2. Does Firm Size Matters for Firm Growth? Evidence from the Romanian Health Sector

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Abstract

We test the nonlinear relationship between firm growth and size within a panel quantile regression framework. Our analysis covers 545 firms operating in the Romanian health care sector and the timespan is 2007 to 2015. We use Canay's (2011) fixed-effect quantile panel data approach to assess the nonlinear, asymmetric influence that firm size has on firm growth. The firm growth is measured in terms of investment dynamics and number of employees. Our findings show an obvious negative influence of size on growth, proving that small firms grow faster. Further, the impact of firm size increases for upper quantiles, meaning that size matters even more for firms that record higher growth rates. Our results are robust to different samples and empirical investigations and indicate the need to encourage the activity of small firms in the Romanian health industry.

Keywords: firm size, firm growth, quantile panel data, health firms, Romania
JEL Classification: D22, L25, I11

1. Introduction

Firm growth is important for the overall economic activity, job creation, and for industrial concentration, with implications on the regulation policies (Hall, 1987). All these elements

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indicate that firm growth's dynamics and factors might be different in the case of small and large firms. That is why, the relationship between firm size and their growth represents an open question.

Early works in this area sustain, however, that firms' growth is independent of their size (*e.g.*, Ijiri and Simon, 1964; Suton, 1997). These works generated an intensive debate about the connection of firm growth with their size and rely on the "law of proportionate growth" advanced by Gibrat (1931). However, an opposite theory proposed by Mansfield (1962) state that firm size and growth cannot be disconnected. In this line, two concurrent strands of the literature appeared. The first one states that large companies record a higher growth rate as compared to their small counterparts. For example, several early empirical papers, such as Hart (1962) or Singh and Whittington (1975), reject the Gibrat's law (1931) in the case of large companies from the manufacturing sector. Such results are explained by different elements, such as the lack of survival concerns for the large firms, which allows them to favour growth to the detriment of short-run profit. Another element is related to their managerial dominance, which supports entering new markets and the decentralization of their activities, with positive implications for job creation (Singh, 1975). The second strand of the literature shows, on the contrary, that small firms record higher growth rates, and criticizes the early empirical works of being oriented toward large companies only. Therefore, the "passive learning" model of Jovanovic (1982) and the "active learning" model of Pakes and Ericson (1998) connect the small firms' growth with their productivity level and show that small firms' growth is encouraged by economic policies, which is not necessarily the case for the large companies. Early empirical studies conducted on the United States manufacturing sector support these hypotheses. For example, Hall (1987) rejects the Gibrat's law for small firms, whereas Evans (1987) state that the size is important for firm growth, but the effect is nonlinear.[6]

Empirical works provide mixed evidence on the role of firm size on its growth. For example, the papers by Das (1995) for a set of Indian companies, by Audretsch *et al.* (2004) for the hospitality services in Netherlands, and by Yasuda (2005) for the Japanese manufacturing firms, show that the role of firm size is not significant for growth. On the contrary, Almus and Nerlinger (2000) reject the Gibrat's law for small firms located in Germany, while Goddard *et al.* (2002) do the same for a panel of manufacturing firms in Japan. In the same line, other studies (*e.g.,* De Fabritiis; 2003; Calvino, *et al*., 2018) document a negative relationship between firm size and growth volatility, showing that size is important for supporting growth.

Starting from these early works, we contribute to the existing literature in several ways. First, we do not focus on the comparison between small and large firms. Instead, we argue that the impact of size on firm growth is asymmetric, depending on their growth dynamics. That is, the size can be more important for the firms with a fast growth rate. At the same time, in line with Coad (2009), we use the Simonian approach (Simon, 1968) to check if small firms grow faster as compared to the large ones. Consequently, if a significant relationship is documented between firm size and growth, then the Gibrat's law is rejected. If this relationship is negative, then the small firms record a faster growth rate (the opposite applies in the case of a positive relationship). To test our hypothesis and to assess the nonlinear effect of size on growth, we resort to Canay's (2011) fixed-effect quantile panel data approach. This approach allows us to consider the specific effects of each firm within our

[6] *For a recent and exhaustive survey of the literature on the relationship between firm size and growth, please refer to Coad (2009).*

sample. As far as we know, this is the first paper investigating the relationship among firm size and growth by assuming this approach.

