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Firm Dynamics and Job Creation in Turkey – Some Preliminary Results

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Özet:

Bu çalışma TUİK tarafından derlenen İş Kayıtları veri tabanını kullanarak Türkiye'de 2005-2012 döneminde girişim temelinde piyasaya giriş, piyasadan çıkış, istihdam artışı, işlerin yaratılma ve iş yok etme dinamiklerini incelemektedir. Özel olarak, küçük işletmelerin iş yaratmadaki rolü araştırılmaktadır. Bu dönemde istihdam (1-2 kişi çalıştıran) çok küçük ve çok genç girişimlerden daha büyük ve daha yaşlı girişimlere kaymış gözükmektedir. Bu dönemde yaratılmış olan net ek işlerin hemen yarısı, başlangıç yılında çalışan sayısı 1-2 olan çok küçük işletmeler tarafından yaratılmıştır. Girişim büyüklüklerinin nasıl sınıflandırıldığı bu bulguyu etkilemektedir. Girişimler taban yılındaki çalışan sayısı değil de ortalama çalışan sayısına göre sınıflandırıldığında toplam yaratılan net iş sayısı içinde çok küçük girişimlerin payı azalmakta, daha büyük işletmelerin payı artmaktadır. Çok küçük işletmelerin yeni giren işletmeler içindeki payı çok yüksektir. Ancak mevcut çok küçük işletmelerin yüzde 43'ü, yeni giren çok küçük işletmelerin ise yüzde 48'i 5 yıl içinde ölmektedir. Mevcut girişimlere göre, yeni giren girişimlerin daha yüksek bir oranı daha yüksek büyüklük gruplarına sıçrama yapabilmektedir. Ekonometrik bulgulara göre, girişim yaşı kontrol edildiğinde girişim büyüklüğünün iş yaratmaya etkisi önemsiz gözükmektedir. Öte yandan, ekonometrik analiz, girişim büyüklüğü kontrol edildiğinde, daha genç girişimlerin daha fazla iş yarattığı ortaya çıkarmaktadır.

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Abstract:

This paper uses the Business Registers (BR) data set put together by the Turkish Statistical Office to examine patterns of firm entry, exit, employment growth, job creation and job destruction in Turkey over the period 2005-2012. In particular, we examine the role of small firms in total job creation. We find that distribution of employment has moved from very small (1-2 employees) and very young firms to larger and older firms over this period. Almost half of net job creation over the period has been generated by firms that have only one or two employees in the base year. This measurement is sensitive to how firm size is classified: when firms are classified according to average size rather than size in the base year, the share of very small firms in total net job creation appears smaller and the share of larger firms appears higher. While the share of very small firms (1-2 employees) in new entry is very high, 43 percent of very small existing firms and 48 percent of very small new entrants die within 5 years. Relative to existing firms, a higher proportion of new entrants grow into higher size groups. Econometric analysis shows that controlling for age, the role of firm size in job creation is negligible. By contrast, we find econometric evidence that controlling for firm size, younger firms create more jobs than older firms.

1. Introduction

Almost all financial support programs to small and medium enterprises are based on size of the enterprises in Turkey. The reasons are that, not only there is a widespread belief that SMEs are main actors of jobs creators, but also they face enormous financial problems which hinder their job creation and operating at full capacity. This perception is so common that in 1990 KOSGEB (Small and Medium Industry Development Organization) was established to support SMEs through various incentives schemes including support to research and development, marketing, export and training activities.

