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Firm Size and Growth in Ecuador's Trade Sector: An Analysis from an Industrial Economics Perspective

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Abstract

This study examines the dynamics of firm growth in the trade sector from 2016 to 2021, utilizing Gibrat's Proportional Effect Law. Panel data and Arellano and Bond's dynamic GMM estimator were employed to analyze variables such as sales revenue, growth, age, innovation, and indebtedness. The results suggest that small firms grow more rapidly than large ones, contradicting the assumption of growth independence from initial size. Additionally, it was observed that the growth of commercial companies is not continuous and is negatively influenced by the previous period, challenging the assumption of independence between periods. Furthermore, evidence of diversity in corporate growth was found, which refutes the idea of a trend towards concentration and monopoly. Finally, age, innovation, and indebtedness were determined to exert a significant influence on firm growth.

Keywords: *Firm Size, Firm Growth, Gibrat's Law, GMM Estimators, Trade.*

Introduction

In recent years, the business sector worldwide has experienced significant growth, driven by business and management resources and capabilities (Morales et al., 2021; Nuñez-Naranjo, et al., 2024). However, firm growth, despite being widely studied since the late 1950s, lacks a general theory and a widely accepted conceptual definition (Correa, 1999). As a result, various approaches and opinions exist regarding its scope, measures, and determining factors. Currently, firm growth is crucial because of its close relationship with firm development and a country's macroeconomic capacities. Both the government and entrepreneurs have paid attention to this aspect and conducted analyses to determine the factors that contribute to differential growth among firms. These analyses allow for the establishment of appropriate strategies and policies to foster sustainable firm growth beneficial to the economy as a whole (Franco & Pacheco, 2018; Morales & Vargas, 2018).

In this context, the relationship between firm size and growth has been widely studied both in theory and in business practice. Likewise, there are different perspectives and approaches, leading to different interpretations and results in research (Adams et al., 2013). Observations indicate that the distribution of firms by size generally conforms to a lognormal distribution, often referred to as a 'stylized fact' (Schmalensee, 1989; Wagner, 1992). This pattern emerges when each firm encounters a consistent distribution of growth opportunities, with the actual growth of each firm determined by a random sampling of this distribution, thereby fulfilling Gibrat's Law of Proportional Growth. Therefore, Gibrat's Law of Proportional Effect posits that the increase in the size of a firm is proportional to its existing size in each period (Capasso & Cefis, 2012).

In Ecuador, the business sector holds a pivotal position in income generation and, notably, in job creation, underscoring the increasing importance of business establishment in recent years (Tobar & Solano, 2021; Ríos & Proaño, 2021). Specifically, Ecuador ranks as the eighth largest economy in Latin America, considering the scale of its GDP (Arévalo, 2014; International Monetary Fund, 2023)

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The country's economic activities are divided into the petroleum and non-petroleum sectors. Gross Value Added (GVA) in the petroleum sector encompasses production related to the extraction of oil and natural gas, as well as the manufacturing of products derived from oil refining. On the other hand, non-petroleum GVA encompasses all other economic branches, such as manufacturing, construction, commerce, agriculture, among others (Central Bank of Ecuador, 2022). Rojas (2022) highlights that agriculture, manufacturing, construction, commerce, and transportation are the key sectors forming the basis of the Ecuadorian economy. Among these sectors, wholesale and retail trade stand out as particularly robust and diverse, accounting for an average of 22% of established companies. Over the past years, this sector has demonstrated its importance in the economy by leading dynamism and the country's recovery during times of recession, for example, after the impacts caused by the COVID-19 pandemic. SuperCias (2021) reports that the trade sector played a vital role in economic reactivation, significantly contributing to the country's growth and development

In the business approach, various studies have explored the relationship between firm size and growth from the perspective of Gibrat's theory. Some of these studies, such as those by Langebaek (2008), Oliveira & Fortunato (2008), Ivandic (2015), Ojinaga (2017), Miralles et al. (2017), Guillén (2018), and Carmona et al. (2020), mostly refute Gibrat's Law, as they find that larger firms, ceteris paribus, record lower growth rates compared to smaller firms. In the specific case of Ecuador, studies such as that by Simbaña et al. (2018), which covers all economic sectors, and those by Morales & Vargas (2018) in manufacturing companies and Franco & Pacheco (2018) in service companies, arrive at similar results by refuting the hypothesis of proportional effects between size and growth of firms. These analyses demonstrate that firm size is not always indicative of growth capacity, contrary to Gibrat's Law, with smaller firms often experiencing higher growth rates than larger firms.

Considering the ideas outlined above, regarding the importance of the trade sector in the Ecuadorian economy and the extensive research related to Gibrat's Law, the purpose of this document is to evaluate and determine if Gibrat's Law can be rejected in the specific context of the trade sector. This work contributes to this line of research by addressing sample selection, variables, and methodological considerations. Thus, understanding the relationship between firm size and growth in Ecuador is vital for fostering economic development and job creation.

Firstly, an analysis is carried out using a sample of commercial firms in an unbalanced panel dataset. This sample includes active companies classified under the CIIU G during the annual period from 2016 to 2022. Moreover, firm characteristics and financial aspects are included as variables, drawing from prior research. Based on the theoretical review, three equations are proposed to test the theory. These equations seek to examine the relationship between the size of commercial firms and their growth rates, taking into account the relevant variables identified in the literature. Finally, the models are estimated using the Generalized Method of Moments (GMM) approach proposed by Arellano and Bond (1991). These techniques allow for robust and efficient parameter estimations, considering the nature of panel data.

The document is divided into five main sections. Following introductory remarks, the second section reviews existing literature on the relationship between firm size and growth. The methodological framework outlines the sample, data, variables, and estimation strategy in accordance with Gibrat's Law. In the results section, empirical findings are presented and discussed. Lastly, the conclusions section summarizes key findings and provides recommendations for future research.

Literature Review

Firm growth has been a subject of debate among theoretical and applied economists. Some theories have pointed out that economic growth is influenced by various aspects, such as human capital (De la Dehesa, 1993; Rodríguez, 2017; Cerquera et al., 2022), physical capital accumulation (Altvater, 2011; Garzarelli & Limam, 2019; Bongers & Torres, 2020), progress in science, technology, and innovation (Ulloa & Nuncira, 2020), as well as trade openness, business environment, and competitiveness (Feal, 2008; Molero et al., 2020).