Second, most of the existing studies focus on the manufacturing industry and developed countries, whereas only few papers (*e.g*., Audretsch *et al*., 2004) are interested in the tertiary sector. Therefore, our panel data investigation is conducted on the private health industry of Romania ("Human health activities" – NACE code 86). We include in our analysis 545 firms and cover the period 2007-2015, using the AMADEUS statistics. Our is the first paper investigating the impact of size on firm growth within the health sector. Indeed, Burger *et al.* (2012) focus on the determinants of firm growth in the health sector firms from Ghana and Kenya. However, these authors do not explicitly investigate the role of firm size. Further, the focus on the Romanian health sector is particularly appealing for at least two reasons. On the one side, the public health activities in Romania are underfinanced and the quality of health services is often questioned, which led to a proliferation of private firms in this sector. On the other hand, the medical staff in Romania can work in both public and private clinics, which might induce an unfair competition between private firms and public organizations, favouring the growth of private firms.

Third, we use several control variables to isolate the size effect on firm growth. We look to the role of research and development (R&D) activities, because innovation is essential for firm growth (see, for example, Coad and Rao, 2008; Yuan and Nishant, 2019). Coad *et al*. (2016) shows that small firms obtain higher benefits from the R&D activities. A positive role of innovation on small firms' growth in a panel quantile framework is recently documented by Ahn *et al.* (2018). At the same time, we consider the role of financial performances in supporting firms' growth. The profit represents the fundament of investment (Almeida *et al.*, 2011; Datta and Agarwal, 2014; Albulescu *et al.*, 2018), in particular for the financially constrained firms (Farla, 2014; Vermoesen *et al*., 2013). Finally, we check for the role of taxation on firm growth. As Langenmayr and Lester (2018) point out, the level of taxation influences corporate risk-taking and, therefore, their development.

Fourth, we apply several robustness checks to our empirical findings. Our sample contains both small and large firms, but is dominated by the small and medium-sized enterprises (SMEs). Likewise, we perform the same analysis excluding from the sample 13 large companies. In addition, although we use Canay's (2011) approach within an instrumental variable framework considering the first lag of firm size as an instrument, the endogeneity issues that appear between firms' investment dynamics and their financial performance might influence our results. Thus, in a subsequent analysis we apply the fixed-effect quantile panel data estimator considering the first lag of our explanatory variables. Moreover, we consider firm growth in terms of investment dynamics, but also in terms of number of employees. Our results prove to be robust to different specifications of firm growth.

The rest of our work is organized as follows. Section 2 presents in details the health sector in Romania, whereas Section 3 describe our data sample and Canay's (2011) methodology. Sections 4 and 5 present the main results and the robustness findings, whereas the last section concludes.

2. Overview of the Health Sector in Romania

2.1. The Social Role of the Health System

Good health is an essential element of quality of life, whreas the access to health services is a fundamental right. The generalized access to quality health services depends on the economic development level and on the allocation and use of available resources. In this context, the main objective of health policies is the achievement of a high level and equitable distribution of health services. Other objectives are related to the increase in health investment, human resources investment, upgrade of the health care infrastructure and disease prevention. As Artiga and Hinton (2018) mention, the social determinants of health are, besides the health care system, the economic stability, the level of education and the access to healthy food.

The business in this sector requires specialised organizations with specific and competing objectives to be achieved. Medical organizations are connected in a system of rules established by the government, aiming to protect consumers and to control negative externalities (Popescu, 2006). In this context, a question related to the effectiveness of health services rises, involving the state and/or the free market. On the one hand, arguments in favour of the market services show that health care market works like any market, by meeting demand and supply of health services. On the other hand, the health care system is considered too complex to be reduced to the relations between supplier and consumer. Elements as access to services, insurance contracts, payment procedures or patient`s choices, strongly influence the market mechanisms. Likewise, the supply of health services would be below the social optimum level if those services will be produced only by the market mechanisms. Beside these concurrent arguments, it is noteworthy to mention that the financing systems of health care services have evolved, and the delivery of services is largely influenced by the financing source, which is public, private, or mixed (Bohm, 2012). However, every source of financing the health care system can be publicly dominated (Wendt *et al*., 2009).

