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Gibrat´s law in Brazilian franchising: an empirical note

Marcelo Resende
Instituto de Economia, Universidade Federal do Rio de Janeiro

Vicente Cardoso
Banco Nacional de Desenvolvimento Econômico e Social

Abstract

The paper investigates lognormality in the context of firm size distribution for the Brazilian franchising segment. That implication of Gibrat´s law-GL is considered on a yearly basis under two settings. The evidence, for both the totality of firms and for mature firms at least 5 years old, was obtained in terms of kernel density estimations and by the use of the Shapiro-Wilk normality test. The results indicate the rejection of the lognormality implication of GL and thus suggest the rejection of the law despite the apparently more favorable environment of the franchising segment.

The authors acknowledge the comments from an anonymous referee but the usual caveats apply.
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Contact: Marcelo Resende - mresende@ie.ufrj.br, Vicente Cardoso - vicentescardoso@bndes.gov.br.
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1. Introduction

Gibrat´s law-GL pertains to the independence between firm growth and size. It is a recurring topic in firm growth and dynamics literature, whose renewed interest is documented in Sutton (1997). The referred assumption of independence has been frequently challenged in the empirical literature, on the basis of the underlying conceptual aspects and yet due to the increasing data availability and more careful statistical and econometric assessments [see Santarelli et al. (2006) for a comprehensive survey of the empirical literature].

As a rule, the literature focused on developed countries' manufacturing industry and often detects a negative relationship between firm growth and size and age, where Evans (1987) and Hall (1987) are landmark studies for the U.S.. It is worth mentioning that scale aspects might play an important role in the rejection of the law for the manufacturing industry. In that sense, Audretsch et al. (2004) advanced the possibility that services industries could provide a more favorable setting for the validity of GL and indeed the evidence for Dutch firms in the hospitality industries was encouraging. However, Piergiovanni et al. (2003) studied Italian new-born firms in that segment and obtained support for the GL only in 2 out of 5 of the business groups considered.

As stated by Sutton (1997), GL comprises two assumptions, being the first that the "next opportunity is taken up by any particular active firm is proportional to the current size of the firm" and the second that firm growth should be independent of size. The second condition will follow from the first, as mentioned by Audretsch (2002), only if size is not related to survival. This is because if growth is random but proportional to firm size, then the growth rates should be equal on average. But if size influences the chances of survival, it follows that GL will not hold in a sample with small and large firms, whereas it will if only larger firms are considered. Following this reasoning, in industries where economies of scale are absent and sunk costs are not relevant, there is not a theoretical case to expect that smaller firms would have a lower survival probability (due to higher costs) than their larger counterparts, hence growth rates tend to be closer to independent of size.

In general, the assessment of GL in service industries provide at most some partial support in a few cases of the handful of studies conducted so far. Lotti (2007) detects significant associations between firm growth and size in selected sectors of the Italian service industries. Hardwick and Adams (2002), on the other hand, focused on the insurance industry in the U.K. and found supportive evidence for GL in the long run, though violations were observed for shorter time intervals.

Finally, Maçãs Nunes and Serrasqueiro (2009) considered the service sector in Portugal and found a negative relationship between firm growth and size which indicated an important role for ownership control in that context.

The present paper intends to investigate distributional regularities implicated by GL in the context of the Brazilian franchising segment and different motivations can be evoked:

a) Previous assessments of GL concentrated on developed countries;
b) The small literature on GL in the case of service industries could further benefit from the study of the franchising segment. Quantitative studies for that sector in developing economies are not common [Façanha et al. (2013) provide an exception in terms of the investigation of firm survival in Brazilian franchising] and it provides a potentially favorable setting for the prevalence of GL as small scaled business can prosper and scale gains are likely to prevail mostly in the centralized provision of inputs and training.

This paper is organized as follows. The second section undertakes a brief digression on relevant conceptual aspects. The third section discusses data sources. The fourth section presents the empirical results and the fifth section brings some final comments.

2. Gibrat´s law and distributional regularities

Beyond direct assessments of the firm growth and size relationship, the empirical literature has discussed distributional regularities that could emerge and possible generating mechanisms. Synthetic *road maps* are presented in Vining (1976) and Resende (2004b). GL contends that the probability of a given proportionate change in size (during a particular period) is the same for all firms in a given industry independent of their size at the beginning of the time period [see e.g. Mansfield (1987)]. The usual argument is presented, for example, in Kalecki (1945), Saboia (1977) and Hay and Morris (1991).

