

The Dynamics of High-Growth Firms

Evidence from Tunisia

Marcio Cruz

Leila Baghdadi

Hassen Arouri



WORLD BANK GROUP

Finance, Competitiveness and Innovation Global Practice

February 2020

Abstract

This paper examines the dynamics and characteristics of high-growth firms in Tunisia. Further knowledge about the dynamics of these firms can inform the design of business support policies, especially toward small and medium-size firms. The analysis suggests that between 1999 and 2015, about 9 to 10.5 percent of the firms in Tunisia achieved high-growth status per year, on average, depending on the

definition used, and these shares have been remarkably stable over time. Although a small share of firms achieves high growth annually, almost one in every three firms that survive for more than a decade has achieved high-growth status at least once. High-growth status is more prevalent among small and young firms, as well as firms that export, import, or receive foreign direct investments.

This paper is a product of the Finance, Competitiveness and Innovation Global Practice. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://www.worldbank.org/prwp>. The authors may be contacted at marciocruz@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

The Dynamics of High-Growth Firms: Evidence from Tunisia¹

Marcio Cruz², Leila Baghdadi³, and Hassen Arouri⁴

JEL classification: D22

Keywords: High-Growth Firms, Entrepreneurship, Tunisia

¹ The analysis for this paper was originally produced as background material for the World Bank Group's report *High-Growth Firms: Facts, Fiction, and Policy Options for Emerging Economies* (Grover, Medvedev, and Olafsen, 2019). The authors are grateful for the helpful comments received from Denis Medvedev, participants of the HGF report authors' seminar, and participants of the Economics Research Seminar Series at the American University in Cairo.

² The World Bank. Email: marciocruz@worldbank.org. Corresponding author.

³ Tunis Business School.

⁴ National Institute of Statistics, Tunisia.

1. Introduction

This paper examines the dynamics and the characteristics of high-growth firms (HGFs) in Tunisia. There are different definitions of HGFs, most of them focusing on a population of firms that achieves outstanding growth performance in terms of turnover or number of employees. We focus on the number of employees and compare three different definitions. For these definitions, we document three sets of stylized facts for HGF in Tunisia. First, we show the share of HGFs over time, and across sectors. Second, we describe their dynamics in terms of entry and survival rates, growth, and jobs generation across different firm age cohorts. Third, we analyze the firm characteristics associated with high-growth status. Our results suggest that high-growth status is negatively associated with firm size and age, although there is a non-linear relationship with age,⁵ and positively associated with trade (exports and imports) and foreign ownership of the firm. Although they do not infer a causal relationship, these associations are statistically significant across different high-growth definitions, even after controlling for sector, region, or firm-level fixed effects.

Understanding the reasons why some firms manage to grow fast and what can be done to facilitate this process is a key policy question for developing countries. If effective policy interventions could lead to more firms achieving high-growth performance, they could increase the number of jobs, revenue, taxes, and other economic benefits, such as higher productivity, export performance, and better salaries, which correlates with larger firms.⁶ Only a small share of firms achieves high growth, and only few of them manage to maintain this status over consecutive years, for a longer period of time. Yet, evidence from the United States suggests that young high-growth firms represent a significant chunk of new jobs created in the economy over time (Haltiwanger et. al., 2013, 2017). Despite the relevance of HGFs, there is lack of knowledge about what are the key characteristics of these firms and their growth dynamics, particularly in developing countries.

To analyze the dynamics of HGF in Tunisia, we use the Tunisian Statistical Business Register, namely the *Répertoire National des Entreprises* (RNE), collected by the National Institute of Statistics in Tunisia (*Institut National de la Statistique*). The RNE results from merging various administrative data using a unique identifier at the firm level. It provides information on number of employees, age of the firm, foreign ownership, *offshore* tax incentive status, and trade status for all registered firms in Tunisia. The data cover the 1996-2015 period, with almost 1.2 million firm-year observations, which are reflected in a firm-level panel data set with an average of 60,000 firms per year.

The analysis suggests that HGFs represent between 9% to 10.5% of firms in Tunisia, on average, in the last 17 years, depending on the definition used. We show that the share of HGFs differs across definitions, but it is remarkably stable over time and weakly correlated with GDP growth. High-growth status is more prevalent among firms in the following sectors: computer and

⁵ Although the age coefficient is negative, the age square coefficient is positive.

⁶ For example, if 1,000 small firms, with 10 employees each, manages to grow 20% per year over 10 years, their number of jobs would increase from 10,000 to almost 62,000 over this period.

electronics, metals, chemical and pharmaceutical, food and beverages, and other manufacturing. Young firms are more likely to achieve high growth. Among firms that survive for more than three years, about 3 in every 10 new firms achieves HGF status and they generate more than 70% of the jobs generated by new firms.

Our paper contributes to a wider literature analyzing the dynamics of HGF by bringing additional evidence from developing countries. We present several stylized facts on HGF patterns in Tunisia that are complementary to previous knowledge available for OECD countries.⁷ This finding is consistent with previous research focusing in Tunisia (Rijkers et. al. 2014, Arouri et. al. 2016, and Arouri et. al. 2018) showing that small firms generate most of the jobs, but this relationship is driven by firm entry and the fact that most entrants start small. These findings are also in line with Haltiwanger et al. (2013) for the United States.

The remainder of the paper is organized as follows. Section 2 reviews the literature and presents the key HGF definitions used in this paper. Section 3 describes the data and analyzes the share of HGFs across time and across sectors. Section 4 describes the HGF dynamics in terms of entry and survival rates, growth, and jobs generation across different firm age cohorts. Section 5 analyzes the firm characteristics associated with high-growth status across HGF definitions, and section 6 concludes.

2. HGF definition

Since the seminal contributions of Birch and Medoff (1994) and Birch et al. (1995), the literature has defined HGF in many different ways. Most of these studies tend to agree on using turnover or number of employees to measure growth (see for instance Autio et al. 2000, Bottazzi and Secchi 2006, Goedhuys and Sleuwaegen 2010, Copass 2013, Holzl 2014, Daunfeldt and Halvarssonin 2016, and Bianchini and Secci 2016, Haltiwanger et. al., 2017). The growth measures using turnover or number of employees are the most available in enterprise surveys worldwide, which make it possible to compare HGFs across countries. We can classify these approaches in two groups: i) Absolute percentage growth (with fixed growth rate or fixed share of top performing firms); ii) Combined growth and initial size measures.

A well-known HGF definition in the first group is provided by OECD (2007). It defines HGF as all enterprises with average annualized growth greater than 20% per annum, over a three-year period, measured by number of employees or turnover. Moreover, this definition uses a 10-employee minimum threshold to eliminate firms with a small number of jobs, for which a small change (e.g. 1 job) can lead to high growth rates. This threshold is contested in some circumstances, because it can significantly influence the number of HGFs in the data set.⁸ An

⁷ The OECD report *Entrepreneurship at a Glance* (OECD 2017) has been publishing several indicators of HGF annually, but mostly concentrated on OECD countries.