Two main categories of health care systems might be identified within the EU. First, the Beveridge model, characterized by public funding based on taxes collected from taxpayers and universal access to health services (specific to the Mediterranean and Nordic countries). Second, the Bismarck model supposes the existence of a funding mechanism based on the compulsory public health insurance of the population, and on public and private health care providers (Central Europe and Eastern European countries).[7] The Romanian health care system is oriented towards the Bismarck model. During the last period, the private health care activities started to develop given the increased number of persons requiring medical assistance, population ageing and the advent of new and costly medical technologies (Duțescu *et al*., 2012).

2.2. Development of the Private Health Sector in Romania

The beginnings of the private medicine in Romania, in the post-December 1989 period[8] may be found in 1993, when the first private laboratories emerged. In 1993, many practitioners

[7] *These categories of health care systems differ from the free-market private insurance model recorded in the United States (for a description, please refer to Donev et al., 2013).*

[8] *In December 1989, in line with other Eastern European countries, Romania renounced to the communist regime.*

were already associated to the Dentists Association and we have witnessed an emergence of radiology and dental technique centres. In 1996, a second leap of the health care market occurred, where networks of private clinics and pharmaceutical industry have been developed (Drăgoi, 2010). The last step for building a real private health care sector was recorded in 1998, with the emergence of private hospitals.

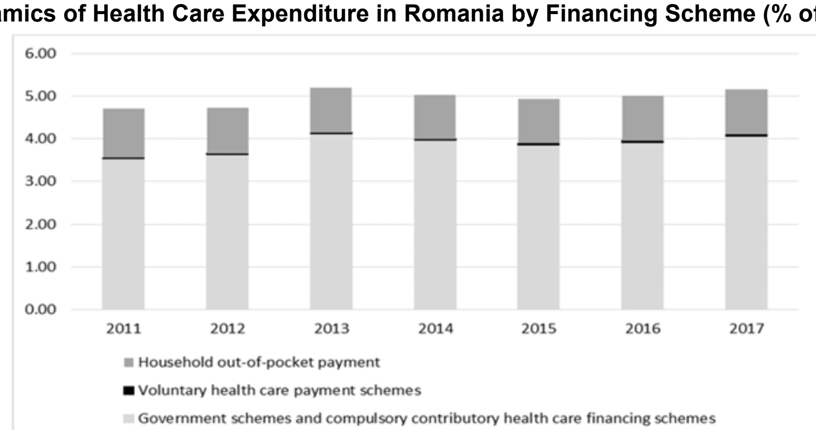
Romanians' orientation towards private medical services is favoured by a higher quality of private health care services. The centralized system of communication, the quality of materials, the medical technology, and a friendly environment, contributed to the development of the private sector. Individuals who choose the services of private clinics expect higher quality services. The ambiance of the private clinics is meant to create a welcoming and pleasant space, able to ensure not only the physical comfort, but also the psychological one (Volintiru, 2018). Therefore, the demand for private services is increasing.

The private health care services in Romania reveal at the same time several drawbacks (Ghenu, 2016). First, the private system does not cover all the health care segments, and some medical procedures can be applied only in the public medical units. Second, it is very likely that a patient still does not find, within a private hospital, experienced medical staff, as in the public hospitals. Therefore, the patients use the private system mainly for medical services that can be supplied in ambulatory. Third, in the case of complex procedures, a private medical clinic provides an easier access to services of a famous professional, but the intervention costs are huge, and only a very small part of the population can afford these services. Fourth, there is a relative state monopoly on blood collection, and the access of private clinics is restricted.

Even if the private health care system has developed during the last decades, the Romanian health system is based on a social health insurance model, in which the state still has a very important role. Although the health expenditures have systematically increased, Romania spends on health less than any other EU country, both in per capita terms and as a share of GDP. As compared to an EU average of about 10% in 2017, Romanian recorded an overall health care expenditure rate of 5.16 % as GDP percentage (Figure 1). Almost 80% is public expenditure.

Figure 1.

Dynamics of Health Care Expenditure in Romania by Financing Scheme (% of GDP)



Source of information: Eurostat database.