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Regarding the business environment, different theories explain growth. For example, in the 1950s, the "classical growth theory" emerges, suggesting that firms can grow until they reach an optimal and efficient size (production level that maximizes profits). However, this approach posits a negative relationship between firm size and growth, contending that the entry of new firms leads to increased production, lower prices, and subsequently reduced profit margins, constraining growth (Teruel, 2007).

In response to criticisms of classical theory, the behavioral approach emphasizes the actions of the firm's main manager. Marris (1964) argues that when the owner does not control the entity, the manager seeks to maximize their own interest by increasing the size of the firm. On the other hand, Penrose (1959) argues that growth is not due to the optimal size, but to current growth rates. Moreover, the concept of competitive advantage, rooted in knowledge, organizational capabilities, and competencies, suggests that distinct firm characteristics lead to varying levels of performance and profitability (Teruel, 2007; Coad, 2009).

Regarding stochastic theories, Gibrat (1931) stands out for postulating that firm size follows a random path, and that growth is independent of this size. On the other hand, Kalecki's model (1945) shows a negative relationship between size and random variables, resulting in a process similar to Gibrat's Law. Additionally, Champernowne (1937) proposes a model where firm size is influenced by the previous state and a random element, with changes in size determined by the variance between the current and desired size.

Learning and selection models arise from the work of Geroski (1995), who argues that firm growth and survival depend on its ability to learn, innovate, and sectoral characteristics. Jovanovic's model (1982) indicates that a firm does not know its level of efficiency until it enters the market, and more efficient firms grow faster, while inefficient ones disappear over time. This concept, known as 'Bayesian or passive learning,' entails that firm growth is influenced by both size and efficiency levels. On the other hand, Pakes & Ericson (1998) indicate that a firm not only knows its level of efficiency when entering the market but can also change it through investments, leading to "active learning." These models provide valuable insights into firm growth and strategic decision-making impacting performance.

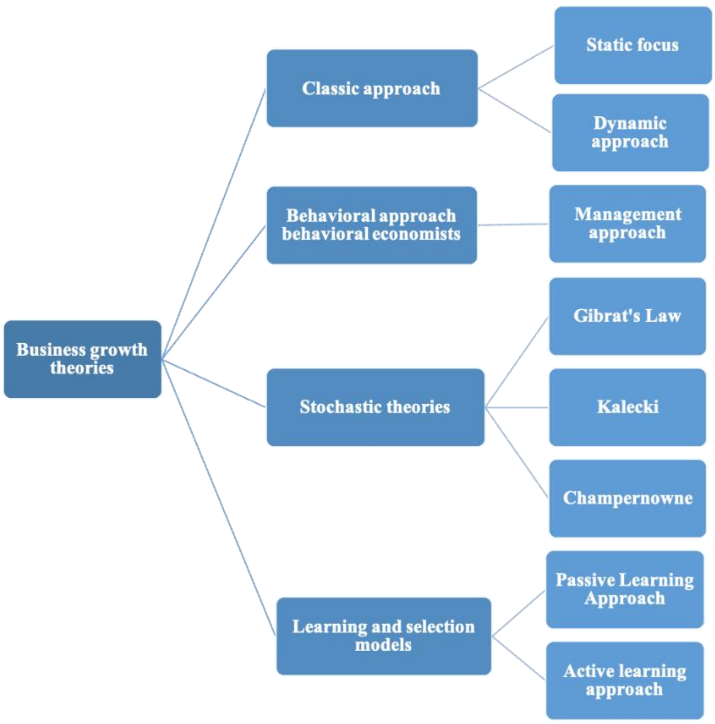

Figure 1. Theories Of Business Growth Teruel (2007)

Other studies, such as Alchian (1950), have adopted the notion of diversity creation and selection to support the dynamics of economic development. In this approach, the selection mechanism propels economic

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progress by favoring the growth and survival of more fit firms, while less viable ones lose market share and eventually exit the market. Downie (1958) developed an industrial model showing that firms grow through profit reinvestment, linking growth rates to enhanced profitability (Coad, 2009)

It is evident that the notion of "optimal size" is limited in understanding firm growth, while adaptability and learning are determinants in the competitive context (Blázquez et al., 2006; Núñez-Naranjo A. et al, 2024). The process of firm growth is influenced by internal and external factors, with firm size playing a crucial role in striving for maximum growth levels (Abdel et al., 2020). Blázquez et al. (2006) suggest that Gibrat's stochastic firm size deviation model is more effective in empirically analyzing firm growth rates compared to classical, behavioral, and learning models.

Gibrat's Law of Proportional Effects

French engineer Robert Gibrat (1931), was one of the first to observe the asymmetric distribution of firm sizes. He proposed the "Law of Proportional Effects," which states that the expected growth rate of a firm is proportional to its size (Riccaboni et al., 2008). Initially used to model income and firm size distribution in the manufacturing sector during the 1930s, its significance in analyzing market structure and firm size dynamics was acknowledged later (Luh, 2014). Gibrat's Law is a significant framework for analyzing market structure and firm growth, illustrating how firm growth is influenced by independent random shocks, irrespective of the firm's initial size. This model can be written as follows:

$$\Delta logSi, = logSi,t - logSi,t-1 = \mu i,t \ donde \ \mu i,t \approx N(0,\delta 2) \quad [1]$$

Where, Si, represents the size of firm "i," usually measured by the number of employees, assets, or sales, in a period "t". On the other hand, μi, is a random variable with a normal distribution with mean zero and variance $\delta 2$. This equation suggests that an unexpected shock can arise from two possibilities: a) it is not expected to occur, or b) it is expected to occur, but it is not known when it will happen. Therefore, it is assumed that this eventuality is difficult to predict. The equation also suggests that unexpected shocks have permanent effects on firm size. "Studies suggest an alternative method to support this claim by tracing back each firm's size to its creation period ('t'=0).

$$logSi, = (1+\mu i,t)logSi,t-1 = logSi,0(1+\mu i,1)(1+\mu i,2)(1+\mu i,t) \quad [2]$$

Rearranging this equation yields the following expression:

$$logSi, = logSi,0 + \sum \mu i,ts=1 \ if \ log(1+\mu i,s) \cong \mu i,s \quad [3]$$

In this expression, the logarithm of firm size in a period "t" (Si,t) depends on two factors: (i) the initial size of the firm (Si,0) measured in terms of number of employees, assets, sales, etc., and (ii) a set of random terms ($\mu i,t$) that are equal for all active firms in the market and independent of firm size. Therefore, Gibrat's Law is characterized by a first-order Markov process, indicating the absence of serial correlation between distinct firm growth rates across time (Teruel, 2007).