⁸ For example, Clayton et al. (2013) and Daunfeldt et al. (2015) find that at least 75% of firms in the US private sector and 95% of surviving firms in Sweden, respectively, are smaller than 10 employees.

advantage of this measure is that it does not impose a limit for the share of top performing firms, which can vary with business cycles. A disadvantage is that the growth rate per se does not take into consideration the differences in initial size, nor relative average differences across countries.

An alternative to the OECD approach is a definition based exclusively on a fixed share of top performing firms, such as the top 1%, 5%, or 10% of highest growing firms in the period. Several studies adopted this measure (Goedhuys and Sleuwaegen 2010, Holzl and Friesenbichler 2010, Lopez-Garcia and Putente 2012, Bjuggren et al. 2010, Capasso et al. 2013, Coad et al. 2014, Bianchini and Secchi 2016, and Daunfeldt and Halvarssonin 2016). This definition is also based exclusively on the growth rate of the firms but keeps the share of HGFs constant. A drawback of these definitions is that, in case there is an unexpected event where all firms have low growth, it still identifies the top percentile of firms as HGF.

The Birch index (Birch, 1979) is likely the most well-known HGF definition in the second group, which also considers the initial size of the firm. The index combines both the absolute and relative growth rates. It is defined as $(X_t - X_{t-3}) \frac{X_t}{X_{t-3}}$, where X_t is the number of employees at the period t . The HGF definition following this method selects a given share of firms in a top percentile of the Birch index distribution.

Another index, following the aim of controlling for differences in the initial size of firms is provided by Davis, Haltiwanger, and Schuh (1996). The DHS index, defined as $[\frac{X_t - X_{t-3}}{0.5(X_t + X_{t-3})}]$, where, X_t is the number of employees at the period t . This index measures the growth rate of the firm relative to the average size. HGF definitions based on this method also select a given share of firms in the top percentile of the index distribution.⁹

In this paper we focus on 3 definitions of HGF including: i) a variation of the OECD definition; ii) the Birch definition; and iii) the DHS definition, as described in table 1. However, due to the large number of small firms in developing countries, we do not impose a threshold on a minimal number of employees. In Tunisia, the median firm has 2 employees. For the sake of space and being concise with some of the descriptive statistics, whenever we present a table only with 1 definition, we use HGF1.

Table 1 – Definition of HGF based on a three-year period of cumulative growth

Definitions	Description	Based on
HGF1	Firms with average annualized growth greater than 20% per annum.	OECD
HGF2	Firms in the top 10 percent of the Birch index, over a three-year period.	Birch
HGF3	Firms in the top 10 percent of DHS Index.	DHS

Source: Authors elaboration.

⁹ Another option suggested by Clayton et al. (2013) classifies a firm with fewer than 10 employees as an HGF if it made a growth of 8 or more employees over a 3-year period.

3. Data and descriptive statistics

The main data set we used for this study is the Tunisian Statistical Business Register, namely the *Répertoire National des Entreprises* (RNE), collected by the National Institute of Statistics in Tunisia (Institut National de la Statistique). The RNE is an exhaustive data set, compiled from merging different administrative folders from the social security fund (Caisse Nationale de la Sécurité Sociale – CNSS), which is the source for the employment data, the Tunisian Customs, the Tunisian Ministry of Finance, and the Tunisian Investment Promotion Agency (l’Agence de Promotion de l’Industrie et de l’Innovation – APII). A major and unique advantage of the Répertoire is that it accounts for all enterprises and covers a relatively long period.

This database contains information on the number of employees, age, trade activities (exports and imports), foreign ownership, as well as trade regime categorization (i.e. offshore) of all registered private firms. The RNE database allows us to track the exit and entry of firms over time. We also exclude firms that report less than one employee to consider only active firms.¹⁰ A detailed description of the RNE is presented in Rijkers et al (2014). Our analysis considers the 1996-2015 period. The data cover approximately 60,000 registered firms per year, for which about 1.2 million firm-year observations were available.

Table 2 describes the main variables used in the analysis. On average, Tunisian firms are about 14 years old, while a median firm is 11 years old. The main variable used in the analysis, to define HGF status, is employment. On average, Tunisian firms have about 15 employees, while a median firm has only 2 employees. Less than 10 percent of the firms have more than 20 employees.

Table 2 – Descriptive statistics of firm-level data for Tunisia (1996-2015)

Variable	N	mean	p50	p10	p90
Age	1,167,050	13.79	11	3	28
Age square	1,167,050	294.90	121	9	784
Employment	1,167,050	15.01	2	1	19.75
Export status	1,167,050	0.06	0	0	0
Import status	1,167,050	0.10	0	0	1
Exports (3-years)	539,550	0.21	0	0	0
Imports (3-years)	539,550	0.40	0	0	2
Foreign	1,167,050	0.03	0	0	0
Offshore	1,167,050	0.06	0	0	0

Note: Exports (3-years) and Imports (3-years) refer to the sum of export or import statuses over 3 years. The calculation is performed only for those firms with 3 or more years of existence for each year, which explains the differences in the number of observations.

¹⁰ The National Institute of Statistics found that 8% of the registered self-employed firms (reporting no employees) are “falsely active.”

Regarding trade activities and foreign ownership, table 2 shows that about 6% of firms are exporters, while 10% of firms are importers. Considering the sum of 3-year exporting status, in which the maximum value is 3 if the firm has exported 3 consecutive years (t1, t2, t3), and the minimum is 0 if the firm has not exported, the average is 0.21. The average of the sum of 3-year importing status is 0.4. Because the calculation of these variables requires more than 3 years of existence, there is a smaller number of observations. The difference refers to firms that do not survive over this period. Approximately 3% of those firms are owned by foreigners, while 6% of them benefit from the offshore tax incentive regimes.

3.1 Share of HGFs across time and across sectors

The definition of HGF matters, but within the same definition the share of HGFs is stable over time. Between 2000 and 2015 there were an average of 45,470 registered firms per year in Tunisia older than three years of age. This number increased, from around 38,067 in 1999 to 52,877 in 2015, despite a significant drop in 2003. Table 3 presents the share of HGFs based on total number of registered firms that exist for at least 3 years. For the same definition, the data show small variations over time, independently of the definition used. The variation is smaller, particularly for the HGF1 definition, if the total number of firms is not constrained by those that exist for at least 3 years.

