Getting smaller: size dynamics of employer enterprises in Portugal[1]

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We describe the size dynamics of active employer enterprises´ in Portugal, from 1985 to 2007, by applying to the *Quadros de Pessoal* dataset the methodology and definitions of the OECD/Eurostat Manual on Business Demography Statistics. We observe that firm size has been decreasing in Portugal over all broad sectors, regions and entrants and exiters from the market and also that firm size distribution is right-skewed, evolving over time towards a lognormal distribution.

1. Introduction

Firm size distribution has always drawn a great deal of attention in Portugal, often related to the so-called lack of performance and competitiveness, in comparison to bigger sized international firms[4], due to the overall small dimension of the internal market (especially for nontradeables) and to the country's type of specialisation model. In fact during the last decades, there has been an increasing number of smaller sized enterprises and a decrease of firm size across all main sectors, for both observed entrants and exiters in the market.

The increasing predominance of small firms in the total enterprise population is not unique to Portugal, it is a phenomena shared by other countries (Eurostat, 2009; OECD, 2008; Núñez, 2004; Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2003; Cabral, 2007; Bartelsman et al., 2005a). There is a great amount of evidence in other developed economies, of the shift in the firm size distribution towards small production units since the 1970s, after years of dominance of the economies of scale in production. Why this change has taken place is not so clear, though. From a theoretical point of view, there is not a single theory of the firm that is able to fully explain the reasons for optimal firm size change. Different theories are then put forward, by different authors that incorporate one or several possible approaches (You, 1995). It most probably is a consequence of the combination of a whole set of factors which concern both specialisation effects and within sector effects, which differ according to the specificities of the country or sector of activity considered. Still, we are able to frame this phenomenon into three main dimensions. The first, is the result of the combination of an intensified global competition (mostly from Asian countries and Eastern Europe, which has been responsible for successive waves of downsizings over the last years) with the acceleration of technological change, which has contributed to the reduction of the minimum scale of entry[5]. The second is the increase in the degree of uncertainty, triggered by episodes of oil price shocks and price instability in raw material markets. Some authors claim that this might have impacted the mass production system directly, thus promoting smaller scale and more flexible production units, where smaller firms develop a comparative advantage relatively to their larger counterparts. Thirdly, the increased globalisation and the digital economy revolution, which shifted

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[4] "It is often said there are too many small firms in Portugal, and that average firm size is too small" (Cabral, 2007).
[5] Firms prefer to enter small, so as to incur in minimum costs, in case they are forced to exit the market.

comparative advantages towards knowledge-based economic activities, where the individual is at the centre of the knowledge chain, as opposed to the firm[6].

This work consists on the application of the methodology and definitions comprehended in the Manual on Business Demography Statistics (OECD/Eurostat, 2007) to the *Quadros de Pessoal* dataset (Employment Administrative Records by the Portuguese Ministry of Labour and Social Security). Accordingly, the analysis focuses on a specific subsample of *Quadros de Pessoal*, consisting only of the population of active enterprises[7] with at least one paid employee. This is the so-called employer enterprise population[8].

The next section describes the main patterns of firm size evolution in Portugal over the last 22 years, section 3 looks at the decomposition of firm size into specialisation and within sector effects, section 4 highlights the importance of employment creation by small firms, section 5 approaches the issue of firm size distribution over time and broad sectors, and finally, section 6 concludes.

2. Patterns of firm size evolution in Portugal

The size of the small business sector in a country is often used as a proxy for entrepreneurial activity. The number of enterprises by size class (Figure 1) highlights the growing importance of small and medium (SME) sized enterprises in Portugal, which are considered a key source of dynamism and innovation in developed and emerging economies, thus making important contributions to job creation, economic growth and productivity (OECD, 2005).

In most countries, firms with less than ten employees represent around three quarters of the employer enterprise total population. Portugal does not seem to be an outlier, as the population of firms is dominated by small and micro units in a wide range of countries (Eurostat, 2009[9]; Bartelsman et al., 2005b; Bartelsman et al., 2004).

In Portugal, the number of active employer enterprises with fewer than 5 employees (micro-firms) went over the 200.000 threshold after 2004 (Table A.1 in Annex), but they already represented a significant share of the employer enterprise universe. Since 1996, more than 60% of all employer enterprise firms in Portugal are micro firms, and more than 81% have fewer than 10 employees. There is a clear tendency for small firms, with less than 10 employees, to increase its share in the total population, throughout all the observed period (74% in 1986, 82% in 1997 and 85% in 2007). In 2007, 97,8% of the Portuguese enterprises present in our dataset employed less than 50 workers, compared to 95% in 1985.
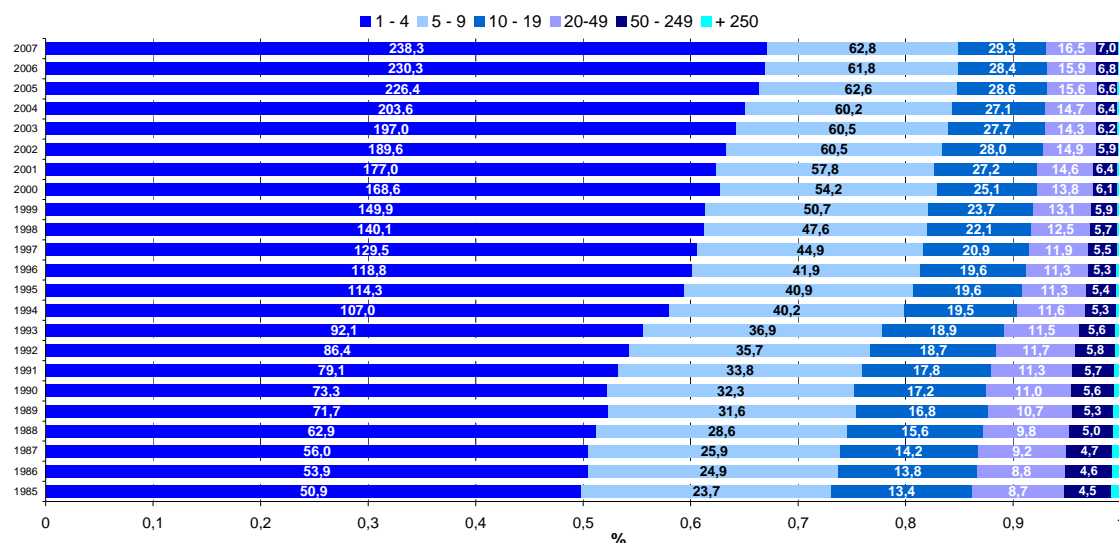
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[6] This can lead to situations where individuals who have acquired a specific technological knowledge, leave the incumbent firm to create his or her own new firm, where this knowledge starts being commercialised.

[7] An *enterprise*, according to the Eurostat/OECD Manual (2007) is the "smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources". An enterprise carries out one or more activities at one or more locations and may be a sole legal unit.