However, a burgeoning literature analyzing job creation (e.g. Haltiwanger et al., 2013; Criscuolo et al. 2014; Rijkers et al. 2014), underlines the importance of young firms (or "age" factor) in job creation. The traditional data sets used in Turkey for analyzing job creation either lack age information (as it is the case with the Annual Industry and Service Statistics, AISS) or are not comprehensive in coverage (as it is the case with the Annual Manufacturing Survey, AMS). This paper uses a data set of all firms in the business sectors of Turkey to investigate patterns of firm dynamics and job creation. The data set that is used is the Business Registers (BR, "İş Kayıtları") put together by the Turkish Statistical Office (Turkstat). The BR data set covers all firms and has information on the sector of activity, the year that firms were established and/or year that the firm started operations, and the number of employees. To our knowledge, this is the first paper using the BR data set to address questions of firm dynamics and job creation in Turkey.

The BR data set offers some important advantages over other data sets (especially the AISS) that have been used in analyses of firm dynamics and job creation in Turkey (for example, Grun et. al (2013). For industries included in the data set, it covers all firms in Turkey, whereas the AISS consists of a census of firms with at least 20 employees and samples of smaller firms. Thus the BR allows the analysis of firm dynamics among small firms, which, as discussed below, have an important share in total employment in Turkey. The BR data set has disadvantages as well. In general, the AISS is "cleaner" because data are checked and corrected by TurkStat experts during the implementation of the questionnaire. Second, the AISS has a much richer set of economic variables. In particular, the BR data set does not have any measures of output hence precluding any analysis of productivity.[4]

This paper has two contributions. First, we document the main characteristics of firm dynamics regarding job creation, entry and exit, survival rate, and size transition matrices. While very small

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[4]Detailed information the BR data set and its coverage is provided in the Appendix.

firms seem to play an important role in job creation these jobs do not seem to be persistent. About 43 percent of very small (1-2 employees) firms and 48 percent of very small entrants die within 5 years. Exit rates decline with firm size. Compared to incumbent firms, larger proportions of entrant firms seem to grow into larger size categories.

Secondly, and more importantly we try to identify the role of "size" and "age" in job creation. Following the methodology developed by Haltiwanger et al. (2013) we are able to disassociate the respective contributions of size and age to job creation. Regression analysis of employment growth at the firm level shows that when age is controlled for, small firms do not appear to create more jobs; in fact, the impact of smallest firms appears to be zero. By contrast very young firms seem to have a disproportionate positive impact on job growth, and this is robust to controlling for size. When the analysis is restricted to continuing firms, job growth does not seem to depend on size, while there seems to be a negative correlation between job growth and firm age.

The paper is organized as follows: Sections 2 to 5 examine the distribution of employment by firm size and age, patterns of entry and exit, job creation and destruction, and survival and size transitions, respectively. Section 6 undertakes a regression analysis of the role of size and age in the creation of jobs. Section 7 concludes.

2. Distribution of Employment

Table 1 shows total number of firms and employment in the data set. Total number of firms actually has not increased much between 2005 and 2012. There has been significant reductions in both the number of firms and employment in 2009, and the decrease in both continue into 2010, with recovery appearing in 2011 and 2012. Employment in the firms covered in the data set has increased by about 5.8 million jobs, or by about 60 percent. This is quite substantial, especially given that the rate of increase in the number of firms between 2005 and 2012 is much smaller.

Table 1: Total employment and number of firms

year	# of firms	employment
2005	3,330,591	9,725,537
2006	3,164,301	9,834,965
2007	3,194,577	10,926,838
2008	3,448,731	14,479,923
2009	3,252,827	12,588,345
2010	3,065,507	11,718,169
2011	3,455,436	13,852,366
2012	3,450,178	15,508,314

Table 2 displays the distribution of number of firms and employment according to size for the years 2005 and 2012. There is a significant decline in the share of firms that employ 1 or 2 persons. Their share in number of firms is reduced from 89 percent to 76 percent and their share in employment is reduced from 32 to 20 percent. This reduction in the employment of 1-2 person firms is matched by increases in the employment share of *all other* size classes, however increases in the employment share of firms with 5-10 and 50-249 workers is more pronounced. One can note that the share in employment of firms with less than 10 employees is reduced from 44 to 36 percent between 2005 and 2012, but the real driver of this change is the reduction in the share of 1-2 employee firms. The table also shows that the employment share of firms with at least 500 employees is about 16 percent in 2012 and has remained almost constant since 2005.

