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Does firm size improve firm growth? Empirical evidence from an emerging economy

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Abstract

This study aims to examine the relationship between firm size and firm growth in Vietnam. The literature does not in general give support to Gibrat's law stating that the expected increase in firm size is proportionate to its initial size, or that firm growth rates are independent of firm size. The present study relies on a sample of 578 listed Vietnamese companies representing eight different industries and covering the period 2010 to 2020. The analysis reveals that growth in firm revenues does not give support to a hypothesis of independence of initial firm sizes. When the firm size is measured by total assets the opposite result appears, i.e. the Gibrat's law is not rejected. When including also the age of the firms in the test methodology the conclusion will be that firm growth—measured by revenue or assets—in all cases will decrease with firm size.

Keywords

- Gibrat's law
- corporate growth
- Vietnamese companies
- emerging economy
- panel data analysis

JEL codes: L25, C23

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Introduction

Market entry and the performance of new as well as incumbent firms in industries has always been a central topic in industrial economics. The European Union and a number of countries globally have for a long time designed special measures in their industrial policies to support small and medium-sized firms which is a topic that has attracted a lot of political focus due to a belief in the developments of private companies as an important creator of more jobs. Of course, the political focus on creating special supporting schemes for small firms seems to be founded on a presumption that they have competitive disadvantages compared to larger firms.

One of the first and most famous contributions to the discussion of the importance of firm size for firm growth is Gibrat (1931) who presents a formal model of firm growth later on designated as 'The Law of Proportionate Effect'. According to this 'Law' the expected increase in firm size is proportionate to the initial firm size. The main reason for this relationship is that large firms also have a proportionally larger growth potential than small firms because they sell their products on a larger market. As the absolute growth of a firm is proportional to firm size Gibrat concludes that firms' growth rates are independent of their initial size. Another implication of Gibrat's law is that if firms' growth opportunities are randomly distributed then the distribution of firm size would be skewed and approach a lognormal distribution after a number of periods and independent of the initial distribution of firm size. In fact, this prediction is much in line with the actual firm size distribution in most industries and countries. Thus, many of the earliest empirical investigations of Gibrat's law tested the actual firm size distribution against a theoretical statistical distribution.

This paper aims to test the validity of Gibrat's law by using a sample of Vietnamese listed companies. Unlike many previous results which often focus on specific industries or only large firms the dataset used is very up-to-date with 578 companies representing all industries in the period of 2010 to 2020. Firms such as banks or other financial institutions are excluded from the data set due to their complex structure making them inappropriate for the present analysis. The database is a balanced panel data set and it has a suitable time-series span to identify the relationship between the firm size and firm growth in Vietnam.

The article is organized as follows. Firstly, a short introduction and then Section 1 gives a survey of the recent empirical literature on Gibrat's law. Section 2 presents the methodology and the empirical model to be estimated. Section 3 includes the data description and the results from the empirical analysis. Finally, the last Section concludes.

1. Literature review

The relationship between firm growth and firm size has been addressed in a large number of theoretical studies as well as empirical studies. The growth of firms is important for the general performance of an economy and the interest in this topic has increased significantly during recent years. Gibrat's law has been employed in some previous studies to examine how the firm size affects its growth and with a hypothesis that large and small firms grow at the same rate and hence the growth of firms is independent of the firm size (Gibrat, 1931). While there are a number of previous results that support the validity of Gibrat's law indicating that a firm's growth is independent of its initial size (e.g., Buckley et al., 1984) some empirical studies confirm the failure of this theory (Shapiro et al., 1987) or find more mixed evidence (Audretsch et al., 2004). Most of these studies have been done with firm data from developed countries and less evidence is available from developing or emerging countries.

