Inter-American
Development Bank

Institutions for
Development Sector

Competitiveness and
Innovation Division

DISCUSSION PAPER

No. IDB-DP-367

The Dynamics of Entrepreneurship in Costa Rica

An Analysis of Firm Entry, Exit, and Growth Rates

Ricardo Monge-González
Federico Torres-Carballo

January 2015

The Dynamics of Entrepreneurship in Costa Rica

An Analysis of Firm Entry, Exit, and Growth Rates

Ricardo Monge-González
Federico Torres-Carballo

Inter-American Development Bank
2015

Abstract*

This study explores for the first time the dynamics of entrepreneurship in Costa Rica based on an analysis of firm entry, exit, and growth rates. Using panel data from 2001 to 2012, it explores the extent to which the growth rates of firms are independent of firm size (Gibrat's law), controlling for age and other possible determinants of growth rates. It also analyzes the question of whether Costa Rica is suffering from the *missing middle* phenomenon. In addition, it explores the questions of which firms are generating more jobs and which companies show high and sustained growth rates (gazelles). The results show an inverse relationship between size and growth rates of firms, even after controlling for age, which does not agree with the predictions of Gibrat's law. In short, it was found that young and small firms are growing faster than older and larger firms in Costa Rica. However, the results also show that large firms are the only ones whose average size increased between 2001 and 2012. It is clear that Costa Rica is not suffering from the *missing middle* phenomenon, because although there are a very large number of micro and small firms, there is not a bimodal distribution. Indeed, mid-sized firms are missing, but large firms are missing too, and the fraction of firms of a given size is smoothly declining in firm size in all of the years analyzed. On the other hand, a positive and significant relationship between the growth rates of firms and their export experience was found, as well as between the former and firm participation as a local supplier of multinational companies.

JEL Classifications: D22, F23, L25, M13
Keywords: age, Costa Rica, employment, entrepreneurship, entry, exit, export, multinationals, linkages, gazelles, growth, size

---

* Author information: Ricardo Monge-González, Professor of Economics at the Instituto Tecnológico de Costa Rica and researcher at CAATEC (rmonge@caatec.org); and Federico Torres-Carballo, Professor of Experimental Economics at the Instituto Tecnológico de Costa Rica and researcher at CAATEC (fmtorresc@gmail.com).

This research was carried out for the ESW "Innovation Policy and Entrepreneurship: Current Programs in Latin America and the Caribbean" of the Inter-American Development Bank (IDB). We would like to thank Carlos Guaipatin, Juan Carlos Navarro, Gustavo Crespi, and Liora Schwartz at the IDB for their valuable comments. Our thanks to Ronald Lacayo and Minor Zúñiga from the Costa Rican Social Security System, Anabel González and Fernando Ocampo from the Ministry of Foreign Trade, Francisco Gamboa from PROCOMER, and Carlos Vargas and Amalia Ramirez from the Ministry of Finance, whose collaboration was crucial for obtaining access to firm-level data. We are also grateful to all of our Latin American partners in this project for their advice and valuable suggestions. Finally, we express our gratitude as well to Laura Torrentes for her valuable work. Any errors found are solely the fault of the authors.

1. Introduction

Current literature provides extensive support and empirical evidence for the notion that entrepreneurship is important for private sector development and economic growth. Recent research shows that fast-growing firms have a significant impact in terms of productivity and job creation (Haltiwanger, Jarmin, and Miranda, 2010; Acs and Audretsch, 1989; among others). These studies suggest that entrepreneurship should generate innovations, facilitate knowledge spillovers, create jobs, and lead to higher economic growth. In addition, entrepreneurship is even higher on the policy agenda today than it was in the past as governments look for remedies and ways to overcome economic crises. It is believed that the economic dynamism inherent in entrepreneurship is an important way to safeguard the long-run viability and competitiveness of national economies (OECD, 2009).

Policymakers need to understand both the performance and determinants of entrepreneurship to analyze the effectiveness of different policy approaches. In general, policymaking processes must be guided, as to the degree that it is possible, by evidence and facts. Over the last few years in the Latin American region, several programs were designed by public agencies to support the development of high-potential firms (such as seed capital grant programs, venture capital supports, incubators, and technological parks). Program design and evaluation is critical for avoiding mistakes and concentrating public resources on the most effective means of support (Lerner, 2002 and 2009). Well-intentioned but poorly designed programs can have many negative unintended consequences, such as: (i) adverse selection (where public support can hinder competition and allow market entry to lower-quality firms); (ii) moral hazard (when some firms may become over-ambitious because they are not risking their own resources); and (iii) hold-up (when indecision creates uncertainty about investment and commitment).[1] According to García-Robles (2011) and Leamon and Lerner (2012), there are only a few isolated studies identifying and evaluating the effects of existing policies and public programs on the dynamics of entrepreneurship.

In the specific case of Costa Rica, recent efforts have been made to identify some of the main characteristics of entrepreneurs, such as their age, educational level, gender, productive activity, and labor experience, as well as their motivation for starting a firm and

[1] According to the Conference by Rodrigo Wagner, "Economics of Entrepreneurship for Competitiveness Policy," held at the Inter-American Development Bank in Washington, DC, June 4–7, 2012.

the funding that was used (Kantis, et al. 2002; Leiva, 2002, 2009, and 2013). However, there is no empirical research on the dynamics of entrepreneurship in the country. This research partially fills that gap.

Leiva (2013) characterizes entrepreneurship in the Costa Rica. His research was based on a 2011 survey of 1,167 micro, small, and medium-sized Costa Rican companies. The author found that most Costa Rican entrepreneurs are men (83 percent) and that they are between 25 to 34 years old (40 percent) and have a university degree (53 percent). Most entrepreneurs had fixed employment (68 percent) when they created their own company, did not have previous experience as entrepreneurs (71 to 84 percent), and primarily depended on the income of their new company (69 percent). Most entrepreneurs decided to start a company to seek independence (68 percent), knew the type of firm they wanted to start (64 percent), and saw a business opportunity (56 percent to 69 percent). One-third of start-up companies (33 percent) were created as *spin-offs* and more than half of the entrepreneurs decided to set up their company individually (55 percent)—that is, without partners. Finally, the author found that most entrepreneurs financed the beginning of their firms with their own resources (80 percent) and fulfilled all the necessary legal requirements from the beginning of the firm (60 percent).

Using the same survey as Leiva (2013), Govaere (2013) found that almost one-fourth of the firms (24 percent) participated either directly or indirectly in the Costa Rican export effort. Slightly less than half of these firms (44 percent) exported directly, while most of them (56 percent) did so through linkages with other exporting companies. In addition, the author indicates that while 19 percent of the exporting microenterprises had sold their products abroad for more than 20 years (before 1990), 40 percent of the exporting medium-sized companies showed a similar behavior. This result may be an indication of the relative importance of exports in determining firm growth.

This research explores how often new companies are created while others are closed, and the sectors in which this happens. The dynamics of these two processes are also analyzed. The extent to which the growth rates of firms are independent of firm size (Gibrat's law) is also explored, controlling for age and other possible determinants of growth rates. We analyze question of whether Costa Rica is suffering from the *missing middle* phenomenon in addition to the questions of which firms are generating more jobs and which companies

show high and sustained growth rates (hereafter referred to as *gazelles*). In doing so, we rely heavily upon the work of Davis, Haltiwanger, and Schuh (1996).[2] Finally, we explore the relative importance of the birth, growth, and death of productive units in Costa Rica, as well as the possible determinants of their performance; the results are important for the design and implementation of Productive Development Policies (PDPs). Access to valuable data from Costa Rica's social security system (Caja Costarricense de Seguro Social, or CCSS), the Export Promotion Agency (PROCOMER), and the Ministry of Finance of Costa Rica, has made it possible to increase the theoretical and conceptual understanding of the role of public policies in fostering entrepreneurship in the country.

This paper is organized in seven sections and one appendix, including the introduction. Section 2 presents background information, discusses the data used in other studies, and contrasts it with the data for Costa Rica. Section 3 describes the data and measurement processes used in the analysis (definitions, descriptive statistics, and limitations). Section 4 discusses firm size distribution and size differences between sectors; it also presents several transition matrices and a growth analysis. This analysis answers the following questions: Is the growth rate of firms independent of their size? Are younger firms, on average, growing faster? Do younger firms account for a disproportionate amount of net job creation? Section 5 discusses the topic of high growth rates of firms and characterizes and analyzes the performance of those firms with a potential for extremely fast growth; these firms are generally referred to as *gazelles* in the literature. The questions addressed here are the following: What is the contribution of gazelles to job creation in the country? Is it possible to predict the emergence of gazelles in Costa Rica? How heterogeneous are gazelles in this country? Section 6, which is a contribution to the economics of entrepreneurship, explores some specific differences among Costa Rican gazelles and the impact of these differences on their growth rates, in particular, their experience with exports and backward linkages with multinationals. Finally, Section 7 offers the main conclusions from the work as a whole.

[2] That is, the growth of a company is measured in terms of the increase in the number of employees between year t-1 and t.

2. Background

According to the literature on industrial organization, firm growth rates are independent of size, a relationship known as Gibrat's law. A substantial amount of research was dedicated to testing the validity of this law, as discussed by Sutton (1997). Initial research in this field found an inverse relationship between firm size and growth, contradicting what Gibrat's law predicts (Birch 1979, 1981, and 1987). These findings provide support for the popular perception, at least with regard to the U.S. economy, that small businesses create most private jobs. However, a variety of subsequent empirical studies have highlighted statistical and measurement pitfalls underlying much of the evidence in support of this last point of view (Davis, Haltiwanger, and Schuh, 1996). A good discussion of this topic is found in Haltiwanger, Jarmin, and Miranda (2010), in which the authors claim that analyses of the relationship between firm size and growth have been hampered by data limitations and measurement issues.

With regard to data limitations, the authors point out that in order to understand firm dynamics, researchers must track both establishments and their parent firms over time. They define an establishment as a specific physical location in which a business activity takes place, while a firm reflects all the establishments under common operational control. The authors claim that it is very difficult to detect the relationship between firm size and growth using only either firm- or establishment-level data. Using only establishment-level data is inadequate because if a firm has several establishments, it is possible that the firm's primary margin of expansion is opening new stores (establishments) rather than the expansion of existing stores, as might be the case for a large national retail chain. For the purpose of the present analysis, the growth from these new establishments should be classified based on the size (and age) of the parent firm, not the size (and age) of the establishment. On the other hand, job growth that is observed only in firm-level data may simply reflect changes in firm structure brought about by mergers, acquisitions, and divestitures; for the purpose of the present analysis, it is helpful to abstract from changes that reflect only a reallocation of employment across firms due to mergers, acquisitions, and divestiture activities.

Regarding pitfalls related to measurement issues, Haltiwanger, Jarmin, and Miranda (2010) claim that even with rich source data, a key challenge in analyzing the establishment

and dynamics of firms is the construction and maintenance of high quality longitudinal linkages that allow accurate measurement of firm births and deaths. This is important in the case of changes in ownership among firms, since a common feature observed in business micro-data is spurious firm entry and exit caused by purely legal and administrative actions (at least in the U.S. economy). This hampers the ability of researchers to distinguish between real business dynamics and events triggered by legal actions or business transactions. On the other hand, it is important to avoid what is referred to in the literature as the *regression fallacy*—that is, the role of regression to the mean effects. As pointed out by Haltiwanger, Jarmin, and Miranda (2010: 6), "Businesses that recently experienced negatively transitory shocks (or even transitory measurement error) are more likely to grow while businesses recently experiencing positive transitory shocks are more likely to shrink. This effect alone will yield an inverse relationship between size and growth." In earlier works, the researchers classified businesses into size classes using base year employment, a method now known to yield results that suffer from regression to the mean; to avoid the regression fallacy problem, they propose an alternative classification method developed by Davis, Haltiwanger, and Schuh (1996), hereafter called DHS.

As discussed later, the present analysis uses firm-level data from CCSS. Given this data, and points mentioned in previous discussion, it is relevant to consider the extent to which Haltiwanger, Jarmin, and Miranda's (2010) comments may indicate important limitations for the study in Costa Rica.

With respect to working with data from both establishments and firms, it should be noted that, due to the size of the Costa Rican economy, in both economic and geographic terms, this limitation is not particularly relevant. Besides, most businesses have only one establishment, because they are micro and small-sized businesses.[3]

Regarding mergers, acquisitions, and divestitures, as well as changes in firm ownership, there is reliable and available information on these topics in Costa Rica. It is only recently that the Minister of Economy has collected information on legal mergers and

[3] As shown later in Section 4, from 2001 to 2012 micro enterprises account for 79 percent of total Costa Rican firms, while small firms account for 16 percent. Besides, most of these firms did not change their size during the same period.

acquisitions.[4] However, according to the data, it seems that the market is not fully developed and that these activities are not as typical as they are in developed economies. In fact, MEIC (Economics, Industry and Commerce Institute of Costa Rica) has only analyzed seven requests for mergers and acquisitions since the new legislation was approved in 2012. For this reason, the **e**xistence of these activities does not seem to be a strong limitation on the use of data from the CCSS for the purposes of the present study. Finally, to avoid the regression fallacy problem, we applied the DHS method to avoid obtaining a negative relationship between firm size and growth attributable to deficiencies in the process of firm classification by size.

3. Data and Measurement

This section describes the data and measurement process used in the analysis, including variable definitions, descriptive statistics, and data limitations for the analysis of the relationship between firm size and growth.

3.1 Nature of the Data

To accomplish the goals of the present research, we combined three available sources of data for Costa Rica to construct a unique data set for the 2001–2012 period. The first data set is from a representative sample of over 16,000 firms (out of approximately 50,000) registered in the CCSS for the 2001–2012 period. The sample was selected using a systematic randomized procedure with k=5. All firms operating until 2001 were ordered by their ID, and every fifth company was selected, beginning with firm number five. Second, the same procedure was used for the selection of additional samples of new companies entering the system in the 2002–2012 period.

Additionally, a dummy variable representing the export experience of each of the firms was added to the CCSS database, based on information from the Ministry of Foreign Trade (COMEX). Another dummy variable was added for sales of products and services to multinational companies operating in Costa Rica, based on records of the General Tax

[4] New legislation that applies to these topics has been enacted due to a reform of the "Ley de Promoción de la Competencia y Defensa Efectiva del Consumidor, Ley No. 7472," October 5, 2012.

Collection Office of the Ministry of the Treasury. In the latter case, the information that is available only covers the 2001–2011 period; information for the 2012 period was not available.

3.2 Definition of Variables

The final database includes the following variables for each firm and for each year from 2001 to 2012: *firm identification number (ID) and name*, *employment*, *salaries*, *location*, 2-digit *industrial classification, rural, export, and linkage*. The *ID and name* of a firm are the number and name under which it was registered in the Costa Rican National Registry; *employment* is the monthly average number of employees that worked during a given year in a specific firm; *salaries* are the total payroll paid by a firm during a year; *location* means the province where the firm is located; *rural* is a dummy variable equal to 1 if the firm is located in the rural area of the country—in the provinces of Guanacaste, Puntarenas, or Limón—during the year t, and 0 otherwise; *export* is also a dummy variable equal to 1 if the firm exported during the year t, and 0 otherwise; and *linkage* is another dummy variable equal to 1 if the firm sold its products to multinational companies operating in Costa Rica during the year t, and 0 otherwise.

3.3 Dataset Limitations

Information in the database has two limitations. First, it does not include the exact year of a firm's creation, and second, it does not include the exact year of a firm's death. As indicated previously, the year of registration in the CCSS is considered to be the year when the firm started operations, and the year in which it ceased to operate was considered to be the year when the firm disappeared from the CCSS records.

Although these assumptions are used in other studies (Crespi, 2003), they may limit the degree of confidence in the results of the analysis herein. In the first place, it is probable that a significant number of Costa Rican firms were registered in the CCSS some years after their operations started since, according to Leiva (2013), only 60 percent of Costa Rican entrepreneurs indicate that they comply with all legal requirements (including registration with the CCSS) when they start their new firms. This would not be a serious limitation on the analysis if the time between creation of a firm and its registration with the

CCSS were similar for all firms. Second, assuming that a firm exits the market at the moment it stops appearing in the CCSS is a less restrictive assumption, as long as it is verified that once a company stops appearing in the CCSS, it does not appear again in following years, strengthening the conclusion that the firm did indeed cease operations in the market.

3.4 Construction of Indicators

Based on the variables in the data set, several indicators were constructed for each firm and for the years 2001–2012. The analysis is restricted to this period in order to define firm age consistently for all firms less than 12 years old. Specifically, the following indicators were estimated:

a) *Firm size*: According to the average number of employees that a firm hires in year *t-1* and year *t*, firms are classified as micro (less than 9 employees), small (10–49 employees), medium-sized (50–249 employees), or large (250+ employees). In short, following Haltiwanger, Jarmin, and Miranda (2010), estimates are made for an average size of the firm in year t-1 and year t; this approach is used for new, existing, and exiting firms.

b) *Firm age*: Starting in the year 2001, the firm is assigned an age based on the first year the ID of the new firm was observed in the CCSS database. The firm is then allowed to age naturally by one year for each additional year it is observed in the data. We also include a category for firms that are 13 years or older (in 2001, these are the firms in operation for which a precise age is not available). Besides, we classify firms in four categories by age: 0–2 years, 3–5 years, 6–10 years, and more than 10 years. An advantage of this approach is that firm births as well as firm deaths are readily and consistently defined.

c) *Entry of the firm*: The entry of a firm is the first year in which the firm ID is observed in the CCSS database, starting in the year 2001, except for those firms that are 13 years or older, for which their entry date cannot be identified.

d) *Exit of the firm*: A firm death (exit) is defined as the moment when a firm ID disappears from the CCSS data set, starting in the year 2001. We corroborated that

once a firm exits from the CCSS data set that it did not enter again during the period of analysis.

e) *Growth rates of firms*: We use the definition of DHS growth rates according to Davis, Haltiwanger, and Schuh (1996). As was pointed out by Haltiwanger, Jarmin, and Miranda (2010), DHS proposes a classification based on current size, which is based on average employment in year *t-1* and *t* (equation 1 below). Thus, the firm-level employment growth rate was measured as follows:

$$r_{jt} = (E_{jt} - E_{jt-1})/(0.5 * (E_{jt} + E_{jt-1})) \qquad (1)$$

As pointed out by Haltiwanger, Jarmin, and Miranda (2012), this growth measure has become the standard in the analysis of establishment and firm dynamics because it shares some useful properties of log differences but also accommodates entry and exit (Davis et al., 1996; and Tornqvist, Vartia, and Vartia 1985). It is a second-order approximation of the log difference for growth rates around zero. Note that DHS growth rate is not only symmetric but also bounded between -2 (exit) and 2 (entrant).

