Small, young, and early exporters: New evidence on the determinants of firm growth

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Abstract

This work investigates how the interaction of firms' age and size contributes to shape their relative growth patterns. We also employ information on the international activities of firms at their earlier stage as a proxy of their capabilities and growth willingness. We address this research question resorting to a novel set of data that covers the universe of Italian business firms and their custom-level data.

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1 Introduction

An important stream of literature within industrial economics has for long been interested in assessing the contribution to employment creation stemming from the different firm-size classes. In this respect, at least since Birch (1981), small firms have been considered as the most important source of job creation. The increasing availability of firm level dataset has further contributed to foster research on the issue, starting from the seminal works of Davis and Haltiwanger (1992) and Davis et al. (1996). These studies represented a relevant advancement for the understanding of employment and industrial dynamics, in that they confirmed, by means of new methodological and empirical tools, that smaller firms are major players in terms of job churning, hence contributing both to employment creation and destruction. Although employing firm (or plant) level data, the main purpose of such stream of literature was to identify the category of firms that are more relevant for both churning and net employment creation, hence the focus is more on the sector and economy-wide implications of firm-level pattern of growth.

A much related stream of literature, dating at least as back as to Penrose (1959) had relatively focused more on the firm, on its growth pattern and determinants. In this respect, the growing availability of firm-level dataset has provided the researchers the unprecedented opportunity to empirically investigate for a variety of potential determinants of firm growth, from innovation to financial performance, from relative productivity to export status and many other firm-specific factors (a recent survey of this rich literature is in Coad, 2009).

The recent economic slowdown and its consequences further complicated the task of the policy analysist and that of the economist seeking to identify the determinants of firm growth and the role of distinct categories of firms in contributing to aggregate growth. In most industrialized countries, over the last five years the growth rate of GDP per capita has been close to zero, if not negative, (Fig. 1.1 from OECD, 2012). In such a scenario, also the most standard and reliable predictors of firm performance, such as productivity or export status, did not regularly allow to discriminate between high and low growth firms. Rather unexpectedly, higher than industry average productivity does not appear to translate into higher firm growth (Bottazzi et al., 2010; Dosi et al., 2012) similarly, exporting firms are not distinguishable in term of growth patterns from non exporters (Grazzi, 2012). In this respect, also the long standing evidence according to which smaller firms tend to display higher growth rates has been challanged recently. Haltiwanger et al. (2013) and Lawless (2014), for example, show that once accounting for firm age, the inverse relationship between growth and size declines very markedly or even disappears. These recent contributions confirm the continuing need of empirical work to assess the evidence about the determinants of firm growth.

The contribution of the paper to the literature on firm growth is twofold. First,

by resorting to the uncensored population of Italian manufacturing firms we investigate the role of several firm characteristics in explaing the growth of companies. The unprecedented availability of the universe of firms enables us to insulate against recurring issues due to censoring and selection bias. Second and foremost, departing from the literature on firm growth recalled above, we identify and focus our analysis on a category of firms, young exporters, which displays several of the characteristics of high growth businesses. The fact that productivity does not show a systematic relation to firm growth suggest that such (or a similar) efficiency measure might capture the relative "ability" of the firm within the industry, but not necessarily its willingness to take up new business opportunities. In this respect, setting up a new firms which exports since its very inception, signals both the existence of the skills and capabilities required to engage in international trade and, at least as relevant, the willingness to look for growth opportunities not only domestically, but also abroad.[1]

Our findings reveal that small and young firms are the best performing players in terms of average growth rates and net job creation rates. Among them, early exporters show a better performance than non exporters. Both age and size have a negative impact on growth. In particular, we find that, controlling for age, the negative size-growth relationship does not disappear, contrary to the recent evidence mentioned above. However, we do confirm, in line with most studies, that the negative impact of size on growth is more relevant for young and small firms.

The paper is organized as follows. Section 2 describes the data and provides a first descriptive account of age-size profile and growth patterns of firms. Section 3 offers a non-parametric analysis of growth rate distributions of exporting and non exporting firms. In Section 4 we present statistics on job creation, job destruction, and net growth. Section 5 presents the results of the regression analysis. Section 6 concludes.

2 Data, variables and descriptive analysis

2.1 Dataset description

The analysis is based upon two firm-level datasets collected by the Italian statistical office (ISTAT), namely the Business Register known as "Archivio Statistico Imprese Attive" (ASIA) and Statistiche del Commercio Estero (COE). ASIA is the register of all active Italian businesses. It covers the period 1998-2006 and contains information on firms' operations including the number of employees, total

[1] In this respect, the signalling effect of being an exporter at an early life stage, is more nuanced as the firm gets older and bigger.