[8] The OECD, the Eurostat and the EU member states have agreed that the collection of data on enterprises that have paid employment can improve the compatibility of enterprise birth and death rates among all OECD countries and some EU countries (Eurostat/OECD, 2007). This methodology is intended to be consistent and to complement other methodological guidelines such as statistical business registers and structural business statistics.

[9] According to Eurostat (2009), "there is an obvious tendency for enterprises to start very small". In 7 of the considered countries in figure 2, more than 50% of newly born enterprises have between 1 and 4 paid employees. This size class combined with the enterprises with no paid employees, represent more than 90% of births in all the countries depicted in page 2.

Figure 1 – Population of Active Employer enterprise population, by size class
(in thousand enterprises and %)

Legend: ■ 1 - 4　■ 5 - 9　■ 10 - 19　■ 20-49　■ 50 - 249　■ + 250

Year	1 - 4	5 - 9	10 - 19	20-49	50 - 249
2007	238,3	62,8	29,3	16,5	7,0
2006	230,3	61,8	28,4	15,9	6,8
2005	226,4	62,6	28,6	15,6	6,6
2004	203,6	60,2	27,1	14,7	6,4
2003	197,0	60,5	27,7	14,3	6,2
2002	189,6	60,5	28,0	14,9	5,9
2001	177,0	57,8	27,2	14,6	6,4
2000	168,6	54,2	25,1	13,8	6,1
1999	149,9	50,7	23,7	13,1	5,9
1998	140,1	47,6	22,1	12,5	5,7
1997	129,5	44,9	20,9	11,9	5,5
1996	118,8	41,9	19,6	11,3	5,3
1995	114,3	40,9	19,6	11,3	5,4
1994	107,0	40,2	19,5	11,6	5,3
1993	92,1	36,9	18,9	11,5	5,6
1992	86,4	35,7	18,7	11,7	5,8
1991	79,1	33,8	17,8	11,3	5,7
1990	73,3	32,3	17,2	11,0	5,6
1989	71,7	31,6	16,8	10,7	5,3
1988	62,9	28,6	15,6	9,8	5,0
1987	56,0	25,9	14,2	9,2	4,7
1986	53,9	24,9	13,8	8,8	4,6
1985	50,9	23,7	13,4	8,7	4,5

Source: Own calculations, based on Quadros de Pessoal, GEP, Ministério do Trabalho e da Solidariedade Social.

The increasing presence of small firms in Portugal is considerable and visible throughout all broad economic sectors, both in terms of the number of enterprises and the number of employees (Table 1). During the period of 1995 to 2007, 92,5% of total enterprises in the economy employed fewer than 20 workers and all sectors, except for manufacturing (81,5%), have a share of over 90%. From the first (1995-1999) to the second sub-period (2000-2007), the number of small enterprises rises in all sectors, but manufacturing displays the highest increase in this size class, above the total economy's, indicating a faster reduction in enterprise size.

On the other hand, the employment share of small firms is much lower, as already verified for other countries (Bartelsman et al., 2005a). This stylised fact, whereby small enterprises constitute the vast majority of firms, but account for proportionally less employment, is common in the literature and is also verified for this universe of employer enterprises.

In parallel to the evolution of the number of enterprises, employment also shows a tendency to rise in all sectors of activity of this size class, except for services. This trend is not only influenced by the level of economic activity[10], but also by the industry structure, as an economy with a large service sector such as Portugal (Table A.2), is more likely to have a higher share of small enterprises in total employment (Table 8).

Table 1 - Share of enterprises with fewer than 20 employees, in the total population of firms and in total employment[11]
(enterprises with fewer than 20 employees as a % of sector's total)

	Enterprises					Employment				
	Total economy	Agriculture and Fishing	Manufacturing	Services	Construction	Total economy	Agriculture and Fishing	Manufacturing	Services	Construction
1995-2007	92,5%	96,5%	81,5%	94,7%	92,9%	39,1%	67,2%	25,1%	42,9%	52,1%
1995-1999	91,5%	95,6%	79,6%	94,6%	92,2%	36,6%	61,7%	22,5%	43,8%	46,5%
2000-2007	92,9%	96,9%	82,6%	94,8%	93,1%	40,4%	70,0%	26,8%	42,5%	54,4%

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

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[10] We have found that the economic cycle highly correlates with enterprise births and deaths cycles. In different regression models we have found that GDP is consistently a statistically significant variable.
[11] Sections A to P of the Classification of Economic Activities (CAE) Rev. 2.1. were considered for the total economy.

By combining the regional with the size class dimension, we may also observe the predominance of small firms in most regions at the NUT II level (Tables 2 and 3), in particular in the Algarve[12], the Açores and the Alentejo. Since 1995, all regions display a similar trend of increasing share of firms with fewer than 20 employees and of employment, except for Alentejo and Açores (from 1995 to 2007).

Table 2 - Share of active employer enterprises with fewer than 20 employees in total number of enterprises by NUT II region (%)

Regions	Enterprise share of size Class of fewer than 20 employees												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Norte	46,9	47,4	47,4	48,3	49,4	49,4	49,9	51,3	52,8	55,1	56,4	57,1	57,6
Algarve	52,8	53,4	53,9	54,7	58,2	58,4	60,6	62,0	63,8	65,7	67,0	67,0	67,7
Centro	49,3	50,4	50,5	51,2	52,4	52,2	53,7	54,9	56,2	59,1	60,6	61,4	61,8
Lisboa	51,0	51,2	51,3	51,6	52,3	52,1	53,1	53,8	54,8	57,7	59,1	59,9	60,2
Alentejo	52,9	54,8	54,7	57,1	58,6	58,5	59,7	60,2	61,9	63,6	65,3	65,1	66,7
Açores	66,6	66,2	66,4	66,4	65,2	64,5	64,9	64,8	63,8	65,1	67,6	68,4	68,2
Madeira	47,4	48,4	47,8	49,4	50,3	52,2	53,9	55,3	55,1	57,6	57,6	57,8	57,7
Portugal	49,9	50,5	50,5	51,3	52,3	52,2	53,2	54,3	55,5	58,0	59,4	60,1	60,6

Table 3 - Share of employment in active employer enterprises with fewer than 20 employees in total regional employment by NUT II region (%)

Regions	Employment share of size class 1 to 19 employees												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Norte	34,7	35,2	36,2	37,5	38,6	40,4	41,0	43,2	43,3	43,0	43,5	42,8	42,4
Algarve	58,2	59,4	60,3	59,9	59,7	60,0	59,6	62,2	61,1	60,8	60,5	59,5	58,4
Centro	41,4	42,4	43,3	44,1	45,4	46,6	47,3	50,5	50,7	49,5	49,8	49,4	49,1
Lisboa	27,9	28,7	28,9	28,6	28,8	29,2	29,1	30,9	30,5	29,6	28,9	28,6	28,4
Alentejo	55,5	54,7	54,5	55,2	55,4	57,0	56,4	58,2	57,5	54,6	55,5	54,2	54,9
Açores	47,8	46,8	47,4	44,7	45,3	44,2	43,4	43,5	44,5	42,9	43,3	44,3	42,0
Madeira	39,2	37,7	38,4	39,5	41,0	42,9	42,5	42,0	42,1	42,0	42,5	43,2	43,2
Portugal	35,1	35,9	36,6	37,1	37,9	39,0	39,3	41,6	41,5	40,7	40,8	40,2	39,9

Source: Own calculations based on Quadros de Pessoal, GEP, MTSS.