Table 2: Distribution of firms and employment according to size (2005, 2012)

	share of employment		share # of firms	
size	2005	2012	2005	2012
1-2	32.31	19.69	88.94	76.15
3-4	4.96	7.93	4.29	10.62
5-9	7.75	10.43	3.49	7.27
10-19	7.99	9.92	1.74	3.32
20-49	11.03	11.95	1.03	1.73
50-99	6.12	7.15	0.26	0.47
100-249	8.70	10.16	0.17	0.30
250-499	6.01	6.79	0.05	0.09
500+	15.12	15.97	0.03	0.06

To look deeper into the employment dynamics of very small firms, Table 3 displays employment share of 1-employee and 2-employee firms over the period 2005-2012. The table brings out an anomaly in the data set in the years 2008 and 2009: It seems that many firms that are recorded as 1-employee firms in other years have been recorded as 2-employee firms in that year.[5] It is for this reason that in this paper we place 1-employee and 2-employee firms into a single group. There are no such large swings in the employment share of other size groups. In any case, however, the table does reveal a secular persistent decline in the total employment share of firms that employ 1 or 2 workers. In addition, we point out that Table 3 suggests that the real decline is in the share 1 person firms, tough this conclusion should be met with caution because statistics associated with 1- and 2- person firms seem to be problematic.

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[5]The inconsistencies across years seem partly due to the fact that firms that had missing and zero employment data were assigned employment levels based on the legal status of the firm, and this methodology may have changed over time.

Table 3: Employment share of very small firms (2005-2012)

| | no. of workers | | |
	1	2	total
2005	28.61	3.70	32.31
2006	26.72	3.74	30.46
2007	23.13	4.51	27.64
2008	3.83	29.87	33.70
2009	8.79	25.17	33.97
2010	20.42	3.55	23.97
2011	18.35	4.62	22.98
2012	14.19	5.50	19.69

Figure 1 displays the distribution of employment by age of firms in 2005, 2006 and 2012.[6] The year 2005 is exceptional in that employment share of firms with zero age is very high (about 20 percent, while in all other years it is about 5-6 percent), hence the spike, in Figure 1, at zero age for 2005 and age 7 at 2012. In general, between 2005 and 2012 the distribution seems to have shifted towards the right, that is, current firms seem to show an older profile in 2012 relative to 2005.

Figure 1: Distribution of employment by age, 2005, 2006 and 2012
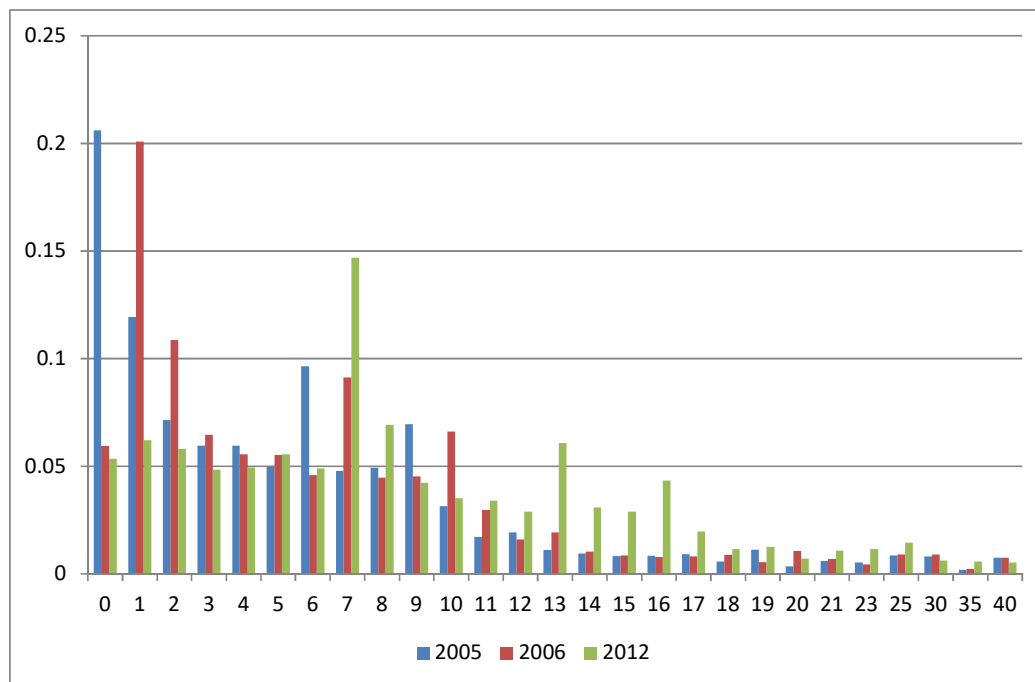
[6]There are a number of observations for which age data is not available. Such observations amount to 2.8 percent of the number of firms and 2 percent of employment in 2005. These ratios decrease over time and are negligible after 2009. Results that involve distribution according to age are obtained after deleting these observations.