According to the Economist Intelligence Unit (2018), reduced investments in the health system influence health and quality of life in Romania. Romania has the lowest life expectancy and the highest infant mortality rate within the EU countries, a reduced number of doctors and nurses per capita, and the highest preventable death rate in the EU. Although the medical system in Romania has a universal coverage, less than 90% of the population has medical coverage. Therefore, a voluntary and complementary private insurance systems is necessary to lower the level of co-payments, but the expansion of the private system must be done without emphasizing the system's inequalities or administrative costs.

3. Data and Methodology

We use data with an annual frequency extracted from the AMADEUS database. The time span (2007 to 2015) covers the period during and after the Global crisis. In Romania, 630 firms are recorded within the industry "Human health activities" (NACE code 86). However, we have retained in our sample only those companies for which at least five consecutive observations are available (that is, 545 firms).[9] For robustness purpose, we removed from the sample in a second step the 13 large companies with over 250 employees.[10] The remaining companies for the robustness analysis are small- and medium-sized enterprises (SME).

Our dependent variable is represented by the firm's growth rate, considering the investment [Eq. (1)] and the employees [Eq. (2)] dynamics:

$$growth\_inv=(fixed\ assets_{t1}-fixed\ assets_{t0})/fixed\ assets_{t0} \quad (1)$$

$$growth\_e=(number\ of\ employees_{t1}-number\ of\ employees_{t0})/number\ of\ employees_{t0} \quad (2)$$

We used the total assets (in natural log), as a *proxy* for the firm size (Albulescu *et al.*, 2018). This is our interest variable.

$$size=LN(total\ assets) \quad (3)$$

The control variables are represented by the level of taxation [Eq. (4)], the R&D expenditure and innovation capacity [Eq. (5)], and by the financial performances in terms of profitability [Eq. (6)]:

$$tax=taxes/operating\ revenue \quad (4)$$

$$inov=intangible\ assets/fixed\ assets \quad (5)$$

$$roa=net\ income/total\ assets \quad (6)$$

[9] Data were collected in January 2018. A linear interpolation was used to avoid the broken panel bias, if one observation is missing from the series. That is, in the case of 35 firms where at least one series was affected by this issue, a total of 140 observation were imputed, which represents less than 0.5% of the total number of observations. This way, we are able to work with a larger sample. In addition, as Young and Johnson (2015) show, data imputation produces some "improvements in the estimates and standard errors of the fixed effects analysis".

[10] Ambulanta BGS Medical Unit SRL, Avitum SRL, Centrul Medical Matei Basarab SRL, Centrul Medical Unirea SRL, Clinica Polisano SRL, Fresenius Nephrocare Romania SRL, Gral Medical SRL, Hiperdia SA, MED Life SA, Medcenter SRL, Medicover SRL, Sanador SRL, Synevo Romania SRL.

Table 1 presents the summary statistics, indicating a strong heterogeneity in terms of investment growth rate within our sample, which recommends the use of a nonlinear, asymmetric regression in quantiles. At the same time, we notice a stronger variability for the taxation and innovation series.

Table 1

Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
growth-inv	4,340	1.893	22.36	-4.000	1,110.1
growth-e	4,341	0.530	2.692	-1.000	75.00
size	4,578	5.560	1.685	-4.330	11.48
tax	4,578	3.438	68.10	-0.320	3316.3
inov	4,578	5.127	135.5	-5.410	9,122.9
roa	4,530	9.658	25.61	-99.26	99.73

Note: "growth-inv" is the firm growth rate based on investment dynamics, "growth-e" represents the firm growth rate based on number of employees, "size" represents the firm size measured in terms of total assets expressed in natural log, "tax" is the level of taxation, "inov" represents the R&D and innovation capacity and "roa" is the return on assets – a proxy for the firm financial performances.
Source: Authors' calculations.

Before applying the panel regression in quantiles, we need to be sure that our series are stationary. To do so, we resort to a battery of panel unit root tests from the first generation (assuming cross-sectional independence) and from the second generation (allowing for cross-sectional dependence). All tests applied in the case of each variable indicates the absence of a unit root process (Table 2).