3. Firm size across and within sectors

The decrease in firm size reflects the influence of both specialisation effects and within sector effects in the economy. Concerning the former, we observe that more small enterprises are born in Portugal each year, in particular in the service sector (Table A.3), which holds a lower average firm size than the manufacturing sector (Table A.5). By comparing different time frames across size classes, we also observe that firm rotation decreases with size[13]. More firms are born within the 1-4 size class (77,9% share of total enterprises in 1987-2000 compared to 80,3% in 1989-2007) and firms with fewer than 20 employees have also been increasing over the past decades (Table 4).

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[12] Even when firms with fewer with less than 50 employees are considered, the Algarve and the Alentejo are still the regions with the highest share of small enterprises in 2007.
[13] This is also visible for employer enterprise deaths and naturally for churn rates.

Table 4 – Average employer enterprise births[14] by periods and firm size

Period	Average entreprise births	Cumulative by Size Class (nº employees)					
		1 - 4	1 - 9	1 - 19	1-49	1 - 249	ALL
1987-2000	31.368	24.442	28.900	30.476	31.147	31.347	31.368
% of total	100	77,9	92,1	97,2	99,3	99,9	100,0
1987-2007	36.803	29.555	34.256	35.885	36.574	36.781	36.803
% of total	100	80,3	93,1	97,5	99,4	99,9	100,0
1992-1999	33.383	26.483	30.982	32.511	33.162	33.363	33.383
% of total	100	79,3	92,8	97,4	99,3	99,9	100,0
2000-2007	48.259	40.287	45.543	47.286	48.011	48.233	48.259
% of total	100	83,5	94,4	98,0	99,5	99,9	100,0

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

On the other hand, there has been an overall decrease in within sector's average size, for all broad sectors of the economy, and particularly for manufacturing (Table 5). While the average size of manufacturing firms still is at least twice as large than services[15] (Table A.2), it tends to decrease faster between the two sub-periods than the remaining sectors (from 20,8 average employees before 2000, to 17,4 afterwards)[16].

Table 5 - Average firm size by broad sectors and periods
(number of employees)

	Total economy	Agriculture and Fishing	Manufacturing	Services	Construction
1995-2007	10,0	4,9	18,9	8,4	8,9
1995-2000	10,9	5,5	20,8	8,6	9,5
2000-2007	9,4	4,5	17,4	8,3	8,3

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

Moreover, the average number of employees across all main sectors has decreased, for both observed entrants and exiters in the market. Entrants and exiters are on average of smaller size than incumbent firms (ranging from 35% to 45% for entrant's size and 39% to 50% for exiters, over the period). A typical entrant is smaller than the industry average[17], and the difference in size compared to the incumbent has been closing down in all the sub-periods considered (Table 6).

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[14] According to the OECD, the core measure of births reflects the concept of employer enterprise birth. A birth amounts to the "creation of a combination of production factors with the restriction that no other enterprises are involved in the event" (Eurostat/OECD, 2007). Births do not include entries into the population which result from break-ups, spit-offs, mergers, restructuring[14] of enterprises or reactivations of units which are dormant within a period of two years[14]. This population thus consists of enterprises that have at least one paid employee in its birth year and also of enterprises that, despite existing before the year in consideration, were below the one employee threshold. An employer enterprise entry is thus counted in the dataset as a birth of an employer enterprise after it recruits its first employee, while complying with the above mentioned requisites.

[15] A known stylised fact is that there is a substantial sectoral component in firms size and that manufacturing firms tend to be larger than services firms (Bartelsman et al, 2005a).

[16] Bartelsman et al. (2005a) divides firm's size across countries and places Portugal in the group of the largest sized countries (US, France and Germany) where the average size is of 15 employees in the total business sector. They obtain an average of 16,8 employees per firm in Portugal for the period 1989-1994. Although we obtain different averages, we also observe that average firm size in services is clearly below the economy's average and that the ratio of manufacturing firm size relative to total economy is 1,8, the same obtained by Bartelsman et al. (2005a).

[17] The fact that the new entrant's size is smaller than incumbents is common to many countries (Bartelsman, 2005a; Nuñez, 2004; Cabral, 2007). It is often related to learning models that approach entrepreneurship dynamics as a learning process, where firms enter the market with a smaller size due to the uncertainty about its potential profitability.

Table 6 - Average number of employees per firm

Period	Total economy	Entrants	Exiters
1987-2007	11,9	4,6	
1987-2000	13,2	5,0	5,8
2000-2005	9,5	4,0	4,2
1985-2005	12,8		5,5
1985-2000	13,9		5,9
2000-2007	9,4	3,9	

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

In Portugal, entrants size is less than half of the economy´s average size, in line with the results obtained for other developed countries (Cabral, 2007; Bartelsman et al., 2005b; López-Garcia and Puente, 2006) for all the observed periods, exception made for the Agriculture and Fishing sector and for the Construction sector after 200. Still, according to Cabral (2005), Portugal has one of the lowest ratios of entrant and exiter size with respect to total average size.

In order to properly assess the contribution of the sectoral specialisation versus the within sector to the trend of decreasing average firm size, we follow a decomposition[18] inspired by Bartelsman et al. (2005a) and Bartelsman et al. (2004). In our analysis, the decomposition of average firm size is measured against the 1995 benchmark, in order to understand how much of the deviation in average firm size can be accrued to the fact that Portugal is specialised in sectors that display specific characteristics which impact in firm size and how much can be accrued to the within sectors discrepancies in average size.

Table 7 - Shift share analysis of the determinants firm size for Portugal
(Benchmark year = 1995)
Contribution coming from differences in:

	Sectoral Composition	Average size of firms	Interaction between sectoral composition and size	Total
1996	0,02	-0,30	-0,04	-0,32
1997	0,05	-0,59	-0,09	-0,63
1998	0,26	-0,37	-0,14	-0,25
1999	0,11	-0,87	-0,21	-0,98
2000	0,11	-1,34	-0,36	-1,59
2001	0,23	-1,32	-0,50	-1,59
2002	0,81	-1,87	-0,49	-1,55
2003	-0,21	-1,95	-0,18	-2,34
2004	-0,31	-1,98	-0,07	-2,36
2005	-0,20	-2,23	-0,27	-2,71
2006	-0,20	-2,21	-0,20	-2,62

Source: Own calculations based on Quadros de Pessoal, GEP, MTSS.
Note: Done at a two digit level of the Classification of Economic Activities Rev. 2.1.