Table 3 - Number of firms and share of HGF by different definitions

Year	Number of firms	HGF1 (Share %)	HGF2 (Share %)	HGF3 (Share %)
2000	38,067	11.2	9.1	9.5
2001	41,585	10.6	8.3	9.2
2002	44,088	10.2	8.9	8.7
2003	40,826	11.0	8.9	9.3
2004	40,855	10.5	8.9	9.0
2005	41,601	9.6	8.9	8.1
2006	42,394	9.5	8.9	8.1
2007	44,152	9.9	8.8	8.5
2008	45,200	10.3	8.8	8.8
2009	46,548	10.5	8.7	8.9
2010	47,534	11.3	8.8	9.7
2011	48,255	10.6	8.9	9.2
2012	49,626	9.8	8.9	8.5
2013	51,624	9.5	8.8	8.2
2014	52,283	9.8	8.7	8.4
2015	52,877	9.7	8.7	8.4
Total (average)	45,470	10.5	9.0	9.0
St Dev.		1.27	0.64	1.07

Note: Average and standard deviation (St Dev.) based on a simple average per year. Both, the number of firms (denominator) and HGF (numerator) include only firms that entered in t-3 or earlier.

This evidence suggests that potential shocks (e.g. demand shocks) that may boost or contract the

growth rates of existing firms may also lead to variations in the total number of firms.¹¹ The correlation between number of firms that enters the market in period t and the number of high-growth firms that entered the market in period t-3 is high (0.73) and statistically significant at 99%.

Table 4 shows that HGFs are present unevenly across different sectors. Among the sectors with larger shares of HGFs in Tunisia, we highlight metals, computer and electronics, professional activities, and chemical and pharmaceutical. Most sectors showing higher shares of HGFs are in manufacturing, despite a few exceptions such as professional activities and accommodation and food services, among the top 10 in the average rank across different definitions.

Table 4 – Share of HGFs by sector

	HFG1	HGF2	HGF3	Rank*
01 Agriculture	10.1	13.6	8.7	8
02 Mining and quarrying	7.6	6.8	6.6	20
03 Food and beverages	9.8	18.3	8.7	4
04 Textile and Apparel	8.5	14.2	7.6	9
05 Leather	5.7	2.2	4.6	28
06 Wood	8.6	11.4	7.6	10
07 Paper	10	15	8.6	6
08 Chemical and Pharmaceutical	11.2	16.7	9.9	3
09 Rubber and Plastic	7.5	12.1	6.5	13
10 Non-metallic minerals	9.3	10	7.9	12
11 Metals	13.1	20.8	11.8	2
12 Computer and electronics	12.8	22.4	11.7	1
13 Automotive	7.2	4.7	5.9	23
14 Furniture	10.1	8.6	8.9	11
15 Repair of machinery	7.7	8.7	6.7	18
16 Other manufacturing	11.9	11.3	10.5	5
17 Construction	6.6	3.3	5.5	24
18 Wholesale and retail motor vehicle	9	6.7	7.7	17
19 Wholesale trade, others	6.4	2.3	5.3	26
20 Retail trade, others	7	8.2	6	19
21 Transportation and storage	5.9	3.6	5	25
23 Accommodation and food	9.5	8.1	8.5	14
24 Information and communication	8.6	9.1	7.1	16
25 Financial and insurance	7.4	5.1	6.6	21
26 Real estate activities	7.8	3.7	6.6	22
27 Professional activities	11.3	12.2	10.1	7
28 Administrative services	6	2.8	5	27
30 Repair of personal goods	4.6	1.9	3.8	30
31 Other activities	5	2.5	4.1	29

Note: The rank is based on the average shares across definition.

¹¹ Because our definitions of HGF are based on 3-year growth rate, for the empirical analysis in section 4 we restrict the sample to those firms that exist for at least 3 years. The table A1 in the appendix presents the share of HGFs when accounted for all existent firms in the denominator.

The next section describes the dynamics of HGFs in Tunisia across age cohorts, entry and survival rates, and growth. Based on this information, it is possible to disentangle the composition of HGFs, by comparing the share of HGFs across firm cohorts, as well as the overall entry, exit, and growth dynamics of firms in Tunisia.

4 HGF dynamics: Entry and survival rates, growth, and jobs

Dynamically, the share of new firms per year, as well as their contribution to jobs, tend to be stable. For example, new firms that entered the market in 1997, 2002, and 2007, represent between 10% and 12% of the total number of firms and correspond to approximately 3.2% and 3.7% of the total number of jobs in 2000, 2005, and 2010, respectively (Table 5). The year 2015 is very atypical with respect to the share of jobs generated by new firms, when compared to the annual series of data over the 1996-2015 period.¹² Also, the ratio between the share of jobs, and share of firms in the economy seems to be stable across cohorts. For the years 2000, 2005, and 2010, this ratio was about 0.3 for new firms that survived for more than 3 years.

Table 5 - Share of firms by the year they entered the market and jobs they generated (HGF1 definition)

Start Year	Share of Firms (A)				Share of Jobs (B)				Ratio (B)/(A)			
	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
<=1996	53.7	37.3	25.3	18.7	75.1	56.7	40.4	31.5	1.4	1.5	1.6	1.7
1997	13.4	8.7	5.8	4.2	10.8	8.8	5.9	5.6	0.8	1.0	1.0	1.3
1998	9.1	5.4	3.5	2.5	4.8	4.2	2.9	1.7	0.5	0.8	0.8	0.7
1999	11.3	6.2	3.9	3.0	5.7	4.5	3.0	2.0	0.5	0.7	0.8	0.7
2000	12.6	5.5	3.5	2.4	3.7	4.6	2.9	1.9	0.3	0.8	0.8	0.8
2001		6.2	4.0	2.8		4.5	3.6	2.5		0.7	0.9	0.9
2002		6.4	3.9	2.8		5.1	3.3	2.2		0.8	0.8	0.8
2003		6.7	4.0	2.7		3.9	2.5	1.5		0.6	0.6	0.6
2004		7.4	4.2	2.8		4.4	3.7	2.6		0.6	0.9	0.9
2005		10.2	4.8	3.2		3.3	4.1	3.1		0.3	0.9	1.0
2006			5.2	3.3			5.8	2.8			1.1	0.8
2007			6.3	4.0			7.3	4.4			1.2	1.1
2008			7.4	4.5			6.9	4.8			0.9	1.1
2009			7.7	4.6			4.4	3.5			0.6	0.8
2010			10.7	5.1			3.2	3.3			0.3	0.6
2011				4.6				3.9				0.8
2012				5.3				3.9				0.7
2013				5.9				3.2				0.5
2014				7.0				3.3				0.5
2015				10.7				12.6				1.2

Note: The first column shows the year that the firm was born. Tables A4 and A5 of the appendix presents the information for every year between 2000 and 2015.

¹² This pattern is very common across the 2000-2014 period. The year 2015 is very atypical regarding the share of young firms in total number of jobs, as described in the appendix.

Regarding the yearly dynamics of new firms, the number has been relatively stable in Tunisia, although the entry rate in 2015 is lower than 2000. The number of new firms entering the market in 2000 (7,195) is very close to the number of new firms in 2015 (7,377), despite falling as low as 5,320 new firms in 2004.¹³ The gap between firms that entered in year t0 and firms that entered in previous periods is related to the survival probability. Figure A1 of the appendix suggests that this gap has been relatively similar across years, comparing the entrance of firms in period t0 with period t-1.