Table 1: Observations by year and export status

Year	All firms	Non exporters	Exporters	Exporters(%)
2000	1,217,251	1,107,791	109,460	8.99
2001	1,252,809	1,140,341	112,468	8.98
2002	1,335,538	1,219,673	115,865	8.67
2003	1,387,156	1,271,768	115,388	8.32
2004	1,418,365	1,305,327	113,038	7.97
2005	1,435,918	1,326,702	109,216	7.60
2006	1,494,419	1,380,913	113,506	7.59

Note. Exporters are defined as firms with strictly positive exports. Authors' computation from ASIA and COE data.

turnover,[2] geographic location of the firm, and much relevant for this work, firm's age, defined as the year of incorporation. The COE dataset consists of all cross-border transactions performed by Italian firms and it covers the period 2000-2007. Using the unique identification code of the firm, we link the firm-level export data from COE to ISTAT's archive of active firms. The data collection and building process of the integrated database are described at lenght in Grazzi et al. (2013).

Notice that the resulting dataset is not a sample but rather it covers the universe of Italian active firms and all international trade transactions. In the reminder of the paper a firm is defined as a legal entity reporting a positive number of full-time equivalent employees during the calendar year. Hence the present analysis excludes self-employment.[3] In the end the dataset employed in the empirical analysis consists of $9,541,456$ observations spanning from 2000 to 2006.

Table 1 reports the breakdown of our dataset by years and export status. The number of active businesses slightly increases over time, whereas the number of exporters, even if increasing in absolute terms, is decreasing as percentage of the total. Export participation over the universe of firms is rather low, around 9% in 2000, which is somewhat lower than most countries for which evidence is available (Bernard et al., 2007; International Study Group on Exports and Productivity, 2008). The reason is twofold. First, most of the times Structural Business Statistics are only available for firms above a certain size threshold. This is the case, for instance, of Serti and Tomasi (2008) which report a rather high export participation (around 70% for manufacturing firms) for firms bigger than 20 employees. Second, and related, the firm size distribution of Italian business companies is even more left skewed than that of other countries. The overwhelming presence of small firms contributes to further lower the percentage of exporting firms.

[2]Information on total turnover is available only in 2000 and 2003.

[3]See Davis et al. (2009) for a discussion of nonemployers' dynamics and its relationship with employer firms.

Table 2: Distribution of firms by age class and export status in 2000 (%)

Age class	All firms	Non exporters	Exporters
Age < 5	23.66	24.49	15.20
Age 5-10	22.53	22.77	20.08
Age 11-20	29.19	29.13	29.71
Age 21+	24.63	23.60	35.01
Total	100.00	100.00	100.00

Note. Pearson's chi-squared test of equal distribution of age classes across exporters and nonexporters: $\chi^2_3 = 9200$; Probability = 0.

2.2 Export participation and the age-size profile

The relation between firm size and export propensity has been much investigated in the literature, and the empirical consensus of a positive relationship (Wagner, 2001; Bernard et al., 2007) is well accounted by existing theories of sunk costs for export market participation (Melitz, 2003). On the contrary, the role of firm age has largely been neglected, mostly to data limitations. This paper provides the first evidence on the subject exploiting the universe of Italian firms.

The descriptive evidence suggets that export market partecipation rates vary with age. Table 2 assigns exporters, non Exporters and all firms to four age classes, respectively, less than five years from incorporation, between 5 and 10, between 10 and 20, and more than 20 years from incorporation. Note that the universe of firms is rather evenly distributed across age classes and the same occurs for non exporting firms. On the contrary, exporters are more concentrated in the category of firms with more than 20 years, encompassing 35% of exporting firms. The export propensity is increasing within age categories (not reported in the table), going from 5.78% of the first class to 12.78% of the last class. Hence, if being an exporter is already an exception with respect to the universe (9%, cf. Table 1) being a young exporter is even rarer.

The relation between firm age and export status is also shown in Figure 1 by means of kernel density estimation for the years 2000 and 2006. The linear decay in the distributions over most of their support suggests that an exponential law would be an acceptable representation of empirical distributions, with departures from the linear fit among the youngest and the oldest firms, in line with the evidence emerging from other studies (Coad, 2010; Coad and Tamvada, 2012; Barba Navaretti et al., forthcoming). In particular, notice that the modal age among non exporters is 2 years in 2000, whereas it is 24 years among exporters: this implies that the departure from the exponential benchmark is negligible in the