Building on the previous discussion, any firm 'i' represents the cumulative impact of all shocks, both expected and unexpected, it has encountered since its inception. That is, due to the unpredictable nature of these shocks, predicting the future size of the firm is difficult.

In general terms, Gibrat's Law establishes that all firms have the same probability of growth, regardless of their initial size. If we project this result into the future, we observe that the market tends to concentrate, as larger firms will increase their market share. Consequently, the size distribution of firms will follow a logarithmically-normal distribution (right-skewed) as a result of the central limit theorem. Random events will lead firms to diverge in size over time, increasing market concentration, despite firms maintaining consistent growth prospects (Teruel, 2007).

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In this context, three verifiable propositions of Gibrat's Law are derived, according to Tschoegl (1983) cited in Oliveira & Fortunato (2008), and González & Correa (1998): first, growth rates are independent of firm size; second, growth variability is independent of firm size; and third, the lack of persistence in growth rates above or below a firm's average from one period to the next, as detailed below:

- Firm growth rates are independent of their initial size. All firms have the same probability of growth, regardless of their initial size. The average expected growth and variability are equal for all firms.

- Firm growth is not influenced by its own past behavior. The growth rate of one period has no effect on the growth rate of the following period.

- Over time, the dispersion or variation between firm sizes increases. Size differences between large and small firms widen over time. This is because, applying the same growth rate to different initial sizes, larger firms will experience greater growth in absolute terms. This can lead to greater industry concentration, unless processes of firm birth and death, which can counteract this effect, are considered (González & Correa, 1998).

According to Gibrat, applying the logarithmic function to firm size yields a good fit. However, it is important to note that the increase in firm size refers only to relative terms. Scholars have debated the applicability of Gibrat's Law to specific samples, resulting in various interpretations. The 'standard' version asserts that the law applies to all firms in a given industry, even those exiting during the study period. The second version considers only firms that have survived over time. Finally, the third version emphasizes that the law should only be applied to large firms or those that have exceeded the minimum efficient scale (MES) level (Relander, 2011).

Regardless of the selected sample, Gibrat's model does not specify an optimal size as there is no additional benefit from a specific size. On the contrary, it should be considered that firm size is a stochastic process (randomly evolving over time) that leads to a skewed distribution, which simply depends on assumptions. Subsequently, a series of studies incorporating diverse samples from various countries, covering small and large firms, yielded a consistent result: growth rates (of surviving firms) tend to systematically decrease as firm size increases (Audretsch et al., 2004). This law has sparked numerous studies, challenging comparisons due to varied sample selections and methodologies. Despite this, a large majority of studies have determined that indeed firm growth is independent of its size in each period of time.

Gibrat's model does not establish an optimal size for firms, and their growth is considered independent of size. Numerous studies indicate a trend where growth rates decrease as firm size increases (Audretsch et al., 2004). However, the diversity in samples and methodologies used makes it difficult to compare the results. Despite variations in studies, the majority align with the notion that firm growth is not tied to its size within a given timeframe.

Methodology

The study was based on a non-experimental design, as there were no intentional manipulations of variables. Information from secondary sources, primarily from the Statistical Information portal of the Superintendence of Companies (SUPERCIAS), was used. Data analysis and interpretation naturally followed prior research, including works by González & Correa (1998), Correa (1999), Oliveira & Fortunato (2008), Ivandic (2015), Simbaña et al. (2017), Simbaña et al. (2018), Morales & Vargas (2018), and Franco & Pacheco (2018), all grounded in 'Gibrat's Law of Proportional Effect), which are based on "Gibrat's Law of Proportional Effect."

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Data and Sample

The study was conducted using accounting data collected from the SUPERCIAS statistical portal during the annual period 2016-2021. This time window allowed for a detailed analysis of variable behavior, including significant events such as the Covid-19 pandemic and its impact on the country's economy. In this context, the target population consisted of a total of 183,184 companies in Ecuador, of which 141,412 are active. Within the sector of interest, trade (CIIU G), 20,831 companies were identified. However, due to study limitations, a sample of 5,213 organizations meeting specific criteria, including reporting balances, data availability in income, assets, liabilities accounts, and employing at least one person, was selected.

Table 1. Construction of the Sample of Companies

Item	Companies
Total companies in the directory	183,184
Active companies	141,412
Trade Companies (CIIU G)	20,831
Companies that reported balances during the period 2016/2021	10,113
Companies discarderd due to atypical data	4,900
Final Sample	5,213

Note. Own elaboration based on the Companies Directory of SUPERCIAS (2023)

Variables and Measures

The variables used in the study were based on Gibrat's Law of Proportional Effect and similar previous research. Therefore, after evaluating several options, it was decided to use sales revenue as the main measure of firm size and growth. This metric was chosen for its ability to more accurately capture a firm's expansion during periods of economic transformation and productivity growth, in contrast to the number of employees, as noted by Dang & Li (2017). While sales revenue may have limitations in cross-industry comparisons, this is not a concern in this single-industry analysis. Additionally, other firm and financial characteristics, such as firm age, innovation, and indebtedness, based on previous studies, were included

Table 2. Specification Of Study Variables

Category	**Nomenclature**	**Detail**	**Expected sign**
		Variables endógenas	
Size	$lnVtas$	Natural logarithm of sales revenue	
Growth	$\Delta lnVtas$	Difference in the logarithm of sales between two periods $(lnVentas_t - lnVentas_{t-1})$	
		Exogenous Variables	
Size	$lnVtas_{t-1}$	Natural logarithm of lagged sales	-
Growth	$\Delta lnVtas_{t-1}$	Growth rate of lagged sales.	-
		Control Variables	
Firm and financial characteristics	Age	Firm age since its establishment	-
	$Agesq$	Age squared	+
	$Innova$	Innovation $(Intangible\ assets_t / Total\ assets_t)$	+
	$Indeb$	indebtedness $(total\ liabilities_t / Total\ assets_t)$	+

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Note. Own elaboration

To develop the indicators mentioned in Table 2, financial data extracted from general balances and income statements, which are available in the open database provided by SUPERCIAS, were used.