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[18] This decomposition exploits the difference between the mean in a given year and a benchmark mean. The formula considers an expression where s_t is the annual average firm size for the total economy, and s_{95} is the overall total economy average in 1995, considered as the benchmark year.
Thus, the difference between the benchmark year and the overall mean in a given year, can be decomposed as follows:

$$s_t - s_{95} = \sum_i \alpha_t^i s_t^i - \sum_i \alpha_{95}^i s_{95}^i = \sum_i (\alpha_t^i - \alpha_{95}^i)\overline{s}_{95}^i + \sum_i (s_t^i - s_{95}^i)\overline{\alpha}_{95}^i + \sum_i (s_t^i - s_{95}^i)(\alpha_t^i - \alpha_{95}^i)$$
$$= \Delta_\alpha + \Delta_s + \Delta_{\alpha s}$$

Where Δ_α accounts for the sectoral composition, Δ_s for the differences within sectors and $\Delta_{\alpha s}$ for the relationship between size and sectoral composition, similar to a covariance measure. A positive term means that size and sectoral composition deviate from the 1995 benchmark in the same direction.

In the expression $\sum_i \alpha_t^i s_t^i$, s_t^i is the average firm size of sub-sector *i* at the 2 digit level of the Classification of Economic Activities Rev. 2.1. in year *t* and α_t^i is the share of firms in sub-sector *i* with respect to the total number of employer enterprises in the economy, in year *t.*

Our findings show that the within sector effect plays a more important role in explainning differences in firm size across the period 1995-2006, as the absolute value of its composition term is greater in absolute value than that from the sectoral composition, and this effect is more expressive over time (Table 7). Even controlling for sectoral specialisation, intrinsic characteristics of sectors are a fundamental determinant of size structure. This can also indicate that the same sectors can be characterised by different and evolving size structures over time[19]. The interaction term points to a somehow volatile correlation between the two terms, indicating that possibly no strong correlation exits as the interaction term stays negative, despite the signal change of the sectoral composition term after 2003[20]. The total component values indicate that overall firm size has been decreasing over time. The year of 2006 points to a stabilization in the evolution of all the components.

Bartelsman et al. (2004 and 2005a) and Pagano and Schivardi (2003) have done a within sector comparison of size differences between different countries, observing that the overall differences in average firm size bettween countries do not solely reflect specialistion differences, but rather variations in size within sectors. The mostl important finding of the industry decomposition for the manufacturing sector, undertook by Bartelsman et al. (2005a), is that the within sector differences play the most importan role in explaining differences in size across countries. This component is much larger than the one of sectoral composition for almost all countries, including Portugal. In Bartelsman et al. (2004), those conclusions are again underlined, but the overall sectoral composition now seems to play a more relevant role in countries such as Portugal, Denmark and France. The interaction terms are correlated positively in both studies, indicating a possible link between size structure and sectoral specialistion, which is not found in our calculations.

4. Employment creation

There is considerable policy interest in the way in which enterprises grow and create employment, particularly for small firms, which play a key role in labour creation and reallocation. If a country's environment tends to favour small sized firms, this should induce a proportional higher employment share in sectors where technological factors favour small size (Pagano and Schivardi, 2000).

In Portugal, the important contribution to aggregate employment growth of the smallest size is sustained by the outstanding employment performance of new firms (Figure A.1), as well as by the amount of employment creation of small established firms. Over the whole period 1987-2005, firms with fewer than 20 employees created 2.828.287 jobs (65,7% of total) and are responsible for almost a quarter (23,4%) of all job creation in the dataset from 1987-2005 (Table 8). The annual net rate of labour allocation of these firms has been positive since 1987, which means small firms create more jobs than they destroy, even in periods of economic downturn.

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[19] Firm size, summarised by average size and dispersion have an important sectoral component. The sectors with the largest standard deviation are "Electricity, gas and water supply" because of its heavily regulation and legal monopolies and "Financial activities" and "Public Administration, Defence and Social Security", "Fishing" and "Education". These are also the sectors with the average highest size. The less dispersed is "Gross and retail commerce" and "Hotels and restaurants". Manufacturing standard deviation is twice as large as total deviation, in line with other countries (Bartelsman et al., 2005a).
When the coefficient of variation is used, the dispersion is highly reduced, with most sectors presenting a higher coefficient of variation than the country's average.
[20] The fact that sectoral composition becomes negative from 2003 might have been influenced by the construction sector that, which lived through an expansion period, both in terms of share of enterprises and employment before 2000, showing a marked decline after 2003 in terms of enterprises and employment share, and average size.

Table 8 - Employment creation, by size class

1987-2005	Total employment creation	Employment creation by entries	Employment destruction by exits	Net job gains by existing firms	Percentage created by firm rotation	Percentage created by existing firms
	1	2	3	4=1-2+3	5=-(4-1)/1*100	6=4/1*100
1 to 4	1.401.816	1.068.780	704.531	1.037.567	26,0	74,0
5 to 9	818.107	575.004	378.679	621.782	24,0	76,0
10 to 19	608.364	414.043	312.102	506.423	16,8	83,2
20 to 49	590.713	386.045	340.473	545.141	7,7	92,3
50 to 249	539.847	363.199	387.057	563.705	-4,4	104,4
250 or more	342.969	317.208	307.236	332.997	2,9	97,1
Total	4.301.816	3.124.279	2.430.078	3.607.615	16,1	83,9

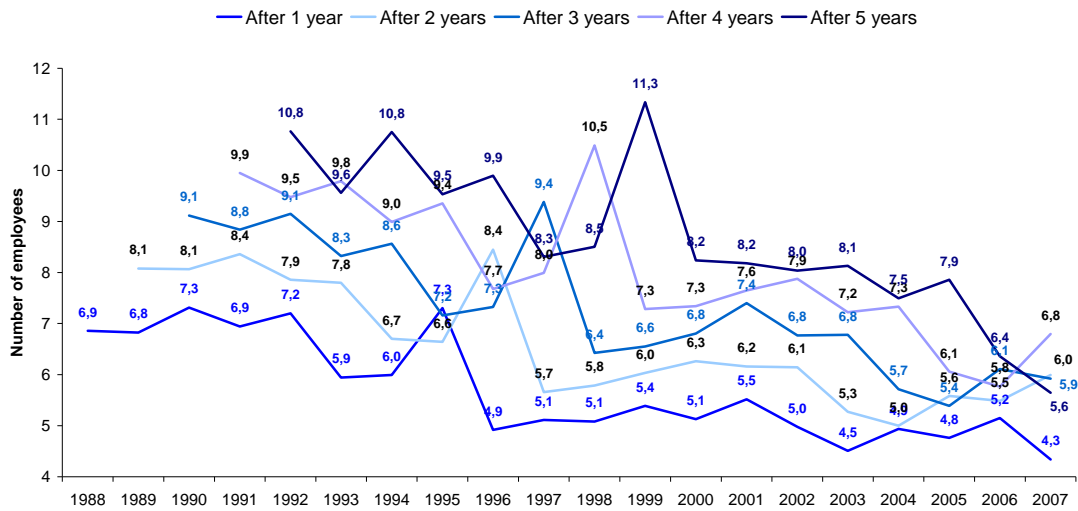Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

The ratio composed by the annual growth rate of employees over the growth rate of employer enterprises (Table A.4), shows that while small firms with fewer than 20 employees create a substantial amount of employment, annual enterprise growth is higher than employment's. A ratio below one is also systematically obtained in the service sector from 1995 onwards, where small firms still account for a larger share of employment than in manufacturing, because of the determinant role played by economies of scale and technological factors. This fact also sheds some light on the evolution of firm size towards smaller size classes.