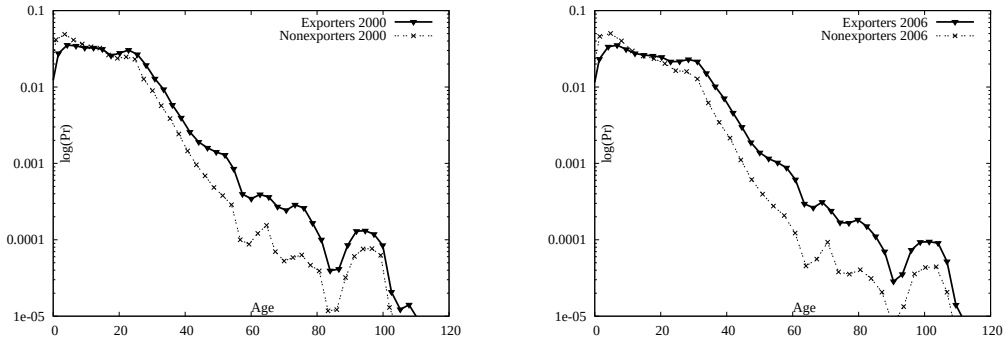


Figure 1: Kernel density of the age distribution for exporters and nonexporters, in 2000 and 2006. Kernel densities are computed using an Epanenchnikov kernel

Table 3: Transition matrix in and out of exporting

	Age < 5		Age 5-10		Age 11-20		Age 21+	
	0	1	0	1	0	1	0	1
0	98.10	1.90	98.20	1.80	98.13	1.87	97.76	2.24
1	22.61	77.39	21.73	78.27	19.33	80.67	15.62	84.38

Note. 0 and 1 represent the status of nonexporter and exporter.

case of nonexporting young firms, while it is quite pronounced in the case of young exporting firms.[4] One possible explanation of this is the decrease in exit rate from export markets observed during the first years of a firm's lifecycle (see below).[5] Finally, Figure 1 shows that the age distributions changed little over time.

Somewhat surprising, age only has a limited impact on the persistency of the export status, as shown by Table 3, which reports the annual transition matrix in and out of exporting for each age class. The probability to export in $t+1$, given that a firm was already exporting in the previous year, is around 77% in the first age class, and is increasing throughout the four classes. In general, the observed persistency in export status is quite high, in agreement with the available evidence from other countries, (see Roberts and Tybout, 1997 for data on Colombia, Bernard and Jensen, 2004 for U.S. and Grazzi, 2012 for sample of medium and large Italian firms). Both the high persistency and the low entry rate into export markets (first row of Table 3) provide supporting evidence to the sunk costs hypothesis (Melitz, 2003) for engaging into international trade. In particular,

[4] An exponential distribution would predict a modal age equal to the very youngest age group (Coad, 2010, p. 10).

[5] Coad (2010), along similar lines, explains the deviation from a linear fit in the case of the youngest firms with an increase in the survival rate.

the evidence of Table 3 shows that such explanation of exporting behaviour based on sunk costs is robust to age disaggregation.

As recalled above, firm size is known to be a relevant characteristic to predict the export status, since exporters are usually found to be bigger than nonexporters. In Table 4 we take advantage of information on both size and age to provide, for the year 2000, a complete descriptive account of the joint disribution of the variables we are mostly interested in: age, size and export status. In order to do so, we divide firms in four size classes: class 1 contains firms with employees > 0 and ≤ 1; class 2-9 contains firms with employees > 1 and ≤ 9; class 10-19 contains firms with employees > 9 and ≤ 19; class 20+ contains firms with employees > 19. Each cell of Table 4 reports the number of firms, the percentage over the total, and the percentage of exporting firms in the cell. The first two size classes account for more than 86% of all firms, which are distributed across age classes more or less according to the aggregate distribution observed above, with most firms aged between 11 and 20. Exporters are quite rare, in relative terms, among small firms: export propensity is around 2.4% in the first size class, and around 7.4% in the second class. In these two size classes, export propensity is stable or slightly increasing in age.

The ratio of exporters over nonexporters increases dramatically among firms in the last two size classes, which contain less than 14% of all firms, but with an export propensity which goes from around 24% in the class 10-19, to around 45% in the class 20-max. Focus in particular on this latter size class, here export propensity is markedly increasing in age, going from around 26% among young firms (age < 5), to around 57% among old firms (age 21+).

2.3 Growth rates

In order to study the pattern of growth of the different categories of firms (i.e. with respect to size, age and export status) we focus on the yearly growth rates of employment, as such variable is available for each year. In line with most of the previous literature, the growth rate is computed as the log-difference between two consecutive years:

$$g_{i,t} = log(Size_{i,t} - Size_{i,t-1}) \tag{1}$$

Figure 2 presents the growth rate distributions for all firms in 2001, together with the size distribution in the same year; Figure 3 presents the pooled growth rate distributions for exporters and nonexporters, by age class. We attribute growth rates to exporters or nonexporters based on the firm's export status at time $t-1$.