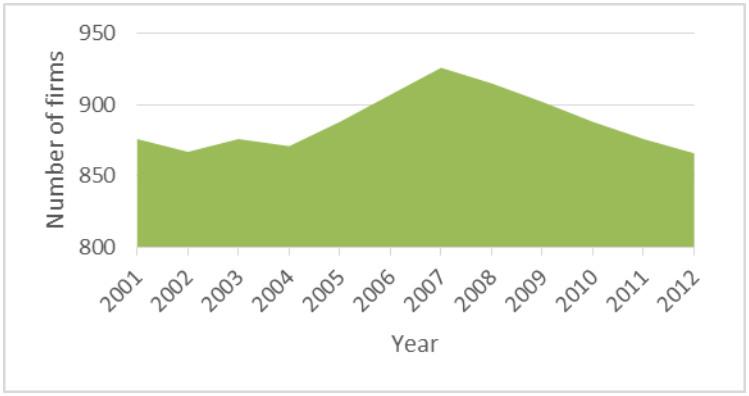
f) *Gazelles*: According to the OECD (2009), gazelles are firms that have been employers for a period of up to five years, with an average annual employee growth of greater than 20 percent per year, over a three-year period and with 10 or more employees at the beginning of the observation period.

g) *Sector*: Using the 2-digit level of the International Standard Classification, firms are classified as belonging to one of five sector categories: agriculture, mining, manufacturing, commerce, or services.

3.5 Descriptive Statistics

Table A.1 in Appendix 1 shows a summary of descriptive statistics on the number of firms and employees by sector for each year from 2001 to 2012. As can be seen from Figure 1, the number of firms dedicated to agricultural activities has remained relatively stable through time with a peak in 2007 before the 2008/2009 global financial crises.

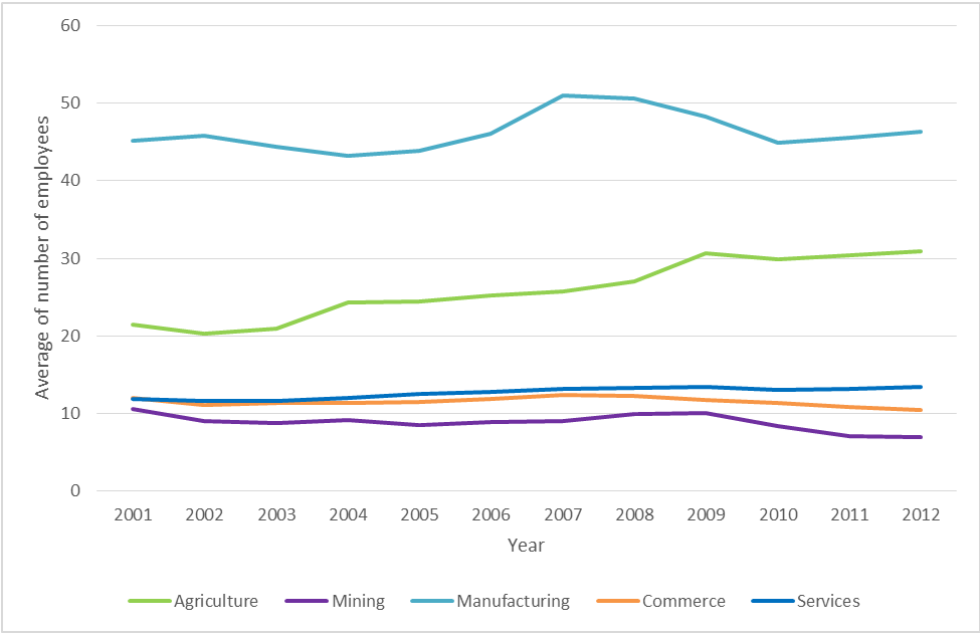
Figure 1: Number of Firms in the Agricultural Sector in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

The average size of Costa Rican agricultural firms increased substantially during the period of analysis, from 20 to 30 employees (Figure 2). This growth is also seen when the size of the largest firm is compared in these two years, rising from 6,000 employees in 2001 to almost 15,000 employees in 2012 (Table A.1). This means that dispersion in these firms by size had increased by the end of the period analyzed.

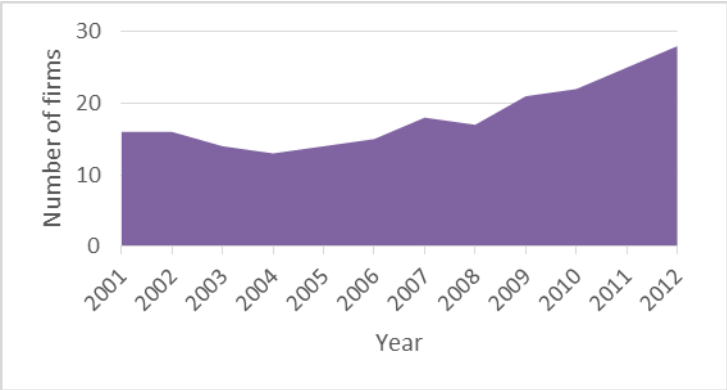
Figure 2: Average Number of Employees of Firms in Each Sector in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

In the mining sector, the number of firms almost doubled between 2001 and 2012 (from 16 to 28 firms), growing continuously during this period (Figure 3). The average size of these firms decreased, as well as did their dispersion (Figure 2). This means that the size of the largest firm in this sector also decreased between 2001 and 2012 (from 29 to 24 employees) (Table A.1).

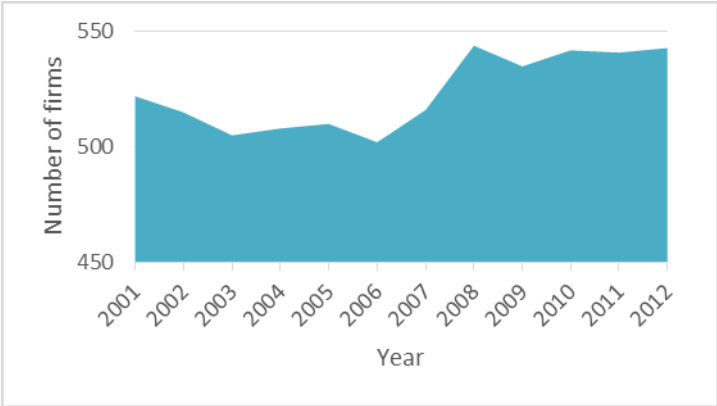
Figure 3: Number of Firms in the Mining Sector in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

The manufacturing sector does not show a substantial difference in terms of the number of firms during the period analyzed, which grew from 522 to 543 firms between 2001 and 2012 (Figure 4). Likewise, the average size of these firms remained stable during the entire period at about 45 employees, without considerable changes in their dispersion (Figure 2). On the other hand, the size of the largest firm in this sector decreased from 2,151 employees in 2001 to 1,827 in 2012 (Table A.1).

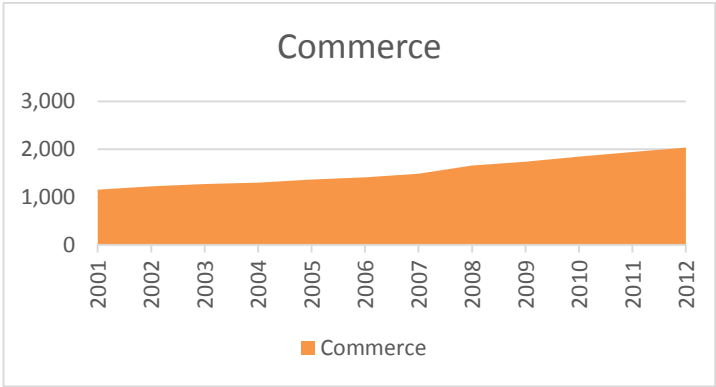
Figure 4: Number of Firms in the Manufacturing Sector in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

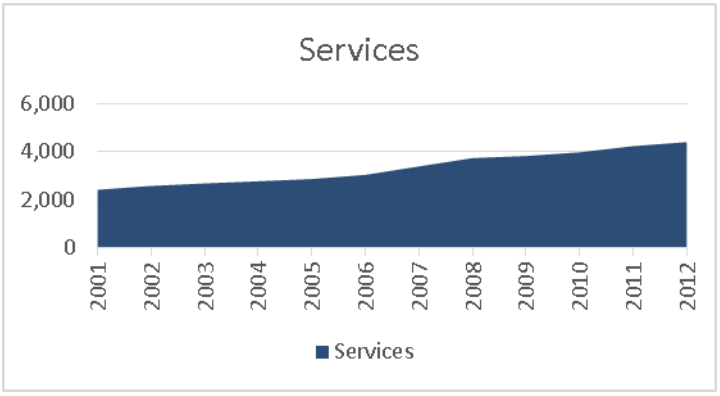
The commerce and services sectors are those which have grown the most in terms of the number of firms during the period analyzed. In fact, the number of firms dedicated to commercial activities increased from 1,154 in 2001 to 2,035 in 2012 (Figure 5), while the number of firms in the services sector rose from 2,421 to 4,401 during the same period (Figure 6). In the case of services firms, their average size has grown slightly and permanently between 2001 and 2012; this was not observed in the case of firms in the commerce sector, although in both cases the dispersion in firms of the same sector increased (Figure 2). In fact, in the services sector, the largest firm went from 832 employees in 2001 to 2,833 employees in 2012, while in the commerce sector the largest firm went from 594 to 1,750 employees during the same period (Table A.1)

Figure 5: Number of Firms in the Commercial Sector in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

Figure 6: Number of Firms in the Services Sector in Costa Rica, 2001–2012

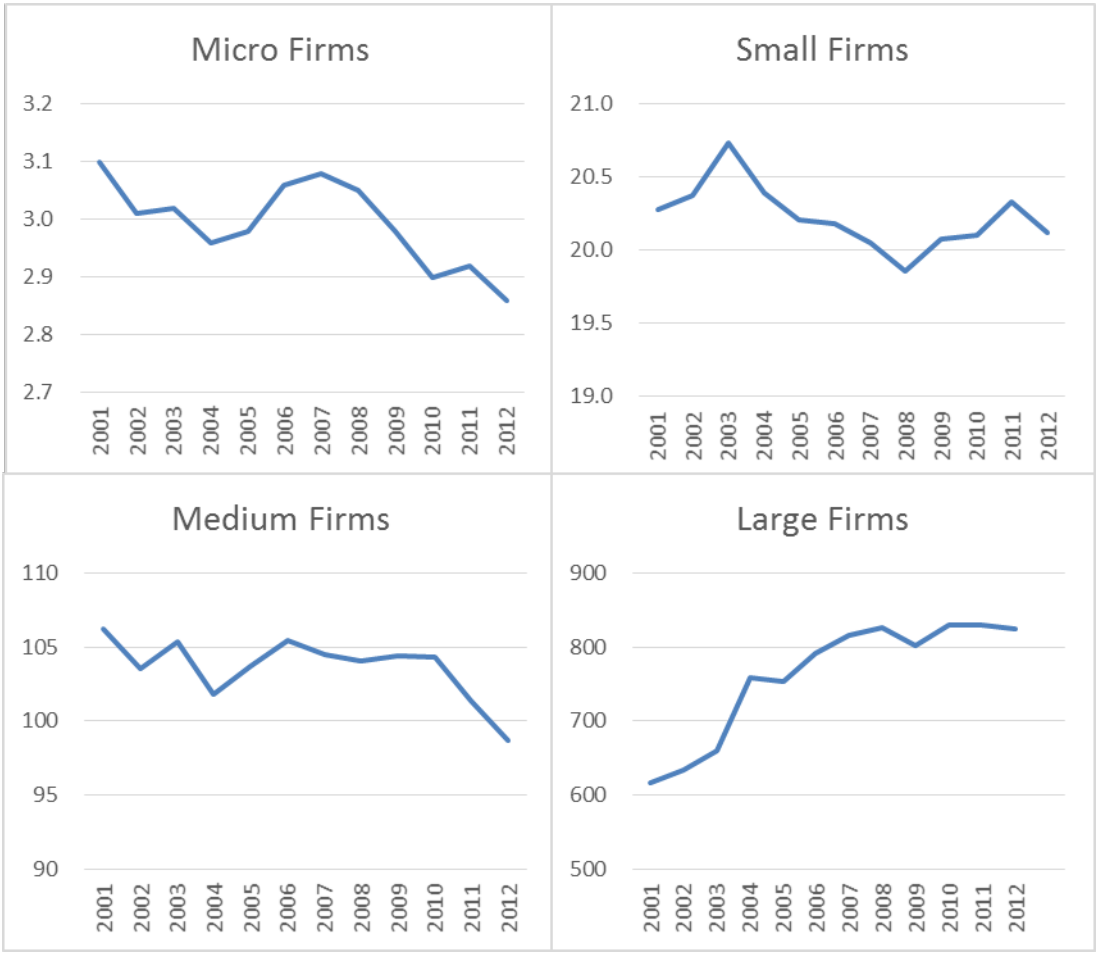


Source: Authors' estimations based on data from the CCSS.

In brief, it may be concluded that, with respect to the number of firms, the mining, commerce, and services sectors show the greatest growth in the Costa Rican economy between 2001 and 2012. In terms of the average number of employees, it seems that firms in the agricultural sector have grown the most.

An analysis of descriptive statistics of firms by size shows several interesting results based on data presented in Table A.2 in Appendix 1. First, in Figure 7 it is clear that the average size of micro and small firms has remained similar throughout the 2001–2012 period (about 3 employees in the first case, and 20 employees in the second case), with a very stable dispersion within the same category. In contrast, the average size of medium-sized firms continuously decreased from 106 employees in 2001 to 98 employees in 2012. In addition, dispersion in terms of the number of employees among these firms also decreases during the same period (standard deviations of 52.4 versus 46.9).

Figure 7: Average Number of Employees by Firm Size in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

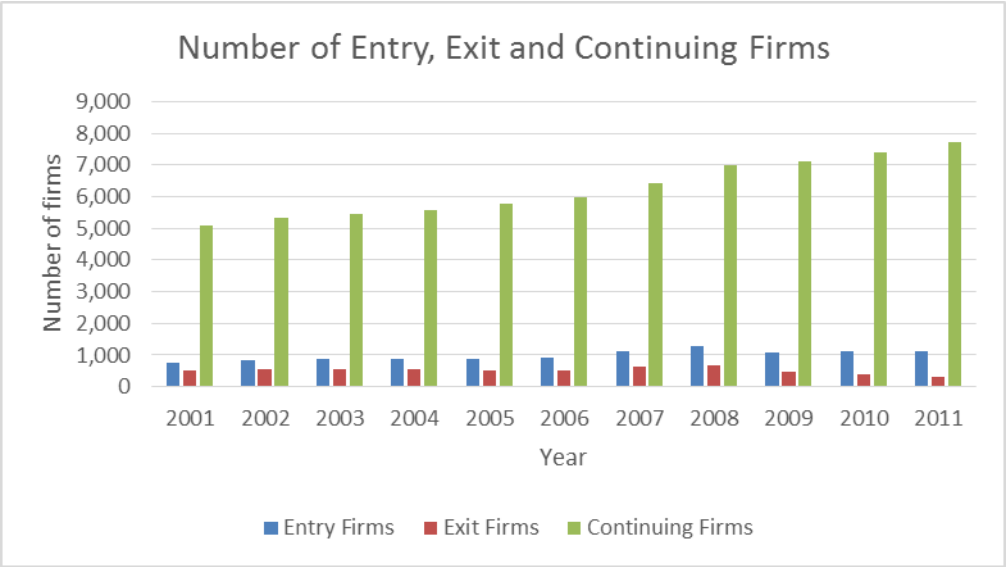
Only large firms show a considerable growth in their average size, from 617 employees in 2001 to 824 employees in 2012, growing continuously until 2008, decreasing in 2009, and remaining relatively stable thereafter. It is important to note the increase in dispersion in these firms; the standard deviation increased from 816 to 1,678 between 2001 and 2012 (Table A.2 in Appendix 1). This fact is also reflected in the data for the largest number of employees of the largest firm in this category, which went from 6,009 employees at the beginning of the period analyzed to almost 15,000 employees at the end of the period. In summary, it seems that large firms are the only ones whose average size increases in the 2001–2012 period.