Among new entrants, the share of HGFs is larger and has been increasing over time (table 6). This pattern is observed for all definitions. The number is slightly larger, conditioned on surviving over 3-years period. When analyzing the share of HGFs and their number of jobs across firm cohorts, we observe that they are more prevalent among younger firms.

Table 6 - Share of HGFs by the year they entered the market and jobs they generated (HGF1 definition)

Start Year	Share of Firms (A)				Share of Jobs (B)				Ratio (B)/(A)			
	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
<=1996	8.8	5.7	5.4	4.6	14.0	7.9	7.1	3.8	1.6	1.4	1.3	0.8
1997	20.4	6.9	6.6	3.7	43.6	10.9	9.9	7.4	2.1	1.6	1.5	2.0
1998		8.4	7.3	5.4		15.7	11.8	3.6		1.9	1.6	0.7
1999		9.6	7.3	5.6		24.8	11.3	5.4		2.6	1.5	1.0
2000		12.6	9.3	6.3		32.1	12.1	4.8		2.5	1.3	0.8
2001		15.3	11.5	5.9		41.6	20.5	6.5		2.7	1.8	1.1
2002		28.8	10.5	6.9		76.0	11.9	6.6		2.6	1.1	1.0
2003			10.5	7.7			14.7	11.8			1.4	1.5
2004			12.9	8.2			27.5	9.8			2.1	1.2
2005			15.5	7.7			28.4	10.4			1.8	1.4
2006			17.3	8.7			36.2	12.0			2.1	1.4
2007			37.1	9.0			82.1	10.9			2.2	1.2
2008				10.1				11.5				1.1
2009				11.5				32.3				2.8
2010				14.1				28.5				2.0
2011				14.9				22.0				1.5
2012				35.7				77.9				2.2

Note: The first column shows the year that the firm was born. Tables A6 and A7 of the appendix presents the information for every year between 2000 and 2015.

Consistent with the fact that the share of HGFs is higher among younger firms (e.g. new entrants), the average age of HGFs in Tunisia is smaller than the average of all firms, independently of the definition. Between 20% and 37% of new firms (e.g. born three years before 2000, 2005, 2010, and 2015) are HGFs. As we move to older cohorts, the share of HGFs decreases (Table 6). Similarly, younger HGFs are responsible for a larger share of jobs within their cohorts. Among new entrants in 2005, 2010, and 2015, almost 80% of the jobs were generated by HGFs. This proportion decreases among older cohorts. This is consistent with the fact that on average it is

¹³ The exit rate varied between 4,000 and 6,000 firms per year over the 1999-2015 period, with the exception of 2004 when almost 12,000 firms exited the market.

harder for older and larger firms to achieve high growth rates, as suggested by the results presented in the next section.

Despite the importance of HGFs, it is very unlikely that a firm achieves high growth over many consecutive years. To test this hypothesis, we follow all firms that existed in 1996 for more than a decade, evaluating their status as: i) high-growth; ii) non- high-growth; iii) exit the market. Table A3 of the appendix summarizes this exercise. From a total population of 43,600 firms that were registered in Tunisia in 1996, only 5 firms, which is 0.01%, achieved the status of high growth (based on the HGF1 definition) in 2000, 2003, 2006, and 2009, consecutively. About 22.5% of firms exited the market by 2009. Also, about 13% of those firms that existed in 1996 managed to survive until 2009 and achieve HGF status at least once over this period. Yet, conditional on the number of firms that never exited the market between 1996 and 2009 (about 34%), almost 34.7% became HGF at least once over this period. This number suggests that almost 1 in every 3 firms that existed in 1996 survived until 2009. Among those firms that survived over this period, 1 in every 3 firms were HGF at least once over this period. Therefore, HGF status is better thought of as a phase during a firm’s lifecycle rather than a more permanent attribute of a firm.

The average growth rate of HGFs in Tunisia is significantly larger than the average of the total sample, independently of the HGF definition adopted (Table 7). A similar pattern is identified among new firms, which have even higher growth rates. The cumulative growth rate of HGFs, defined by the HGF1 criteria, is about 259 percent, and almost 400 percent over the same period, if these are new firms, while the average cumulative growth for all firms is about 26.8 percent. When analyzing the growth rates over time, we see persistent differences across HGF definitions and significant variations across years. For example, the year of 2009 shows the highest average growth for all the HGF definitions.

A potential explanation for these variations could be related to aggregate demand shocks associated with economic growth. To test this hypothesis, we analyzed the correlation between economic growth and the average growth rates of firms across different HGF definitions. Yet, the correlations between GDP growth or per capita GDP growth and the average growth of firms are weak and not statistically significant in most cases (see details in figure A2 in the appendix).

Table 7- Average cumulative growth of HGF

HGFs	Average		Average (HGF new firms)	
HGF 1	259.2	***	393.2	***
HGF 2	257.5	***	521.1	***
HGF 3	289.7	***	425.5	***
Total firms	26.8			

Note: *** statistically different from the average cumulative growth for the full sample at 1%. In the case of the new firms that are HGFs, their average growth rates are also larger and statistically different from total HGFs samples.

5 HGF Characteristics

There are several potential determinants of HGFs emphasized by the literature. Audretsch (2012) summarizes this discussion and presents a few potential candidates, including: i) Managerial skills of the entrepreneur and the founding teams (e.g. better managerial skills and level of education); ii) Access to finance; iii) Market orientation (e.g. access to the external market); iv) Human capital (e.g. availability and capacity to attract skilled employees); v) Geographic clusters, among others; and vi) Demand shocks.

We focus on identifying correlations that highlight important observable characteristics of HGFs in Tunisia, related to size, age, trade, and foreign ownership. We then test the robustness of these associations controlling for different factors and across different HGF definitions. To proceed with this analysis, we use a linear probability model, based on an ordinary least square (OLS) estimator, following this empirical specification:

$$Y_{it} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \beta_4 Employment_{i(t-3)} + \beta_5 Exports (3years)_{it} + \beta_6 Imports (3years)_{it} + \beta_6 Foreign_{it} + \beta_6 Offshore_{it} + \delta_s + \rho_r + \theta_t + \varepsilon_{it} \quad (1)$$

Where Y_{it} refers to the HGFs' outcome of interest (e.g. HGF status) of firm i , at time t .¹⁴ Age_{it} is the age of firm i , at time t , in number of years and age_{it}^2 is its square value. $Employment_{i(t-3)}$ refers to the initial employment level of the firm. $Exports (3years)_{it}$ is the number of times the firm was an exporter in the last 3 years. The value can vary from 0 to 3. $Imports (3years)_{it}$ is the number of times the firm was an importer in the last 3 years. The value can vary from 0 to 3. $Foreign_{it}$ takes the value of 1 if the firm is owned by a foreigner and zero otherwise, and $Offshore_{it}$ takes the value of 1 if the firm benefits from offshore tax incentive and zero otherwise. δ_s is the sector fixed effects, ρ_r is the region fixed effects, θ_t is the year fixed effects, and ε_{ist} is the error-term. Based on the descriptive presented in the previous sections and previous literature, we expect HGF status to be negatively associated with age and size, and positively associated with trade activity and foreign direct investments.

