rejected the validity of Gibrat's law in all V4 countries except for Poland, where the results were mixed. Using the quantile regression, we concluded that the size-growth link differed depending on actual firm size.

From this perspective, the tourism markets of V4 countries appear to be mature; economies of scale can play a significant role in the growth process. Due to economies of scale, larger firms grow faster than smaller ones; after achieving MES, diseconomies of scale start to prevail, resulting in the faster growth of smaller firms as compared to larger ones. Around the MES, the growth rate tends to be a random process independent of firm size; MES can be identified mostly with median of the firm size.

We can conclude that our results have confirmed that firm size is a crucial factor affecting the growth dynamics and seems to be essential in the tourism industry. Hence, firm size classifications should be considered in firm growth analysis, not only in the manufacturing industry but also in the service sector.

We admit that there are some limitations in the used research design. As already mentioned, the sample for Poland is unfortunately too small to draw general conclusions. We also conducted the research with a sample consisting only of companies due to the lack of data for sole proprietorships. The findings are valid for this sample. However, entrepreneurs may represent a relatively significant segment of the market. Should their data be included in the sample, the findings may somewhat differ.

An investigation of additional factors might be a topic for further research. It may be necessary for establishing a link between company size and growth. For instance, management is among the most important stakeholders (Slabá 2013) and may significantly influence the firm growth. Hedija (2017) showed that the gender composition of management had no critical effect on the validity of Gibrat's law. On the other hand, the age composition of managers and their preferences might play a role.

Acknowledgements

This research was supported by the College of Polytechnics Jihlava, under Grant no. 1170/4/186, "The Validity of Gibrat's Law in Visegrad Group Countries".

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