Finally, this section analyzes firm age as well as entry into and exit from the market during the 2001–2012 period. Table A.3 (Appendix 1) shows that in 2001 there were 4,333 firms in the sample that entered the market prior to that year. In other words, of the 16,347 firms in the sample studied, 26.5 percent had been operating for more than 12 years. Between 2001 and 2012, 12,014 of the firms in the sample entered the Costa Rican economy, increasing in number until 2008, decreasing in number in 2009, and remaining relatively constant in number during the last three years of the period analyzed. An average of 1,001 firms in the sample entered the Costa Rican economy per year. On the other hand, between 2001 and 2012, 7,870 firms in the sample exited from the Costa Rican economy–an average of 514 per year.

The dynamics of entry, exit, and continuing (living) firms is depicted in Figures 8 and 9. From Figure 8 it is clear that the number of continuing firms increases through time during the entire period, thanks to the fact that entry firms are more numerous than those that exit the market. Entry firms show continued growth until 2008, and contraction thereafter, as shown most clearly in Figure 9. In the case of exit firms, there is not a clear pattern between 2001 and 2008, but after the 2009 global financial crisis, it is noteworthy that the number and percentage of firms exiting the market decreases (Figure 9).

In short, it may be concluded that there was a sustained increase in the number of continuing firms in the Costa Rican economy (Figure 8); the total number of firms in the sample grew in net terms by 8,477 in the 2001–2012 period, with an average increase of 530 firms per year.

Figure 8: Number of Entry, Exit, and Continuing Firms in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

Figure 9: Percentage of Entry and Exit Firms in Costa Rica, 2001–2012

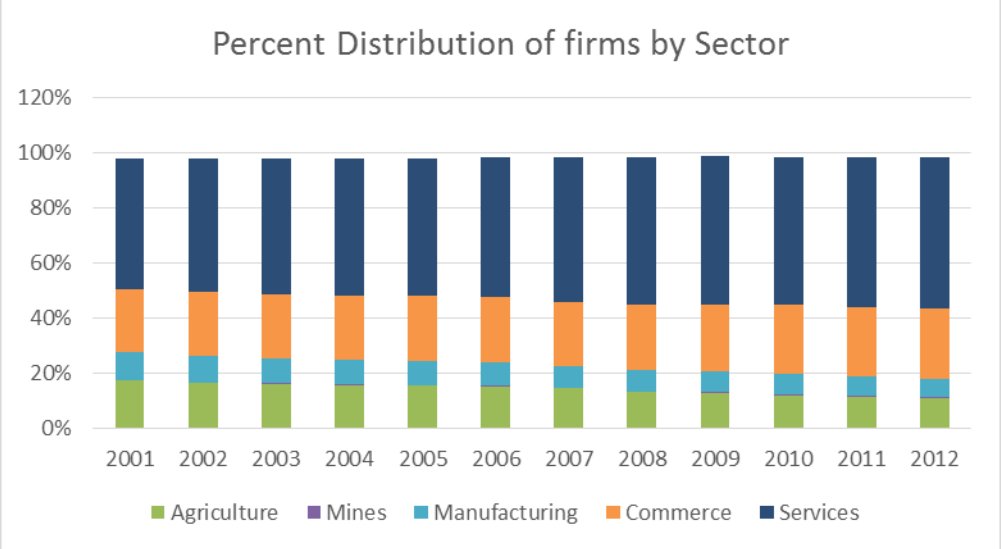
Source: Authors' estimations based on data from the CCSS.

4. Firm Size Distribution for Small and Young Firms

4.1 Firm Size Distribution by Sector and Size

Figure 10 shows firm distributions by productive sector in percentages (see data in Table A.4 in Appendix 1). As indicated in part 3.5 of the previous section, the mining, commerce, and services sectors are those that show the greatest growth in terms of the number of firms in the Costa Rican economy between 2001 and 2012. This last result is consistent with the percentage distribution of firms by productive sector shown in Figure 10; it is clear that during the period analyzed, the agricultural and manufacturing sectors lost relative importance, decreasing 6 percent in the first case (17 percent versus 11 percent) and 3 percent in the second case (10 percent versus 7 percent), between 2001 and 2012. On the other hand, the commerce and services sectors gained relative importance in terms of the number of firms in operation: the commerce sector gained 2 percent (23 percent versus 25 percent), and the services sector gained 8 percent (47 percent versus 55 percent) during the same period.

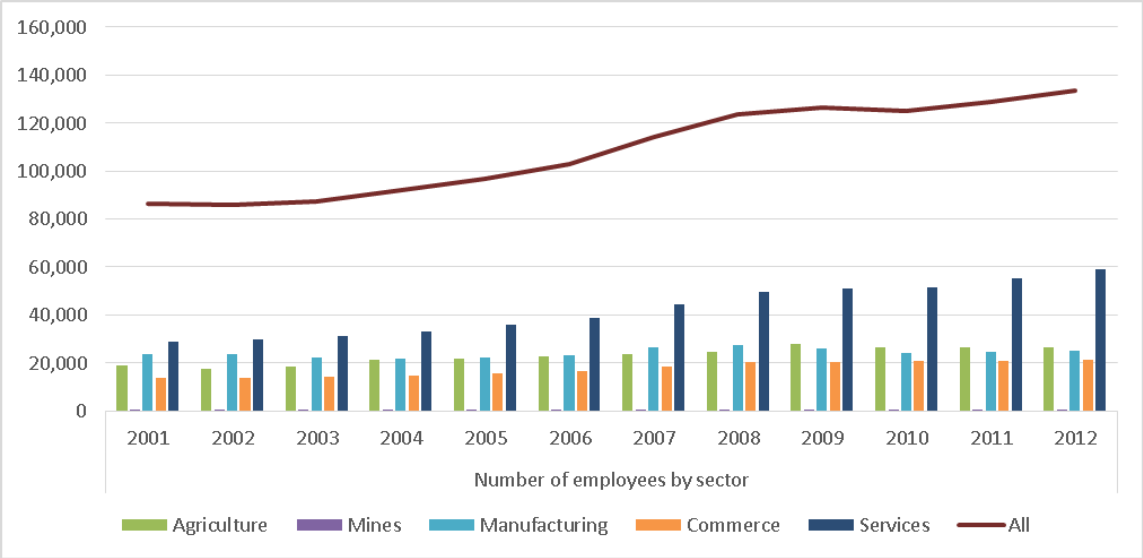
Figure 10: Distribution of Firms by Sector in Percentages in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

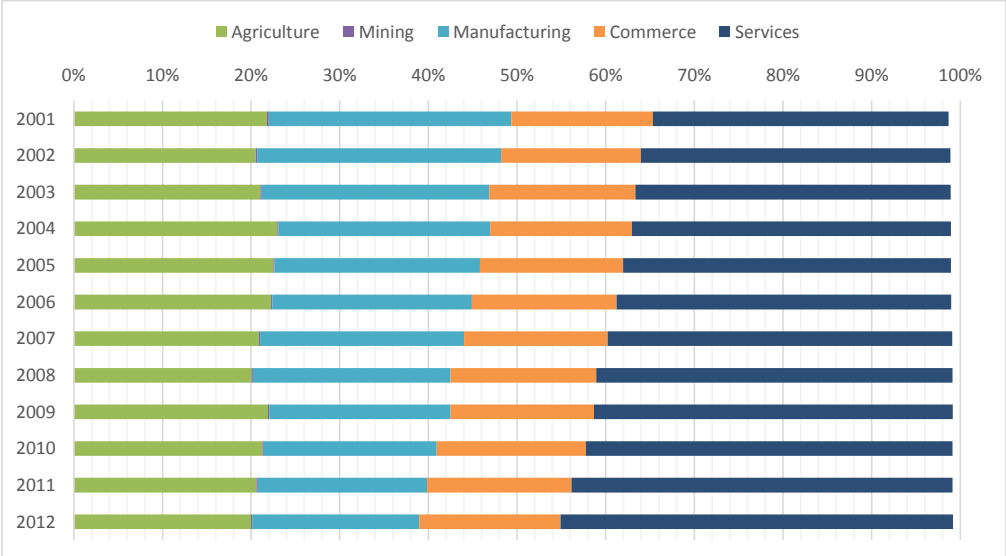
Regarding generation of employment, Figure 11 shows that the number of employment sources increased in all sectors throughout the period.[5] However, in terms of percent participation, important changes are seen in the 2001–2012 period, as shown in Figure 12.

Figure 11: Evolution of Total Employment by Sector in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

Figure 12: Distribution of Employment by Sector in Costa Rica, 2001–2012



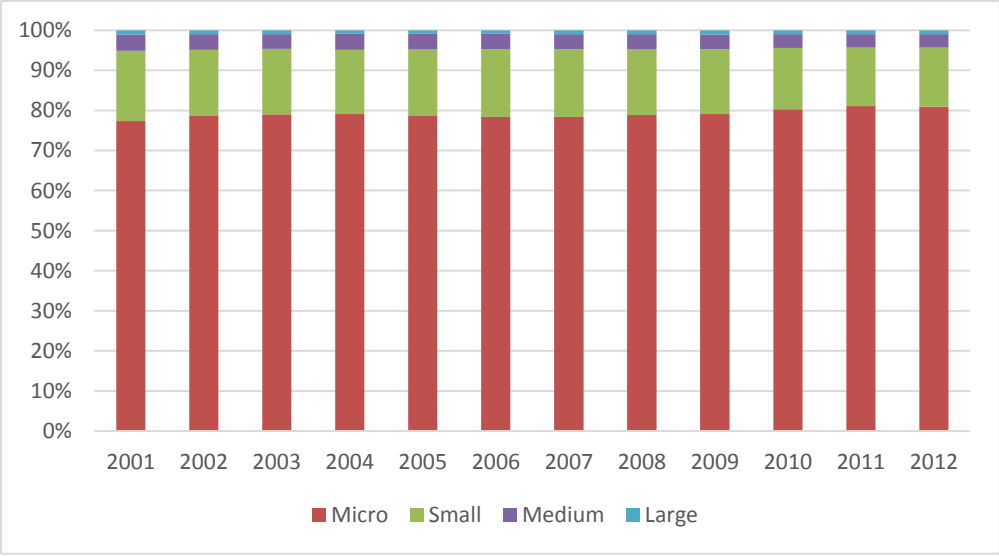
Source: Authors' estimations based on data from the CCSS.

[5] See data in Table A.5 in Appendix 1.

First, the agricultural sector lost 2 percent, with 20 percent of employment in the Costa Rican economy; the manufacturing sector lost 8 percent in the same period; and the commerce sector kept its relative contribution to overall employment sources (16 percent). On the other hand, employment generation increased in the services sector by 11 percent, from generating 33 percent of employment in 2001 to 44 percent in 2012. In other words, the Costa Rican economy has become more of a service-based economy. This result is important because, according to Pagés (2010), the commerce and services sectors are those in which Costa Rica faces the greatest challenges to increasing productivity.

An analysis of firm distribution by size shows several interesting results. First, a comparison of the number of firms existing in 2001 with those in 2012 shows that their number increased for all firm size categories (see Table A.6 in Appendix 1). However, the group that grew the most is microenterprises, whose relative importance increased from 77 percent to 81 percent during the analyzed period (Figure 13). On the other hand, the relative importance of small and medium-sized enterprises (SMEs) decreased slightly, particularly in the case of small firms, which went from 18 percent to 15 percent during the period of analysis.

Figure 13: Distribution of Firms by Size in Costa Rica, 2001–2012

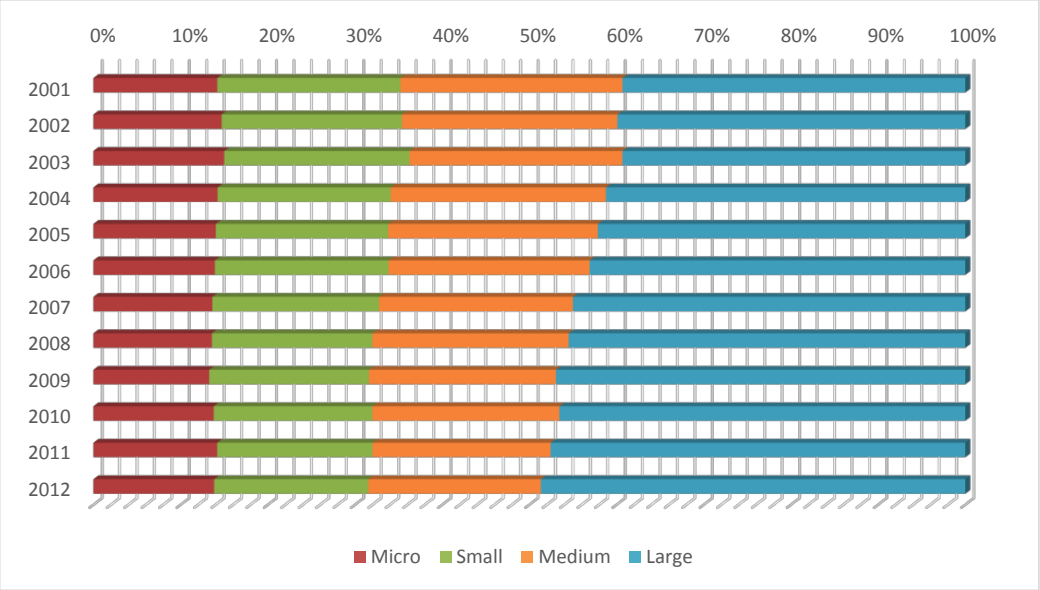


Source: Authors' estimations based on data from the CCSS.

The relative importance of Costa Rican microenterprises (81 percent) is not significantly different from that obtained for OECD countries, where firms with less than 10 employees represent between 70 percent and 95 percent of firms in these countries (OECD, 2013).

With respect to the generation of sources of employment by firm size, the analysis presented in Figure 14 shows that microenterprises generated only 14 percent of employment sources in Costa Rica, a situation that did not change between 2001 and 2012.[6] This result contrasts with that of the OECD countries, where microenterprises account for less than 20 percent of the employment generated in some cases and more than 40 percent in others (OECD, 2013). In other words, although microenterprises are not as important relatively in Costa Rica as they are in the OECD countries, it seems that these firms in Costa Rica do not have the necessary size to be an important source of employment.

Figure 14: Distribution of Total Employment by Firm Size in Costa Rica, 2001–2012



Source: Authors' estimations based on data from the CCSS.

The last result may be attributed to disadvantages that microenterprises have in many dimensions with respect to larger firms. In fact, several studies, including those of Monge-González (2009) and Monge-González and Rodriguez-Alvarez (2010), indicate that

[6] See the data on Table A.7 in Appendix 1.

Costa Rican microenterprises confront a series of restrictions such as lack of access to financing, weak administrative capacity, lack of employee skills, inability to exploit economies of scale, poor information about market opportunities, scarce access to new technologies and work organization methods, and excessive bureaucratic requirements for their creation and operation, among other restrictions related to the investment climate. All of these restrictions have serious repercussions for the development of this type of firm and, therefore, on the economy as a whole.

It is worth mentioning that SMEs, especially the medium-sized ones, have lost relative importance in terms of employment generation. This result is consistent with the reduction of their average size between 2001 and 2012, which was discussed previously. On the other hand, the relative importance of large firms as generators of employment increases significantly from 39 percent in 2001 to 49 percent in 2012. This relative importance is greater in Costa Rica than in more developed countries, where these firms represent between 3 percent (in the case of Italy) and 21.6 percent (in the case of the United Kingdom) of employment sources (OECD, 2013).

4.2 Transition Matrix

To assess whether micro and small firms in Costa Rica have experienced significant growth through time, it is necessary to see how their size varies. Table 1 shows the results of a transition matrix between 2002 and 2012 with five initial stages: micro, small, medium-sized and large firms, and exit (death). The data in the first row shows that of the total number of microenterprises operating in 2002, 38.4 percent continued to be microenterprises in 2012, while 56 percent exited the market (died) by the end of the period. On the other hand, only 5.3 percent moved up to the category of small, and practically none of them moved forward to the medium-sized category (0.2 percent). This means that success in terms of survival and growth at the microenterprise level is less than 6 percent. This result is quite discouraging, since microenterprises represent four-fifths of the total number of firms in Costa Rica (see Table A.6).

Table 1: Transition Matrix for Costa Rican Firms, 2001–2012

	t+10=2012					
t=2002	Micro	Small	Medium	Large	Death	Total
Micro	38.44%	5.30%	0.20%	0.00%	56.06%	100%
Small	14.66%	38.88%	8.07%	0.50%	37.89%	100%
Medium	2.58%	11.86%	37.63%	10.82%	37.11%	100%
Large	0.00%	3.85%	13.46%	61.54%	21.15%	100%
Birth	22.97%	5.38%	1.79%	0.12%	69.74%	100%
All	28.17%	9.56%	2.84%	0.98%	58.45%	100%

Source: Authors' estimations based on data from the CCSS.