Table 8 presents the results. It shows that age and initial level of employment are negatively associated with HGF status. The results confirm that high-growth status is more common across younger and smaller firms. The divergent signs related to the variable age and its square suggest a non-linearity where the negative association with HGF status increases at early ages, but the marginal effects become positive after a given age threshold. This threshold varies across specifications, but the marginal effect of age is negative around the average age of firms (14 years of age) for all specifications. An additional year of age for an average 14-year-old firm is associated with a reduction in the likelihood of achieving high growth of about 0.9%, based on the HGF1 definition. Also, an increase in 1 log point in the number of employees is associated with a

¹⁴ The HGF status is calculated based on the definitions previously described over 3-years growth rate average.

reduction of about 5% in the likelihood of high growth, everything else constant. All estimations control for sector, region, and year-fixed effects, as well as trade activities and foreign ownership.

Table 8 – Results of equation 1 across different definitions of HGFs (OLS)

	HGF1	HGF2	HGF3
age	-0.011*** (0.000)	-0.009*** (0.000)	-0.010*** (0.000)
age ²	0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)
Log of employment (t-3)	-0.044*** (0.001)	0.046*** (0.001)	-0.041*** (0.001)
Exports 3-years	0.005*** (0.001)	0.014*** (0.002)	0.004** (0.001)
Imports 3-years	0.030*** (0.001)	0.032*** (0.001)	0.027*** (0.001)
Foreign	0.025*** (0.005)	0.024*** (0.006)	0.025*** (0.005)
Offshore	0.079*** (0.004)	0.092*** (0.005)	0.078*** (0.004)
Fixed Effects			
Sector	Yes	Yes	Yes
Region	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	539,550	539,550	539,550
R-sq	0.069	0.141	0.066

Note: ***, **, and * are statistically significant at 1%, 5%, and 10%, respectively. Results include sector fixed effects based on 31 sectors, and regional fixed effects, based on 24 Governorates.

With respect to trade, our results suggest a positive and statistically significant association between the number of times firms export or import over a 3-year period and HGF status. Results for imports are consistent and robust across all specifications. An increase of 1 year of exporting activity (e.g. from being a non-exporter to exporting for a year over the last three years or adding a year of exporting activity) is associated with an increase of 0.5% in the likelihood of high-growth status, following the HGF1 definition. Being an importer is also associated with higher likelihood of HGF status, but the coefficient is larger. An increase of 1 year of importing activity is associated with an increase of 3% in the in the likelihood of high-growth status.¹⁵ The differences in the size of these coefficients are important, given the disproportional attention given to export performance, vis-à-vis import activities. In line with export and import activities, our results also

¹⁵ This estimation assumes a linear relationship regarding exporting and importing statuses. It means that the marginal estimates associated with becoming an exporter (importer) or exporting (importing) an additional year with high-growth status are constant.

suggest a positive association between foreign direct investments, under the form of foreign ownership, and high-growth status. There is also a positive association between benefiting from offshore tax incentive schemes and high-growth status.

Results are still robust if controlling for turnover and number of exporting firms in the sector, in the region, or in the sector-region (see table A8 of the appendix). While the initial number of employees is negatively associated with HFG status, the initial level of turnover in year t-3 is positively associated with HGF status for all definitions. The coefficients for both variables are statistically significant at the 95% level for all definitions and specifications we have tested. Because the variable turnover is not available for a large amount of firms, they are not included in the main results presented in table 8.

To analyze if the associations between these variables are still present when controlling for observable and unobservable firm characteristics that do not vary over time, we use the following linear probability model with panel fixed-effects.

$$Y_{it} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \beta_3 Employment_{i(t-3)} + \beta_4 Exports(3years)_{it} + \beta_5 Imports(3years)_{it} + \beta_6 Foreign_{it} + \beta_7 Offshore_{it} + \mu_i + \theta_t + \varepsilon_{it} \quad (2)$$

Where μ_i refers to firm-level fixed effects.

Table 9 – Results of equation 2 across different definitions of HGFs (Panel Fixed Effects)

	HGF1	HGF2	HGF3
age	-0.011*** (0.000)	-0.008*** (0.000)	-0.010*** (0.000)
age ²	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Log of employment (t-3)	-0.352*** (0.002)	-0.200*** (0.002)	-0.329*** (0.002)
Exports 3-years	0.007*** (0.002)	-0.008** (0.003)	0.005** (0.002)
Imports 3-years	0.016*** (0.001)	0.009*** (0.002)	0.015*** (0.001)
Foreign	-0.006 (0.048)	-0.052 (0.066)	-0.001 (0.046)
Offshore	-0.016 (0.042)	-0.026 (0.066)	-0.002 (0.040)
Fixed Effects			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	539,550	539,550	539,550
R-sq	0.274	0.129	0.272

Note: ***, **, and * are statistically significant at 1%, 5%, and 10%, respectively.

The results of panel fixed effects (table 9) suggest that even after controlling for time-invariant firm observable and unobservable characteristics, the relationship between the age of the firm, as well as initial level of employment with HGF status are significant. The export coefficient is positive under the HGF1 and HGF3 definitions, but becomes negative under the HGF2 definition. Foreign and Offshore statuses are also negative, but not significant. Yet, these variables have low variation within-firm, given that a very small share of firms change their FDI or offshore status over time.

We cannot infer any causal relationship based on the results presented in table 8. The simultaneity between HGF status and trade activities, as well as with other relevant factors that are not observed in the model are important challenges to be addressed in order to understand the key determinants of high-growth status. It might be that unobservable variables (e.g. skills, persistence, or experience of the entrepreneur or manager, or other internal shocks that lead to improvements in technology and productivity) explain both, the export or import performance of the firm, as well as the high-growth status. The same apply for other covariates. Moreover, firms may be exposed to other internal shocks (e.g. productivity, improvements in managerial practices) that could simultaneously lead to more exports and higher growth in the domestic market. Yet, these results suggest a strong association between trade-related activities and FDI with high-growth status in Tunisia, which emphasizes the importance of further understanding these channels when designing business support policies, especially those with focus on small and medium-size firms (SMEs).

6 Conclusion

This paper analyzes the dynamics of HGFs in Tunisia. The paper compares several indicators related to different HGF definitions, based on number of employees. Overall, we show some regularities in patterns of HGFs over time, irrespective of the HGF definition. The share of HGFs is remarkably stable across years, but varies across sectors. Among new firms, there is a larger share of HGFs and this share has been increasing over time. We show that almost one in every three firms that survive for more than a decade has achieved high-growth status at least once. Thus, HGF status is better thought of as a phase during a firm's lifecycle rather than a more permanent attribute of a firm.