Table 4 displays the joint distribution of employment according to size and age for the years 2005 and 2012. Size classifications are done according to the Eurostat broad definition of size categories. Several observations can be made. The most visible change is that the decrease in the share of young firms and increase in the share of mature firms along all size classes. Second, the most drastic decline seems to in the employment share of young micro firms, while the largest increase in employment share has been recorded by large mature firms.

Table 4: Distribution of employment by size and age, 2005 and 2012 (%)

		2005	2012	Change
young	micro	37.74	26.56	-11.18
young	small	16.56	14.20	-2.37
young	medium	12.45	10.17	-2.28
young	large	16.13	12.46	-3.66
mature	micro	7.00	11.49	4.49
mature	small	2.67	7.67	5.00
mature	medium	2.45	7.14	4.69
mature	large	5.00	10.30	5.30

Note: Micro: 1-9 employees; small: 10-49 employees; medium: 50-249 employees; large 250+ employees. Young: 0-9, mature 10+ years old.

Table 5 shows the distribution of employment by sector in 2005 and 2012.[7]The manufacturing sector stands out for a significant decline in its share in total employment from about 29 to 25 percent. The employment share of wholesale and retail trade has also decreased from 27 to 24 percent. Sectors that record sizable increases in employment are construction (from 7 to 11 percent) and real estate and business services (from 9 to 13 percent).

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[7]The abbreviations for sectors are as follows: Mining (MIN); manufacturing (MAN); public utilities - electric, gas, water (PU); construction (CONS); wholesale and retail trade (WRT); hotels and restaurants (HR); transport, communication and storage (TSC); finance, insurance, real estate and business services (RBS), excluding sector J (financial intermediation) in NACE Rev 1 and sector K ((financial and insurance activities) in NACE2; community, personal and government services (CSPSGS).See the Appendix for details.

	2005	2012
MIN	0.99	0.89
MAN	28.46	24.83
PU	1.15	1.06
CONS	7.21	10.76
WRT	26.73	24.13
HR	6.10	6.89
TSC	11.21	10.02
RBS	8.54	12.54
CSPSGS	9.61	8.88

It will also be interesting to compare the size distribution of employment across sectors, which is displayed in Figure 2 for all observations covering the years 2005 to 2012 and for sectors whose share in total employment is at least 10 percent in 2012. The figure shows wide variation in the size distribution of employment across industries. Wholesale and retail trade and transport, communication and storage both have a large percentage of employment situated in firms that employ 1-2 people (42 and 51 percent, respectively). In the construction industry, middle-sized firms (10-249 employees) carry a high share in employment. The share of large (250+) firms in total sectoral employment is relatively higher in manufacturing and real estate and business services.