Estimation Strategy

Various studies such as those by Correa (1999), Teruel (2007), Oliveira & Fortunato (2008), and Simbaña et al. (2018) have proposed several equations to verify compliance with Gibrat's Law of Proportional Effects. Economic literature often mentions two particular equations that test Gibrat's Law:

Firstly, the logarithm of firm "i" size during period "t" (Si,t) depends on the logarithm of the number of employees in the previous period ($Si,t-1$):

$$logSi,=\alpha+\beta logSi,-1+\mu i,t \quad [4]$$

Gibrat's Law is verified when the coefficient $\beta=1$, which implies that firm growth is independent of its initial size. If $\beta<1$, smaller firms will experience faster growth than larger firms, leading to convergence in the industry. On the other hand, if $\beta>1$, larger firms will have faster growth, resulting in divergence in firm size and greater concentration and monopoly in the industry (Ivandic, 2015).

Secondly, there is another dynamic model of firm growth that is linked to the implication of the absence of any dynamics associated with lagged dependent variables:

$$\Delta logSi,=\alpha+\beta\Delta logSi,t-1+\mu i,t \quad [5]$$

Where the logarithm of growth in period "t" for firm "i" depends on the growth rate of the firm in the previous period. In this case, Gibrat's Law is accepted if $\beta=0$. Both equations have an error term ($\mu i,$) that not only depends on the time period but is also individual for each firm.

Thirdly, it is suggested that the dispersion or variation between firm sizes increases over time. According to Oliveira & Fortunato (2008), this aspect can be quantified through a standard test of heteroscedasticity applied to the residuals of each estimated equation. On the other hand, González & Correa (1998) argue that this assumption can also be measured by the variance of firm sizes.

Model Specification

The equations described above allow for direct tests of Gibrat's Law. By adapting them to the studied situation and sector, the assumptions that determine the Law of Proportional Effects have been sought to be contrasted, where the variable that measures size and growth corresponds to sales revenue. Additionally, considering the reviewed studies, additional exogenous variables have been added. In this case, the null hypotheses $H0=0$ are tested against the alternative that they are different from zero. If the null hypotheses are not rejected, this means that firm age, innovation, and indebtedness do not influence firm growth. Under this approach, the following econometric equations are obtained.

$$lnVtasi,=\alpha i+\delta t+lnVtasi,-1+\sum xj,i,t+\varepsilon i,t \quad [6]$$

$$\Delta lnVtasi,=\alpha i+\delta t+\beta 1\Delta lnVtasi,t-1+\sum\beta jxj,i,t+\varepsilon i,t \quad [7]$$

Where, $lnVtasi,t$ corresponds to the natural logarithm of sales revenue for firm i in period t; $lnVtasi,t-1$ refers to period $t-1$; $\Delta lnVtasi,t$ represents the growth of the variable; xj,i,t contains the set of explanatory variables, such as the natural logarithm of firm age, its square, innovation and indebtedness ratios; αi and δt show the individual and time effects respectively; $\beta 1$, βj are the regression estimators. Finally, $\varepsilon i,$ is a random disturbance, assumed to be normal.

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Given the dynamic nature of the research, the use of dynamic panel models has been considered, as suggested by Oliveira & Fortunato (2008), Maçãs & Serrasqueiro (2009), and Simbaña et al. (2018). These models explore the relationship between growth in previous periods and current growth, aiming to mitigate endogeneity issues among the variables of interest. In particular, the Generalized Method of Moments (GMM) has been chosen, which is an instrumental regression approach that corrects for correlation and endogeneity effects in the explanatory variables. A widely used estimator in this context is that of Arellano & Bond (1991), specifically designed for panels with few periods and many individuals. This approach uses lags and differences in the endogenous and exogenous variables, using instruments based on lags and differences. It is important to note that this model does not allow for second-order autocorrelation, but first-order autocorrelation is allowed to capture dynamic effects. Moreover, as Montero (2010) highlights, it is preferable for the equations to be over-identified. Therefore, for equations 6 and 7, the Arellano & Bond GMM model will be used, using lags and differences in the endogenous variables and instruments based on lags of the exogenous variables.

Results

Descriptive Statistics

The study distinguishes a descriptive analysis of the main measures of the variables to be studied, such as company growth and size, along with other indicators that were added to the study. This analysis aims to identify the behavior and performance of the sample companies within the defined measures and timeframe. Prior to delving into the descriptive statistics, it's important to note that around 80% of commercial enterprises in Ecuador are concentrated in the provinces of Guayas and Pichincha. This distribution is mainly due to the processes of industrialization and modernization of society, which have generated a series of advantages in urban life, such as greater job opportunities and a better quality of life for its inhabitants.

In Table 3, the data indicates that sales in the sample of companies vary significantly, with a mean of $661,463 and a wide range spanning from minimum sales of $1 to maximum sales of $2,178,777,987. Likewise, the growth of companies varies widely, with an average of 0.44 and a standard deviation of 76.12. This variation suggests that companies within the sample have experienced both positive and negative growth over the specified period. A detailed analysis of the data reveals a decrease in sales in recent years, due to the economic slowdown caused by various factors such as the fall in oil prices, dollar appreciation, social protests, and restrictive tax measures, which negatively impacted commercial activity. Additionally, the COVID-19 pandemic led to the cessation of commercial operations and generated significant losses in revenue and profits. Nevertheless, the trade sector exhibited signs of recovery in 2021, fueled by a sustained rise in household consumption, showcasing its resilience and adaptability amidst economic and health adversities.