Younger and smaller firms are more likely to achieve high growth. HGF status is positively and significantly associated with exports, imports, receiving *offshore* tax incentives, and foreign ownership. When controlling for firm-level time-invariant characteristics (panel fixed effects), the association between exports and imports with HGF status is still significant, but the results are more robust for importing status. Although we cannot infer any causal relationship based on these associations, these results reinforce the importance of trade and FDI related channels, particularly imports, when designing and implementing SME policies aiming to support firms with high growth potential.

References

- Autio, E., Arenius, P., & Wallenius, H. (2000). Economic impact of gazelle firms in Finland. Working Papers Series 2000:3, Helsinki University of Technology, Institute of Strategy and International Business, Helsinki.
- H Arouri, AB Youssef, F Quatraro (2016). Entry, exit and net job creation in Tunisia: an exploratory analysis. *Eurasian Business Review* 6 (3), 323-337
- H Arouri, A Ben Youssef, F Quatraro, M Vivarelli (2018), The Determinants of Young Firms Growth in Tunisia. IZA Discussion Papers, n. 11400.
- Baghdadi L., Ben Khedhr S. and Arouri H., (2017), "In search of a new development model for Tunisia: Assessing the performance of the offshore regime", ERF Working Paper.
- Bianchini, S., Bottazzi, G., Tamagni, F. (2016). What does (not) characterize persistent corporate high-growth? *Small Business Economics* 47.
- Birch, D.L. (1979), *Job Generation Process*, Cambridge, MA: Joint Center for Neighborhood and Regional Development, MIT.
- Birch, D.L., Medoff, J.L. (1994). Gazelles. In: Solmon LC, Levenson AR (eds) *Labor markets, employment policy, and job creation*. Westview Press, Boulder, pp 159–167
- Birch, D.L., Haggerty, A., Parsons, W. (1995). *Who's creating jobs?* Cognetics Inc, Boston
- Bjuggren, C.M., Daunfeldt, S.O., Johansson, D. (2013). High-growth firms and family ownership. *Journal of Small Business and Entrepreneurship* 26 (4):365–385
- Bottazzi, G., Secchi, A. (2006). Explaining the distribution of firm growth rates. *RAND Journal of Economics* 37 (2): 235-25.
- Brüderl, J., Preisdörfer, P. (2000). Fast-growing businesses: empirical evidence from a German study. *International Journal of Sociology* 30(3):45–70.
- Clayton, R.L., Sadeghi, A., Spletzer, J.R., Talan, D.M. (2013). High-employment-growth firms: defining and counting them. *Monthly Labor Review* 136 (6):3.
- Coad, A., Daunfeldt, S-O., Johansson, D., Wennberg, K. (2014). Whom do high-growth firms hire? *Industrial and Corporate Change* 23 (1): 293–327.
- Capasso, M., Cefis, E., Frenken, K. (2013). On the existence of persistently outperforming firms. *Industrial and Corporate Change* 23 (4):997–1036.
- Daunfeldt, S.O., Elert, N. & Johansson, D. (2014). The Economic Contribution of High-Growth Firms: Do Policy Implications Depend on the Choice of Growth Indicator? *Journal of Industry, Competition and Trade* 14 (3), pp 337–365
- Daunfeldt, S.-O., Halvarsson, D. (2015). Are high-growth firms one-hit wonders? Evidence from Sweden. *Small Business Economics* 44:361–383.

- Daunfeldt, S.O., Johansson, D., Halvarsson, D. (2015). "Using the Eurostat-OECD definition of high-growth firms: a cautionary note", *Journal of Entrepreneurship and Public Policy*, Vol. 4 Iss 1 pp. 50 - 56
- Du, J., Temouri, Y. (2015). High-growth firms and productivity: evidence from the United Kingdom. *Small Business Economics* 44:123–143
- Eurostat-OECD (2007). Eurostat-OECD Manual on Business Demography Statistics.
- Goedhuys, M., Sleuwaegen, L. (2010). High-growth entrepreneurial firms in Africa: a quantile regression approach. *Small Business Economics* 34 (1): 31–51.
- Grover, G. A., Medvedev, D.; Olafsen, E. (2019). High-Growth Firms: Facts, Fiction, and Policy Options for Emerging Economies. Washington, DC: World Bank.
- Hölzl, W., Friesenbichler, K. (2010). High growth firms, innovation and the distance to the frontier. *Econ Bull* 30(2):1016–1024
- Holz, W. (2014). Persistence, survival, and growth: a closer look at 20 years of fast-growing firms in Austria. *Industrial and Corporate Change* 23 (1): 199–231.
- Haltiwanger, J., R. S. Jarmin, and J. Miranda. 2013. "Who Creates Jobs? Small versus Large versus Young," *The Review of Economics and Statistics* 95(2): 347-361.
- Haltiwanger, J., R. S. Jarmin, R. Kulick, and J. Miranda. 2017. "High Growth Young Firms: Contribution to Job, Output, and Productivity Growth," in Haltiwanger, J., E. Hurst, J. Miranda, and A. Schoar (eds), *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*, NBER: University of Chicago Press.
- Lopez-Garcia, P., Puente, S. (2012). What makes a high growth firm? A probit analysis using Spanish firm-level data. *Small Bus Econ* 39:1029–1041
- Reyes, Jose Daniel (2017). FDI spillovers and high-growth firms in developing countries (English). Policy Research working paper; no. WPS 8243. Washington, D.C: World Bank Group.
- Schreyer, P. (2000). High-Growth Firms and Employment. OECD Science, Technology, and Industry Working Papers, 2000/03, OECD Publishing, Paris.

Appendix

Figure A1 – Total number of new firms

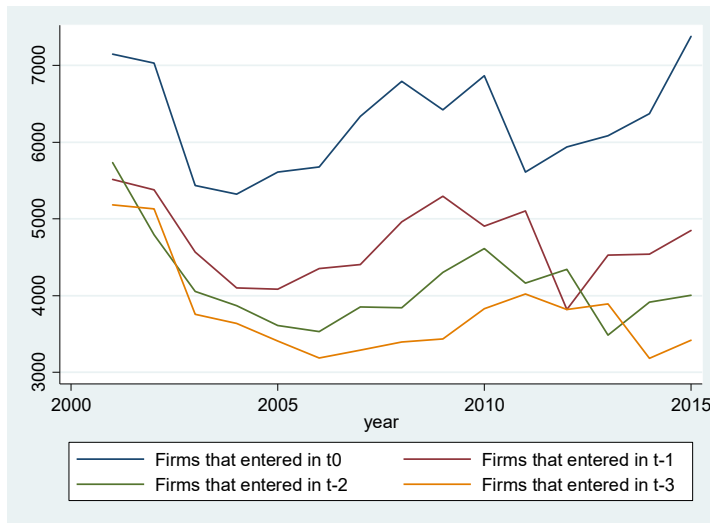
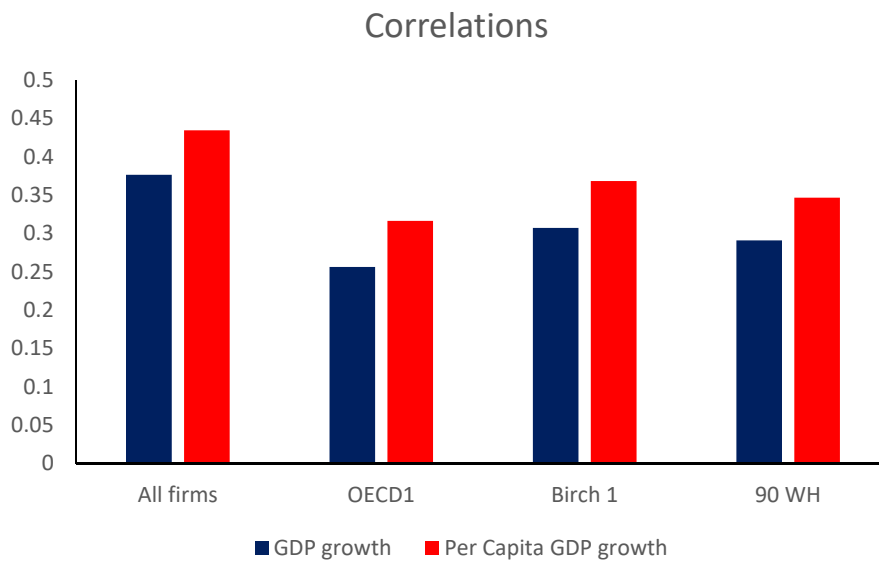