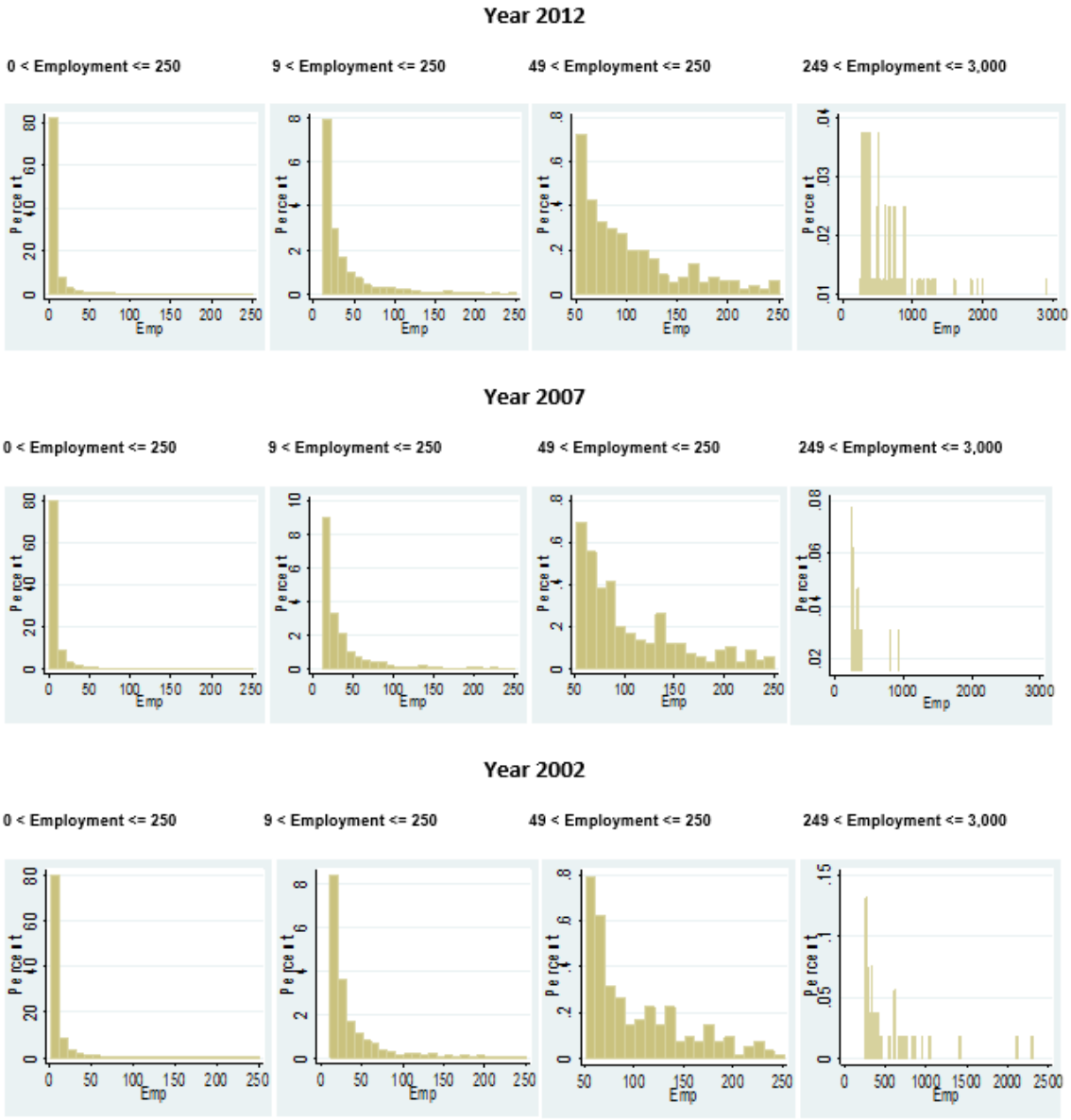
In the case of small firms, the results in the second row of Table 1 show that of the total of firms classified at this level in 2002, 38.9 percent remained as small firms in 2012, 37.9 percent had died, and 14.7 percent had moved down to the microenterprise category. Only 8.0 percent of the firms had moved up to the medium-size category, and almost none of the small firms had moved up to the segment of large firms (0.5 percent). In brief, the growth dynamics at the level of small firms is not very different from that at the level of microenterprises, although there certainly is a greater rate of survival (62 percent versus 44 percent, respectively).

In the case of medium-sized firms, of the total number of companies in this segment in 2002, 37.6 percent were still at the same level in 2012; 37.1 percent had died; 11.9 percent had moved down to the small category; and 2.6 percent shrank to microenterprises. On the other hand, 10.8 percent moved up to the large firm level. The greatest stability is observed in large firms, where 61.5 percent of the firms that were large in 2002 were also large in 2012; 13.5 percent had moved down to the category of medium; another 3.8 percent went down to the small category; and none of them had moved down to the micro level; while 21.1 percent of them had died. Finally, in the case of firms that were born in the year 2002, it is interesting to point out that 23 percent remained as micro firms in 2012, 5.4 percent as small firms, and 1.8 percent as medium-sized firms, while 69.7 percent had died.

The findings on micro and small firms might suggest that Costa Rica could be suffering from the *missing middle* phenomenon (World Bank, 2006); that is, the distribution of firm size in this country is characterized by a bimodal distribution with a

missing middle. In order to explore that claim, the work of Hsieh and Olken (2014) was used to construct a distribution of firm size in bins of 10 workers. The first column presents the size distribution of all Costa Rican firms. The first row presents the distribution for 2012, the second row for 2007, and the third row for 2002. The figure shows that the vast majority of firms in all three years are small, with no evidence of bimodality in firm size distribution.

Figure 15: Distribution of Firm by Employment in Costa Rica

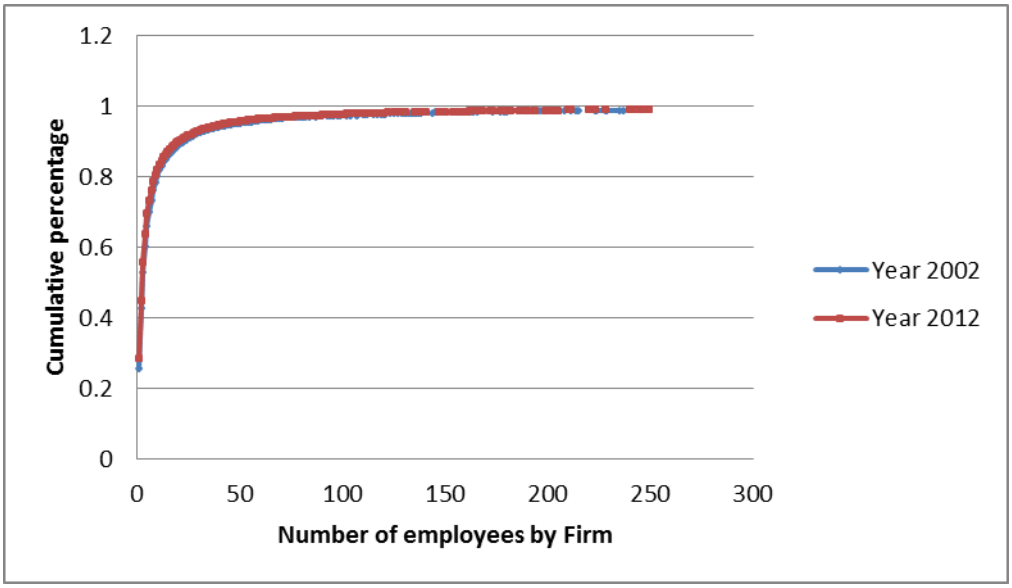


Source: Authors' estimations based on data from the CCSS.

The next columns of Figure 15 focus on different samples of the data (using the OECD classification for small, medium, and large firms) so that the patterns are more easily visible. Specifically, the sample is restricted to firms with 9 to 250 workers (column 2), 49 to 250 workers (column 3), and 249 to 3,000 workers (column 4). In all cases, the distribution of firm size is right skewed and generally smoothly declining in firm size, with no evidence of bimodality or discontinuity. There is no evidence of a missing middle of firms when one examines the raw distribution of firm size in any of the three years.

Another way to analyze the missing middle issue is through the accumulative distribution of firms. Figure 16 shows such a distribution for 2002 and 2012, respectively. From this it is possible conclude that although most firms are micro, the distribution of firms does not show any discontinuity.

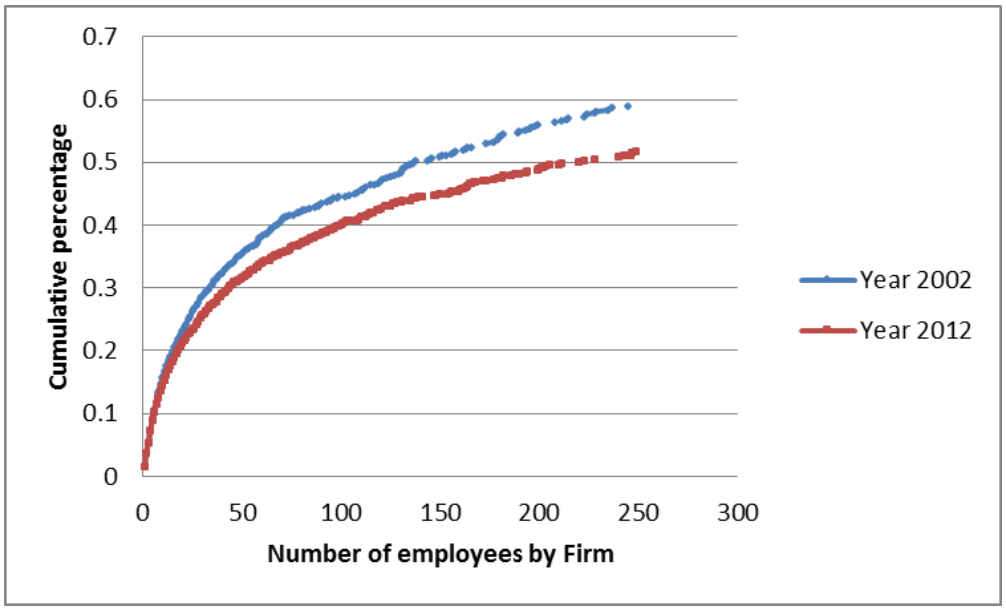
Figure 16: Cumulative Distribution of Firm by Employment in Costa Rica



Source: Authors' estimations based on data from the CCSS.

One interesting result is shown in Figure 17. Here we present the cumulative distribution of firm size weighted by employment. It seems that firms in 2012 are larger than firms in 2002, according to the number of employees they hire. This result complements that of the previous discussion, according to which larger firms are the ones that generate more employment in Costa Rica.

Figure 17: Cumulative Distribution of Firm by Employment in Costa Rica



Source: Authors' estimations based on data from the CCSS.

Four important conclusions may be drawn from the previous discussion. First, the mortality rate of Costa Rican firms seems to be moderate at all levels, with the exception of the microenterprise category. Second, there is a strong and positive correlation between firm size and survival. In fact, the firms that are most likely to survive are the largest firms. Third, most Costa Rican firms do not tend to grow significantly in size through the years—only a very few micro, small, and medium firms increase in size through time; instead, some small, medium, and large firms move down to smaller size categories (micro, small, and medium, respectively). Fourth, a significant number of firms born in 2002 had died 10 years later in 2012 (69.7 percent) and from those live firms, most of them remain as microenterprises at the end of the period. However, it seems that Costa Rica is not suffering of a missing middle of firms, which becomes apparent when one examines the raw distribution of firm size in different years from 2002 and 2012.

As a complement to these results, and in keeping with Crespi (2003), it is clear that the dynamics shown by Costa Rican firms throughout the period analyzed is of the

revolving door type of growth or selection model.[7] This presents significant challenges for the formulation of a policy favoring small firms (especially micro and small firms) since there is a risk of altering the mechanisms that select which firms survive and favoring (proportionally) too many inefficient, low-productivity firms, thus artificially extending their lifetimes and affecting the efficiency of the economy as a whole. This possibility emphasizes the importance of having efficient impact monitoring and evaluation systems for the programs designed and implemented as part of subject matter expert (SME) policies in Costa Rica.

The results in Table 1 are possibly affected by different sector and regional dynamics in Costa Rican firms, as indicated by Crespi (2003). Therefore, a multinomial logistic regression estimate was carried out that predicts the probability that each firm is at each of the five final stages as a function of the initial stages of each of those firms operating at the beginning of the period studied, and also as a function of a series of regional and sector categorical variables.[8] The results of this exercise are presented in Table 2.

Table 2. Transition Matrix for Costa Rican Firms, Adjusted by Sector Effects, 2001–2012

	t+10=2012					
t=2002	Micro	Small	Medium	Large	Death	Total
Micro	38.28%	5.30%	0.19%	0.00%	56.23%	100%
Small	14.68%	38.97%	7.74%	0.47%	38.14%	100%
Medium	2.50%	11.96%	37.83%	10.82%	36.88%	100%
Large	0.00%	3.52%	13.90%	64.46%	18.12%	100%
Birth	23.34%	5.25%	1.59%	0.10%	69.72%	100%

Source: Authors' estimations based on data from the CCSS.

[7] The author explains that in this situation the great majority of new firms would not be able to survive even in the very short term. These firms enter the market basing their expectations on the possibility that innovation, or new ideas will allow them to compete effectively, but after several years they realize that these expectations will not be met and that they will not be profitable; then they exit from the market. From this perspective, the industrial organization of virtually every market or sector may be represented by the image of a revolving door, in which the top part of the door (representing large firms) moves much more slowly than the lower part (representing smaller firms) (Crespi, 2003).

[8] Micro, small, medium-sized, or large enterprises; or exit from the market.

The main conclusion of contrasting the results from Table 2 with those from Table 1 is that the results from Table 1 still hold since there are no significant changes when there are controls for regional and sector categorical variables.

4.3 Firm Birth and Death

Table 3 shows the dynamics of firm birth for the 2001–2012 period. As shown, the values shaded in grey indicate that start-ups account for 14 percent to 17 percent of the total number of firms operating in every year of the period analyzed. These figures are slightly higher than those from developed countries, where birth rates are around 6 percent (Rumania) to 15 percent (Korea).[9] However, birth rates are relatively stable in Costa Rica through the years as is the case in the OECD countries, changing only an average of 3 percent during the entire period.

Table 3: Percentage of Live Firms by Age in Costa Rica, 2001–2012

Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
12+	85%	72%	63%	56%	50%	45%	39%	34%	32%	29%	27%	25%
11	15%	12%	9%	7%	6%	6%	5%	4%	4%	3%	3%	3%
10		16%	12%	9%	8%	7%	6%	5%	4%	4%	4%	3%
9			16%	11%	8%	7%	6%	5%	4%	4%	4%	3%
8				16%	12%	9%	7%	6%	5%	5%	4%	4%
7					16%	12%	9%	7%	6%	5%	5%	4%
6						16%	11%	9%	7%	6%	5%	5%
5							17%	12%	9%	7%	6%	6%
4								18%	13%	10%	8%	7%
3									15%	11%	9%	7%
2										15%	11%	9%
1											14%	10%
0												14%

Source: Author's estimations based on data from the CCSS.

[9] Figures are for the year 2010 according to OECD (2013).

Table 4 presents firm death rates in Costa Rica for the 2002–2012 period. The values shaded in grey indicate that the annual death rate of firms in this country accounts for 18 percent to 28 percent of the total amount of firms born a year earlier. However, contrary to what happens in the case of start-ups, these death rates do not show a stable pattern and are much higher than those for firms in OECD countries, in which death rates range from 8 percent (Romania) to 13 percent (Australia).[10] It is worth noting that death rates of firms in Costa Rica are much higher during the first two years after firms are born and decreasing thereafter.

Another interesting conclusion that may be drawn from Table 4 is based on a consideration of the data in the last column, which presents the survival rates of firms according to their year of birth. What emerges is that survival rates decrease with age, ranging from 72 percent in 2012 to 30 percent in 2004 and afterwards. Thus, it seems that the survival rate of Costa Rican firms stabilizes after 9 years of operation.

Table 4: Percentage Cohort Mortality by Year, with Respect to the Total Number of Firms Born a Year Earlier in Costa Rica, 2002–2012

Cohort Age	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Survivors
11	18%	16%	12%	5%	5%	3%	3%	3%	2%	2%	2%	30%
10		24%	16%	8%	4%	4%	4%	3%	2%	2%	2%	30%
9			27%	18%	9%	4%	2%	4%	3%	1%	2%	30%
8				23%	16%	7%	5%	5%	3%	3%	2%	35%
7					23%	15%	7%	7%	5%	4%	2%	38%
6						22%	13%	9%	8%	3%	3%	41%
5							25%	18%	8%	4%	4%	40%
4								28%	16%	7%	6%	44%
3									24%	15%	7%	54%
2										21%	16%	63%
1											28%	72%

Source: Authors' estimations based on data from the CCSS.

It is important to evaluate the contribution of start-ups to total employment in Costa Rica. Table 5 shows that start-ups account for 4 percent to 9 percent of the total employment in the country (shaded values); although there is not a well-defined pattern for

[10] Figures are for the year 2010, according to OECD (2009).

the entire period, it is interesting to point out that from 2004 to 2012 there is a slight tendency towards decreasing percentages of employment opportunities generated by start-ups.