The right tail of the size distribution is quite near to the Pareto benchmark (a straight line of negative slope on log-log axes) whereas growth rates distributions

Table 4: Distribution of firms by age, size class and export status in 2000

	Size class				
Age Class	1	2-9	10-19	20+	All
Age < 5	126,465	136,638	15,899	8,941	287,943
	10.39	11.23	1.31	0.73	23.66
	2.59	6.23	15.91	25.95	5.78
Age 5-10	104,571	138,558	19,546	11,596	274,271
	8.59	11.38	1.61	0.95	22.53
	2.66	7.85	22.07	34.63	8.01
Age 11-20	122,150	182,548	31,054	19,517	355,269
	10.03	15.00	2.55	1.60	29.19
	2.15	7.60	24.86	42.52	9.15
Age 21+	90,895	150,722	30,137	28,014	299,768
	7.47	12.38	2.48	2.30	24.63
	2.06	7.94	28.69	56.50	12.78
All	444,081	608,466	96,636	68,068	1,217,251
	36.48	49.99	7.94	5.59	100.00
	2.38	7.43	24.01	44.75	8.99

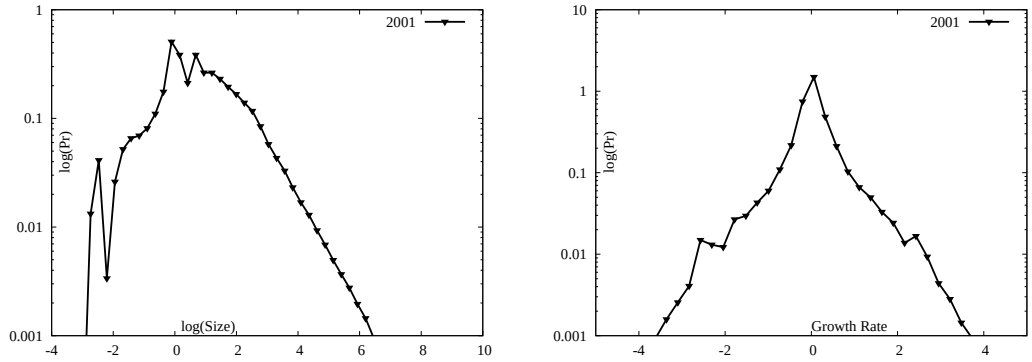
Note. Each cell reports the number of firms, the percentage over the total, the percentage of exporting firms in the cell.

show the familiar "tent-shape" which has been found in several datasets (see, among others, Stanley et al., 1996; Bottazzi and Secchi, 2003; Coad, 2007; Bottazzi et al., 2011).

Across the four age classes, the support of the distributions appears to shrink, expecially on the right, with young firms experiencing high growth episodes more frequently than older firms. This is consistent with some recent empirical evidence from other countries (see Coad et al., 2013 for Spain, and Barba Navaretti et al., forthcoming for a comparative perspective across France, Italy, and Spain) and broadly in tune with theoretical learning models of firm growth *á la* Jovanovic, which predict that younger firms have both higher and more variable growth rates (Jovanovic, 1982).

On the other hand, it is difficult to detect, by means of just graphical inspection, any significant differences in the way in which age impacts on growth rates of exporters and nonexporters. Across the four classes, exporters enjoy a lower variance in the center of the distribution, whereas the left tail seems to overlap with the nonexporters' distribution. On the contrary, the right tail of exporters appears steeper than the nonexporters' one.

What about size? Figure 4 shows the distributions of exporters and non exporters aged less than 5 years, by size class. Among young firms, the bigger ones enjoy less frequently very large growth rates (the right tail is steeper), whereas



(a) Size Distribution, 2001 (b) Growth rates distribution, 2001

Figure 2: Kernel density estimation of firm size and growth rates.

the probability of a downsizing becomes much higher (the left tail is not a straight line but more convex to the origin). As for the difference between exporters and nonexporters, we observe that the former distribution is less spread than the latter one among bigger firms.