5. Has firm size distribution changed in Portugal?

Cabral and Mata (2007) reveal that age also plays an important role in the process of shaping firm size distribution. Although a deeper analysis of firm age and survival would be useful, it is not within the scope of this analysis. We provide instead an overview of the time series perspective of the data, confirming that average firm size has been markedly decreasing since 1988, for all the observed survival[21] cohorts, from 1 to 5 years of survival (Figure 2). The gap in average firm size between the firms that managed to survive for 1 and 5 years in 1992 (7 and 11 employees, respectively) is higher than that of 2007 (4 and 6 employees, respectively). Over time, there has been a closing of the gap of average firm size between the first and the fifth year of survival, and particularly from the second to third year of survival, indicating that firms that manage to survive longer do not necessarily grow in size.

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[21] According to the Manual of Business Demography Statistics (Eurostat/OECD, 2009), the survival of an enterprise is defined in the following way: "The number of n-year survival enterprises for a particular year (t) refers to the number of enterprises with at least one employee for the first time in year (t-n) which had not died in year (t)." The survival of an enterprise is an event that should always be observed between two consecutive years.

Figure 2 – Average firm size of employer enterprises by years of survival after birth (number of employees)

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

Therefore, an employer enterprise created in 1987, which survived for 5 years, had in 1992 an average 11 employees, compared to an average of 6 employees in 2007, for the same survival period (Figure 3).

Figure 3 – Average Firm size, 1992 and 2006 cohorts, number of employees (%)
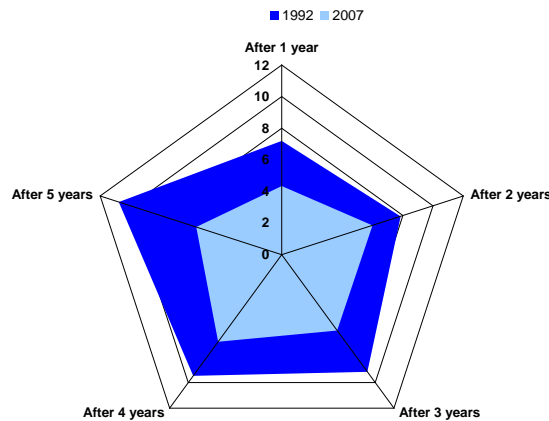
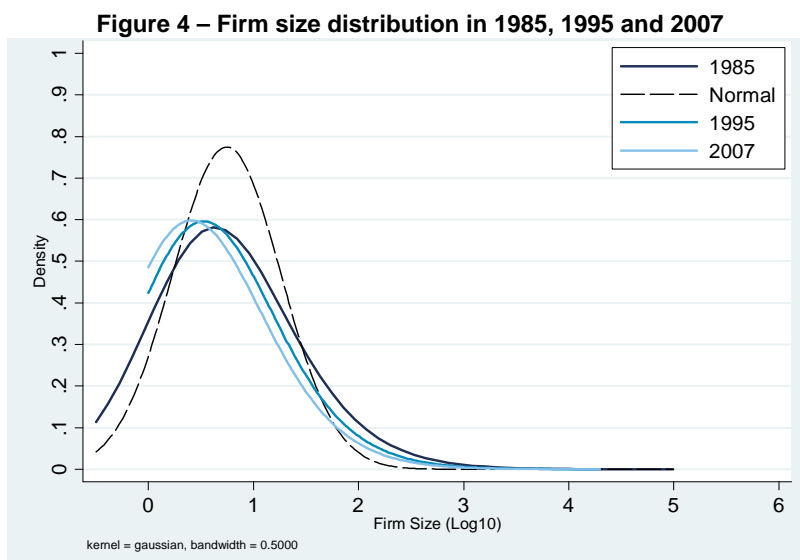Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

Turning to firm size distribution, it is important to keep in mind that this distribution does depend heavily on the type of data source considered (Cabral, 2007). Cabral and Mata (2003)[22] tested the hypothesis that more comprehensive data sets (which consider micro data as *Quadros de Pessoal* does) are described by firm size distributions that evolve over time and are skewed to the right, thus being distinct from the lognormal distribution curve[23]. Following the same methodology, we applied a nonparametric estimation method, a gaussian kernel density smoother with a bandwidth of 0,5 to the logartithm of firm size to test if firm size (expressed as the log of the employment of the firm) distribution is stable and approximately lognormal for the population of active enterprises, births and deaths[24].

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[22] They also refer that several feature of the Portuguese datasets are consistent with findings from other countries.
[23] The lognormal distribution seems to empirically fit well data from commonly used databases and theoretically supports growth rates being independent from firm size.
[24] This evidence is not included in the present analysis, but available at request.

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We have found a distribution with a distinct shape from the Normal distribution, confirming Cabral and Mata´s (2003) conclusions. Our results also show that firm size distribution is skewed to the right and that the distribution is not stable over time. The whole firm size distribution has indeed been shifting to the smallest size classes both in the service, manufacturing and construction sectors (Figure 4).

Figure 4 – Firm size distribution in 1985, 1995 and 2007

kernel = gaussian, bandwidth = 0.5000

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

In order to eliminate the possibility of missing out on relevant sector specific effects, we introduce the firm size distribution in the manufacturing and service sector in Annex (Figures A.2 and A.3),

The visual results are confirmed by the normality test implemented, as described by D'Agostino, Balanger and D'Agostino, Jr. (1990). The D'Agostino's K^2 test allows rejection of the normality, for all the distributions presented in Table A.6 in Annex. The firm size distribution is thus positively skewed when compared to the Normal distribution. Again, this pattern of right skewdness is not unique to Portugal (Bartlesman et al., 2003; Cabral, 2007).

Considering the evolution of the firm size density distribution, it is also possible to observe that it becomes biased to the left, with smaller rather than larger firms becoming predominant in all broad sectors considered. Throughout time, this process drives the population of employer enterprises to smaller units (Figures A.4, A.5 and A.6). This conclusion also holds for enterprise births and deaths.