Table 5: Employment Generation by Age of Firms in Costa Rica, 2001–2012

Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Age
12+	94%	87%	83%	76%	72%	69%	65%	63%	61%	62%	60%	58%	12+
11	6%	6%	6%	5%	5%	5%	5%	5%	4%	4%	4%	4%	11
10		7%	6%	5%	5%	5%	5%	5%	4%	4%	4%	4%	10
9			6%	4%	4%	4%	3%	3%	3%	3%	3%	3%	9
8				9%	9%	9%	8%	8%	8%	4%	4%	3%	8
7					5%	4%	3%	3%	3%	3%	3%	3%	7
6						5%	4%	4%	3%	3%	3%	3%	6
5							6%	5%	4%	4%	4%	3%	5
4								5%	4%	4%	4%	5%	4
3									5%	5%	4%	4%	3
2										4%	4%	4%	2
1											4%	4%	1
0												4%	0

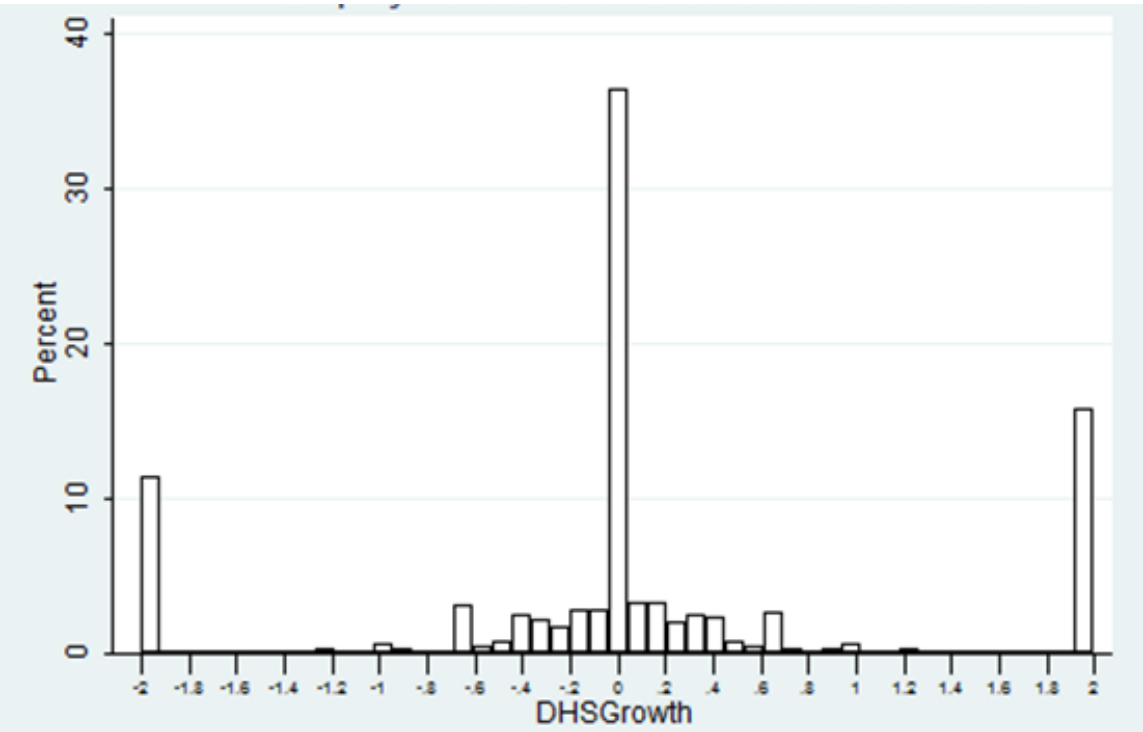
Source: Author's estimations based on data from the CCSS.

4.4 Growth Rate and Firm Size

Growth rates of firms were analyzed using DHS growth rates according to Davis, Haltiwanger, and Schuh (1996);[11] this type of growth rate is referred to as *symmetric growth*. Based on the definition of DHS growth rates, Figure 18 shows that for the overall 2001–2012 period most firms are clustered around zero growth; that is, showing relatively small growth rates. However, the number of firms that show positive and relatively high growth rates is evident (see the right side of the figure). This last result suggests the possibility of finding gazelles, a topic discussed later in this section.

[11] See definitions in point e) Section 3.2.

Figure 18: Firm Employment Growth Distribution in Costa Rica According to DHS Growth Rates Definition, 2001–2012



Source: Authors' calculations.

With respect to firm growth, the first topic that must be discussed is the relationship between growth rate and firm size. It is here that the applicability of Gibrat's law is explored, which states that firm growth rates are independent of firm size (Sutton, 1997). To test this law in the case of Costa Rica, equation (2) is estimated:

$$DHSGrowth_{jt} = \beta_0 + \beta_1 \ln X_{jt-1} + \epsilon_{jt} \qquad (2)$$

where $DHSGrowth_t$ is the DHS growth rates of the firm estimated according to Davis, Haltiwanger, and Schuh, $X_{jt\text{-}1}$ is the lag value of the size of the firm estimated according to Haltiwanger, Jamir, and Miranda (2012) and *ln* means natural logarithm.[12]

According to Gibrat's law, the $\beta 1$ coefficient should not be significant. Equation (2) is estimated by OLS using both fixed-effectsand cluster-robust standard errors (According

[12] As mentioned before, the average of firm size (X_{jt}) in year t-1 and year t was used. That is, $X_{jt} = 0.5*(E_{jt}+E_{jt\text{-}1})$, where E_{jt} is the employment in year t for firm j.

to the Hausman's test result). As shown in column 2 in Table 6, the β_1 coefficient associated with firm size in *t-1* is significant but negative, meaning that growth is inversely related to firm size; this seems to contradict the Gibrat's law. In short, this result indicates that small firms are growing faster than large companies in Costa Rica.

Since some companies enter and leave the market intermittently during the period of analysis (2001–2012), it is important to control for this factor in equation (2). Therefore, in the third column of Table 6, a covariate called *flashing* is introduced, which is a dummy variable that takes the value of 1 from the first time that the company left the market and returned until the year 2012, and 0 otherwise. It is important to note that although the coefficient associated with the *flashing* variable is positive and significant, its inclusion in equation (2) does not change the coefficient associated with the *size* variable.

Table 6: Relationship Between Growth Rates and Firm Size
(fixed effects and cluster-robust standard errors)

Variables	DHSGrowth	DHSGrowth
Size (lnX_{jt-1})	-0.2525***	-0.2525***
	(0.00067)	(0.0087)
Flashing (a dummy variable that takes the value of 1 from the first time that the company left the market until the year 2012, and zero otherwise)		0.5247***
		(0.0347)
Constant	0.0729***	0.0586***
	(0.0094)	(0.0118)
Number of observations	68,905	68,905
R-squared	0.0260	0.0350
F value	1435.1383	520.1173
Log likelihood	-5.693e+04	-5.661e+04
pvalue for F test	0.0000	0.0000
Test of Hausman (p-value)	0.0000	0.0000

Source: Authors' calculations.
Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.

According to Haltiwanger, Jarmin, and Miranda (2012) the inverse relationship between growth rates and firm size found in equation (2) may be the result of a lack of controlling for firm age. These authors pointed out the following: "because new firms tend to be small, the finding of a systematic inverse relationship between firm size and net growth rates in prior analyses is entirely attributable to most new firms being classified in small size classes." To explore this argument, an additional equation was estimated in which growth rate depends on both firm size and age (equation 4). However, before doing this, the question of whether, on average, younger firms grow faster than older firms, is explored using equation (3).

$$DHSGrowth_{jt} = \gamma_0 + \gamma_1 age_{jt} + \sigma_{jt} \qquad (3)$$

$$DHSGrowth_{jt} = \delta_0 + \delta_1 \ln X_{jt-1} + \delta_2 age_{jt} + \mu_{jt} \qquad (4)$$

Table 7: Relationship Between Growth Rates and Firm Age
(fixed effects and cluster-robust standard errors)

Variables	DHSGrowth	DHSGrowth	DHSGrowth
Age	-0.1326***	-0.0445***	-0.0528***
	(0.0016)	(0.0011)	(0.0011)
Size (ln X_{jt-1})		-0.2323***	-0.2287***
		(0.0087)	(0.0085)
Flashing (a dummy variable that takes the value of 1 from the first time that the company left the market until the year 2012, and zero otherwise)			0.8140***
			(0.0352)
Constant	0.6148***	0.2526***	0.2638***
	(0.0073)	(0.0121)	(0.0118)
Number of observations	81799	68905	68905
R-squared	0.0983	0.0610	0.0814
F value	7134.1360	1337.0450	1255.3226
Log likelihood	-1.115e+05	-5.567e+04	-5.491e+04
pvalue for F test	0.0000	0.0000	0.0000

Source: Authors' calculations.
Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.

The last two equations were estimated by OLS using both random-effects[13] and cluster-robust standard errors. The expectation is that in equation (3), the γ_1 coefficient will be negative and significant. As shown in the first column of Table 7, this is the actual result obtained. Thus, it seems that, on average, younger firms grow faster than older firms in Costa Rica.

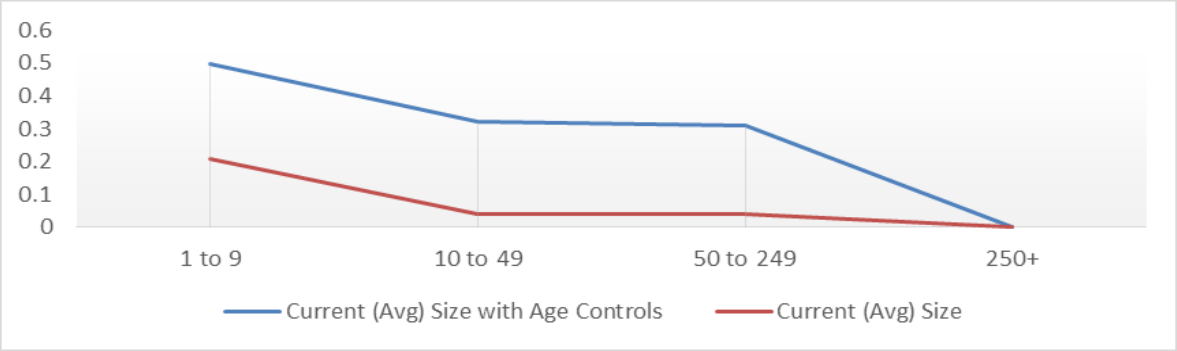
On the other hand, the results in the second column of Table 7 do not change the result already found for the relationship between growth rates and firm size, even after controlling for age. In fact, the coefficient associated with δ_1 is negative and significant, indicating that growth is inversely related to firm size. In short, it seems that on average small and young firms are growing faster than other firms in Costa Rica. This result is consistent with other findings in the recent literature (Lotti, Santarelli, and Vivarelli, 2003; Coad, 2009). One possible explanation for this result is that most of the firms in Costa Rica are micro and small, and they maintained their size during the period analyzed. Finally, the inclusion of the *flashing* variable does not change the conclusions already obtained from the estimation of equations (3) and (4), but makes them more robust.

Another way to analyze the relationship between firm size and growth, controlling by size, is estimating equations (3) and (4) for each one of the four size groups in the present study: micro (less than 9 employees), small (10–49 employees), medium-sized (50–249 employees), or large firms (250+ employees). Given the focus on the partial effects of size controlling for firm age and vice versa, the results are reported in figures similar to those of Haltiwanger, Jamir, and Miranda (2012), and present the regression coefficients in Appendix 1 (see Tables A.8 to A.11). To facilitate comparisons between the two models that were estimated (equations (3) and (4)), the focus is on a comparison of differences in effects relative to a baseline group, which is in all cases the largest (250 or more employees) or oldest (9 or more years) firms. To facilitate the interpretation of magnitudes, the baseline group is reported at zero for each of the two models estimated. From here it is a simple matter to rescale the other effects by subtracting the value of the regression coefficient for the baseline category (the 250 or more firm size class or 9 or more years) from each coefficient from the other categories.

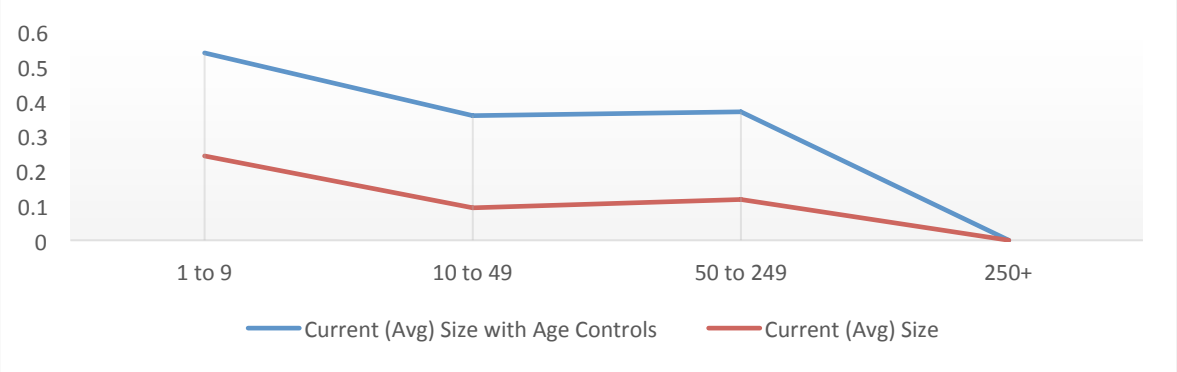
[13] According to the Hausman's test result.

Figure 19 shows the relationship between net employment growth and firm size. Panel A displays results from the regressions for all firms. Panel B displays the size effects results from the regression where the sample was limited to continuing firms only. Beginning with the main results in the upper panel, the plotted curve without age controls shows a strong inverse relationship between firm size and net employment growth. The average annual rate of net employment growth in the smallest size class is about 20.8 percentage points higher than that for the largest size firms (250 or more employees). The effect declines more or less monotonically as the size of the firm increases. The relative net employment growth premium for being small declines to 3.9 percent and 4.1 percent for size classes 10–49 and 50–249 employees, respectively.

Figure 19: The Relationship between Net Growth and Firm Size
Panel A: All Firms



Panel B: Continuing Firms Only



Source: Authors' calculations.

Controlling for firm age has no significant change on these patterns. Regardless of the size classification methodology, once we control for firm age, we still observe a systematic inverse relationship between net growth and firm size is still observed. However, the average annual rate of net employment growth in the smallest size class is now about 49.9 percentage points higher than that for the largest size firms (250 or more employees), which is more than double that obtained without controlling for age (20.8). The relative net employment growth premium for being small declines to 32 percent and 31.1 percent for size classes 10–49 and 50–249 employees respectively.

The lower panel of Figure 19 shows the results when the analysis is restricted to only continuing firms. The results in both panels are similar, showing no difference between the analysis of all firms or only continuing firms in this regard.

It should be noted that measurement of the *age* variable has important limitations that may have an influence on the results previously discussed. In fact, if *age* is considered to be the sum of years the firm has been operating from the year it was first registered in the CCSS, a significant number of firms that were operating in 2001, but whose age at that time is unknown, will be missing from the study as there is no information about when they were registered in the CCSS. As was previously discussed, it is possible that the date of entry of a firm in the CCSS database is not the date the firm actually began to operate, which can generate a bias in the results of an analysis whose direction is unknown. The results of the analysis of the inverse relationship between growth rates and size, controlling for age, should therefore be viewed with caution.

As a complement to the previous analysis, the relative importance of young firms (up to 2 years old) and their participation in employment generation in Costa Rica was explored. Table 8 shows that young firms account for about one-third of the total number of Costa Rican firms operating during the period 2003–2012. This relative importance was highest in 2008 (39 percent) and lowest in 2012 (33 percent). In addition, young firms accounted for less than one-fifth of total employment during the same period. The relative importance in employment generation tends to decrease through time; while in 2004 the employment share was 19 percent, in 2012 it was 12 percent. The results show that young firms account for a small fraction of total employment in the Costa Rican productive sector, and that this fraction has been decreasing through time.

Table 8. Relative Importance of, and Employment Generation by, Young Firms, 2003–2012

Young Firms by year										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Young Firms	2,003	2,025	2,058	2,171	2,400	2,704	2,639	2,659	2,656	2,638
Firms Alive	5,474	5,591	5,763	5,982	6,447	6,979	7,119	7,386	7,737	7,991
%	37%	36%	36%	36%	37%	39%	37%	36%	34%	33%
Employment generation by year										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Young Firms	15,204	17,165	17,198	18,412	15,564	16,365	16,647	16,603	16,378	15,609
Firms Alive	87,160	91,964	96,551	102,845	114,204	123,430	126,588	124,846	129,008	133,673
%	17%	19%	18%	18%	14%	13%	13%	13%	13%	12%

Source: Authors' estimation based on data from the CCSS.

The results of the previous analysis indicate the importance of improving the design and implementation of public policies to support young firms. It is noteworthy that these firms have the highest growth rates, but at the same time represent only a small proportion of total employment in Costa Rica, and this proportion has been decreasing through time. In fact, it seems that in Costa Rica, young and small firms are not receiving appropriate support from public policies that would facilitate and promote their continuing growth as well as the generation of more employment sources. This is consistent with the fact that the country still has serious deficiencies in its business environment in terms of infrastructure, simplification of procedures, and access to financing. All of these shortcomings have a greater relative effect on the performance of smaller firms. Recent improvements in the ranking of Costa Rica's business climate in the World Bank's *Doing Business* (2013) report appears to indicate that the situation is improving, but the improvement is just beginning.[14]

[14] Costa Rica moved up 12 positions in the Doing Business global ranking in 2013 moving from position 122 to position 110, placing the country among the top 10 reformers analyzed in this report. However, given that a total of 185 countries were ranked, it is clear that there is still much room for improvement (World Bank, 2013).

5. Firms with High Growth Potential: The Gazelles

This section presents and discusses results on gazelles, as defined by the OECD (2009). As shown in Table 9, for the 2005-2012 period gazelles account for 167 (18 percent) of the 926 Costa Rican firms in the sample that had at least 10 employees when they began operations. The relative number of gazelles has varied through time, from a low of 13 percent in 2011, to a maximum of 29 percent in 2007.

Table 9 also shows strong heterogeneity among gazelles according to firm size. Most gazelles are SMEs, and their relative importance changes according to size category. While gazelles account for 52 percent of large firms during the 2005–2012 period, there are only 3 percent of microenterprises that rank as gazelles in the same period.