Table 2

Panel Unit Root Tests

First generation tests	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
growth-inv	-93.79***	-63.25***	2047.4***	3,458.9***
growth-e	-845.8***	-55.62***	1990.1***	3,602.7***
size	-59.35***	-6.239***	1282.4***	2,446.9***
tax	-109.4***	-18.32***	1773.3***	2,201.0***
inov	-2,029***	-798.2***	1104.4***	1,526.1***
roa	-265.3***	-27.21***	1962.0***	2,393.1***
Second generation tests	Fisher-type ADF t			Pesaran CADF
	Pm	Z	L*	z-bar
growth-inv	198.3***	-62.33***	-118.6***	-7.858***
growth-e	178.0***	-61.21***	-108.6***	-22.43***
size	109.9***	-26.95***	-60.26***	-11.64***
tax	54.91***	-23.97***	-36.53***	0.286
inov	83.51***	-27.27***	-58.27***	10.04
roa	72.03***	-29.00***	-45.58***	-8.429***

*Notes: (i) the null for all tests is the presence of unit roots; (ii) ***, **, * denote statistical significance at the 1%, 5%, and 10% level.*

The sample heterogeneity requires nonlinear techniques to capture all relevant information. We test a general model as follows:

$$growth_{it}=\alpha_0+\alpha_1 size_{it}+\alpha_2 tax_{it}+\alpha_3 inov_{it}+\alpha_4 roa_{it}+\mu_i+\gamma_t+\varepsilon_{it}, \quad (7)$$

where: μ_i are the firm specific effects (time invariant), γ_t are the time specific effects and ε_{it} are the error terms.

Starting from the general specification of the model, we use Canay's (2011) panel quantile regression with fixed effects, and we assess the asymmetric, nonlinear relationship between firm size and firm growth in the case of the health care private firms from Romania.

Panel quantile fixed effects models are described as follows:

$$Y_{it} = X'_{it}\theta(U_{it}) + \alpha_i, \quad (8)$$

where: $t = 1,\dots,T$; $i = 1,\dots,n$; Y_{it} and X_{it} are the observable variables, whereas U_{it} is unobservable; X'_{it} is assumened to contain a constant term and $\theta(\tau)$ represents the interest parameter.

Asumming a function $\tau \to X'\theta(\tau)$ which increases in $\tau \in (0,1)$, and that α_i is observable, it follows that:

$$P[Y_{it} \leq X'_{it}\theta(U_{it}) + \alpha_i | X_i, \alpha_i] = \tau, \quad (9)$$

under the assumption that $U_{it} \sim U[0,1]$, conditional on $X_i = (X'_{i1},\dots,X'_{iT})'$ and α_i.

A correct identification of $\theta(\tau)$ represents the key issue of panel quantile fixed effects models. Therefore, if $Q_Y(\tau|X)$ is the τ-quantile of Y conditional on X and $e_{it}(\tau) \equiv X'_{it}[\theta(U_{it}) - \theta(\tau)]$, equation (9) will be:

$$Y_{it} = X'_{it}\theta(U_{it}) + \alpha_i + e_{it}(\tau), \quad (10)$$

By assuming that α_i is a location shift, different from previous models (*e.g.*, Koenker, 2004), Canay (2011) shows that $\theta(\tau)$ is identified for $T \geq 2$. According to this view, only $\theta(\tau)$ and $e_{it}(\tau)$ depend on τ, whereas equation (8) is transformed as follows:

$$Y_{it} = X'_{it}\theta\mu + \alpha_i + u_{it}, \qquad E(u_{it}|X_i, \alpha_i) = 0. \quad (11)$$

This transformation stays at the center of Canay's (2011) approach and allows for the computation of the two-step estimator, $\hat{\theta}\mu$.[11] First, Canay (2011) obtains a consistent estimator of α_i ($\sqrt{T}$) and $\theta\mu$ ($\sqrt{nT}$), with $\hat{\alpha}_i \equiv E_T[Y_{it} - X'_{it}\hat{\theta}\mu]$. Second, the author introduces $\hat{Y}_i \equiv Y_{it} - \hat{\alpha}_i$, while $\hat{\theta}\mu$ becomes:

$$\hat{\theta}\mu \equiv \underset{\theta \in \Theta}{argmin}\, \mathbb{E}_{nT}\,[\rho_\tau(\hat{Y}_{it} - X'_{it}\hat{\theta}\mu], \quad (12)$$

where: $\mathbb{E}_{nT}(\cdot) \equiv (nT)^{-1}\sum_{t=1}^{T}\sum_{i=1}^{n}(\cdot)$.