The evidence in favour of Gibrat's law is typically found in the studies conducted in the 1960s or 1970s (e.g., Hart & Prais, 1956; Simon & Bonini, 1958). In the context of the robust development of technologies and increased globalization during recent decades some studies reject Gibrat's law as firms' growth rates seem to be significantly correlated with firm size. Likewise, Daunfeldt and Elert (2013) analyze a sample of Swedish firms covering five industries and the results reject Gibrat's theory as small firms grow faster than large firms. However, Gibrat's law is confirmed when industry-specific regressions are applied and factors such as minimum efficiency scale, market concentration ratio or the number of young firms in the industry therefore influence the test results. Aydogan and Donduran (2019) strongly reject Gibrat's law in the case of Turkish firms where firms do not grow in proportion to their size; the reason seems to be that the economic environment in Turkey was beneficial for smaller firms in the period and hence they experienced a faster growth.

In general, there are only a few empirical studies related to testing Gibrat's law for developing countries. Firm growth is considered important for the economic development and in developing countries, the relationship between firm growth and firm size is investigated in relation to fast growing countries. Bigsten and Gebreeyesus (2007) analyze the determinants of manufacturing firm growth in Ethiopia. The empirical results show that firm growth decreases with its size and therefore smaller firms are found to have higher growth rates than larger firms. Park et al. (2010) conclude with data from Korea that firm size and age have significant negative effects on firm growth and they find a significant positive effect on firm survival in the case of manufacturing industry. Rasiah et al. (2014) examine the same relationship between firm size and growth for the construction sector in Malaysia. The results show that

growth contributed significantly to profitability in small and medium firms but they also showed that firm size and growth are independent and in this sense give support to Gibrat's law. Yu (2016) also investigates whether the firm size is independent of firm growth with a sample of mobile phone firms in mainland China, Hong Kong and Taiwan. The empirical findings are generally in favour of independence between firm size and growth, but for subsamples the study shows that a number of firms affected by innovation and technology development are not giving support to Gibrat's law. Villari et al. (2021) investigate the firm growth model for service industries in India. The study finds a significant relationship between firms' growth and their size and age where the knowledge-intensive service sector has experienced different growth patterns compared to other sectors. To conclude, the literature review most studies do not lend support to Gibrat's law and this also seems to be the case for developing countries.

2. Data and the empirical test methodology

The data used in the empirical analysis is firm-specific and collected for listed Vietnamese companies where annual reports of the firms contain the economic information needed for the present purpose. The data covers the period 2010 to 2020 and is included in the data set for firms with accountant reports each year giving information on total assets, annual turnover, profits, year of establishment and some other variables. In total 578 firms are included in the data set and they cover eight industries; approximately half of the firms belong to manufacturing industry. Thus, the final data set is a balanced panel including 578 firms for a time span of eleven years. Since 1986 economic reforms have been initiated in Vietnam and these have contributed to a transformation towards more economic growth and increased welfare. The number of private firms has increased and the economy has become much more integrated in the world economy during the last couple of decades (see Le & Nguyen, 2018). Therefore, also listed companies with relevant accounting data are present and the information can be applied for economic analysis as with the topic on firm growth addressed in this analysis. The data from the listed firms are checked by audit companies and also by the Ministry of Finance and are therefore in a common or consistent format in relation to empirical analysis.

Various measures of firm size are considered in the literature and with the present data set either annual turnover or total assets can be selected as the measure of firm size. In the empirical tests both variables is included although the turnover might seem to be the most appropriate measure. The variable total

assets is influenced by many factors, e.g., short-run financial conditions which might have a smaller effect in relation to the turnover variable and be considered less important in connection with the size measure. Turnover will also be influenced by a range of both internal and external conditions for the respective firms and therefore the assets variable is included in the test procedure.

Table 1 reports some summary statistics for the turnover, assets and age of the firms in the data set. During the decade 2010 to 2020 the total turnover increased around fifty per cent in real terms; measured by mean values and for the assets the increase was somewhat larger with a value of around eighty per cent. The mean age of the firms was eighteen years in 2010 and thus relatively young firms with also a very low standard error (0.6). There are a few more firms added to the sample after 2010 but all firms have at least an age of six years in 2020 as exhibited in Table 1.