Figure 5 - The cumulative distribution function of firms size for the Manufacturing, Construction and Services sectors, 1985 and 2006 cohorts
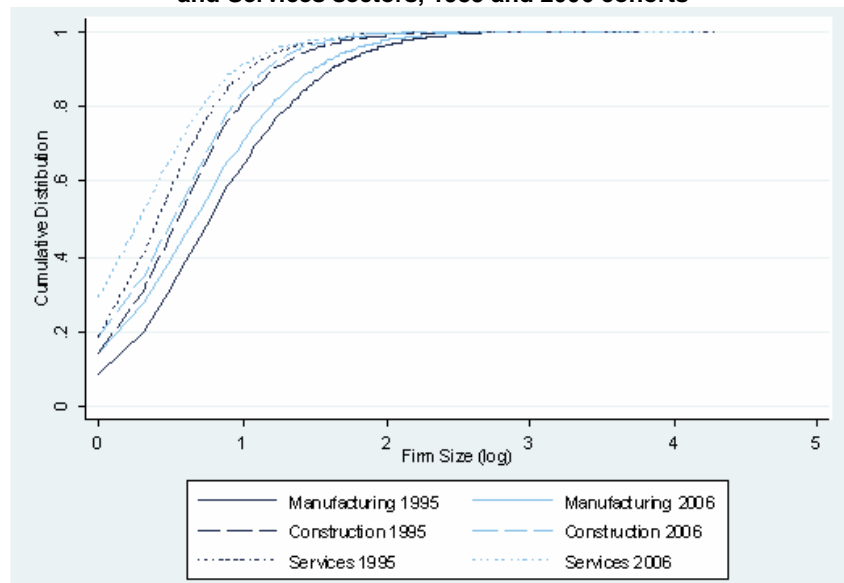
Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

6. Final remarks

Over a period of more than 20 years, we find an overall decreasing average size for employer enterprises in Portugal, which is extended to all broad sectors, NUT II regions, entrants and exiters in the market. Given the growing importance of small enterprises, both in terms of the number of small employer enterprises and their share in employment creation, it is important to address what kind of policy implications should be drawn from the observed dynamics, given that small sized firms are usually the most exposed to specific constraints, such as administrative burdens and financial restrictions.

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Table A.1 - Active Employer enterprises population, by size class
(number)

	Total	1 - 4	5 - 9	10 - 19	20-49	50 - 249	+ 250
1985	102.031	50.886	23.671	13.409	8.650	4.538	877
1986	106.741	53.851	24.861	13.780	8.805	4.586	858
1987	110.842	55.970	25.944	14.172	9.180	4.718	858
1988	122.754	62.914	28.586	15.583	9.834	5.007	830
1989	137.133	71.735	31.641	16.840	10.667	5.342	908
1990	140.293	73.273	32.286	17.237	11.017	5.570	910
1991	148.578	79.096	33.779	17.810	11.263	5.705	925
1992	159.175	86.380	35.729	18.690	11.711	5.774	891
1993	165.860	92.135	36.927	18.892	11.491	5.585	830
1994	184.297	106.955	40.156	19.534	11.562	5.287	803
1995	192.242	114.284	40.872	19.564	11.339	5.372	811
1996	197.546	118.815	41.885	19.563	11.250	5.251	782
1997	213.582	129.473	44.917	20.946	11.918	5.539	789
1998	228.816	140.128	47.613	22.051	12.498	5.720	806
1999	244.238	149.921	50.745	23.702	13.119	5.911	840
2000	268.689	168.588	54.217	25.131	13.827	6.089	837
2001	284.002	177.027	57.830	27.200	14.648	6.399	898
2002	299.788	189.648	60.494	28.017	14.922	5.879	828
2003	306.561	196.986	60.484	27.731	14.335	6.178	847
2004	312.938	203.642	60.226	27.093	14.713	6.380	884
2005	340.775	226.362	62.590	28.591	15.649	6.639	944
2006	344.021	230.318	61.776	28.359	15.872	6.756	940
2007	354.920	238.304	62.846	29.281	16.539	6.988	962

Source: Own calculations based on *Quadros de Pessoal* , GEP, MTSS.

Table A.2 - Average firm size number of employees
(Number of employees /Active employer enterprises)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Agriculture and Fishing	5,7	5,8	5,5	5,4	5,3	5,0	5,0	5,0	4,8	4,7	3,6	3,7
Manufacturing	22,5	22,0	20,9	20,4	19,8	18,9	18,5	17,4	17,1	17,1	16,6	16,4
Services	8,8	8,6	8,6	8,6	8,6	8,4	8,5	8,0	8,0	8,0	8,0	8,1
Construction	10,5	10,4	10,0	9,2	8,6	8,1	8,6	8,2	7,9	8,1	8,1	8,2
Total	11,6	11,3	11,0	10,8	10,6	10,0	10,0	9,4	9,3	9,3	9,0	9,0

Source: Own calculations based on *Quadros de Pessoal* , GEP, MTSS.
Note: This disaggregation is only provided after 1995 due to the start of SEC 95, and up to 2006 due to the problems of compatibility with CAE Rev. 3 after 2007.

Table A.3 - Share of Enterprise births, by broad sectors in total economy (%)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Agriculture and Fishing	4,5	4,6	5,2	4,1	3,8	3,5	3,5	3,7	3,9	4,3	14,9	5,8
Manufacturing	15,5	14,6	15,0	14,3	14,1	12,2	14,2	11,6	10,4	9,8	8,7	9,2
Services	68,9	68,9	66,1	65,9	64,7	65,4	59,5	65,2	71,4	72,4	64,5	71,6
Construction	11,1	11,9	13,7	15,7	17,4	19,0	22,8	19,4	14,2	13,5	11,9	13,3

Source: Author's calculations based on *Quadros de Pessoal* GEP, MTSS

Table A.4 - Growth rates of employees and active employer enterprises in enterprises with fewer than 20 employees and ratio of growth rates

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Growth rate of employees in active employer enterprises with fewer than 20 employees	4,0	3,7	10,3	10,3	2,2	4,7	5,9	3,1	8,5	2,4	1,9	7,4	6,4	6,8	7,8	6,4	4,6	0,7	-0,2	6,0	-0,3	2,7
Growth rate of active employer enterprises with fewer than 20 employees	5,6	4,1	11,7	13,0	2,1	6,9	8,2	5,7	14,0	5,5	3,6	8,5	7,7	6,9	11,0	5,4	6,5	2,9	2,5	9,5	1,1	3,1
Ratio of Employment over Enterprise growth rate	0,7	0,9	0,9	0,8	1,0	0,7	0,7	0,5	0,6	0,4	0,5	0,9	0,8	1,0	0,7	1,2	0,7	0,2	-0,1	0,6	-0,3	0,9

Source: Author's calculations based on *Quadros de Pessoal* GEP, MTSS
Note: A value lower to one means that enterprise growth rate is greater than employment growth rate, contributing to lower the ration of average firm size.