Figure 2: Distribution of employment by firm size: Selected sectors (%, 2005-2012 total)
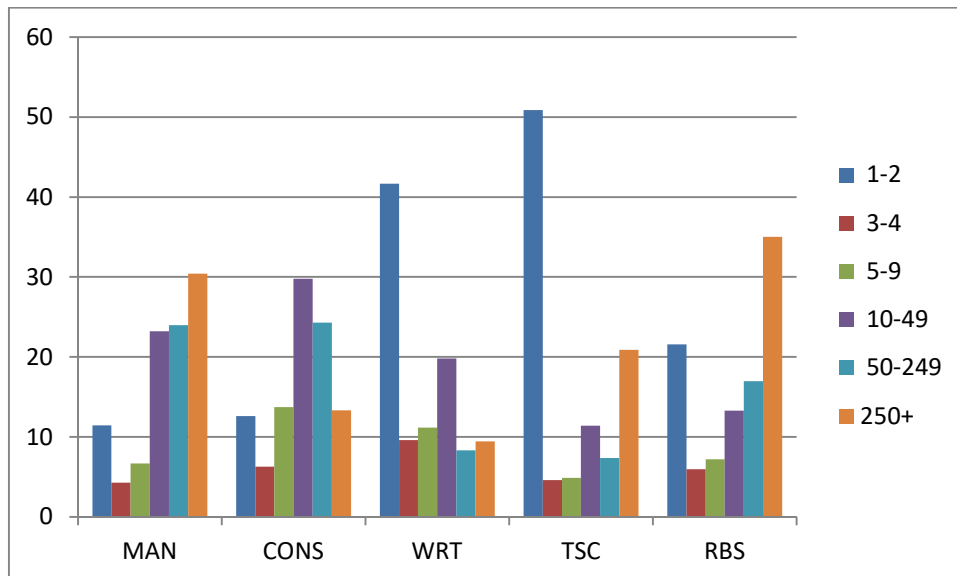
3. Entry and Exit, Job Creation and Destruction

Table 6 provides basic data on entry and exit of firms. The variables are defined as follows.

E(t) = Number of firms that were not in the data set in (t-1) but which are in the data set in t.

C(t) = Number of firms that are observed in the data set both in (t-1) and (t).

X(t) = Number of firms that were in the data set in (t-1) and not in the data set in (t).

T(t) = Total number of firms in year t.

Note that T(t) = E(t) + C(t) = C(t+1) + X(t)

ER = Entry rate = E(t)/T(t-1)

XR=Exit rate = X(t) /T(t-1)

Since the data set starts in year 2005, the first year that entrants can be identified is 2006. Excepting the year 2010 and 2011, where entry rates are extremely low and high, respectively, entry rates are around 10-13 percent. For the exit rate 2008 is an exceptionally low year. Otherwise, exit rates vary over a larger range, between 10 and 17 percent.

Table 6: Entry and exit (2006-2012)

	E	C	X	ER	EX
2006	400014	2764287	566304	12.0	17.0
2007	357101	2837476	326825	11.3	10.3
2008	323449	3125282	69295	10.1	2.2
2009	394487	2858340	590391	11.4	17.1
2010	130103	2935404	317423	4.0	9.8
2011	825557	2629879	435628	26.9	14.2
2012	458311	2991867	463569	13.3	13.4

E: No. of entrants, C: No. of continuing firms; X: No. of exitors.
ER: Entry rate; EX: Exit rate. See text for definitions.

Table 7 shows entry and exit rates by sector. Hotels and restaurants and RBS stand out as high turnover industries; entry and exit rates in the rest of the sectors are not very different from each other. The table shows that entry and exit rates, with the exception of PU, are generally positively correlated across industries (when PU is excluded the correlation coefficient between entry and exit rates is about 83 percent). This suggests that entry and exit are mostly associated with creative destruction, rather than sector wide profitability shocks. The exception is PU, which displays high entry and low exit rates, suggesting high profitability opportunities in that industry over the 2006-2012 period.