Table 1. Summary statistics: Size and age of Vietnamese listed firms ($N = 578$)

All firms	2010			2020		
	Revenue	Assets	Age	Revenue	Assets	Age
Mean	1057	1300	18.4	1570	2355	26.9
SE of mean	124	146	0.6	243	508	0.6
Minimum	0.7	7.8	1	0.1	9.6	6
Maximum	48076	39679	58	66830	254940	68

Note: The size is measured as revenue and assets in billion VND (2010-prices) and is reported as the mean value of the respective firms and with the standard error of the mean also reported. The age variable is the mean age since establishment (in years).

Source: own elaboration.

The empirical studies differ in relation to the estimation methodologies applied and it is intended to include two different approaches to test the validity of Gibrat's law. Some studies use a dynamic approach based on a random walk model specification: $z_{t,i} = \beta z_{t-1,i} + \varepsilon_{t,i}$ which in the empirical testing procedure will be (see Chesher, 1979):

$$\Delta z_{t,i} = \gamma z_{t-1,i} + \varepsilon_{i,t} \tag{1}$$

Gibrat's law holds if the restriction $\gamma = 0$ is fulfilled ($\gamma = \beta - 1$), i.e. the growth rates are independent of size which also implies that growth rates are persistent over time.

However, if serial correlation is present in $\varepsilon_{t,i}$, estimation gives biased parameters and therefore the empirical specification can be extended to deal with autocorrelation in the residuals (see Audretsch et al., 2004) and a second order process for the stochastic term is included:

$$\varepsilon_{t,i} = \rho\varepsilon_{t-1,i} + \omega\varepsilon_{t-2,i} + \nu_{t,i} \quad (2)$$

Adding this to the error term gives the empirical Model 1 to be estimated:

$$\Delta z_{t,i} = (\beta - 1 + \rho)z_{t-1,i} + (\omega - \beta\rho)z_{t-2,i} - (\beta\omega)z_{t-3,i} + \upsilon_t \quad (3)$$

The panel data relates to the listed Vietnamese companies and $z_{i,j}$ is measured (in log values) by the deviation of the firm size from the average size of companies within an industry thereby including an industry-specific fixed effect. Firm size will be measured by the total turnover (revenue) as an appropriate definition of size but the data also includes information for firm assets which will be included in the tests.

Alternatively, firm's size can be calculated in real terms, e.g., total turnover deflated by an appropriate price index—thereby ignoring the industry-specific mean values—and in this case the panel data will require some fixed effects' correction. Staying with the first-mentioned demeaned values of variables is deemed more appropriate when using panel data and they are usually the preferred measure of firm size found in the empirical literature on this topic. The parameters in Model 1 will be estimated by using a non-linear iteration procedure for the panel data with variables in logs and Gibrat's law is considered to be fulfilled when (β, ρ, ω) is equal to (1, 0, 0). The Model 1 from (3) is a dynamic panel model with lagged values of the dependent left-side variable included and this gives rise to a problem of endogeneity due to the dependence between these lagged values and the error term. This problem is addressed by using instrumental GMM estimations where lags of the right-hand variable(s) are included as instruments (Arellano & Bond, 1991). This procedure will be utilized when estimating the parameters from (3) and with results presented in Table 2.

As an alternative methodology—instead of the procedure related to Model 1 (Evans, 1987)—is followed where the firm growth is specified as a function of size and age as the age information for all firms is also possessed. There are a number of studies taking the same approach to the empirical tests and applying a second order logarithmic expansion of the firm growth relation including both size and age (see Shanmugam & Bhaduri, 2002; Villari et al., 2021). With the same notation and variables in log values but including age (a) the empirical relation to test is Model 2:

$$\Delta z_{t,i} = \gamma_0 + \gamma_1 z_{t-1,i} + \gamma_2 a_{t-1,i} + \gamma_3 z_{t-1,i} \cdot a_{t-1,i} + \gamma_4 (z_{t-1,i})^2 + \gamma_5 (a_{t-1,i})^2 + \varepsilon_{t,i} \quad (4)$$