3 Non-parametric analysis

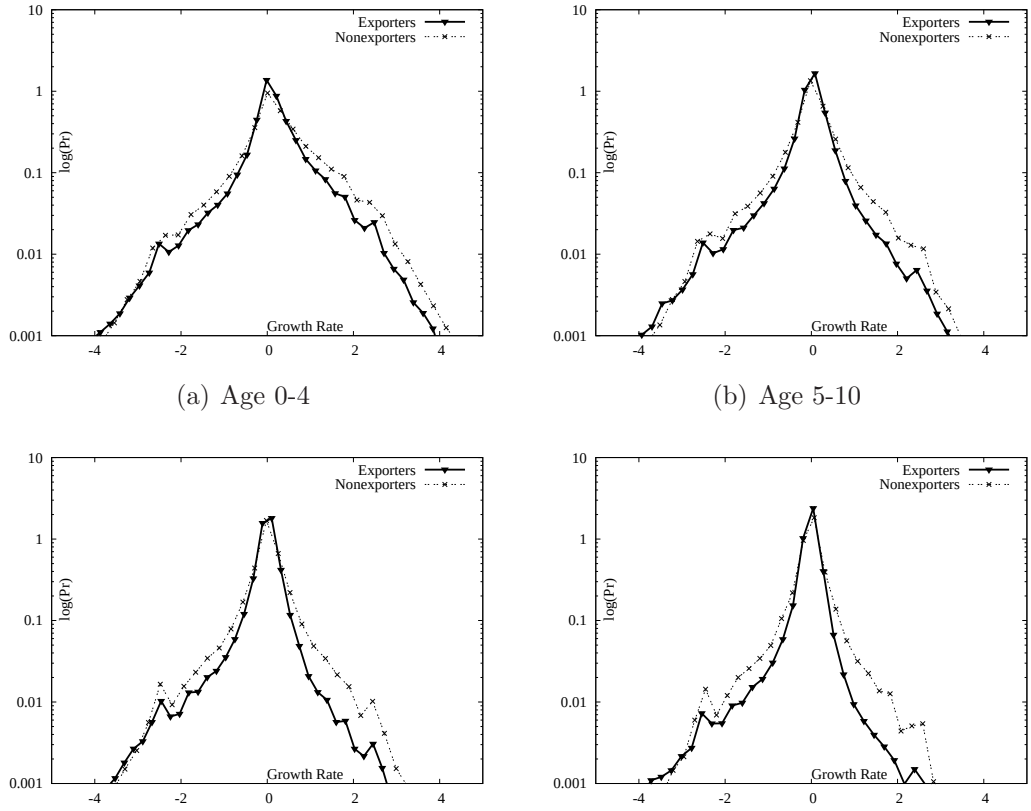
We now move from graphical analysis to a formal test of the distributional equality between exporters and nonexporters. We need a test to compare two samples that a) have different numerosity and b)display clear non-normalities and unequal variances. As a first step, let us introduce the concept of stochastic (in)equality.

Let F_E and F_{NE} be the distributions of growth rates of exporters and nonexporters. Denote with $\boldsymbol{X}_E \sim F_E$ and $\boldsymbol{X}_{NE} \sim F_{NE}$ the associated random variables, and with X_E and X_{NE} two respective realizations. The distribution F_E is said to have stochastic dominance over F_{NE} if Prob $\{X_E > X_{NE}\} > 1/2$. That is, if one randomly selects one exporter and one nonexporter, the former has a higher probability of having a greater value. Remembering the equality:

$$Prob\{X_E > X_{NE}\} > 1/2 = \int dF_E(X)F_{NE}(X)$$

the statistical test to assess which of the two distributions dominates over the other can be formulated as a test of

$$H_0 : \int dF_E F_{NE} = \frac{1}{2} \text{ vs } H_1 : \int dF_E F_{NE} \neq \frac{1}{2}$$