Let S_t denote the size of a given firm in period t and let ε_t stand for the growth rate of the form relative to the previous period, then it follows that:
$S_1 = S_0(1+\varepsilon_1)$ and after recursive substitutions one obtains:

$$S_t = S_0(1+\varepsilon_1)(1+\varepsilon_2)...(1+\varepsilon_t) \qquad (1)$$

Moreover, let $Y_i = \log S_i$ for i=0, t and $y_i = \log(1+\varepsilon_i)$ for i=1,2...t. Taking the logarithm of expression (1), it follows:

$$Y_t = Y_0 + y_1 + y_2 + ... + y_t \qquad (2)$$

Considering a first-order Taylor expansion around zero, one obtains:

$$Y_t \cong Y_0 + \varepsilon_1 + \varepsilon_2 + ... + \varepsilon_t \qquad (3)$$

where one is using the approximation $\log(1+\varepsilon_i) \cong \varepsilon_i$ for i=1,2,...,t. Assuming that the growth rates are independent of the initial firm size and that this has finite mean μ_ε and variance σ_ε^2, it is possible to consider a Central Limit Theorem and conclude that the distribution of Y_t can be approximated by a normal distribution with mean 0 and variance 1 as $t \to \infty$. Therefore one can consider the log-normal distribution for firm size as a long run implication of GL.[1] That distributional regularity is robust even when one allows for negative correlation between firm growth and size [see Kalecki (1945)] or consider a more general autocorrelation structure in terms of an ARIMA model [see Saboia (1977)].

The next generation of stochastic growth models included Simon (1955), Simon and Bonini (1958), Ijiri and Simon (1964) and Steindl (1965), and pinpointed the emergence of Pareto and Yule distributions when one allows for entry and exit dynamics. Therefore, the independence assumption underlying GL leads to skewed distributions under distinct hypotheses. Cabral and Mata (2003) investigate shapes of the firm size distribution in Portugal for unconditional and conditional cases what can be relevant for considering some aspects emphasized by the literature as for example the age of the firm.[2] Simon and Bonini (1958) outline some possible factors that could lead to violations in GL as for example: i) non growth objectives, ii) merger activity, iii)

[1] Asymptotically the contribution of the initial firm size Y_0 would be negligible as $t \to \infty$. In the general case a somewhat more complex expression would arise.

[2] Resende (2004b) implemented tests for lognormality of firm size at the sectorial level in the Brazilian manufacturing industry and a strong rejection of that implication of GL was indicated.

new investments, iv) regional demand, v) aggressiveness in marketing and management, vi) customer brand preference, vii) firm age .

As for the growth and size relationship it is important to identify different constraints to firm expansion that could be directly related and favored by a larger scale. In fact, the financial constraints for growth in the case of the franchising segment possess a distinct character as the investment in stores is enabled by means of the fixed component of the contract (the franchise fee).

Michael (1996) contends that economies of scale are likely to arise in connection with marketing, purchasing and product development. In fact, nation-wide TV advertisements are usual for some mature fast food chains. Nevertheless, the existence of potential agency problems in terms of moral hazard issues can put quality standards at risk and requires costly monitoring activities. Those aspects can counteract scale gains and tend to be more complex if the degree of heterogeneity across franchisees is substantial. Moreover, independent of the level of effort in providing quality, different locations offer distinct degrees of risk expressed, for example, in terms of the variability of sales [see related discussion in Martin (1988)].

The franchising business format could in principle lighten the importance of scale advantages in general and make the independence between firm growth and size more tenable when those potential scale gains are not particularly salient. However, for newly created firms it still would be possible to observe expansion constraints reflecting a brand that is not yet consolidated. In any case, it would be relevant to also consider age aspects in empirical analyses of the franchising segment.

Finally, it is important to note that the log-normality of the size distribution of firms is a long-run implication of GL. In that sense, rejection of that implication would suffice to reject GL but favorable support, on the other hand, would warrant further investigation in terms of a direct approach.

3. Data sources

The Brazilian franchising association (Associação Brasileira de Franchising-ABF) conducts an annual survey published in the so-called *Guia das Franquias*, where detailed data from the previous year is collected with respect to different aspects of the contract (franchise fee, royalty fee, advertising fee among others), sector of activity, date of foundation and different qualitative information. This paper considers the 1994-1999 period (available in the annual reports from 1995 until 2000) so as to assure the homogeneity of the data. Indeed, up to the beginning of the 1990s, that data source included also contracts that could not be characterized as a typical franchising scheme as for example brand licensing agreements and after 2000 (annual report in 2001) the publication became less comprehensive as it started to exclude firms that were not associated to ABF. The choice of the proxy for firm size is not completely uncontroversial in the absence of reliable sales data. In that sense, we follow the lead of the literature and consider the number of franchised outlets [see e.g. Kosová and Lafontaine (2010)]. The analysis is developed upon the natural log of that variable.