Figure A2 – Correlations between average growth of firms and economic growth



Source: WDI and RNE micro data.

Note: (*) significant at 5%. The correlations are not significant at 5%.

Table A1 - Number of firms and share of HGF by different definitions (Full sample)

Year	Number of firms	HGF1 (Share %)	HGF2 (Share %)	HGF3 (Share %)
2000	57,029	7.4	6.1	6.3
2001	59,983	7.3	5.7	6.3
2002	61,290	7.3	6.4	6.3
2003	54,886	8.1	6.6	6.9
2004	54,145	7.9	6.7	6.8
2005	54,906	7.3	6.8	6.1
2006	55,959	7.2	6.7	6.1
2007	58,746	7.4	6.6	6.4
2008	60,798	7.7	6.5	6.6
2009	62,568	7.8	6.5	6.6
2010	63,915	8.4	6.6	7.2
2011	63,128	8.1	6.8	7
2012	63,731	7.7	6.9	6.6
2013	65,728	7.5	6.9	6.5
2014	67,104	7.6	6.8	6.5
2015	69,110	7.4	6.7	6.4
Total (average)	60,814	7.6	6.6	6.5

Table A2– Share of HGF among new firms and average age of HGFs

year	HGF1	HGF2	HGF3
1999	13.9	11.3	11.9
2000	15.2	10.5	13.3
2005	27.4	19.3	24.3
2010	35.7	23.8	33.0
2015	33.9	23.1	31.2
Total	28.4	19.2	25.8
St Dev.	6.1	4.0	5.8
Average age of HGFs			
Total	11.4	8.1	9.4
St. dev.	0.9	0.3	0.5

Table A3– Dynamics of HGF in Tunisia (HGF1 definition)

Start Year	2000	2003	2006	2009	Total	Share
1996	HGF	HGF	HGF	HGF	5	0.01
				nHGF	8	0.02
			nHGF	HGF	6	0.01
				nHGF	116	0.27

			exit	exit	19	0.04	
			exit	nHGF	8	0.02	
			exit	exit	15	0.03	
		nHGF	HGF	HGF	35	0.08	
				nHGF	79	0.18	
				exit	10	0.02	
			nHGF	HGF	36	0.08	
				nHGF	1,151	2.64	
				exit	192	0.44	
			exit	HGF	9	0.02	
				nHGF	147	0.34	
				exit	332	0.76	
		exit	nHGF	HGF	14	0.03	
				nHGF	148	0.34	
	exit			17	0.04		
	exit		nHGF	11	0.03		
	nHGF	HGF	HGF	HGF	17	0.04	
				nHGF	33	0.08	
				exit	2	0.00	
			nHGF	HGF	38	0.09	
				nHGF	975	2.24	
				exit	140	0.32	
			exit	HGF	7	0.02	
				nHGF	100	0.23	
				exit	200	0.46	
			nHGF	HGF	HGF	234	0.54
					nHGF	420	0.96
					exit	75	0.17
				nHGF	HGF	282	0.65
					nHGF	9,912	22.72
		exit			1,684	3.86	
		exit	HGF	HGF	59	0.14	
				nHGF	1,224	2.81	
				exit	3,509	8.04	
			exit	nHGF	85	0.19	
		exit	nHGF	nHGF	1,317	3.02	
				exit	226	0.52	
				exit	HGF	4	0.01
			exit	nHGF	176	0.40	
				exit	7,202	16.51	
				exit	HGF	49	0.11
			exit	HGF	nHGF	78	0.18
					exit	4	0.01
					exit	HGF	61
				nHGF	nHGF	1,485	3.40
		exit			174	0.40	
		exit			HGF	9	0.02
exit		nHGF		nHGF	110	0.25	
				exit	752	1.72	
				exit	HGF	17	0.04
		exit		nHGF	215	0.49	
exit				88	0.20		
exit				HGF	4	0.01	
exit		nHGF		124	0.28		
exit		exit		9,837	22.55		

Table A4 - Share of firms in the economy by the year they entered the market

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<=1996	53.7	49.0	45.2	43.4	40.2	37.3	34.8	32.0	29.3	27.3	25.3	24.2	24.4	21.4	20.0	18.7
1997	13.4	12.2	11.1	10.4	9.5	8.7	8.1	7.4	6.8	6.2	5.8	5.5	3.8	5.0	4.6	4.2
1998	9.1	8.0	7.1	6.3	5.8	5.4	4.9	4.5	4.1	3.8	3.5	3.3	3.0	2.6	2.9	2.5
1999	11.3	9.8	8.6	7.5	6.8	6.2	5.6	5.2	4.8	4.4	3.9	3.8	3.5	3.2	2.9	3.0
2000	12.6	9.2	7.8	6.8	6.1	5.5	5.1	4.6	4.1	3.8	3.5	3.3	3.1	3.0	2.7	2.4
2001		11.9	8.8	7.5	6.9	6.2	5.6	5.1	4.7	4.3	4.0	3.7	3.5	3.2	3.1	2.8
2002			11.5	8.3	7.3	6.4	5.8	5.2	4.7	4.4	3.9	3.7	3.5	3.2	3.0	2.8
2003				9.9	7.6	6.7	5.9	5.3	4.8	4.3	4.0	3.6	3.4	3.2	3.0	2.7
2004					9.8	7.4	6.4	5.7	5.0	4.6	4.2	3.9	3.7	3.4	3.1	2.8
2005						10.2	7.8	6.7	5.9	5.3	4.8	4.4	4.2	3.8	3.6	3.2
2006							10.2	7.5	6.4	5.8	5.2	4.7	4.3	4.0	3.7	3.3
2007								10.8	8.2	7.0	6.3	5.7	5.2	4.8	4.4	4.0
2008									11.2	8.5	7.4	6.5	6.0	5.4	4.9	4.5
2009										10.3	7.7	6.7	6.2	5.6	5.1	4.6
2010											10.7	8.1	7.0	6.3	5.7	5.1
2011												8.9	6.0	5.8	5.2	4.6
2012													9.3	6.9	6.0	5.3
2013														9.3	6.8	5.9
2014															9.5	7.0
2015																10.7