(a) Age 0-4

(b) Age 5-10

(c) Age 11-20

(d) Age 21+

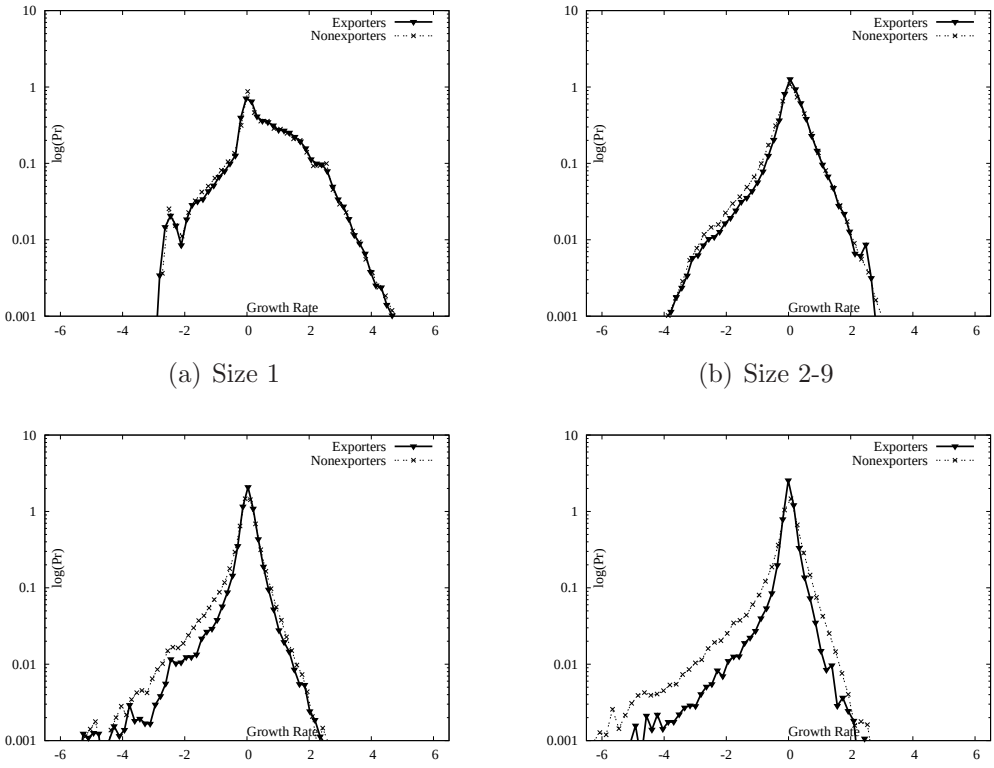
Figure 3: Kernel density estimation of employment growth rates for exporters and nonexporters, by age class.

The procedure developed in Fligner and Policello (1981) provides a valid statistic for H_0.[6] Notice also that, in case of rejection of the null, the sign of the Fligner Policello (FP) statistic tells us which of the two group of firms is dominant: a positive (negative) sign means that exporters (non-exporters) have a higher probability to experience higher growth rates.

Table 5 reports the results of the distributional comparison between exporters and nonexporters for each age-size class combination. By way of comparison, we also report the results from the Kolmogorov-Smirnov (KS) test.[7] Among firms aged less than 5 years, the FP statistic is always positive and significant, meaning that the growth rate distribution of young exporters dominate the growth rate

[6] More on the Fligner-Policello test in Bottazzi et al. (2008).

[7] For an application of the Kolmogorov-Smirnov test to the differences between exporters and nonexporters, see Delgado et al. (2002); Cassiman et al. (2010).



(a) Size 1

(b) Size 2-9

(c) Size 10-19

(d) Size 20+

Figure 4: Kernel density of employment growth rates for young (age < 5) exporters and nonexporters, by size class.

distribution of nonexporters. In the other age classes, the picture is less clear-cut. In general, we observe that the difference between exporters and nonexporters is either positive (exporters dominate) or not significant in the first size class, whereas the contrary is true in the remaining size classes, with the exception of firms aged between 11 and 20 in the last size class, where exporters dominate over nonexporters. Finally, notice that the Kolmogorov-Smirnov statistic is very small when comparing firms in the last two size classes.

Table 5: Fligner-Policello and Kolmogorov-Smirnov Tests

	Size class							
	1		2-9		10-19		20+	
Age class	FP	KS	FP	KS	FP	KS	FP	KS
Age < 5	31.75	0.26	37.67	0.14	10.84	0.05	7.30	0.06
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age 5-10	4.02	0.32	-5.00	0.09	-4.72	0.03	-0.20	0.02
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.84)	(0.00)
Age 11-20	-0.64	0.40	-7.51	0.12	-1.51	0.03	4.14	0.03
	(0.52)	(0.00)	(0.00)	(0.00)	(0.13)	(0.00)	(0.00)	(0.00)
Age 21+	2.58	0.51	-8.05	0.17	-7.57	0.03	-4.35	0.05
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note. p-value in parentheses.

4 Job creation, job destruction and net growth

In this section, we document the contribution to aggregate growth by each size-age class, both for exporters and non exporters. Start by noting (Table 6) that average growth rates are negative for most size-age classes, the only exception being firms in size class 1, which show high positive growth rates (declining with firm age), and young exporters in size class 2-9. Moreover, exporters perform better than non exporters in all age-size classes.

Table 7 presents patterns of job creation, job destruction, and net growth. The most relevant thing to note is the better performance of exporters in terms of net growth, especially among small firms (size less than 20).