The minimum number of firms was 412 in 1998 whereas the maximum number of firms was 630 in 1997. Further analysis was carried out for more mature firms with a smaller sample. In the case of firms with at least 5 years since foundation the sample sizes ranged from 281 to 477 firms in different years. Those reduced sample sizes reflect inconsistent age reporting that required smaller samples in order to conduct a reliable analysis and yet retain acceptable asymptotic properties for the nonparametric

estimation. Unfortunately, additional analysis in terms of a longer horizon with firms with at least 10 years since foundation was not feasible given the small samples thus obtained.

4. Empirical analysis

The lognormality issue is approached by means of kernel estimators for the density function and the Shapiro-Wilk normality test.[3] All the analyses were carried out with Stata 12.0. We consider 2 levels of analysis:

a) Lognormality analysis for the totality of firms in each year;

b) Lognormality analysis for the totality of firms in each year filtered by a minimum age in general (based on the foundation date);

It is worth mentioning that we use the Epanechnikov kernel function. In fact, the really critical choice concerns the window width for which we adopt Silverman´s rule of thumb.[4]

The initial case is considered in figure 1. The visual inspection shows a closer adherence to lognormality in 1998 but non-negligible discrepancies appear to prevail throughout the different years. Next, we consider the distributions in terms of mature firms with at least 5 years since foundation and from the start of franchising activities the results become slightly more favorable for the GL. The corresponding results appear respectively in figure 2.

One can note some discrepancies with lognormality when one controls for age and thus no clear support for that implication of GL appears to prevail in franchising. We had access to data on years of franchising experience. However, the smaller size samples in that case would not provide sufficient statistical rigor in that case despite the similar evidence obtained for that age criterion.

[3] See Shapiro and Wilk (1965).
[4] That rule adopts a criterion based on the minimization of the integrated mean squared error, see Pagan and Ullah (1999) for details.

Figure 1

Kernel density estimation – Brazilian Franchising segment 1994-99 – totality of firms