The variables are in demeaned values before applied in the Model 2 as panel data is used which is a similar procedure in relation to Model 1. Due to the lags there is a dynamic panel data model where the estimated parameter values may be influenced or biased due to autocorrelation. Therefore, the

model will be estimated[3] including a correction for first order autocorrelation where allowance is made for different autocorrelation coefficients among all panel members (i.e. 578 firms) which will take up some degrees of freedom in the estimations but forcing the same autocorrelation function to all panel members will influence the results and is therefore not the optimal procedure. The main interest is of the parameter estimates to size and age, i.e. whether firm growth is related to firm size and age (see Evans, 1987).

3. Empirical test results

The size of firms will be measured by both the turnover as well as assets measured in the Vietnamese currency (VND) and, as mentioned earlier, the estimations will include both Model 1 and Model 2 in order to evaluate whether the choice of functional form and estimation strategy will influence the final conclusions. Table 2 reports the parameter estimates for Model 1 as well as the overall test statistic for the restriction in relation to the three parameters.

Table 2. Model 1: Parameter estimates and test statistics, all firms ($N = 578$) manufacturing ($N = 280$)

Variable (log)	$N \times T$	β	P	ω	χ^2-test
Revenue:	2761	0.9793	0.0254	1.6199	28.90***
All firms		*(0.1518)*	*(1.6896)*	*(2.4419)*	[0.00]
Manufacturing	1339	1.0398	–0.8289	0.6471	13.16***
		(0.0293)	*(0.7778)*	*(1.5310)*	[0.00]
Assets:	2772	1.0056	–0.4182	0.4494	2.44
All firms		*(0.0043)*	*(0.6173)*	*(0.3812)*	[0.49]
Manufacturing	1347	1.0110	0.1626	0.1855	5.77
		(0.0060)	*(0.7623)*	*(0.3318)*	[0.12]

Note: The number of observations (firms) in the different industries is reported in the first column. Standard errors are reported in parentheses. The χ^2-test of the (β, ρ, ω)-restriction with p-values reported in parentheses, where *** indicates a rejection of the restriction at (least) the one per cent level of significance. Model 1 is estimated including lagged values of z_t (instruments in a GMM estimation) as mentioned in the main text.

Source: own elaboration.

In Model 1 the estimates of β, ρ and ω should be (1, 0, 0) in order not to reject the hypothesis of firm growth independent of firm size and including the correction for autocorrelation as mentioned in the former section. The

[3] All estimations of both models are done in the software Rats from Estima.com.

results in Table 2 reveal the revenue size measure for all firms as well as for the sub-sample of manufacturing firms and demonstrate that the restriction for the three before-mentioned parameters is not fulfilled, i.e. rejecting the hypothesis of a random walk in relation to Model 1. Thus the empirical evidence is not in favour of Gibrat's law for the Vietnamese firms when the size measure is total revenue. When the size measure is total assets the opposite result seems to be the case and thus the Gibrat's law is not rejected.

The next step in the test procedure is to include Model 2 where also the age of the firms is included. The present data set for Vietnamese firms includes the age variable and thus allows for estimating Model 2 which is of importance as the age is expected to influence firm growth potential. Table 3 exhibits the fixed effects parameter estimates of the model where a flexible procedure for correcting first-order autocorrelation is also included as mentioned in the methodology section.