Table A.5 - Firm size across industries and time

Industry	Year	Mean employment	Standard deviation of employment	Coefficient of variation	Share of industry employment in total employment (%)	Share of enterprises in total economy (%)
Agriculture and Fishing	1995	5,7	13,0	2,3	2,0	4,0
	1996	5,8	12,6	2,2	2,1	4,0
	1997	5,5	11,9	2,2	2,1	4,2
	1998	5,4	12,8	2,3	2,1	4,1
	1999	5,3	9,8	1,8	2,0	3,9
	2000	5,0	9,3	1,9	1,9	3,7
	2001	5,0	7,5	1,5	1,9	3,7
	2002	5,0	6,6	1,3	2,0	3,7
	2003	4,8	4,7	1,0	1,9	3,6
	2004	4,7	4,1	0,9	1,9	3,7
	2005	3,6	3,3	0,9	2,2	5,6
	2006	3,7	2,9	0,8	2,1	5,2
Manufacturing	1995	22,5	130,2	5,8	39,3	20,4
	1996	22,0	130,6	5,9	39,3	19,4
	1997	20,9	116,3	5,6	37,0	19,4
	1998	20,4	109,5	5,4	35,7	18,9
	1999	19,8	95,9	4,8	34,6	18,4
	2000	18,9	73,9	3,9	32,8	17,4
	2001	18,5	54,7	3,0	30,8	16,7
	2002	17,4	57,6	3,3	29,3	15,8
	2003	17,1	54,6	3,2	28,4	15,5
	2004	17,1	45,0	2,6	27,6	15,0
	2005	16,6	35,8	2,2	26,0	14,1
	2006	16,4	32,2	2,0	25,0	13,7
Services	1995	8,8	23,2	2,6	49,1	65,0
	1996	8,6	22,1	2,6	49,1	65,7
	1997	8,6	19,4	2,3	50,7	65,1
	1998	8,6	17,9	2,1	51,8	64,9
	1999	8,6	16,9	2,0	52,9	64,7
	2000	8,4	15,0	1,8	53,9	64,7
	2001	8,5	13,4	1,6	54,3	64,5
	2002	8,0	14,6	1,8	55,3	65,1
	2003	8,0	13,1	1,6	56,9	66,0
	2004	8,0	12,0	1,5	57,8	66,8
	2005	8,0	9,6	1,2	59,2	66,3
	2006	8,1	9,6	1,2	60,3	67,3
Total economy	1995	11,6	61,3	5,3	100	100
	1996	11,3	61,0	5,4	100	100
	1997	11,0	54,5	5,0	100	100
	1998	10,8	51,3	4,8	100	100
	1999	10,6	45,3	4,3	100	100
	2000	10,0	35,6	3,5	100	100
	2001	10,0	27,2	2,7	100	100
	2002	9,4	28,4	3,0	100	100
	2003	9,3	26,9	2,9	100	100
	2004	9,3	22,7	2,5	100	100
	2005	9,0	18,6	2,1	100	100
	2006	9,0	17,0	1,9	100	100

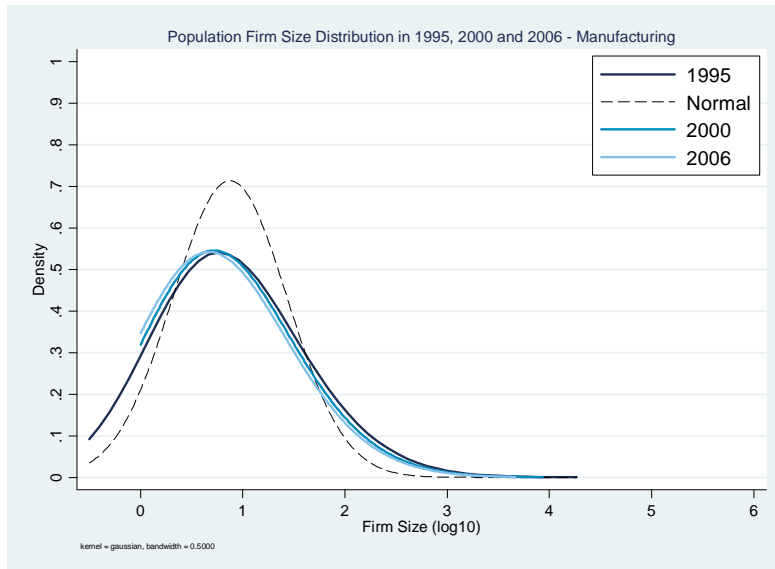Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.
Note: Done for sectors at one letter level of the Portuguese Classification of Economic Activities (CAE Rev. 2.1.).

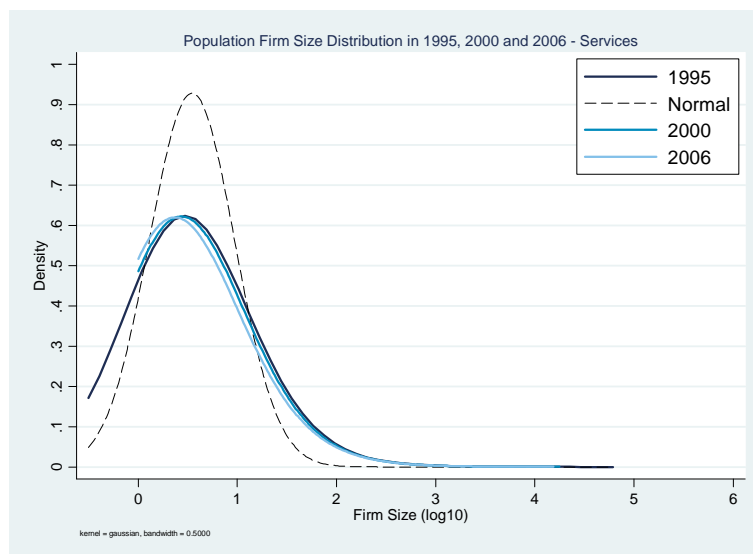**Figure A.1 - Job creation by size class, 1995-2005**