Table 6: Average growth rates (%) by age, size and export status

	Size class							
	1		2-9		10-19		20+	
Age class	Nonexp	Exp	Nonexp	Exp	Nonexp	Exp	Nonexp	Exp
Age < 5	58.37	60.85	4.01	9.18	-7.36	-0.64	-10.79	-2.58
Age 5-10	20.31	24.65	-7.48	-3.14	-9.97	-4.94	-10.64	-4.35
Age 11-20	12.76	15.02	-6.45	-4.17	-6.99	-4.22	-6.46	-3.42
Age 21+	6.68	9.31	-6.69	-5.67	-5.84	-5.29	-4.61	-3.63

Table 7: Job creation, job destruction and net growth by age, size and export status

		JC		JD		NET		NET share	
Age	Size	Nonexp	Exp	Nonexp	Exp	Nonexp	Exp	Nonexp	Exp
< 5	1	118.36	129.36	-9.56	-8.22	108.80	121.14	21.24	0.64
< 5	2-9	35.42	35.09	-12.57	-9.56	22.84	25.54	27.05	2.06
< 5	10-19	20.03	17.35	-12.73	-8.17	7.30	9.18	3.46	0.71
< 5	20+	21.85	7.17	-9.93	-6.09	11.92	1.07	14.28	0.88
5-10	1	42.90	55.31	-10.41	-8.46	32.49	46.85	8.30	0.34
5-10	2-9	15.81	16.81	-12.77	-10.20	3.03	6.61	5.37	1.11
5-10	10-19	10.49	9.75	-11.51	-8.42	-1.01	1.33	-0.83	0.26
5-10	20+	11.10	6.04	-8.97	-5.37	2.13	0.67	4.75	1.08
11-20	1	28.42	38.51	-8.58	-7.54	19.84	30.97	6.02	0.22
11-20	2-9	11.90	11.59	-10.64	-8.93	1.26	2.67	2.58	0.58
11-20	10-19	7.69	7.55	-8.99	-7.13	-1.30	0.42	-1.34	0.14
11-20	20+	9.50	6.82	-7.49	-5.65	2.00	1.17	4.65	2.39
21+	1	19.85	26.47	-7.79	-6.61	12.06	19.86	3.24	0.12
21+	2-9	8.62	8.77	-9.40	-8.47	-0.78	0.30	-1.56	0.07
21+	10-19	5.91	5.07	-7.54	-6.82	-1.62	-1.75	-1.85	-0.82
21+	20+	6.94	3.63	-5.83	-4.80	1.10	-1.17	3.92	-9.07

5 Regression analysis

This section uses a regression framework to investigate how export actitivity and size are related to firm growth within each age class. Our dependent variable, $g_{i,t}$, is the growth rate of firm i at time t, and is defined, as before, as the log-difference between firm's employment in two consecutive years. We relate $g_{i,t}$ to the regressors through the following linear specification:

$$\begin{aligned} g_{i,t} =& \alpha + \beta_1 Export_{i,t-1} + \beta_3 log(Size_{i,t-1}) + \beta_3 (log(Size_{i,t-1}))^2 \\ &+ \boldsymbol{\gamma}' \boldsymbol{Z} + \epsilon_{i,t} \end{aligned} \tag{2}$$

where $Export_{i,t-1}$ is a binary variable taking value one it the firm exports, and zero otherwise, $Size_{i,t-1}$ is the firm's employment and $\boldsymbol{Z}$ is a vector of control variables including dummies for calendar years, 2-digits sectors, and provinces. The squared term $log(Size_{i,t-1})^2$ is added to control for the fact that the growth-size relationship is usually found to be dependent on firm size (for similar specifications, see Evans, 1987; Lawless, 2014).

Results from OLS estimation of Equation (2) are presented in Table 8, with the first column pooling all firms and controlling also for $log(Age)$, and the remaining columns showing the results separately for each age class. Column (1) shows that, controlling for size, firm growth decreases with age and that exporters enjoy, on average, an increase in growth rate of 3.3%. This support our earlier finding that young firms grow more, and also underlines the additional advantage deriving from being an exporter. Columns (2)-(5) test whether the export advantage remains significant when the relationship is estimated within each age class, and the answer is positive: both young and old exporters growth more than nonexporters, controlling for size.

The coefficient on $Size$ is negative and significant, whereas that on $Size^2$ is positive and significant, and both are declining, in absolute values, throughout the four age categories. This implies that, contrary to the prediction of the Gibrat's law, growth and size are not independent, but firm growth decreases with firm size, and the effect of size is lower among old and big firms. It is worth notice, moreover, that the magnitude of the coefficients are quite high, implying that an increase of one (log) employee is related to an average decrease in growth rate of around 45% for firms aged less than 5 years.