Table 3. Model 2: Parameter estimates and test statistics, all firms (*N* = 578) and manufacturing (*N* = 280)

Variable	Revenue all	Manufacturing	Assets all	Manufacturing
γ_0	0.0033	0.0090	0.007	0.0014
	(0.0070)	*(0.0106)*	*(0.0031)*	*(0.0044)*
γ_1	–0.4156***	–0.8070***	–0.2356***	0.2391***
	(0.0412)	*(0.0746)*	*(0.0232)*	*(0.0426)*
γ_2	0.0905	0.6356***	–0.0697	0.3249***
	(0.1015)	*(0.1810)*	*(0.0474)*	(0.0734)
γ_3	0.0364***	0.1623***	0.0018	0.0161
	(0.0135)	*(0.0234)*	*(0.0075)*	*(0.0129)*
γ_4	0.0376***	0.0337***	0.0154***	0.0228***
	(0.0028)	*(0.0046)*	*(0.0033)*	*(0.0048)*
γ_5	–0.0863***	–0.2192***	–0.0165	–0.1038***
	(0.0233)	*(0.0398)*	*(0.0107)*	*(0.0156)*
Autocorrelation (range)	[–1.24; 1.26]	[–1.07; 1.20]	[–0.98; 1.28]	[–1.27; 1.10]
R^2	0.29	0.21	0.14	–0.01
N × T	5024	2435	5036	2444

Note: The parameter estimates refer to Model 2 with standard errors reported in parentheses, where *** indicates significance at (least) the one per cent level. All variables are demeaned corresponding to including fixed effects in the panel data. Thereafter the model is estimated with a correction for first order autocorrelation (Cochrane-Orcutt procedure). The autocorrelation parameter is allowed to vary between the firms and the span for this parameter is reported in the sharp parenthesis.

Source: own elaboration.

The parameter estimates are reported for the variables revenue and assets respectively and also with a separate result for the manufacturing sector. As mentioned earlier the revenue is probably a better measure of firm size compared to the assets which might be influenced by various factors, e.g., financial conditions, especially in the short run. For the last case in Table 3 using assets for the manufacturing sector the model is not at all appropriate as revealed by the negative R^2 value. For the other cases the parameter estimate of γ_1 is negative and significant and therefore gives no support to Gibrat's law. Growth is negatively related to firm size which is also in accordance with many other studies. The study by Evans (1987) reports negative parameter estimates for both firm size and age which corresponds to the findings in many other studies as exhibited in the survey in Bartolini et al. (2020)

Table 4. Parameter estimates of γ_1 for specific industries (Model 2)

	Revenue	**Assets**
Basic industry	–0.0407 (0.2633)	**–0.3299**** *(0.1390)*
Manufacturing	**–0.8070***** (0.0745)	**–0.2391***** *(0.0426)*
Tech	0.3359 *(0.3247)*	–0.2661 *(0.2174)*
Infrastructure	**–0.4124***** *(0.1622)*	–0.1898 *(0.1013)*
Transport	**–0.5322***** *(0.1704)*	–0.1562 *(0.1363)*
Wholesale	**–0.3199***** *(0.1058)*	**–0.2711***** *(0.0777)*
Real Estate	**–0.2819**** *(0.1172)*	**–0.1713***** *(0.0619)*
Health	–0.8065 *(0.4858)*	1.1517*** *(0.3746)*
All firms	**–0.4156***** *(0.0412)*	**–0.2356***** *(0.0232)*

Note: Parameter estimates of γ_1 and the parameter estimates refer to Model 2 with standard errors reported in parentheses where ** indicates significance at the five per cent level and *** significance at the one per cent level. A constant term and other variables from Model 2 are included in the estimations but the values are not reported. All variables are demeaned corresponding to including fixed effects in the panel data and thereafter the model is estimated with a correction for first-order autocorrelation (Cochrane--Orcutt procedure), allowing the autocorrelation parameter to vary between firms. The latter procedure is only followed for the first two industries since for the last six cases there is a restricted number of observations and in these cases a common value of the autocorrelation parameter is imposed.

Source: own elaboration.

with the general conclusion of a negative relationship between growth and firm size/age. The parameter estimate to firm age (γ_2) is insignificant in two of the cases but positive and significant for the manufacturing sector that can be related to older firms having more experience, a better organization and management (see Villari et al., 2021). The remaining three variables are included in the model due to the second order expansion and are of less interest compared to estimates of the size and age parameters but they are mostly significant and the overall degree of explanation reasonable for the first three cases. The parameter γ_1 is of the main interest and Table 4 reports the estimated values for the specific industries from Model 2 with only the size parameter reported.