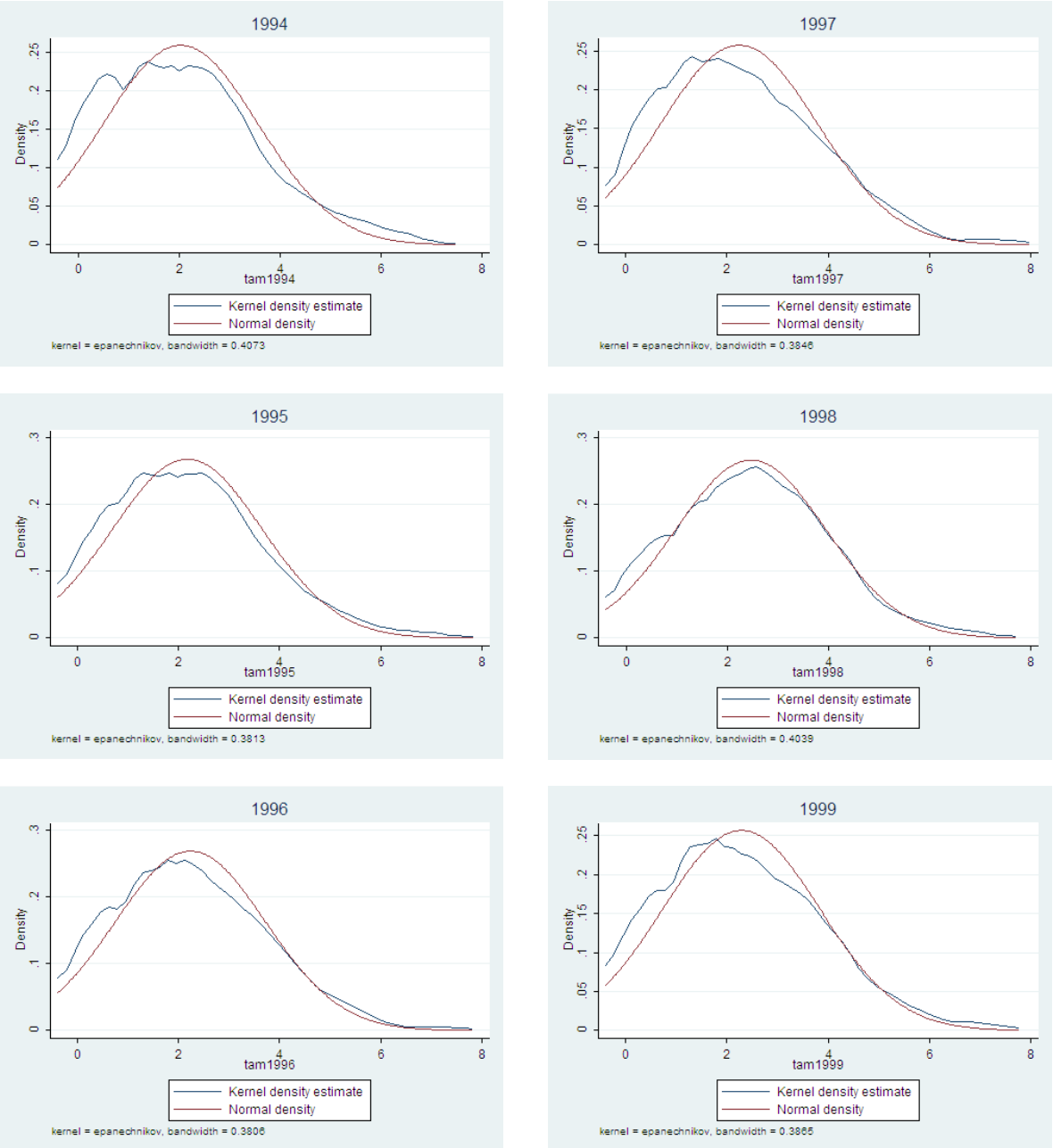
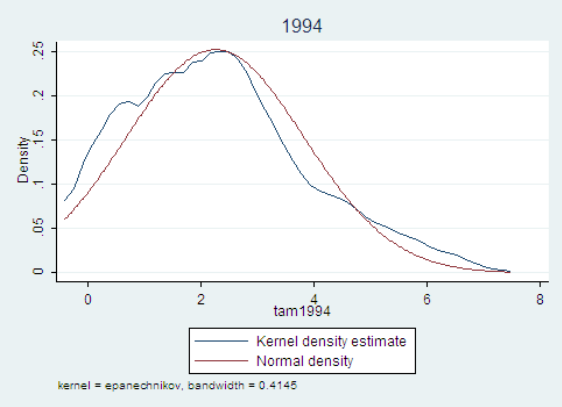
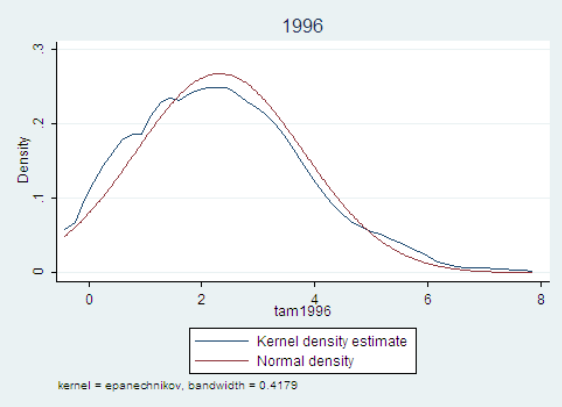
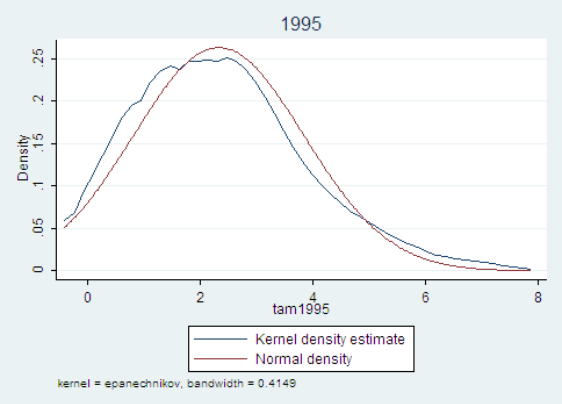