Table 9. Relative Importance of Gazelles in Costa Rica, by Size, 2005–2012

Number of Gazelles by Size									
Size	2005	2006	2007	2008	2009	2010	2011	2012	All
Micro			1		1		1	5	8
Small	6	10	11	12	10	10	5	11	75
Medium	8	7	13	10	11	9	8	3	69
Large	1	2	3	1	1	1	3	3	15
All	15	19	28	23	23	20	17	22	167
Number of Firms with more than 10 employees at first year of period of observation by Size									
Size	2005	2006	2007	2008	2009	2010	2011	2012	All
Micro	20	16	15	25	34	46	52	31	239
Small	46	46	51	66	70	74	66	72	491
Medium	29	22	25	21	22	22	14	12	167
Large	3	3	5	5	1	2	4	6	29
All	98	87	96	117	127	144	136	121	926
Percent of Gazelles with respect to Firms with at least 10 employees in first year									
Size	2005	2006	2007	2008	2009	2010	2011	2012	All
Micro	0%	0%	7%	0%	3%	0%	2%	16%	3%
Small	13%	22%	22%	18%	14%	14%	8%	15%	15%
Medium	28%	32%	52%	48%	50%	41%	57%	25%	41%
Large	33%	67%	60%	20%	100%	50%	75%	50%	52%
All	15%	22%	29%	20%	18%	14%	13%	18%	18%

Source: Authors' estimation based on data from the CCSS.

An important result from the analysis of gazelles is that their relative importance in terms of employment generation is higher than their importance in terms of number of firms. Table 10 shows that for the 2005–2012 period gazelles employed almost one-third (31 percent) of the total labor force in Costa Rica, which contrasts with their relative importance in the total amount of firms (18 percent).

Table 10. Relative Importance of Gazelles and Employment Generation, by Size, 2005–2012

Number of employees of Gazelles by Year and Size									
Size	2005	2006	2007	2008	2009	2010	2011	2012	All
Micro			1		2		7	26	36
Small	141	308	321	432	329	281	132	338	2282
Medium	871	789	1609	1087	1183	832	744	236	7351
Large	346	568	1116	785	321	285	1621	2267	7309
All	1358	1665	3047	2304	1835	1398	2504	2867	16978
Number of Employees of Firms with more than 10 employees in First Year of Period of Observation									
Size	2005	2006	2007	2008	2009	2010	2011	2012	All
Micro	99	67	74	134	168	208	276	148	1174
Small	1219	1185	1124	1478	1550	1523	1378	1515	10972
Medium	2972	2301	3046	2302	2258	2111	1539	1267	17796
Large	2458	1836	5760	6052	321	1611	3018	3950	25006
All	6748	5389	10004	9966	4297	5453	6211	6880	54948
Percent of employees in Gazelles witn respect to Firms with at least 10 employees at first year of observation period									
Size	2005	2006	2007	2008	2009	2010	2011	2012	All
Micro	0%	0%	1%	0%	1%	0%	3%	18%	3%
Small	12%	26%	29%	29%	21%	18%	10%	22%	21%
Medium	29%	34%	53%	47%	52%	39%	48%	19%	41%
Large	14%	31%	19%	13%	100%	18%	54%	57%	29%
All	20%	31%	30%	23%	43%	26%	40%	42%	31%

Source: Authors' estimation based on data from the CCSS.

Industry heterogeneity was explored for gazelles, and the results are shown in Table 11. The results summarized in this table show that gazelles are present in all industry sectors with similar relative importance, except in the mining sector, where no gazelles were found. During the 2005–2012 period, gazelles account for 21 percent of the total number of firms in the services sector, 17 percent in agriculture, 15 percent in commerce and 11 percent in manufacturing. It may be concluded that gazelles are not an industry-specific phenomenon in the case of Costa Rica.

Table 11. Relative Importance of Gazelles and Employment Generation, by Sector, 2005–2012

	Number of Gazelles								
Sector	2005	2006	2007	2008	2009	2010	2011	2012	All
Agriculture	1	1	6	3	1	2	1	3	18
Mines	0	0	0	0	0	0	0	0	0
Manufacturing	1	1	5		1	1	2	2	13
Commerce	0	3	4	7	3	3	1	1	22
Services	13	14	13	13	18	14	13	16	114
All	15	19	28	23	23	20	17	22	167
	Number of Firms with more than 10 employees in First Year of Observation Period								
Sector	2005	2006	2007	2008	2009	2010	2011	2012	All
Unknown	1	0	0	0	1	1	0	0	3
Agriculture	6	11	19	19	14	16	12	10	107
Mines	0	0	0	0	0	0	0	1	1
Manufacturing	19	9	12	16	16	20	18	11	121
Commerce	15	14	16	26	24	18	16	13	142
Services	57	53	49	56	72	89	90	86	552
All	98	87	96	117	127	144	136	121	926
	Percentage of Gazelles with respect to Firms with at least 10 employees at first year of observation period								
Sector	2005	2006	2007	2008	2009	2010	2011	2012	All
Unknown	0%	0%	0%	0%	0%	0%	0%	0%	0%
Agriculture	17%	9%	32%	16%	7%	13%	8%	30%	17%
Mines	0%	0%	0%	0%	0%	0%	0%	0%	0%
Manufacturing	5%	11%	42%	0%	6%	5%	11%	18%	11%
Commerce	0%	21%	25%	27%	13%	17%	6%	8%	15%
Services	23%	26%	27%	23%	25%	16%	14%	19%	21%
All	15%	22%	29%	20%	18%	14%	13%	18%	18%

Source: Authors' estimation based on data from CCSS.

A consideration of the previous results gives rise to an important question: Is it possible to predict the emergence of gazelles in Costa Rica? To answer this question, a Probit equation was estimated where the dependent variable is the probability of becoming a gazelle and the co-variables are the size of the firm ($\ln X$), the export experience (*export*), the lagged value of export dosage (amount of years the firm has been exporting since 2001) (*export_dosage*), the linkages (selling products or services) with multinationals (*linkage*), and the lagged value of linkage dosage (amount of years the firm has been a local supplier of multinationals) (*linkage_dosage*). This specification is presented as follows:

$$P\_gazelle_{jt} = \rho_0 + \rho_1 \ln X_{jt-1} + \rho_2 export_{jt} + \rho_3 export\_dosage_{jt-1} + \rho_4 linkage_{jt} + \rho_5 linkage\_dosage_{jt-1} + \tau_{jt} \quad (5)$$

Where *P_gazelle* is the probability of a firm becoming a gazelle. Table 12 shows the results for different specifications of equation (5), where the one considered the best is found in the fifth column. From there it can be concluded that the size of the firm is an

important determinant of gazelles since the coefficient ρ_1 is positive and significant (0.7108). This means that larger firms have a higher probability of becoming gazelles than smaller firms. It seems that being an exporter can be an important determinant of gazelles, since there is a positive and significant relationship between the former and the probability of being a gazelle (1.4424). On the other hand, a negative and significant coefficient associated with the lagged value of export (ρ_3) was obtained. One possible interpretation of this coefficient (-0.4210) is that in order to become a gazelle what matters most is to be a young exporter instead of having a lifelong experience of being an exporter. Being a local supplier of a multinational cannot be considered as an important characteristic of gazelles. Indeed, although a positive coefficient associated with this variable was found, this is not significant. Finally, it seems that the accumulated experience of being a local supplier of multinationals is not an important factor to become a gazelle, since the coefficient associated with the lagged value of linkage dosage is not significant.

Table 12. Determinants of the Emergence of Gazelles
(*probit model and cluster-robust standard errors)*

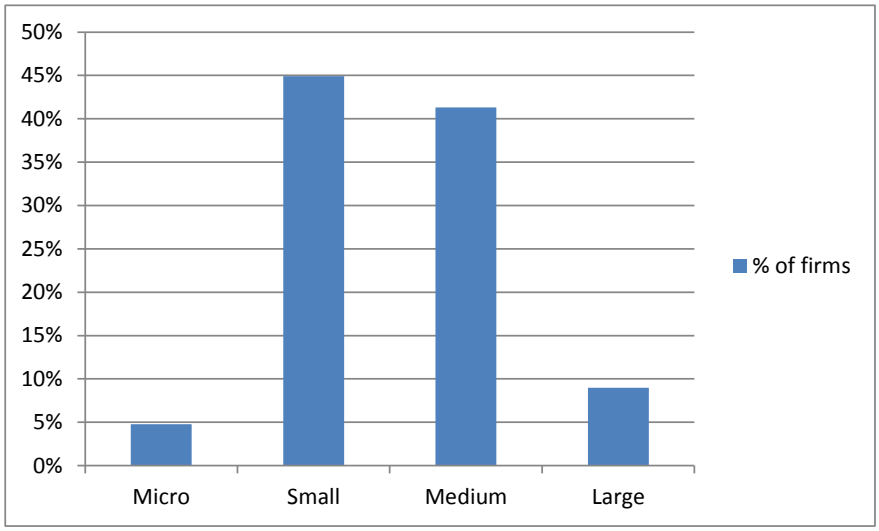
Variables	(1)	(2)	(3)	(4)	(5)
Size (ln X_{jt-1})	0.6792***	0.6340***	0.7008***	0.6922***	0.7108***
	(0.1107)	(0.1123)	(0.1200)	(0.1204)	(0.1234)
Export		0.7636*	1.4518***	1.4509***	1.4424***
		(0.3380)	(0.4361)	(0.4373)	(0.4357)
Lagged Export Dosage			-0.4312**	-0.4314**	-0.4210**
			(0.1627)	(0.1630)	(0.1628)
Linkage				0.2754	0.5289
				(0.3843)	(0.4437)
Lagged Linkage Dosage					-0.2336
					(0.1947)
Constant	-3.9932***	-3.9519***	-4.1218***	-4.1134***	-4.1554***
	(0.5063)	(0.5142)	(0.5347)	(0.5361)	(0.5447)
Number of observations	902	902	902	902	902
Chi-squared	37.6617	38.3443	41.9123	41.8172	41.9572
p value	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Authors' estimation based on data from the CCSS.
Note: Only firms with more than 10 employees were considered.

There are three dimensions of interest with respect to the gazelles in Costa Rica that are explored in this section. First, what is the size of the gazelles when they are born? Second, what is the mortality rate of gazelles in the period analyzed (2001–2012)? Finally,

where are the gazelles located geographically in the country? That is, is there any pattern of agglomeration in these type of companies? Regarding the first point, it should be noted that in accordance with Figure 20, gazelles are born mainly as small (45 percent) and medium (41 percent) businesses.

Figure 20: Distribution of Gazelles by Birth Size



Source: Authors' calculations.

With regard to the second question, the following transition matrix (Table 13) shows that the rate of mortality of gazelles is relatively low in Costa Rica (9.49 percent) and significantly lower than the average mortality rates of companies in this country (from 18 percent to 28 percent) (see Table 4). In addition, it seems that gazelles that stay alive remain the same size during the period under study in most cases. A similar pattern to that found in all Costa Rican companies (see Table 13).

Table 13. Transition Matrix for Gazelles in Costa Rica, 2001–2012

Size	Micro	Small	Medium	Large	Death	Total
Micro	72,92	16,67	0,00	0,00	10,42	100,0
Small	4,95	78,15	12,84	0,00	4,05	100,0
Medium	0,00	6,85	82,26	5,65	5,24	100,0
Large	0,00	2,00	10,00	88,00	0,00	100,0
All	7,24	44,72	31,67	6,88	9,49	100,0

Source: Authors' estimations based on data from the CCSS.

Finally, it seems that there is not a geographic concentration of gazelles in Costa Rica, which rules out the hypothesis about a possible concentration of such enterprises around certain *clusters* within the country (see Table 14).

Table 14. Geographic Distribution of Gazelles in Costa Rica, 2001–2012

Province	Canton	Number of Gazelles	Frecuencia %	Cumulative %
San José	San José	30	18%	18%
	Escazú	6	4%	22%
	Tarrazú	1	1%	22%
	Santa Ana	9	5%	28%
	Vazquez	1	1%	28%
	Tibas	1	1%	29%
	Moravia	1	1%	29%
	Montes de Oca	5	3%	32%
	Curridabat	1	1%	33%
Alajuela	Alajuela	12	7%	40%
	San Ramón	1	1%	41%
	Orotina	9	5%	46%
Cartago	Cartago	1	1%	47%
	Paraíso	1	1%	47%
	La Unión	3	2%	49%
	El Guarco	3	2%	51%
Heredia	Heredia	10	6%	57%
	Santo Domingo	2	1%	58%
	Belén	2	1%	59%
	Flores	3	2%	61%
Guanacaste	Santa Cruz	2	1%	62%
	Carrillo	2	1%	63%
Puntarenas	Puntarenas	4	2%	66%
	Esparza	1	1%	66%
	Buenos Aires	1	1%	67%
	Osa	2	1%	68%
	Aguirre	1	1%	69%
	Corredores	3	2%	71%
Limón	Limón	2	1%	72%
	Pococi	3	2%	74%
	Matina	2	1%	75%
Unknown		42	25%	100%
Total		167	100%	

Source: Authors' estimations based on data from the CCSS.

Although all the above findings are important, it is clear that more research is needed to be able to identify the whole determinants of the emergence of gazelles, as well as to answer some critical questions such as: What type of market failures do gazelles face? What are the main factors that promote and/or prevent the emergence of gazelles? Are there specific policies that can be formulated and implemented to promote the creation of gazelles? The 167 gazelles already identified in the present study should be the starting point for a new research study.

6. Export Experience, Linkages to Multinationals and Firm Growth Rate

In this section, the importance of differences between Costa Rican firms that affect their growth rates is explored. In particular, the relative importance of size, age, export experience, and linkages (selling products or services) with multinationals is studied.

An important dimension of the dynamics of growth rates is the possibility of learning by exporting, in which a firm´s performance improves after entering export markets. There are a variety of mechanisms that might induce productivity gains when firms start exporting, such as investing in marketing, upgrading product quality, innovating, or dealing with foreign buyers (De Loecker, 2013). In short, firms entering export markets may expect an impact on their future revenue through increased demand and /or decreased cost of production. There is substantial evidence supporting the learning by exporting hypothesis from case studies (Keller, 2004) and from a few econometrics studies (Van Biesebroeck, 2005; Keller, 2010; De Loecker 2007 and 2013).

Table 15 shows that there were a significant number of Costa Rican firms of all sizes exporting during the period analyzed. It also indicates that this number increased in a sustained manner during this period, at a relatively moderate average annual rate of 3 percent (increasing from 204 to 281 between 2001 and 2012). It is interesting to note that firms in the micro and small size categories showed increased participation in exportation through time, representing approximately two-thirds of Costa Rican exporting firms (64 percent) in 2012.

Table 15. Number and Distribution of Exporting Firms by Size

	Distribution of exporting firms by Size											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	43	42	46	52	57	46	51	52	54	61	75	76
Small	60	62	72	72	70	82	76	78	87	110	106	104
Medium	68	56	52	60	67	67	70	70	63	60	58	62
Large	33	32	34	31	34	33	38	39	34	33	34	39
Total	204	192	204	215	228	228	235	239	238	264	273	281
	Percent Distribution of Exporting firms by Size											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	21%	22%	23%	24%	25%	20%	22%	22%	23%	23%	27%	27%
Small	29%	32%	35%	33%	31%	36%	32%	33%	37%	42%	39%	37%
Medium	33%	29%	25%	28%	29%	29%	30%	29%	26%	23%	21%	22%
Large	16%	17%	17%	14%	15%	14%	16%	16%	14%	13%	12%	14%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Authors' estimation based on data from the CCSS and Ministry of Foreign Trade.

Another dimension of firm exposure to international competition is the possibility of becoming a supplier of one or several multinational companies operating in Costa Rica. Since all of the multinationals are exporters, being a local supplier to these firms turns supplying firms into indirect exporters. There is also evidence that local firms benefit from knowledge and technology transfers through this relationship, which allows them to improve their performance as measured in terms of employment, among other indicators (Monge-González, and Rodríguez-Alvarez, 2013). It may therefore be expected that local suppliers of multinationals would show a positive net growth rate thanks to their relationship with multinational companies.

Before exploring this potential relationship, it is worth asking how important local suppliers are among the sample of firms being analyzed, during each one of the years studied. The information in Table 16 allows us to answer this question. First, the number of local suppliers of multinationals is important and has been growing in a sustained and significant manner at an average annual rate of 17.8 percent (going from 72 in 2001 to 372

in 2011) [15]. It is interesting to note that the number of local suppliers of multinational companies during 2011 is substantially higher than the number of firms that exported directly during that year, as can be seen by comparing figures in Tables 15 and 16.

Table 16. Number and Distribution of Local Suppliers of Multinational Companies by Size

	Distribution of local suppliers of Multinationals by Size										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Micro	9	33	38	52	72	82	104	126	119	152	162
Small	35	54	63	67	73	88	95	100	113	121	128
Medium	15	22	29	30	32	34	44	49	44	48	47
Large	13	16	18	18	24	23	32	34	36	37	35
Total	72	125	148	167	201	227	275	309	312	358	372
	Percent Distribution of local suppliers of Multinationals by Size										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Micro	13%	26%	26%	31%	36%	36%	38%	41%	38%	42%	44%
Small	49%	43%	43%	40%	36%	39%	35%	32%	36%	34%	34%
Medium	21%	18%	20%	18%	16%	15%	16%	16%	14%	13%	13%
Large	18%	13%	12%	11%	12%	10%	12%	11%	12%	10%	9%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Authors' estimation based on data from the CCSS and Ministry of Finance.

The relationship between export experience, linkages to multinationals and net growth rates may be explored through the estimation of equation (6). Equation (6) is estimated for the entire sample of firms, as well as for each of the firm size groups: micro (1-9 employees), small (10-49 employees), medium (50 to 249 employees), and large-sized (250 or more employees); and for each one of the five productive sectors: agriculture, mining, manufacturing, commerce, and services.

$$DHSGrowth_{jt} = \theta_0 + \theta_1 \ln X_{jt-1} + \theta_2 age_{jt} + \theta_3 export_{jt} + \theta_4 linkage_{jt} + \varepsilon_{jt} \qquad (6)$$

[15] It was unfortunately not possible to obtain data about supplying firms for 2012, and in the particular case of analysis of linkages to multinationals, the data used covered only the period 2001-2011.