Table A5 - Share of jobs in the economy by firms' cohorts (the year firms entered the market)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<=1996	75.1	70.5	66.6	63.5	60.2	56.7	53.3	49.4	45.5	42.4	40.4	40.4	42.1	38.9	36.9	31.5
1997	10.8	10.3	10.0	9.2	9.2	8.8	8.0	7.3	6.5	6.3	5.9	5.7	3.0	5.8	5.4	5.6
1998	4.8	5.0	4.7	4.8	4.4	4.2	4.0	3.8	3.3	3.3	2.9	2.6	2.3	2.0	2.1	1.7
1999	5.7	5.7	5.4	5.2	4.9	4.5	4.4	4.0	3.6	3.4	3.0	2.6	2.4	2.4	2.1	2.0
2000	3.7	5.2	5.5	5.5	5.0	4.6	4.3	4.0	3.6	3.1	2.9	2.7	2.6	2.4	2.4	1.9
2001		3.4	4.6	4.8	4.7	4.5	4.5	4.3	4.1	3.9	3.6	3.1	3.0	3.0	3.0	2.5
2002			3.2	4.4	4.8	5.1	4.7	4.0	3.9	3.5	3.3	2.9	2.7	2.7	2.5	2.2
2003				2.6	3.7	3.9	3.8	3.7	3.2	3.1	2.5	2.3	2.1	1.9	1.8	1.5
2004					3.3	4.4	4.7	4.6	4.0	3.8	3.7	3.6	3.5	3.0	3.2	2.6
2005						3.3	4.7	4.9	4.9	4.6	4.1	4.1	4.0	3.9	3.7	3.1
2006							3.7	5.8	6.2	6.3	5.8	4.3	4.1	3.7	3.4	2.8
2007								4.3	7.0	7.3	7.3	7.2	7.3	6.3	6.4	4.4
2008									4.3	6.2	6.9	6.5	6.3	5.8	5.1	4.8
2009										2.9	4.4	4.2	4.1	3.9	4.0	3.5
2010											3.2	4.5	4.4	4.2	3.8	3.3
2011												3.2	3.7	4.3	4.6	3.9
2012													2.5	3.6	3.9	3.9
2013														2.4	3.3	3.2
2014															2.7	3.3
2015																12.6

Table A6 - Share of HGFs firms' cohorts (the year firms entered the market)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1997	20.4	11.4	9.8	9.6	7.9	6.9	6.8	6.6	6.5	6.4	6.6	5.8	5.5	5.4	5.3	3.7
1998		26.7	13.3	12.8	10.2	8.4	7.8	7.7	8.3	7.9	7.3	5.9	6.0	5.1	5.2	5.4
1999			24.0	13.7	11.6	9.6	8.4	8.6	8.1	7.8	7.3	7.1	5.9	5.8	5.9	5.6
2000				33.2	14.9	12.6	11.4	10.9	10.6	9.2	9.3	7.1	7.4	6.3	5.8	6.3
2001					33.2	15.3	12.9	11.2	11.7	10.5	11.5	9.7	8.3	7.3	7.5	5.9
2002						28.8	15.2	13.1	11.3	10.6	10.5	9.0	6.5	6.3	6.7	6.9
2003							29.4	14.9	12.9	11.8	10.5	8.1	7.9	7.7	7.7	7.7
2004								34.4	17.5	15.1	12.9	11.0	9.3	8.1	8.3	8.2
2005									32.2	16.9	15.5	12.6	9.1	7.8	7.4	7.7
2006										33.6	17.3	13.4	11.7	9.6	9.3	8.7
2007											37.1	16.9	12.6	11.1	9.3	9.0
2008												35.5	16.3	12.6	12.0	10.1
2009													32.8	14.9	13.0	11.5
2010														32.3	17.2	14.1
2011															36.0	14.9
2012																35.7

Note: Based on the HGF1 definition.

Table A7- Share of jobs in HGFs with respect to the total amount of jobs by firms' cohorts (the year firms entered the market)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1997	43.6	31.2	24.9	16.4	15.1	10.9	8.8	8.5	8.8	12.1	9.9	12.0	10.3	11.8	7.6	7.4
1998		72.3	39.8	34.4	23.8	15.7	18.3	14.5	10.9	10.8	11.8	10.7	11.8	12.3	5.5	3.6
1999			67.2	36.9	28.2	24.8	16.2	14.6	12.9	13.0	11.3	9.2	6.0	11.0	6.1	5.4
2000				77.3	37.7	32.1	23.7	21.5	16.9	12.9	12.1	13.0	13.7	10.3	6.7	4.8
2001					70.4	41.6	38.9	36.7	18.7	18.1	20.5	20.7	23.2	14.7	10.1	6.5
2002						76.0	38.6	34.1	26.9	14.8	11.9	10.4	7.4	7.8	6.2	6.6
2003							70.8	44.9	32.6	19.6	14.7	12.1	19.5	13.7	10.3	11.8
2004								68.9	34.7	28.9	27.5	25.7	21.7	16.0	13.1	9.8
2005									69.1	40.5	28.4	24.9	20.1	16.0	12.1	10.4
2006										76.8	36.2	26.2	19.9	15.2	13.5	12.0
2007											82.1	33.6	44.5	31.7	26.0	10.9
2008												69.8	44.0	37.5	21.0	11.5
2009													70.5	40.4	34.9	32.3
2010														70.1	37.1	28.5
2011															61.7	22.0
2012																77.9

Note: Based on the HGF1 definition.

Table A8 – Results of equation 1 across different definitions of HGFs (panel random effects)

	HGF1	HGF2	HGF3
age	-0.015*** (0.001)	-0.012*** (0.000)	-0.013*** (0.001)
age ²	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Log of employment (t-3)	-0.152*** (0.002)	-0.022*** (0.001)	-0.142*** (0.001)
Exports 3-years	0.023*** (0.002)	0.028*** (0.002)	0.022*** (0.002)
Imports 3-years	0.037*** (0.001)	0.039*** (0.001)	0.035*** (0.001)
Foreign	0.106*** (0.007)	0.093*** (0.007)	0.104*** (0.007)
Turnover (t-3)	0.037*** (0.001)	0.023*** (0.001)	0.033*** (0.001)
Export-Sector-Region	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Fixed Effects			
Sector	Yes	Yes	Yes
Region	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	273,390	273,390	273,390