Figure 5 plots the binned relationship between size and growth for exporters and nonexporters aged less than 5. In subfigure (a), we consider firms from all size classes. It is apparent that firms which reports full-time employees between 0 and 1 have growth rates that are many times larger than the growth rates of all other firms. This is due to the fact that for firms whose size is close to 0, very small increases in size correspond to very large percentage growth rates. In subfigure

Table 8: Growth, size and export status: all firms

	(1) All firms	(2) Age < 5	(3) Age 5-10	(4) Age 11-20	(5) Age 21+
Export	0.033***	0.026***	0.047***	0.029***	0.022***
	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
Size	−0.323***	−0.455***	−0.334***	−0.280***	−0.191***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
$Size^2$	0.072***	0.098***	0.079***	0.068***	0.040***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	−0.077***				
	(0.000)				
Observations	7,145,683	1,321,736	1,774,712	2,056,470	1,992,765
R^2	0.193	0.286	0.165	0.135	0.079

Note. Dummies for calendar years, 2-digits sectors, and provinces included. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

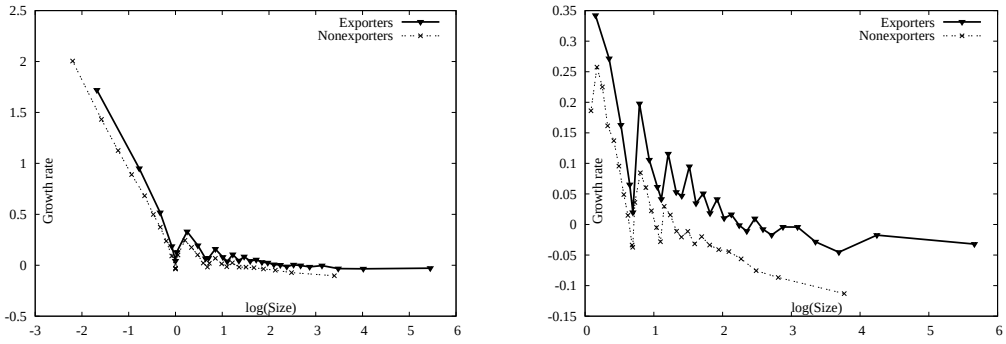
(b), we plot the same growth-size relationship excluding firms from size class 1. The relationship becomes much smoother, and does not seem to be dominated by a single group of firms.

To check whether our results were driven by the micro firms (with employees between 0 and 1), we estimate Equation 2 after excluding firms that were in size class 1 (at time $t-1$). Results are reported in Table 9. Looking at column (1), we observe that both the coefficient on *Age* and *Export* are still significant and with the expected sign. From columns (2)-(5), we see that exporters grow more across the four age classes, with an advantage which is now markedly declining with age. Greater differences are observed for coefficient on *Size* and $Size^2$. As before, we observe that the effect of size on growth is declining in firm age and size, with point estimates which are now much smaller and become not statistically different from 0 for firms aged more than 20 years.

These patterns show that, contrary to recent findings (see Haltiwanger et al., 2013; Lawless, 2014), size impacts on firm growth rates even after controlling for age, and that the Gibrat's hypothesis of independence becomes true only when we consider mature firms (Age > 20) and exclude micro firms (employees between 0 and 1) (On Gibrat's law, see Lotti et al., 2003 and Coad, 2009, chapter 4 for surveys).

6 Conclusions

In this paper we showed that size, age, and export status are relevant predictors of firm growth. In particular, we found that age, size and young exporters are the



(a) All firms (b) Excluding size class 1

Figure 5: Binned relationship between growth and size for young (age < 5) exporters and nonexporters

best performing firms.

The growth performance of early exporters supports the idea that the attitude towards growth opportunities is a meaningful and sometimes neglected determinant of firms growth, corroborating the robust evidence that growth processes are also shaped by behavioural factors (for the evidence on both Europe and US see Bottazzi et al., 2010; Dosi et al., 2012, 2013). Indeed, this attitude of firms towards growth is already apparent from the very early stage of firm's life-cycle and it represents one of the 'idiosyncratic' covariates regarding, so to speak, the 'identity cards' of individual firms, ideally revealing also their technological and organizational capabilities. (more in Dosi and Grazzi, 2006). Being involved in international activities at a very early stage captures both the capabilities of firms to compete on foreign markets and also their intention to "grab" growth opportunities.

Table 9: Growth, size and export status: excluding firms in size class 1

	(1) All firms	(2) Age < 5	(3) Age 5-10	(4) Age 11-20	(5) Age 21+
Export	0.028***	0.040***	0.039***	0.022***	0.008***
	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
Size	−0.051***	−0.172***	−0.052***	−0.027***	−0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
$Size^2$	0.008***	0.021***	0.008***	0.006***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	−0.043***				
	(0.000)				
Observations	4,851,920	790,951	1,197,418	1,414,798	1,448,753
R^2	0.012	0.023	0.009	0.007	0.007

Note. Dummies for calendar years, 2-digits sectors, and provinces included. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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