[11] *Besstremyannaya and Golovan (2019) recently underline a potential bias associated with the non-existence of the limiting distribution for the coefficients' estimator for Canay's (2011) approach. In addition, the authors state that Canay's approach generates an incorrect asymptotic standard error of the constant term estimator. However, the same authors mention that this issue does not affect the slope coefficients.*

4. Results

We perform two categories of analysis, considering the investment and the employees dynamics as proxy for firm growth. In the first case, Table 3 indicates a significant, strong, and negative impact of firm size on its growth.

Table 3

Panel Quantile Regression – The Investment Growth Rate

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
size	-4.233***	-4.631***	-4.810***	-4.911***	-4.980***	-5.050***	-5.140***	-5.188***	-5.133***
	(0.136)	(0.071)	(0.036)	(0.032)	(0.032)	(0.033)	(0.035)	(0.057)	(0.120)
tax	-0.004	-0.005***	-0.006***	-0.006***	-0.001**	-0.001**	-0.002***	-0.002*	-0.002
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
inov	-0.080***	-0.045***	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
roa	0.001	0.003	0.005**	0.003*	0.003*	0.005***	0.003*	0.006*	0.002
	(0.008)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.007)
constant	21.02***	25.70***	27.76***	29.06***	30.06***	31.06***	32.26***	33.38***	35.18***
	(0.820)	(0.429)	(0.220)	(0.194)	(0.192)	(0.203)	(0.215)	(0.347)	(0.728)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) 4,002 observations.*

The significant impact of firm size on its growth level is recorded for all quantiles. These results reject Gibrat's (1931) law and are in line with the findings reported by Almus and Nerlinger (2000) and Goddard *et al*. (2002). At the same time, our results contradict the findings reported by Audretsch *et al.* (2004) and Yasuda (2005), who report no significant relation between firm size and growth. Further, the negative impact intensifies for the upper quantiles, that is, for firms with strong investment dynamics. We therefore notice that the small firms record a higher growth rate as compared to their large counterparts (the negative sign of the coefficient). Further, it seems that the size represents an impediment for firm growth, in particular for those firms that are developing fast.

In terms of control variables, the level of taxation has a negative impact on firm growth as expected, although the effect of taxation is reduced. This result may be explained by the existence of a flat tax rate in Romania during the analyzed period. Indeed, Castelluccio (2020) states that a flat tax rate might better sustain consumption and investment as compared to progressive taxation.

We also show that the level of profitability has a positive, but a marginal effect on firm size for the medium and upper quantiles. Our findings are thus in agreement with those reported by Almeida *et al.* (2011), Datta and Agarwal (2014) and Albulescu *et al.* (2018). The capacity of innovation (estimated as a ratio of intangible to tangible fixed assets) seems to have no significant influence on firm growth. This result, in contradiction with the findings reported by Coad *et al.* (2016), may be explained by the fact that the level of intangible assets is still reduced in the health care private industry of Romania.

Similar results are obtained when we use the employees' growth rate to estimate the firm growth level (Table 4). Nevertheless, in this case the impact of firm size, although negative and significant for all quantiles, is less strong. Moreover, the effect of profitability is no longer significant, except for the upper quantiles, where the sign is negative. The last result may be explained by the fact that an increased profitability does not necessarily lead to an increased number of employees. The existing employees might receive higher wages from their employers, to stimulate their productivity.