Table 3 Descriptive Statistics

Variable	Obs.	Mean	Des. Est.	Minimum	Maximum
Sales	26.065	661.463	2,09	1	2.178.777.987
	26.065	0,44	76,12	-1.364,66	1.463,37
Age	26.065	12	0,71	1	92,00
Innovation	26.065	1,02	0,76	0	195,90
Indebtedness	26.065	53,06	0,83	0	37.036,90

Note. Authors' calculation.

Regarding age, the youngest company in the sample is 1 year old, while the oldest is 92 years old. This diversity in age range highlights a wide variety of commercial enterprises, with the majority clustered around

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the average age of 12 years. Data on innovation reveals that some companies do not report any innovative activities.

Finally, the results show that, on average, these companies have a debt ratio of 53%. However, it is important to note that the standard deviation is low, suggesting that most companies have a similar level of indebtedness. On the other hand, it is noteworthy that the minimum recorded value is 0, indicating that some companies operate debt-free using their own resources. On the other hand, the maximum value indicates that there are companies with a high level of indebtedness, possibly due to investments or financing to boost their growth or finance commercial projects. Hence, commercial enterprises heavily depend on external financing due to their business turnover, leading to a less stable financial condition amid challenges related to trade and external factors impacting their operations

Econometric Estimation

In the following estimations shown in Table 4, the analysis of the impact of firm size on firm growth of companies that make up the CIIU G of Commerce is presented. In general, all estimations have coefficients significant at the 1% level. The Arellano and Bond GMM models meet the assumption of no second-order correlation in the first differences of disturbances, supported by p<0.05 values in the Hansen J statistic, indicating successful handling of endogeneity. For its part, the Sargan Test considers that equations are correctly over-identified by the $p\ valor$ > 0.05. This result could stem from heteroscedasticity problems. Thus, to address potential heteroscedasticity issues, robust estimators were employed in running the dynamic models, enabling estimation despite such challenges.

Subsequently, in Table 4, the results are considered in light of the assumptions and hypotheses held in this research. The second column evaluates equation 6, where according to the Law of Proportional Effects, every company has the same probability of growth. The coefficient β1=-0.23 supports a negative effect, where an increase of 1 unit in size (t-1) implies a decrease of companies by 0.23%. Here, a β1<1 suggests that smaller companies exhibit higher growth rates, contradicting theories that assume firm growth is size-independent, as implied by Gibrat's Law. Therefore, large companies are less likely to grow in the market, and there is no tendency towards concentration and monopoly. Skender et al. (2017) suggest a potential trend for firm sizes to revert to the population's average size. Based on these results, it is determined that Gibrat's law is not confirmed in Ecuadorian trade companies, as their growth is not independent of their size. These results are consistent with the studies of González & Correa (1998), Teruel (2007), Maçãs & Serrasqueiro (2009), Adams et al. (2013), Skender et al. (2017), Franco & Pacheco (2018), Morales & Vargas (2018), Oke (2018), Simbaña et al. (2019), and Yadav et al. (2020); the works of Simbaña et al. (2018), Ivandic (2015) also rejected this assumption, although the found link was positive.

In economic terms, Oliveira & Fortunato (2008) consider that there is a minimum efficient scale of the firm, and until this size is reached, the firm experiences a fall in average costs and can enjoy rapid growth. Beyond this threshold, the firm's average cost curve stabilizes, transitioning into the realm of constant marginal and average costs typical of firms operating above the minimum efficient scale. In this context, learning and selection models identify the level of efficiency as a key determinant of firm growth and survival. A firm does not know its efficiency level until it enters the market. In the market, the most efficient firms grow more quickly, until they reach a minimum efficient size. However, inefficient firms will eventually leave. Hence, small firms grow faster than large firms, as they are in the initial stages of efficiency discovery (Oke, 2018).

The last column contrasts equation 7, where Gibrat considers that the growth rate of the current period is not influenced by its past growth. In this case, the coefficient $\beta 1$=-0.15 determines that the growth of companies in the previous period negatively influences the growth of companies in the current period. This suggests that the growth process of commercial companies is not continuous. Thus, $\beta 1 \neq 0$ establishes a clear relationship between the organization's growth in the previous period and the current growth, invalidating Gibrat's assumption. These findings are in contrast with the works of Oliveira & Fortunato

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(2008), Oke (2018), and Contrary Maçãs & Serrasqueiro (2009), although the latter presents a significant positive link.

The third assumption of Gibrat, which has been described in the methodological section, maintains that the dispersion or variation between the sizes of companies increases over time. This aspect is quantified around the assumption of heteroscedasticity, as in the study of Oliveira & Fortunato (2008). Therefore, as detailed, the estimated models have failed this assumption, as the variance of the errors has not been constant in all observations made. This analysis is not evident in Table 4 as the models displayed were adjusted using robust estimators. Additionally, although it is considered that increases in the size of large companies will affect market concentration, the results of the first equations have determined that small companies grow at a high rate, which can increase market competitiveness. Considering these factors, it is clear that these results challenge the aforementioned hypothesis. That is, the dispersion between the sizes of companies does not increase over time, since as various studies have shown, this can be a mere situation of chance, which in turn can also be influenced by both internal situations and external forces.

Table 4GMM Estimation Results

	GMM [6]	GMM [7]
	$lnVtas$	$\Delta lnVtas$
$lnVtas_{t-1}$	-0,2342*** (0,067)	
$\Delta lnVtas_{t-1}$		-0,151*** (0,031)
Age	1,4356*** (0,245)	-139,184*** (16,827)
$Agesq$	-0,5592*** (0,067)	27,425*** (4,231)
$innova$	-0,0331*** (0,011)	-1,058 (1,722)
$Indebtedness$	0,0610*** (0,020)	8,624*** (2,718)
Constant	16,5187*** (0,889)	127,360*** (23,239)
N°. observations	15.639	15.639
Instruments	11	11
Statistics J Hansen	0,319	0.337
Statistic Sargan	0,000	0.000

Note. Robust Standard Errors Are Shown in Parentheses. *** P<0.01, ** P<0.05, * P<0.1. Source: Authors' Calculations.