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

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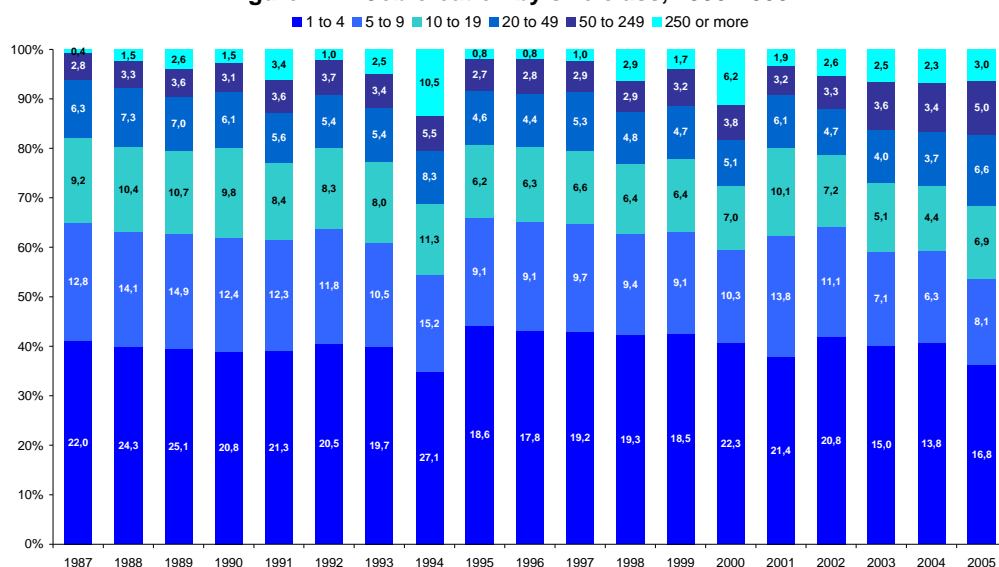
Figure A.2 and A.3 - Firm size distribution in 1995, 2000 and 2006 in the manufacturing and service sector

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

Note: This disaggregation is only provided after 1995 due to the start of SEC 95, and up to 2006 due to the problems of compatibility with CAE Rev. 3 after 2007.

Figure A.4, A.5 and A.6 - Firm size distribution for the 1990, 1995 and 2000 cohorts
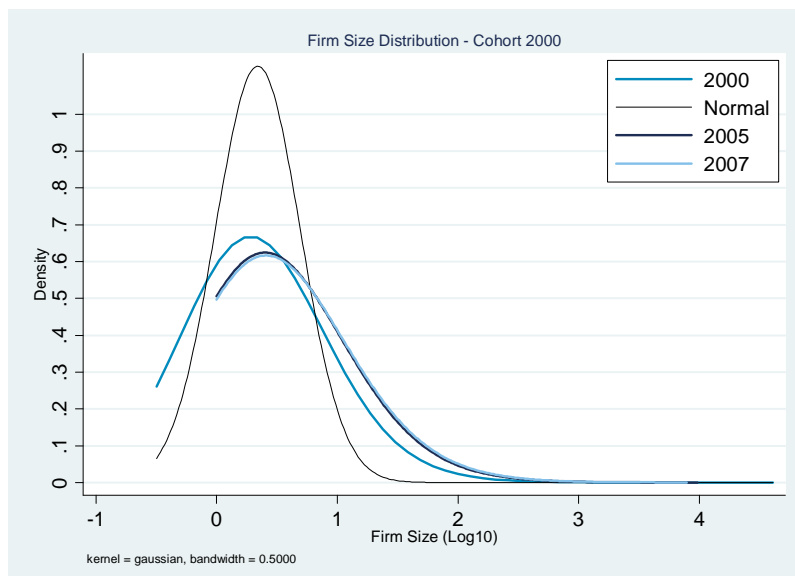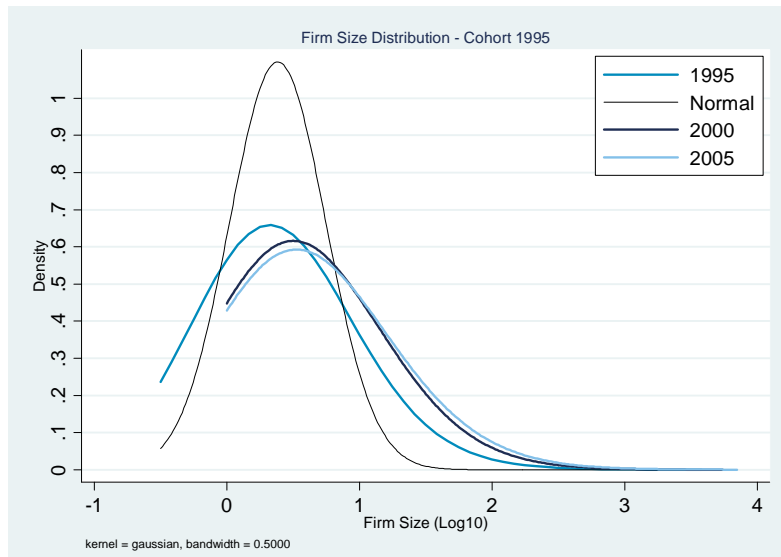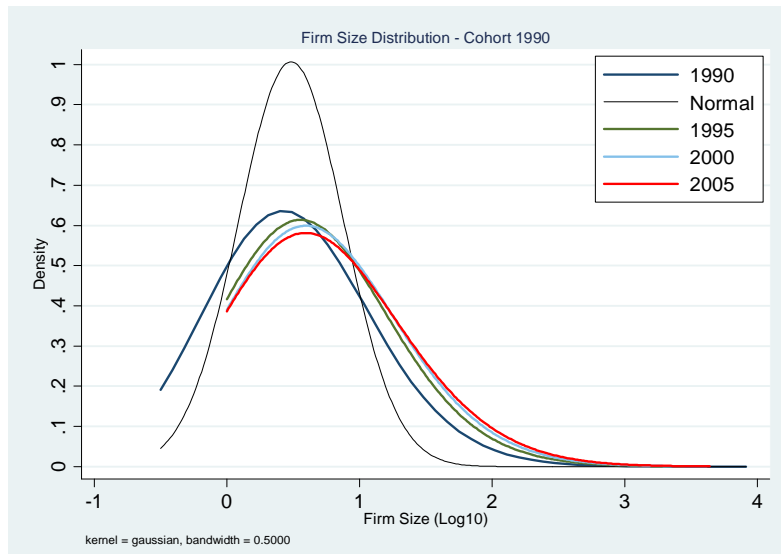
Source: Own calculations based on *Quadros de Pessoal*, GEP, MTSS.

Table A.6 – Normality Tests

. sktest l10_pemp if N==1 & ano==1985, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        16642.01     0.0000
```

. sktest l10_pemp if N==1 & ano==1995, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        31632.23     0.0000
```

. sktest l10_pemp if N==1 & ano==2007, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        62901.32     0.0000
```

. sktest l10_pemp if B==1 & ano==1987, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        2451.56     0.0000
```

. sktest l10_pemp if B==1 & ano==1997, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        6770.69     0.0000
```

. sktest l10_pemp if B==1 & ano==2007, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        13754.89     0.0000
```

. sktest l10_pemp if D==1 & ano==1985, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        2195.88     0.0000
```

. sktest l10_pemp if D==1 & ano==1995, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
   l10_pemp |    0.000          0.000        4932.89     0.0000
```

. sktest l10_pemp if D==1 & ano==2005, noadjust

```
        Skewness/Kurtosis tests for Normality
                       ------- joint ------
   Variable |  Pr(Skewness)   Pr(Kurtosis)    chi2(2)    Prob>chi2
-------------+---------------------------------------------------------
                        l10_pemp |   0.000     0.000     11561.60     0.0000
```