Table 4

Panel Quantile Regression – Employees Growth Rate

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
size	-0.738***	-0.758***	-0.798***	-0.818***	-0.826***	-0.838***	-0.848***	-0.851***	-0.854***
	(0.034)	(0.014)	(0.009)	(0.006)	(0.006)	(0.006)	(0.007)	(0.012)	(0.024)
tax	-0.000	-0.000***	-0.001***	-0.001***	0.000***	0.0005***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
inov	-0.014***	-0.002***	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
roa	0.001	0.000	-0.000	-0.000	-0.000	-0.000	-0.000*	-0.000	-0.003**
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
constant	3.557***	4.249***	4.734***	5.003***	5.174***	5.368***	5.572***	5.779***	6.277***
	(0.204)	(0.088)	(0.058)	(0.040)	(0.040)	(0.039)	(0.0464)	(0.074)	(0.147)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) 4,003 observations.*

These findings might me influenced by the sample composition, including both SMEs and large companies. At the same time, a reverse causality issue may appear between firm size and its growth. Therefore, we perform two series of robustness analyses. We first use a re-sampling procedure, excluding from our sample 13 large companies (with more than 250 employees). Second, we use in regression the first lag of our explanatory variables to avoid any endogeneity bias.

5. Robustness Analysis

Table 5 shows that, when we analyse the SMEs sample, we practically obtain similar results with those reported in Table 3.

Table 5

Panel Quantile Regression – Investment Growth Rate (SMEs Sample)

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
size	-4.105***	-4.478***	-4.703***	-4.814***	-4.898***	-4.996***	-5.110***	-5.122***	-4.997***
	(0.144)	(0.078)	(0.040)	(0.036)	(0.036)	(0.036)	(0.038)	(0.064)	(0.128)
tax	-0.003	-0.005***	-0.006***	-0.006***	-0.001***	-0.001***	-0.002***	-0.002*	-0.003
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
inov	-0.085***	-0.035***	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
roa	0.002	0.004	0.006***	0.005***	0.004**	0.005***	0.004*	0.006*	0.0046
	(0.008)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.007)
constant	19.98***	24.44***	26.70***	28.05***	29.12***	30.27***	31.64***	32.61***	34.05***
	(0.855)	(0.462)	(0.238)	(0.217)	(0.214)	(0.216)	(0.229)	(0.380)	(0.761)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) 3,900 observations; (iv) Davidson-MacKinnon test of exogeneity for "size" 180.4 (p=0.00).*

Therefore, we show that the results are robust on the sample composition. Indeed, the firm size negatively impacts firm growth level for all quantiles, and the result is very significant. As in the previous case, the negative impact is higher for the upper quantiles, representing the firms with stronger investment dynamics. Tha taxation effect is negative for all quantiles, while the profitability has a positive impact on firm growth. Further, similar to the main results, no significant effect is reported for the innovation activities. However, we recall that the R&D and innovation activities are estimated on the basis of the intangible assets level, which might explain this result. First, the level of intangible assets is reduced in the case of Romanian health care system. Second, firms usually invest in short-term, tangible assest, which generate rapid outcomes, especially the financial constrained ones (Pérez-Orive, 2016).

From Table 6 we also notice that the size has a negative and significant impact on firm growth for all quantiles, validating the results presented in Table 4 and proving thus their robustness.

Table 6

Panel Quantile Regression – Employees Growth Rate (SMEs Sample)

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
size	-0.744***	-0.744***	-0.780***	-0.806***	-0.815***	-0.826***	-0.828***	-0.823***	-0.796***
	(0.0383)	(0.015)	(0.010)	(0.007)	(0.007)	(0.007)	(0.008)	(0.013)	(0.026)
tax	-0.000	-0.000***	-0.001***	-0.001***	0.000***	0.000***	0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
inov	-0.014***	-0.002***	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
roa	0.001	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.003*
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
constant	3.522***	4.102***	4.559***	4.868***	5.039***	5.230***	5.392***	5.571***	5.895***
	(0.226)	(0.091)	(0.062)	(0.045)	(0.042)	(0.043)	(0.051)	(0.078)	(0.155)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) 3,901 observations; (iv) Davidson-MacKinnon test of exogeneity for "size" 184.5 (p=0.00).*

In the next step, we consider the endogeneity issue. When we use the first lag of explanatory variables, we notice that the impact of size is still negative and significant, but relatively smaller (Table 7). This result shows that the previous performance is less important as compared to the actual performance in the investment decision. Further, in this case we observe that the impact of innovation activities is significant, being positive for upper quantiles (that is, for firms that grow faster), whereas for lower quantiles is negative. This original result shows that the R&D and innovation activities might have a different impact on firm growth, depending on their growth level.