In equation (6) *export* is a dummy variable equal to 1 if the firm exported during the year t, and zero otherwise, while *linkage* is a dummy variable equal to 1 if the firm sold products or services to multinationals, and zero otherwise. Equation (6) was estimated by OLS using both fixed-effects and cluster-robust standard errors. It is expected that both of the coefficients θ_3 and θ_4 will be positive and significant, showing that export experience and linkages with multinationals have a positive impact on firms' growth rates.

Table 17. Relationship between Export Experience, Linkages to Multinationals and Growth Rates: All Firms

(fixed effects and cluster-robust standard errors)

Variables	DHSGrowth	DHSGrowth	DHSGrowth	DHSGrowth	DHSGrowth	DHSGrowth	DHSGrowth	DHSGrowth
Size (ln X_{jt-1})	-0.2525***	-0.2323***	-0.2271***	-0.2309***	-0.2474***	-0.2486***	-0.2503***	-0.2492***
	(0.0067)	(0.0087)	(0.0085)	(0.0085)	(0.0091)	(0.0091)	(0.0092)	(0.0089)
Age		-0.0445***	-0.1703***	-0.1704***	-0.1927***	-0.1927***	-0.1928***	-0.2134***
		(0.0011)	(0.0039)	(0.0039)	(0.0046)	(0.0046)	(0.0046)	(0.0045)
Age squared			0.0103***	0.0103***	0.0125***	0.0124***	0.0123***	0.0132***
			(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Export				0.2816***	0.2675***	0.2575***	0.2552***	0.2504***
				(0.0254)	(0.0267)	(0.0275)	(0.0275)	(0.0279)
Linkage					0.1900***	0.1876***	0.1638***	0.1636***
					(0.0186)	(0.0186)	(0.0201)	(0.0197)
Lagged Export Dosage						0.0171***	0.0114**	0.0186***
						(0.0041)	(0.0043)	(0.0043)
Lagged Linkage Dosage							0.0228***	0.0303***
							(0.0046)	(0.0045)
Flashing								0.9391***
								(0.0403)
Constant	0.0729***	0.2526***	0.5065***	0.5020***	0.5539***	0.5545***	0.5572***	0.5960***
	(0.0094)	(0.0121)	(0.0143)	(0.0142)	(0.0155)	(0.0155)	(0.0156)	(0.0150)
Number of observations	68905	68905	68905	68905	61168	61168	61168	61168
R-squared	0.0260	0.0610	0.0854	0.0873	0.0938	0.0940	0.0943	0.1188
F value	1435.1383	1337.0450	1257.6642	955.5646	730.3605	608.6288	521.5866	645.2539
Log likelihood	-5.693e+04	-5.567e+04	-5.476e+04	-5.469e+04	-4.790e+04	-4.790e+04	-4.789e+04	-4.705e+04
pvalue for F test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Authors' calculations.
Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.

As shown in the fifth and sixth columns of Table 17, this is the result obtained, with positive and significant coefficients associated to the *export* and *linkage* variables (0.2675 and 0.1900, respectively). On the other hand, the coefficient associated with the age variable is negative and significant (-0.1927), showing that young firms grow more than old firms. It is important to point out that the inclusion of *flashing* variable does not change the previous results, but makes them more robust. Finally, the coefficients associated with the dosage in both export and linkage variables are positive and significant, meaning that supporting these firms in their efforts for internationalization is important to increase their growth.

The results in Table 18 show a positive relationship between exporting experience and net growth rates in all firm groups grouped by size, but large firms. In fact, in all cases the coefficients associated with the *export* variable are positive and significant. It also seems that the relationship is slightly greater in medium-sized firms (0.1264 for medium-sized versus 0.0768 and 0.0676 for micro and small firms, respectively).

When analyzing the effects of linkages to multinationals, a positive and significant relationship was found only in the case of microbusinesses (0.0740), indicating that buyer-seller relationships with multinationals has a greater impact on this type of firms. On the other hand, the coefficient associated with age variable is negative and significant only in the case of microenterprises (-0.0088) and small firms (-0.0166), meaning that in these cases younger firms grow faster than the older ones.

Table 18. Relationship between Export Experience, Linkages to Multinationals and Growth Rates by Firm Size

(fixed effects and cluster-robust standard errors)

Variables	Micro DHSGrowth	Small DHSGrowth	Medium DHSGrowth	Large DHSGrowth
Size (ln X_{jt-1})	-0.4862***	-0.6273***	-0.6659***	-0.4777***
	(0.0075)	(0.0168)	(0.0370)	(0.0411)
Age	-0.0088***	-0.0166**	-0.0025	0.0001
	(0.0025)	(0.0055)	(0.0111)	(0.0180)
Age squared	0.0003	0.0016***	0.0005	-0.0000
	(0.0002)	(0.0004)	(0.0008)	(0.0013)
Export	0.0676*	0.0768**	0.1264*	0.0772
	(0.0323)	(0.0253)	(0.0511)	(0.0559)
Linkage	0.0740***	0.0232	0.0409	0.0437
	(0.0221)	(0.0181)	(0.0348)	(0.0368)
Lagged Export Dosage	0.0050	0.0012	0.0053	-0.0022
	(0.0106)	(0.0060)	(0.0077)	(0.0079)
Lagged Linkage Dosage	0.0141	-0.0006	0.0068	0.0133
	(0.0097)	(0.0063)	(0.0081)	(0.0087)
Flashing	0.1014***	0.0003	0.0294	
	(0.0269)	(0.1295)	(0.1683)	
Constant	0.4358***	1.8301***	2.9440***	2.9253***
	(0.0089)	(0.0477)	(0.1646)	(0.2519)
Number of observations	40713	9359	2269	605
R-squared	0.2294	0.3680	0.4203	0.2494
F value	545.6653	187.2496	51.5933	23.3544
Log likelihood	-3698.2477	613.9118	174.6469	119.5097
pvalue for F test	0.0000	0.0000	0.0000	0.0000

Source: Authors' calculations.

Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance. Besides, there are not flashing firms in the case of large companies.

Finally, interesting results were obtained when analyzing the relationship between export experience, linkages to multinationals, and net growth rates by productive sector. A positive and significant relationship between export experience and net growth rates was found in all cases, except in the mining sector (see Table 19).

Table 19. Relationship between Export Experience, Linkages to Multinationals and Growth Rates by Sector

(fixed effects and cluster-robust standard errors)

Variables	Agriculture DHSGrowth	Minig DHSGrowth	Manufacturing DHSGrowth	Commerce DHSGrowth	Services DHSGrowth
Size (ln X_{jt-1})	-0.2991***	-0.3102**	-0.2325***	-0.1770***	-0.2658***
	(0.0254)	(0.1171)	(0.0275)	(0.0179)	(0.0125)
Age	-0.1621***	-0.2224**	-0.1730***	-0.2225***	-0.2286***
	(0.0106)	(0.0790)	(0.0145)	(0.0090)	(0.0066)
Age squared	0.0095***	0.0155*	0.0095***	0.0139***	0.0144***
	(0.0008)	(0.0062)	(0.0012)	(0.0007)	(0.0005)
Export	0.5152***	-0.1189	0.3173***	0.1156**	0.1595**
	(0.0909)	(0.4557)	(0.0565)	(0.0397)	(0.0515)
Linkage	0.0537	-0.1292	0.1085*	0.1996***	0.1697***
	(0.0804)	(0.6616)	(0.0475)	(0.0334)	(0.0299)
Lagged Export Dosage	0.0026	0.0797	0.0286***	0.0297***	0.0217
	(0.0096)	(0.0726)	(0.0081)	(0.0065)	(0.0152)
Lagged Linkage Dosage	0.0490**	0.0914	0.0173	0.0288***	0.0352***
	(0.0179)	(0.3459)	(0.0099)	(0.0074)	(0.0078)
Flashing	0.7826***	1.5189***	0.9232***	0.8940***	1.0275***
	(0.1112)	(0.3438)	(0.1531)	(0.0914)	(0.0525)
Constant	0.5851***	0.7504*	0.6873***	0.5748***	0.5808***
	(0.0399)	(0.3235)	(0.0648)	(0.0289)	(0.0207)
Number of observations	8916	166	5199	14458	31299
R-squared	0.1033	0.2065	0.1085	0.1177	0.1283
F value	83.3350	4.0349	44.5164	154.7278	355.0488
Log likelihood	-6397.6811	-107.9767	-3781.5241	-1.072e+04	-2.488e+04
pvalue for F test	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Authors' calculations.
Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.

It seems that the relationship between exporting experience and net growth rates is stronger in the agricultural and manufacturing sectors than in the commerce and services sectors (0.5152 and 0.3173 versus 0.1156 and 0.1595, respectively). With respect to linkages with multinationals, a positive and significant relationship was found only between this variable and growth rates in the manufacturing, commerce and services sectors (0.1085, 0.1996, and 0.1697, respectively). On the other hand, young firms seem to be those that grow faster in all sectors, since the coefficient associated with age variable is negative and significant in all cases.

The results of the previous analysis indicate the relevance of strengthening the linkage program between local firms and multinational companies, which is already underway in Costa Rica, as well as all efforts aimed at increasing the number of companies that wish to explore the possibility of exporting to foreign markets, as a policy to increase growth rates of local firms.

7. Conclusions

The following list outlines the main findings drawn from the previous analysis:

1. The mining, commerce and services sectors show the fastest growth among all firms in the Costa Rican economy during the period analyzed (2001-2012). On the other hand, from the perspective of employment generation, employment has grown faster in the agricultural sector during the same period.
2. Large firms are the only ones whose average size has increased between 2001 and 2012. That is, they are the ones that are generating more employment in the country.
3. Based on an entry and exit analysis of firms, the total amount of firms shows a significant and sustained path of growth from 2001 to 2012.
4. The commerce and services sectors have increased their relative importance in the Costa Rican economy, according to both the number of firms and workers employed in these sectors.
5. Microenterprises are the most numerous firms in Costa Rica around 80 percent, similar in relative importance to those of OECD countries (between 75 percent and 95 percent). On the other hand, Costa Rican microenterprises generate only 14

percent of the total number of jobs, while similar firms of the OECD countries generate between less than 20 percent and more than 40 percent of total employment.

6. Mortality rates in firms of all sizes are relatively high (between 18.1 percent for large firms and 56.2 percent for microenterprises).
7. There is a strong and positive correlation between firm size and survival rate. In fact, the companies that survive the longest are the largest ones.
8. It seems that Costa Rica is not suffering from the "missing middle" phenomenon. Although there are a very large number of micro and small firms, there is not a bimodal distribution: mid-sized firms are missing, but large firms are missing too, and the fraction of firms of a given size is smoothly declining in firm size in all the years analyzed.
9. Start-ups account for 14 percent to 17 percent of the total amount of firms, and their annual death rate ranges between 18 percent to 28 percent during the 2001–2012 period.
10. Start-ups account for 4 percent to 9 percent of total employment in the country.
11. On average, small and young firms seem to be growing faster than other firms in Costa Rica, contradicting the prediction of Gibrat's law.
12. Young firms account for one-third of the total number of firms and for less than one-fifth of the total employment.
13. Gazelles account for 18 percent of the total amount of firms in Costa Rica with 10 employees or more. Most gazelles are born as SMEs, and their relative importance varies according to their size category. Gazelles employed almost one-third (31 percent) of the total labor force in Costa Rica (of companies with more than 10 employees), which contrasts with their relative importance among the total amount of firms. Furthermore, gazelles are present in all industry sectors, except in the mining sector (21 percent in services, 17 percent in agriculture, 15 percent in commerce, and 11 percent in manufacturing). The size of the firm is an important determinant of gazelles, meaning that large firms have higher probability of becoming gazelles than small firms. Besides, being an exporter is also an important characteristic of gazelles.

14. The exporting experience seems to assist firm growth regardless of firm size, while linkages with multinational companies do the same only in the case of microenterprises. This result is especially important given that Costa Rican authorities have support programs for both exportation and linkages.
15. Young firms seem to grow faster than older firms.
16. More research is needed to identify the main determinants and characteristics of gazelles. What type of market failures do gazelles face? What are the main factors that promote and/or prevent the emergence of gazelles? Are there specific policies that can be formulated and implemented to promote the creation of gazelles? The 167 gazelles already identified in the present study should be the starting point for a new research study.

References

Acs, Z. J. and D. B. Audretsch. 1989. "Editors' Introduction." *Small Business Economics* 1(1): 1–55.

Birch, D.L. 1979. "The Job Generation Process." Washington, D.C.: MIT Program on Neighborhood and Regional Change for the Economic Development Administration, U.S. Department of Commerce. Unpublished.

_____. 1981. "Who Creates Jobs?" *Public Interest* 65(3): 3–14.

_____. 1987. *Job Creation in America: How Our Smallest Companies Put the Most People to Work*. New York; NY: Free Press.

Crespi, G. 2003. *PyME en Chile: nace, crece y... muere. Análisis de su desarrollo en los últimos siete años*. Santiago, Chile: Fundes.

Davis, S. J., J. C. Haltiwanger, and S. Schuh. 1996. *Job Creation and Destruction*. Cambridge, MA: MIT Press.

De Loecker, J. 2007. "Do Exports Generate Higher Productivity? Evidence from Slovenia." *Journal of International Economics* 73(1): 69–98.

De Loecker, J. 2013. "Detecting Learning by Exporting." *American Economic Journal: Microeconomics* 5(3): 1-21.

García-Robles, S. 2011. "Building a Local Venture Capital Industry in Latin America and the Caribbean." Washington, DC: Multilateral Investment Fund, Inter-American Development Bank.

Haltiwanger, J. C., R. S. Jarmin, and J. Miranda. 2010. "Who Creates Jobs? Small vs. Large vs. Young." NBER Working Paper. Cambridge, MA: National Bureau of Economic Research.

Hsieh, C., and B. A. Olken. 2014. "The Missing 'Missing Middle'." NBER Working Paper. Cambridge, MA: National Bureau of Economic Research.

Kantis, H., I. Masahiko, and K. Masahiko. 2002. *Empresarialidad en economías emergentes: la creación de empresas en América Latina y el Este de Asia*. Washington DC: Inter-American Development Bank.

Keller, W. 2004. "International Technology Diffusion." *Journal of Economic Literature* 42: 752–82.

_____. 2010. "International Trade, Foreign Direct Investment, and Technology Spillovers." In B. H. Hall and N. Rosenberg, eds., *Handbook of the Economic of Innovation*, *Vol. 2.* Amsterdam, Holland: North-Holland.

Leamon, A., and J. Lerner. 2012. "Creating a Venture Ecosystem in Brazil: FINEP´s INOVAR Project." Harvard Business School Working Paper No. 12-099. Boston, MA: Harvard Business School.

Leiva, J. C. 2002. "El Proceso de Creación de Empresas en Costa Rica: Creación y Desarrollo de Nuevas Empresas en América Latina y el Este De Asia: Informe Costa Rica." *Revista Tecnología en Marcha* 17(2): 87.

_____. 2009. "Origen de la Empresa.", in L. Brenes and V. Govaere, eds., *Estado Nacional de las Micro, Pequeñas y Medianas Empresas Formales.* San Jose, Costa Rica: Editorial Universidad Estatal a Distancia.

_____. 2013. "Origen de la Empresa." In L. Brenes and V. Govaere, eds., *Estado nacional de las MIPYMES 2012.* San Jose, Costa Rica: Observatorio de MIPYMES, UNED.

Lerner, J. 2002. "When Bureaucrats Meet Entrepreneurs: The Design of Effective Public Venture Capital Programmes." *The Economic Journal* 112: F73–F84.

_____. 2009. *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed and What to Do About It.* Princeton: Princeton University Press.

Lotti, F., E. Santarelli, and M. Vivarelli. 2007. "Defending Gibrat's Law as a Long-run Regularity." IZA Discussion Paper No. 2744. Bonn, Germany: Institute for the Study of Labor.

Monge-González, R. 2009. "Banca de Desarrollo y Pymes en Costa Rica." Serie financiamiento del desarrollo No. 209. Santiago, Chile: Comisión Económica para América Latina y el Caribe (CEPAL) and GTZ.

Monge-González, R., and J. A. Rodríguez-Alvarez. 2010. "Financiamiento a la inversión de las pymes en Costa Rica." Serie financiamiento del desarrollo No. 233. Santiago, Chile: Economic Commission for Latin America and the Caribbean (ECLAC) and The Spanish Agency for International Development Cooperation (AECID).

_____. 2013. "Impact Evaluation of Innovation and Linkage Development Programs in Costa Rica: The Cases of PROPYME and CR Provee." IDB Working Paper Series No. IDB-WP-461. Washington, DC: Inter-American Development Bank.

OECD (Organisation for Economic Co-operation and Development). 2009. *Measuring Entrepreneurship: A Collection of Indicators*. Paris, France: OECD Publishing.

———. 2013. *Entrepreneurship at a Glance*. Paris, France: OECD Publishing.

Pagés, C. (ed.). 2010. *La era de la productividad. ¿Cómo transformar las economías desde sus cimientos?* Washington DC: Inter-American Development Bank.

Sutton, J. 1997. “Gibrat’s Legacy.” *Journal of Economic Literature* 35(1): 40–59.

Tornqvist, L., P. Vartia, and Y. Vartia. 1985. “How Should Relative Change Be Measured?” *American Statistician* 39(1): 43–46.