The control variable "Age," which represents the company's seniority, shows a significantly positive relationship with size and growth of the company, according to most estimations. This indicates that more experienced companies tend to have higher growth rates. However, when introducing quadratic Age into the analysis, a negative impact is observed, suggesting that older or obsolete companies have a lower growth capacity. This result is consistent with the idea that younger companies converge more quickly towards the central point compared to older companies, as proposed in other studies such as Teruel (2007). In summary, companies exhibit accelerated growth in their early years until reaching a turning point where the effect becomes negative, following an inverted U-shaped pattern. This finding supports Gibrat's assumptions, where it is established that smaller companies tend to grow more rapidly than large ones. However, studies like Oliveira & Fortunato (2008), Simbaña et al. (2018), and Skender et al. (2017) show a negative relationship between Age and firm growth. Furthermore, smaller companies experience faster growth than larger ones as they explore their efficiency levels in the initial stages. However, once they surpass their

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minimum efficient scale, their growth gradually slows down. This result is similar to the findings of previous studies such as Teruel (2007) and Oke (2018).

The significant negative coefficient of innovation indicates that, in this study, companies experience a decrease in their size and growth when they increase their innovation activities, unlike what is generally found in the literature. This can be explained by inadequate management of innovation, production, and marketing strategies, where despite entrepreneurial innovation, no economic compensation is generated (Simbaña et al., 2017). External factors, such as macroeconomic and health imbalances, can also influence this situation, leading large companies to refrain from significant and creative innovation (Audretsch et al., 2014). On the other hand, it must be considered that innovation in small companies benefits from their flexibility and creativity, and in larger companies more from the availability of resources such as external capital and qualified personnel (Heunks, 1998). Moreover, Arrow (1993) suggests that small companies and those at a more advanced stage of development are likely to produce less costly and more original innovations. Therefore, because the measure of innovation uses the intangible assets / assets ratio, this indicator may not efficiently capture the characteristics of different-sized companies, as there is a clear disparity in intangible asset investment. Despite limited investment in innovation, some companies have experienced significant economic growth, as shown in the first equations, where greater growth is recorded by small companies (Simbaña et al., 2017).

The debt ratio is positively related to the size and growth of companies, indicating that external capital plays an important role in the growth process of companies in the commercial sector. This relationship suggests that Ecuadorian companies in the CIIU G usually adopt an adequate combination of debt and capital to boost their growth when self-financing is insufficient. This finding aligns with studies by Maçãs & Serrasqueiro (2009) and Ivandic (2015).

Finally, it is important to highlight the hypothesis regarding the control variables, where the null hypothesis $H0=0$ was contrasted against the alternative that these variables have a different impact from zero on the growth of companies. In this instance, the null hypothesis is rejected, as there is significant evidence indicating that the age of the company, innovation, and debt exert a substantial influence on company growth.

Discussion

Using an unbalanced panel with 5,213 observations (i) for the period between 2016 and 2021(t), this study empirically examines the assumptions of Gibrat's Law of Proportional Effects in the trade industry according to the CIIU G. Furthermore, it explores the impacts of diverse control and company-specific variables on corporate growth.

The analysis shows a high concentration of commercial companies in specific provinces of Ecuador, driven mainly by industrialization and modernization processes. On the other hand, despite the variability in sales and company growth, a decrease has been observed in recent years due to economic slowdown and the impacts of the COVID-19 pandemic. Nevertheless, the trade sector has shown signs of resurgence in recent years, propelled by a rise in household consumption and its agility in responding to evolving market needs. Moreover, companies have demonstrated a strong commitment to innovating and addressing challenges in the evolving business landscape. Finally, it is important to highlight the sector's dependence on external financing to sustain its operations and growth projects.

The estimation results suggest that Gibrat's law is rejected for different assumptions, even when controlling for unobservable heterogeneity at the firm level. The analysis also highlights the importance of efficiency level as a key determinant in the growth and survival of companies. Observations indicate that smaller companies exhibit faster growth rates than larger ones, challenging the notion of growth independence from initial size. Moreover, the growth process of commercial companies is non-continuous and negatively impacted by the preceding period, challenging the assumption of growth rate independence across periods. Lastly, preliminary results have been obtained that contradict the idea of a trend towards concentration and monopoly, as a diversity in corporate growth has been observed. Additionally, tests of heteroscedasticity of disturbances have revealed a disparity and inconsistency in variance, which has been fundamental to discard this assumption.

Regarding the control variables, the analysis reveals that the age, innovation, and debt variables have a significant impact on company growth. Age shows a U-shaped relationship, where companies experience positive growth in their early years, but reach a point where this effect becomes negative. Innovation exhibits an atypical and negative relationship, potentially attributed to variations in innovation approaches or the selection of an inappropriate indicator. Moreover, debt positively impacts growth, underscoring the significance of external capital in cases of inadequate self-financing.

Conclusions

The results emphasize the importance of implementing regulations to control market concentration and avoid the formation of monopolies and oligopolies. Likewise, it is suggested to establish special credit lines that boost the growth of Ecuadorian companies, especially small and medium-sized enterprises. It is important to promote investment in innovation as a means to stimulate business growth. Furthermore, there is a need for more comprehensive research on Gibrat's Law across various industries in Ecuador, employing tailored models for different company sizes.