Table 7

Panel Quantile Regression – Investment Growth Rate (First Lag for Endogeneity)

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
lagsize	-1.278***	-1.508***	-1.632***	-1.712***	-1.778***	-1.823***	-1.872***	-1.951***	-2.156***
	(0.091)	(0.041)	(0.021)	(0.015)	(0.012)	(0.013)	(0.014)	(0.028)	(0.111)
lagtax	-0.000	-0.001	-0.001***	-0.002***	-0.001***	-0.000*	-0.000*	-0.000	-0.000
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
laginov	-0.031***	-0.012***	-0.000	-0.000	-0.000*	-0.000**	-0.000**	0.007***	0.162***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
lagroa	0.014**	0.007***	0.006***	0.005***	0.005***	0.006***	0.007***	0.009***	0.018**
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.007)
constant	5.534***	8.507***	9.888***	10.72***	11.39***	11.91***	12.48***	13.33***	15.42***
	(0.536)	(0.246)	(0.126)	(0.0890)	(0.0746)	(0.0768)	(0.087)	(0.1672)	(0.658)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) 4,293 observations.*

These findings are validated by the last series of estimates we performed (Table 8) and prove the robustness of our results. That is, all our estimates reject the Gibrat's law and show that small firms growth faster.

Table 8

Panel Quantile Regression – Employees Growth Rate (First Lag for Endogeneity)

quantiles	lower quantiles			middle quantiles			upper quantiles		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
lagsize	-0.277***	-0.237***	-0.247***	-0.265***	-0.288***	-0.314***	-0.347***	-0.426***	-0.711***
	(0.027)	(0.011)	(0.006)	(0.005)	(0.004)	(0.005)	(0.008)	(0.033)	(0.120)
lagtax	0.000	-0.000	-0.000	-0.000	-0.000**	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
laginov	-0.011***	-0.001***	-0.000	-0.000*	-0.000**	-0.000**	-0.000*	0.016***	0.225***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
lagroa	0.005***	0.003***	0.002***	0.002***	0.002***	0.002***	0.004***	0.006***	0.007
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.007)
constant	0.967***	1.186***	1.463***	1.705***	1.943***	2.187***	2.509***	3.230***	5.776***
	(0.161)	(0.067)	(0.039)	(0.033)	(0.028)	(0.031)	(0.051)	(0.194)	(0.709)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) 4,293 observations.*

Conclusions

The increased number of persons requiring medical assistance, the population ageing, and an underfinanced public health care system require the development of the private health care services. This is also the case of Romania, where private firms in the field expand rapidly, the main targets being the large cities and a supply of integrated services. There is a lot of space for development, but the process seems to be extremely heterogenous.

Against this background, the purpose of our paper was to investigate the link between firm growth and size within a panel quantile regression framework, and to assess the asymmetries in the firm development process. To this end, we use firm-level data for 545 Romanian firms operating in the health care sector, and the fixed-effect quantile panel data approach of Canay (2011).

Our analysis conducted for the period 2007 to 2015 clearly shows that the influence of size on growth is negative and significant for all quantiles, meaning that small firms growth faster as compared to their larger counterparts. At the same time, the negative impact increases in the upper quantiles (firms that growth faster). This result is obtained for different specifications of firm growth rate and is validated by different robustness checks. We also show that the taxation level has a negative, but reduced impact on firm growth, whereas the profitability effect is positive, but marginal. At the same time, we document no significant influence of R&D and innovation activities on firm growth in the case of health care system of Romania.

The policy implications of our findings show the necessity to encourage the activity of small firms in the Romanian health industry, given that these firms have a stronger contribution to economic growth and employment. Given that the taxation has a significant negative impact on firm growth, a reduced fiscal pressure for these companies will allow them to develop. The flat tax rate used in Romania during the analyzed period did not discourage the investment within this sector. This way, the authorities may partially compensate the deficiencies of the public health system. Our study has an important limitation, given that during the analyzed period the economic activity has severely contracted in 2009, which affected the dynamics of investment.

Acknowledgements

This work was supported by a Grant of the Romanian National Authority for Scientific Research and Innovation, CNCS–UEFISCDI, Project Number PN-III-P1-1.1-TE-2019-0436.

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