Van Biesebroeck, J. 2005. “Exporting Raises Productivity in Sub-Saharan African Manufacturing Firms.” *Journal of International Economics* 67(2): 373–91.

World Bank. 2006. *World Development Report 2006: Equity and Development.* Washington DC. World Bank. Oxford University Press.

———. 2013. *Doing Business. Smarter Regulations for Small and Medium-Size Enterprises.* 10th edition. Washington DC: Word Bank.

Appendix 1: Additional Tables

Table A.1. Costa Rica: Summary of Descriptive Statistics on Employment, by Sector, 2001–2012

		Summarize of descriptive statistics Employees by Sector											
Sector		**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
	# firms	117	119	122	125	117	105	109	106	99	111	118	118
	mean	9.58	7.88	7.70	7.69	8.62	9.83	9.42	9.96	10.68	9.65	9.48	9.17
Unknown	stdev	55.21	54.31	56.84	59.39	65.57	72.06	74.35	80.15	83.33	79.19	78.66	79.11
	max	570.00	589.00	627.00	665.00	711.00	740.00	778.00	827.00	831.00	836.00	856.00	861.00
	min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	# firms	876	867	876	871	888	907	926	915	902	888	876	866
	mean	21.47	20.31	20.93	24.24	24.48	25.24	25.73	27.04	30.69	29.93	30.34	30.86
Agriculture	stdev	209.10	206.43	207.99	240.57	254.73	270.64	276.40	291.37	359.32	452.69	499.59	513.61
	max	6,009.00	5,920.00	5,979.00	6,127.00	6,524.00	6,977.00	7,162.00	7,444.00	9,752.00	13,331.00	14,659.00	14,990.00
	min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	# firms	16	16	14	13	14	15	18	17	21	22	25	28
	mean	10.50	9.06	8.71	9.08	8.50	8.93	8.94	9.88	10.00	8.41	7.08	6.86
Mining	stdev	9.09	8.96	9.93	10.63	9.57	8.97	8.51	9.60	10.03	9.41	8.33	7.31
	max	29.00	31.00	34.00	35.00	30.00	30.00	29.00	27.00	33.00	31.00	26.00	24.00
	min	3.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	# firms	522	515	505	508	510	502	516	544	535	542	541	543
	mean	45.24	45.86	44.34	43.21	43.88	46.13	50.98	50.64	48.33	44.90	45.58	46.34
Manufacturing	stdev	163.37	176.61	174.51	168.19	168.44	174.79	187.14	175.52	159.69	152.69	157.73	161.48
	max	2,151.00	2,135.00	2,237.00	2,464.00	2,610.00	2,701.00	2,664.00	1,876.00	1,632.00	1,610.00	1,678.00	1,827.00
	min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	# firms	1,154	1,223	1,272	1,301	1,366	1,412	1,487	1,659	1,739	1,845	1,942	2,035
	mean	11.96	11.07	11.30	11.33	11.41	11.90	12.43	12.24	11.76	11.39	10.82	10.49
Commerce	stdev	36.33	34.87	39.00	45.28	53.22	69.09	80.67	83.88	81.75	70.20	58.99	57.68
	max	594.00	643.00	836.00	1,150.00	1,572.00	2,237.00	2,704.00	2,929.00	2,895.00	2,101.00	1,572.00	1,750.00
	min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	# firms	2,421	2,581	2,685	2,773	2,868	3,041	3,391	3,738	3,823	3,978	4,235	4,401
	mean	11.90	11.62	11.54	11.93	12.45	12.77	13.09	13.27	13.40	12.99	13.09	13.45
Services	stdev	42.33	42.27	44.01	48.49	53.30	55.73	60.42	64.45	67.58	69.64	71.62	74.67
	max	832.00	892.00	1,026.00	1,176.00	1,393.00	1,590.00	1,917.00	2,210.00	2,426.00	2,659.00	2,745.00	2,833.00
	min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Authors' estimations based on data from the CCSS.

Table A.2. Costa Rica: Summary of Descriptive Statistics on Employment by Sector, 2001–2012

Size	Statistics	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	Mean	3.10	3.01	3.02	2.96	2.98	3.06	3.08	3.05	2.98	2.90	2.92	2.86
	Stdev	2.26	2.23	2.22	2.19	2.19	2.22	2.24	2.22	2.19	2.16	2.18	2.15
	Max	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
	Min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Small	Mean	20.28	20.37	20.73	20.39	20.21	20.18	20.05	19.86	20.08	20.10	20.33	20.12
	Stdev	10.00	9.90	10.40	10.16	10.11	10.19	10.12	9.92	10.20	9.96	10.04	9.95
	Max	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00
	Min	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Medium	Mean	106.21	103.57	105.33	101.81	103.67	105.47	104.50	104.09	104.38	104.28	101.36	98.71
	Stdev	52.41	50.19	51.48	52.13	52.19	54.11	52.89	52.92	51.56	50.22	47.50	46.98
	Max	249.00	241.00	248.00	245.00	249.00	247.00	244.00	249.00	248.00	249.00	248.00	236.00
	Min	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Large	Mean	617.13	634.11	659.27	758.06	753.50	791.21	815.78	825.78	802.46	830.23	829.32	823.80
	Stdev	816.59	828.68	848.44	949.46	994.66	1,061.20	1,049.17	1,054.64	1,232.57	1,587.65	1,692.47	1,678.99
	Max	6,009.00	5,920.00	5,979.00	6,127.00	6,524.00	6,977.00	7,162.00	7,444.00	9,752.00	13,331.00	14,659.00	14,990.00
	Min	262.00	254.00	250.00	254.00	252.00	254.00	251.00	251.00	250.00	252.00	259.00	252.00

Source: Authors' estimations based on data from the CCSS.

Table A.3. Costa Rica: Entry, Death and Survival of Firms by Age, 2001–2012

Age	Initial Firms	Entry Firms	Death Firms	Survivals
	2000 and before	2001-2012	2001-2012	2012
12+	4,333		2,213	2,120
11		773	496	277
10		836	543	293
9		858	559	299
8		893	542	351
7		896	519	377
6		934	510	424
5		1,117	635	482
4		1,264	675	589
3		1,087	475	612
2		1,123	399	724
1		1,104	304	800
0		1,129		1,129
All	4,333	12,014	7,870	8,477

Source: Authors' estimations based on data from the CCSS.

Table A.4. Costa Rica: Distribution of Firms by Sector, 2001–2012

	Number of Firms											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Unknown	117	119	122	125	117	105	109	106	99	111	118	118
Agriculture	876	867	876	871	888	907	926	915	902	888	876	866
Mines	16	16	14	13	14	15	18	17	21	22	25	28
Manufacturing	522	515	505	508	510	502	516	544	535	542	541	543
Commerce	1,154	1,223	1,272	1,301	1,366	1,412	1,487	1,659	1,739	1,845	1,942	2,035
Services	2,421	2,581	2,685	2,773	2,868	3,041	3,391	3,738	3,823	3,978	4,235	4,401
All	5,106	5,321	5,474	5,591	5,763	5,982	6,447	6,979	7,119	7,386	7,737	7,991
	Percentages											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Unknown	2%	2%	2%	2%	2%	2%	2%	2%	1%	2%	2%	1%
Agriculture	17%	16%	16%	16%	15%	15%	14%	13%	13%	12%	11%	11%
Mines	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Manufacturing	10%	10%	9%	9%	9%	8%	8%	8%	8%	7%	7%	7%
Commerce	23%	23%	23%	23%	24%	24%	23%	24%	24%	25%	25%	25%
Services	47%	49%	49%	50%	50%	51%	53%	54%	54%	54%	55%	55%

Source: Authors' estimations based on data from the CCSS.

Table A.5. Costa Rica: Employment Distribution by Sector, 2001–2012

	Number of Workers											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Unknown	1,121	938	940	961	1,008	1,032	1,027	1,056	1,057	1,071	1,119	1,082
Agriculture	18,804	17,612	18,339	21,113	21,739	22,893	23,825	24,743	27,684	26,578	26,582	26,726
Mines	168	145	122	118	119	134	161	168	210	185	177	192
Manufacturing	23,617	23,619	22,390	21,952	22,381	23,157	26,306	27,548	25,857	24,335	24,658	25,160
Commerce	13,806	13,534	14,372	14,737	15,591	16,796	18,490	20,307	20,452	21,019	21,019	21,337
Services	28,800	29,985	30,997	33,083	35,713	38,833	44,395	49,608	51,228	51,658	55,453	59,176
All	86,316	85,833	87,160	91,964	96,551	102,845	114,204	123,430	126,488	124,846	129,008	133,673
	Percentages											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Unknown	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Agriculture	22%	21%	21%	23%	23%	22%	21%	20%	22%	21%	21%	20%
Mines	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Manufacturing	27%	28%	26%	24%	23%	23%	23%	22%	20%	19%	19%	19%
Commerce	16%	16%	16%	16%	16%	16%	16%	16%	16%	17%	16%	16%
Services	33%	35%	36%	36%	37%	38%	39%	40%	41%	41%	43%	44%

Source: Authors' estimations based on data from the CCSS.

Table A.6. Costa Rica: Distribution of Firms by Size, 2001–2012

	Number of Firms											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	3,950	4,191	4,326	4,422	4,540	4,686	5,051	5,500	5,631	5,929	6,273	6,469
Small	894	871	894	896	945	1,015	1,090	1,144	1,154	1,130	1,130	1,175
Medium	207	205	202	223	224	225	243	267	260	257	260	268
Large	55	54	52	50	54	56	63	68	74	70	74	79
Total	5,106	5,321	5,474	5,591	5,763	5,982	6,447	6,979	7,119	7,386	7,737	7,991
	Percentages											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	77%	79%	79%	79%	79%	78%	78%	79%	79%	80%	81%	81%
Small	18%	16%	16%	16%	16%	17%	17%	16%	16%	15%	15%	15%
Medium	4%	4%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Large	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%

Source: Authors' estimations based on data from the CCSS.

Table A.7. Costa Rica: Employment Distribution by Firm Size, 2001–2012

	Distribution of total employees by Size											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	12,260	12,618	13,070	13,092	13,546	14,328	15,567	16,763	16,794	17,222	18,312	18,504
Small	18,128	17,741	18,531	18,265	19,095	20,478	21,850	22,722	23,173	22,709	22,972	23,636
Medium	21,986	21,232	21,277	22,704	23,221	23,731	25,393	27,792	27,139	26,799	26,354	26,453
Large	33,942	34,242	34,282	37,903	40,689	44,308	51,394	56,153	59,382	58,116	61,370	65,080
Total	86,316	85,833	87,160	91,964	96,551	102,845	114,204	123,430	126,488	124,846	129,008	133,673
	Percent Distribution of total employees by Size											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Micro	14%	15%	15%	14%	14%	14%	14%	14%	13%	14%	14%	14%
Small	21%	21%	21%	20%	20%	20%	19%	18%	18%	18%	18%	18%
Medium	25%	25%	24%	25%	24%	23%	22%	23%	21%	21%	20%	20%
Large	39%	40%	39%	41%	42%	43%	45%	45%	47%	47%	48%	49%

Source: Authors' estimations based on data from the CCSS.

Table A.8. Relationship between Growth Rates and Size: All Firms

(fixed effects and cluster-robust standard errors)

Variables	1 to 9	10 to 49	50 to 249	250+
	DHSGrowth	DHSGrowth	DHSGrowth	DHSGrowth
Size (ln X_{jt-1})	-0.5489***	-0.7181***	-0.7157***	-0.7570***
	(0.0097)	(0.0235)	(0.0503)	(0.1940)
Constant	0.4303***	2.0167***	3.2057***	4.7617***
	(0.0076)	(0.0642)	(0.2190)	(1.1978)
Number of observations	25572	4015	802	128
R-squared	0.2629	0.4616	0.5156	0.4745
F value	3231.0023	934.3292	202.4357	15.2227
Log likelihood	-3100.2752	-354.7546	-116.9883	-3.5648
pvalue for F test	0.0000	0.0000	0.0000	0.0000

Source: Authors' calculations.

Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.

Table A.9. Relationship between Growth Rates and Size Controlling by Age: All Firms

(fixed effects and cluster-robust standard errors)

Variables	1 to 9 DHSGrowth	10 to 49 DHSGrowth	50 to 249 DHSGrowth	250+ DHSGrowth
Size (ln X_{jt-1})	-0.5499***	-0.7291***	-0.7379***	-1.0494***
	(0.0097)	(0.0259)	(0.0614)	(0.2215)
2.VarAge	-0.0338***	-0.1519***	-0.1971***	-0.1699
	(0.0071)	(0.0211)	(0.0506)	(0.0922)
3.VarAge	-0.0360***	-0.1085***	-0.1190*	0.0977
	(0.0071)	(0.0225)	(0.0558)	(0.1032)
4.VarAge	-0.0248**	-0.0859***	-0.0842	0.2140
	(0.0079)	(0.0245)	(0.0625)	(0.1334)
5.VarAge	-0.0285**	-0.0640*	-0.0133	0.2061
	(0.0088)	(0.0276)	(0.0574)	(0.1828)
6.VarAge	-0.0079	-0.0351	0.0044	0.2268
	(0.0102)	(0.0283)	(0.0603)	(0.1933)
7.VarAge	-0.0214	-0.0367	-0.0269	0.1459
	(0.0116)	(0.0330)	(0.0724)	(0.1668)
8.VarAge	-0.0102	-0.0269	-0.0895	0.3183
	(0.0137)	(0.0336)	(0.0783)	(0.1627)
9.VarAge	-0.0461**	0.0002	-0.0245	0.5364*
	(0.0167)	(0.0383)	(0.0860)	(0.2345)
10.VarAge	-0.0134	-0.0404	0.0104	0.6223*
	(0.0193)	(0.0551)	(0.1080)	(0.2463)
11.VarAge	-0.0789**	0.0684	-0.0170	0.5237*
	(0.0264)	(0.0501)	(0.1284)	(0.2465)
Constant	0.4514***	2.1112***	3.3697***	6.3983***
	(0.0087)	(0.0665)	(0.2566)	(1.2910)
Number of observations	25572	4015	802	128
R-squared	0.2648	0.4775	0.5379	0.6179
F value	300.0336	98.2508	22.2055	7.8737
Log likelihood	-3066.4581	-294.3910	-98.0694	16.8252
pvalue for F test	0.0000	0.0000	0.0000	0.0008

Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.
Source: Authors´ calculations.

Table A.10. Relationship between Growth Rates and Size: Continuing Firms Only
(fixed effects and cluster-robust standard errors)

Variables	1 to 9 DHSGrowth	10 to 49 DHSGrowth	50 to 249 DHSGrowth	250+ DHSGrowth
Size (ln X_{jt-1})	-0.5154***	-0.6638***	-0.6402***	-0.7566***
	(0.0107)	(0.0246)	(0.0455)	(0.1952)
Constant	0.4402***	1.8871***	2.9105***	4.7100***
	(0.0087)	(0.0672)	(0.1994)	(1.1932)
Number of observations	17812	3116	627	119
R-squared	0.2544	0.4575	0.5182	0.4744
F value	2300.7697	725.3412	197.6268	15.0235
Log likelihood	-2409.0376	-76.5343	-24.2466	-7.4040
pvalue for F test	0.0000	0.0000	0.0000	0.0000

Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.
Source: Authors´ calculations.

Table A.11. Relationship between Growth Rates and Size Controlling by Age: Continuing Firms Only

(fixed effects and cluster-robust standard errors)

Variables	1 to 9 DHSGrowth	10 to 49 DHSGrowth	50 to 249 DHSGrowth	250+ DHSGrowth
Size (ln X_{jt-1})	-0.5188***	-0.6992***	-0.6875***	-1.0569***
	(0.0108)	(0.0279)	(0.0662)	(0.2219)
2.VarAge	-0.0145	-0.1200***	-0.1507*	-0.1774
	(0.0088)	(0.0232)	(0.0614)	(0.1089)
3.VarAge	-0.0075	-0.0591*	-0.0748	0.1009
	(0.0084)	(0.0236)	(0.0623)	(0.1154)
4.VarAge	0.0040	-0.0238	0.0367	0.2299
	(0.0091)	(0.0259)	(0.0661)	(0.1498)
5.VarAge	0.0089	-0.0009	0.0512	0.2390
	(0.0100)	(0.0279)	(0.0685)	(0.2014)
6.VarAge	0.0260*	0.0203	0.0350	0.2430
	(0.0113)	(0.0289)	(0.0698)	(0.2068)
7.VarAge	0.0123	0.0285	0.0106	0.1615
	(0.0125)	(0.0324)	(0.0887)	(0.1800)
8.VarAge	0.0276	0.0441	0.0264	0.3330
	(0.0145)	(0.0331)	(0.0809)	(0.1767)
9.VarAge	-0.0105	0.0665	0.0319	0.5528*
	(0.0174)	(0.0373)	(0.1014)	(0.2481)
10.VarAge	0.0199	0.0212	0.0623	0.6387*
	(0.0196)	(0.0563)	(0.1203)	(0.2602)
11.VarAge	-0.0503	0.1196*	0.0427	0.5415*
	(0.0263)	(0.0501)	(0.1370)	(0.2579)
Constant	0.4421***	2.0010***	3.1278***	6.3543***
	(0.0099)	(0.0709)	(0.2665)	(1.2717)
Number of observations	17812	3116	627	119
R-squared	0.2558	0.4732	0.5412	0.6206
F value	214.3659	74.6665	19.5542	7.8910
Log likelihood	-2391.9509	-30.8948	-8.8882	11.9977
pvalue for F test	0.0000	0.0000	0.0000	0.0008

Source: Authors' calculations.

Note: * Coefficient is statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level; no asterisk means the coefficient is not different from zero with statistical significance.