References

Abdel, M., Ibrahim, L., & Nawaiseh, A. (2020). The Effect of Firm's Age, Size and Growth on Its Profitability: Evidence from Jordan. European Journal of Business and Management , 12(5), 88-93. https://doi.org/10.7176/EJBM/12-5-10
Adams, M., Fredrik, L., Hardwick, P., & Lindmark, M. (2013). Firm size and growth in Sweden's life insurance market between 1855 and 1947: A test of Gibrat's law. Business History, 56(6), 956-974. https://doi.org/10.1080/00076791.2013.848341
Alchian, A. (1950). Uncertainty, Evolution, and Economic Theory. The University of Chicago Press, 58(3), 211-221.
Altvater, E. (2011). Crecimiento económico y acumulación de capital después de fukushima. Revista del Departamento de Ciencia Política, Universidad Nacional, Sede Medellín.(2), 13-40.
Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies, 2(277-297), 58.
Arévalo, G. (2014). Ecuador: economía y política de la revolución ciudadana, evaluación preliminar. Apuntes del CENES, 33(58), 109-134.
Arrow, K. (1993). Innovation in Large and Small Firms. The Journal of Small Business Finance, 2(2), 111-124.
Audretsch, D., Coad, A., & Segarra, A. (2014). Firm growth and innovation. Small Business Economics, 43, 743–749. https://doi.org/10.1007/s11187-014-9560-x
Audretsch, D., Klomp, L., Santarelli, E., & Thurik, R. (2004). Gibrat's Law: Are the Services Different? Review of Industrial Organization, 24(3), 301-324. https://doi.org/10.1023/B:REIO.0000038273.50622.ec
Banco Central del Ecuador. (2022). Informe de la evolución de la economía ecuatoriana en 2021 y perspectivas 2022. BCE. Subgerencia de Programación y Regulación.
Blázquez, F., Dorta, J., & Verona, M. (2006). Factores del crecimiento empresarial. Especial referencia a las pequeñas y medianas empresas. INNOVAR. Revista de Ciencias Administrativas y Sociales, 16(28), 43-56. https://www.redalyc.org/pdf/818/81802804.pdf
Bongers, A., & Torres, J. (2020). Factores determinantes del crecimiento económico: Una comparativa a nivel mundial. Universidad de Málaga.
Capasso, M., & Cefis, E. (2012). Firm Size and Growth Rate Variance: The Effectsof Data Truncation. Review of Industrial Organization, 41(3), 193–205. https://doi.org/10.1007/s11151-012-9350-z
Carmona, M., Carvajal, Y., SaudyMilena, Ocampo, F., & Flórez, A. (2020). Determinantes del crecimiento empresarial en elsector manufacturero colombiano. Panorama Económico, 28(1), 1-15. https://doi.org/10.32997/pe-2020-2665
Cerquera, Ó., Clavijo, M., & Pérez, C. (2022). Capital humano y crecimiento económico: evidencia empírica para Suramérica. Apuntes del CENES, 45(73), 145-169. https://doi.org/10.19053/01203053.v41.n73.2022.13679
Champernowne, D. (1937). The theory of income distributions. Econometrica, 5, 379-381.
Coad, A. (2009). Firm Growth: A Survey. Papers on Economics and Evolution, 1-56. https://doi.org/10.4337/9781848449107
Correa, A. (1999). Factores determinantes del crecimiento empresarial. Universidad de la Laguna: Departamento de Economía Financiera y Contabilidad.
Dang, C., & Li, F. (2017). Measuring Firm Size in Empirical Corporate Finance. Journal of Banking & Finance, 1-59. https://doi.org/10.2139/ssrn.2345506
De la Dehesa, G. (1993). Capital humano y crecimiento económico.
Downie, J. (1958). The competitive process. Duckworth.

Feal, M. (2008). Crecimiento económico y apertura comercial: Análisis de la influencia de los canales. Estudios Económicos, 25(50), 37-73. https://www.redalyc.org/pdf/5723/572363595002.pdf
Fondo Monetario Internacional. (2023). GDP, current prices. Fondo Monetario Internacional: https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD
Franco, P., & Pacheco, P. (2018). Aplicación de la Ley de Gibrat para las PYMES de servicios ecuatorianas. Universidad de las Fuerzas Armadas: Departamento de Ciencias Económicas. http://repositorio.espe.edu.ec/xmlui/bitstream/handle/21000/14734/T-ESPE-057792.pdf?sequence=1&isAllowed=y
Garzarelli, G., & Limam, Y. (2019). Physical capital, total factor productivity, and economic growth in sub-Saharan Africa. South African Journal of Economic and Management Sciences , 22(1), 1-10. https://doi.org/10.4102/sajems.v22i1.2309
Gibrat, R. (1931). Les inégalités économiques: applications: aux inégalités des richesses, à la concentration des entreprises, aux populations des villes, aux statistiques des familles, etc., d'une loi nouvelle, la loi de l'effect proportionnel. Recueil Sirey.
González, A., & Correa, A. (1998). Crecimiento y tamaño: Un estudio empirico. Revista española de financiación y contabilidad, 27(95), 541-573.
Guillén, I. (2018). Análisis empírico de la ley de Gibrat: Evidencias del sector comercio en España, 1996-2016. Universidad Zaragoza: Facultad de la Economía y Empresa.
Heunks, F. (1998). Innovation, Creativity and Success. Small Business Economics, 10, 263–272. https://doi.org/10.1023/A:1007968217565
Ivandic, N. (2015). Gibrat's Law and the impact of ownership: a case study of Croatia's hotel industry. Tourism Economics, 21(1), 105–120. https://doi.org/10.5367/te.2014.0439
Kalecki, M. (1945). On the Gibrat Distribution. The Econometric Society, 13(2), 161-170.
Langebaek, A. (2008). Determinantes del crecimiento de las empresas no financieras en Colombia: Ley deGibrat y otras teorías. Borradores de Economía(493), 1-27.
Luh, E. (2014). Gibrat is law and port growth. University of Oregon. Robert D. Clark Honors College.
Maças, P., & Serrasqueiro, Z. (2009). Gibrat's law: empirical test of Portuguese service industries using dynamic estimators. The Service Industries Journal, 29(2), 219–233. https://doi.org/10.1080/02642060802295026
Marris, R. (1964). The Economic Theory of 'Managerial' Capitalism. Palgrave Macmillan.
Miralles, M., Millares, J., & Daza, J. (2017). Contraste de la ley de Gibrat en la banca comercial brasilena˜. Contaduría y Administración(62), 1643–1656.
Molero, L., Anchundia, J., Patiño, R., & Escobar, Y. (2020). Crecimiento económico y apertura comercial: Teoría, datos y evidencia (1960-2017). Revista de Ciencias Sociales (Ve), XXVI(4), 476-493. https://www.redalyc.org/journal/280/28065077035/28065077035.pdf
Montero, R. (2010). Panel dinámico. Universidad de Granada.
Morales, A., & Vargas, G. (2018). La Ley de Gibrat aplicada en las PYMES manufactureras del Ecuador. Universidad de las Fuerzas Aramadas: Departamento de Ciencias Económicas.
http://repositorio.espe.edu.ec/bitstream/21000/14643/1/T-ESPE-057766.pdf
Morales, X., Salazar, J., & Silva, C. (2021). Business Growth in Ecuador: A Perspective from Penrose's Theory of Resources and Capabilities. En M. Botto, H. Cruz, & A. Díaz, Artificial Intelligence, Computer and Software Engineering Advances. CIT 2020. Advances in Intelligent Systems and Computing (págs. 202-2011). Springer.
Núñez-Naranjo A, Morales-Urrutia X and Simbaña-Taipe L (2024) Social capital, education, and subjective well-being in Ecuador. Front. Sociol. 9:1417538. doi: 10.3389/fsoc.2024.1417538.
Núñez-Naranjo, AF, Morales-Urrutia, X., & Martínez-Jumbo, A. (2024). Gobernanza y bienestar subjetivo en los países de la Comunidad Andina (CAN). Patrimonio y Desarrollo Sostenible , 6 (2), 459–482. https://doi.org/10.37868/hsd.v6i2.575
Ojinaga, B. (2017). Análisis del cumplimiento de la Ley de Gibrat en las empresas manufactureras españolas. Universidad Zaragoza: Facultad de la Economía y Empresa.
Oke, B. (2018). Testing the Gibrat's Law: A Dynamic Panel Analysis of Firm Size and Firm Growth Nexus in Nigeria. Nigerian Journal of Management Studies, 18(2), 78-89.
Oliveira, B., & Fortunato, A. (2008). The dynamics of the growth of firms: evidence from the services sector. Empirica, 35, 293–312. https://doi.org/10.1007/s10663-008-9065-4
Pakes, A., & Ericson, R. (1998). Empirical Implications of Alternative Models of Firm Dynamics. Journal of Economic Theory, 79(1), 1-45. https://doi.org/10.1006/jeth.1997.2358
Penrose, E. (1959). The Theory of the Growth of the Firm. Oxford University Press.
Relander, P. (2011). Gibrat's law revisited - A study on Gibrat's law with models of industry dynamics. Finland: Aalto University School of Economics.
Riccaboni, M., Pammolli, F., Buldyrev, S., Ponta, L., & Stanley, H. (2008). The size variance relationship of business firm growth rates. The National Academy of Sciences of the USA, 105(50), 19595–19600. https://doi.org/10.1073/pnas.0810478105
Ríos, D., & Proaño, M. (2021). Determinantes del desempeño empresarial en el Ecuador durante la pandemia de COVID-19. Cuestiones Económicas: Edición Especial: Memorias IV Encuentro Internacional de Economía EPN, 31(3), 37-42. https://doi.org/10.47550/RCE/MEM/31.49
Rodríguez, A. (2017). Crecimiento económico y capital humano: metodología para la simulación de una variante del Modelo de Lucas con aplicación a México. Revista Mexicana de Econom´ıa y Finanzas, 12(2), 23-47. https://www.redalyc.org/pdf/4237/423750525002.pdf