Most cases in Table 4 have a significant, negative parameter estimate to the firm size (γ_1) and only one case (Health) has a positive value. Thus, there is similarity between the industries with a growth rate declining with firm size which is consistent with the general findings in the literature. The main findings in relation to developing countries are summarized in Table 5 and the present analysis is in line with these studies showing non-acceptance of the Gibrat's law.

Table 5. Firm's growth: Main findings from selected studies of developing countries

Study	Industry (data)	Factor	Effects
Das (1995)	computer	sales	positive (age) negative (size)
Liu et al. (1999)	electronics	employment	negative (size, age)
Shanmugam and Bhaduri (2002)	manufacturing	sales	positive (age) negative (size)
Simbana-Taipe et al. (2019)	service	sales employment	negative (age)
Villari et al. (2021)	service	sales	negative (large size, age)

Source: own elaboration.

However, based on the cheap labour cost approach the Vietnamese companies often employ a labour-intensive technology model which of course requires a large amount of labour in the production of goods or services (see Gregorio, 2018). The technology investments are not increased sufficiently and the larger companies using labour decrease in the average labour productivity, the long-run average total cost rises as output increases and the larger companies can exhibit diseconomies of scale. Thus, larger companies can have lower growth potential compared to smaller companies.

A specific element in emerging economies like Vietnam is that listed companies with large assets are priority customers in the banking system and hence they may more easily obtain advantages in the form of credits and preferential loans from commercial banks (see Pincus, 2016). Many companies drive corporate growth by a high level of financial leverage with loans from the banking system which is the case for many large companies in Vietnam based on their official financial annual reports. However, the commercial interest rate in Vietnam is significantly higher than in other economies and therefore large companies face a risk of bankruptcy when the market moves in an unfavourable direction (see Ninh et al., 2018; Thuy et al., 2022). This phenomenon is an important reason why large companies have lower growth rates compared to smaller companies.

Conclusions

The Law of the Proportionate Effect states that firm growth rates are independent of their size and the present study involves two of the methodologies most often applied for testing the hypothesis. The study uses a large sample of Vietnamese firms to evaluate the validity of Gibrat's law for various industries spanning the period 2010 to 2020. Firm size can usually be measured as total revenue (turnover) or total assets and both variables are included in the tests.

The growth rate of firms is modelled as a function of lagged firm size and corrected for any problems of autocorrelation and endogeneity in relation to a dynamic panel data model. This procedure follows a vast amount of empirical studies from recent decades of which Chesher (1979) is an early study from this tradition. For the total turnover as the firm size measure there is no empirical evidence that the firm growth rate should be independent of the initial firm size, and this result holds when testing for all firms (N = 578) as well as for the manufacturing industry (N = 280). When total assets are included as the size measure in the test methodology the Gibrat's law cannot be rejected for all firms and also for the manufacturing industry, i.e. the growth in assets may be independent of the initial size. In the final part of the analysis the age of the firms is included as a control variable and for all cases the findings show that the larger the firm, the smaller the growth rate. This conclusion also seems valid for the eight specific industries included in the analysis. Thus, in total the empirical results do not leave much support for Gibrat's law in connection with Vietnamese firm data.

The conclusion in relation to Vietnamese firms is in accordance with most studies of Gibrat's law for developing countries as illustrated by the selected

studies reported in the former Table 5. Many studies, like the present one, rely on data for listed firms and then there may be a bias in relation to all firms in a certain industry or country. Non-listed firms in relation to for example a stock exchange registration may be of interest as their growth behaviour may differ due to a recent upstart or active in a new industry. Additionally, future studies of the Gibrat's law should also deal with a closer comparison with the findings for industrialized and developing countries, respectively, in order to ascertain whether the law is related to a specific development stage—or not at all seems to be valid as appearing in several studies.

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