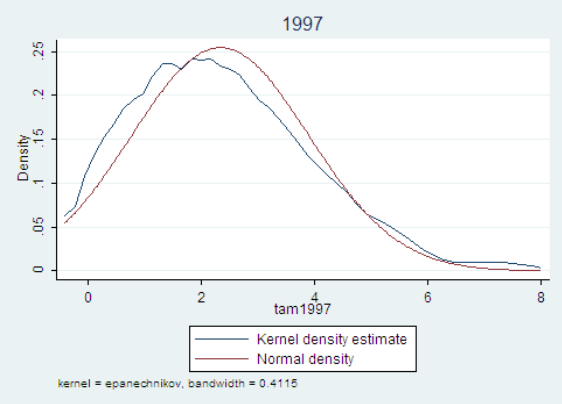
Figure 2

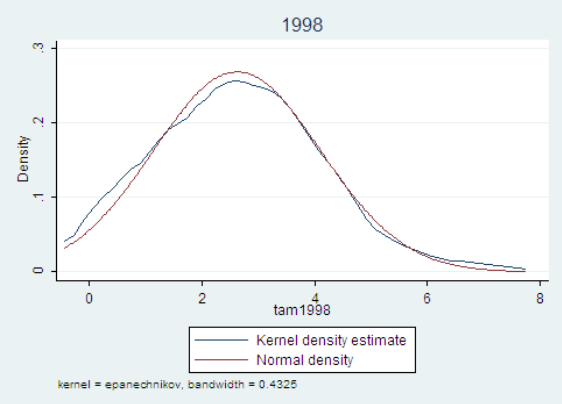
Kernel density estimation – Brazilian Franchising segment 1994-99 – firms with at least 5 years since the foundation date

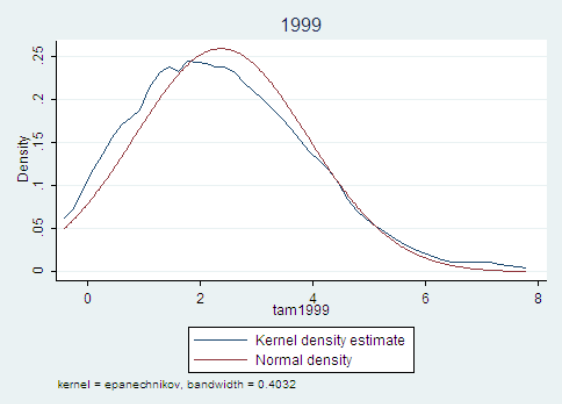












The visual inspection of the estimated densities does not indicate very dramatic discrepancies from lognormality in some years. Therefore, we complement the analysis by considering the Shapito-Wilk test. [5] The corresponding evidence is presented in table 1.

Table 1

Shapiro-Wilk tests (lognormality of firm size distribution)

Year	**Totality of firms**		**Mature firms**	
	test statistic (W)	**N**	**test statistic (W)**	**N**
1994	0.975 (0.000)	455	0.974 (0.000)	339
1995	0.979 (0.000)	515	0.976 (0.000)	384
1996	0.984 (0.000)	532	0.980 (0.000)	341
1997	0.979 (0.000)	630	0.976 (0.000)	474
1998	0.988 (0.002)	412	0.987 (0.014)	281
1999	0.983 (0.000)	622	0.981 (0.000)	477

Note: p-values are reported in parentheses

The evidence indicates a sound rejection of the lognormality implication and thus the results suggest the rejection of GL.

5. Final comments

The paper aimed at testing the lognormal distributional shape that is implied by Gibrat´s law-GL. For that purpose we considered the totality of firms along the 1994-99 time span on a yearly basis and sub-samples with mature firms with at least 5 years of existence.

The evidence did not support GL for the totality of firms neither for more mature ones. The graphical analysis based solely on eyeballing the empirical density estimations did not suffice to unveil the distributional properties of the data therefore a more detailed analysis grounded on normality tests was performed.

Altogether, in some years the departures are moderate so that it appears that indeed franchising provides a more favorable setting for testing that regularity vis-à-vis industrial firms. Scale gains (especially in advertising) are likely to be associated with larger mature firms while large scale marketing initiatives tend to prevail only in selected sectors as for example fast food and cosmetics. Nevertheless, the departures from normality were noteworthy and are likely to reflect some relevance for scale aspects that are not readily observable and would relate to centralized training and

[5] The test is reputed to have superior power properties in comparison with other tests. See Shapiro et al. (1968).

purchasing of inputs, for example. Additional investigations that consider the role of franchising experience should be carried out in the future should the necessary data become available.

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