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DOI: https://doi.org/10.62754/joe.v3i6.4159
Rojas, J. (2022). Análisis sobre el comportamiento del sector manufacturero ecuatoriano en el periodo 2007 – 2019. Universidad del Azuay: Facultad de Ciencias de la Administración.

Schmalensee, R. (1989). Inter-industry studies of structure and performance. En R. Schmalensee, & R. Willig, Handbook of Industrial Organization (págs. 951-1009). North Holland.

Simbaña, L., Rodríguez, M., & Rodeiro, D. (2017). Growth determinants in Ecuadorian companies. European Journal of Applied Business Management, 3(3), 120-135.

Simbaña, L., Rogríguez, M., & Rodeiro, D. (2018). El no cumplimiento de la ley de Gibrat en economías en desarrollo: el caso de ecuador en el período 2000-2013. Revista Galega de Economía, 27(2), 85-98.

Simbaña, L., Vargas, G., Morales, A., Rodríguez, M., & Rodeiro, D. (2019). The law of Gibrat applied in the manufacturing SMEs of Ecuador. GCG Georgetown University - Universia, 13(1), 34-49. https://doi.org/10.3232/GCG.2019.V13.N1.01

Skender, H., Mirković, P., & Zaninović, V. (2017). Testing Gibrat's Law on Croatian Freight Transport And Logistic Firms. Business Logistics in Modern Management, 17, 3-13.

SuperCias. (2021). Rendición de cuentas 2021. Superintendencia de Compañías, Valores y Seguros.

Superintendencia de Compañías, Valores y Seguros. (Marzo de 2023). Potal de información SUPERCIAS. Directorio de Compañías: https://mercadodevalores.supercias.gob.ec/reportes/directorioCompanias.jsf

Teruel, M. (2007). Firm growth, persistence and multiplicity of equilibria: an analysis of Spanish manufacturing and service industries. Universitat Rovira i Virgili: Departament d'Economia.

Tobar, L., & Solano, S. (2021). El sector empresarial en el Ecuador 2019. Notas de Economía, 2(23), 1-14. https://doi.org/10.13140/RG.2.2.21475.17441

Tschoegl, A. (1983). Size, Growth, and Transnationality Among the World's Largest Banks. The Journal of Business, 56(2), 187-201.

Ulloa, C., & Nuncira, W. (2020). Importancia de la ciencia, tecnología e innovación en el crecimiento económico: comparativo América Latina y tigres asiáticos. Universidad César Vallejo-Scientia, 12(1), 49-64.

Wagner, J. (1992). Firm Size, Firm Growth, and Persistence of Chance: Testing GIBRAT's Law with Establishment Data from Lower Saxony, 1978—1989". SmallBusiness Economics, 4(2), 125-131. https://doi.org/10.1007/BF00389853

Yadav, I., Pahi, D., & Goyari, P. (2020). The size and growth of firms: new evidence on law of proportionate effect from Asia. Journal of Asia Business Studies, 14(1), 91–108. https://doi.org/10.1108/JABS-12-2018-0348.