One can also note that in international comparison, entry and exit rates in Turkey are similar to those in OECD countries and Latin America, and lower than those witnessed in transition economies (see, for example, Figure 1, Panel D in Bartelsman et. al. (2004) which reports entry and exit rates for the total business sector with at least 1 employee).

Table 7: Entry and exit rates by sector (2006-2012 averages)

	ER	EX
MIN	11.05	8.98
MAN	11.88	10.81
PU	19.81	3.43
CONS	13.86	10.14
WRT	11.91	12.05
HR	17.13	15.39
TSC	9.14	9.60
RBS	21.13	14.50
CSPSGS	12.36	10.98

At this point, an anomaly in the data set needs to be highlighted. Entrants in principle can also be identified on the basis of age. The age of an entrant is zero. In principle, firms appearing in the data set for the first time should have age zero. However this is not the case in the data set. Table 8 shows for each year the percentage of entrants that have age 0 and 1. It can be seen that age and appearance in the data set are highly correlated in the years 2006 and 2007. For example, in 2006, 93 percent of entrants are of age 0 and 4 percent are of age 1. However, these ratios start declining in 2008. Starting in 2008, only about 80 percent of all firms that enter the data set have age 0 or 1, and in 2010 this ratio is just below 70 percent. There may be various reasons for this. It could be that some firms change their legal identities due to mergers and acquisitions, and thereby their identification code number is changed in the data set. Since entry is defined as first appearance in the data set, such firms are treated as new entrants. We guess that, at least for some observations, the year of establishment, which forms the basis of the definition of the age variable used in this study, is still recorded according to the original date of establishment. Of course, such cases should be treated as continuing firms, but the data set does not have any information which would allow us to do so. Another reason could be mistakes in recording the establishment year of the enterprise, though it is not clear why this should create a systematic change in the bias between earlier and later years. In this study we will continue to use appearance in the data set to identify entrants.[8] One can also note in the table that the share of age-0 firms in job creation by entrants, again defined as firms that appear in the data set for the first time, also decline significantly starting

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[8] An alternative could be to restrict the definition of entrants to firms whose age is zero. We do not take this route for two reasons: First, the age variable seems quite noisy (see Appendix). For instance, even for firms appearing in all years in our sample, sometimes, there exist more than one year of birth. More importantly, in that case firms (or rather ID codes) that first appear in the data set but with positive age would need to be recorded as continuing firms. In that case since we cannot observe earlier employment levels of these firms, this would have resulted in an overestimation of job creation by continuing firms.

in 2008, and is especially low in 2010. In any case, additional information that would allow differentiating between firm growth due to mergers and acquisition on the one hand and organic growth on the other would increase the quality of the data.

Table 8: Percentage of entrants at age 0 and 1 and their share in entrants' employment

year	age	% of entrants	% of job creation by entrants
2006	0	92.47	92.56
2006	1	3.87	3.73
2007	0	94.51	94.56
2007	1	3.40	2.95
2008	0	71.72	75.84
2008	1	4.81	4.49
2009	0	62.74	70.00
2009	1	6.20	9.53
2010	0	75.21	61.58
2010	1	7.74	7.13
2011	0	43.82	40.19
2011	1	29.10	39.68
2012	0	77.40	80.57
2012	1	4.73	3.21

Next, we examine the distribution of entrants according to size. The employment share of entrants of different size groups in total jobs created by entrants displayed in Figure 3, which shows the distribution of entrants' job creation by Eurostat broad definition of size categories. The figure shows that the share of micro firms (1-9 employees) in total employment created by entrants varies between 60-80 percent over the years. The share of large firms (250+) is generally below 10 percent.

Figure 3: Distribution of entrants' employment according to size (%)
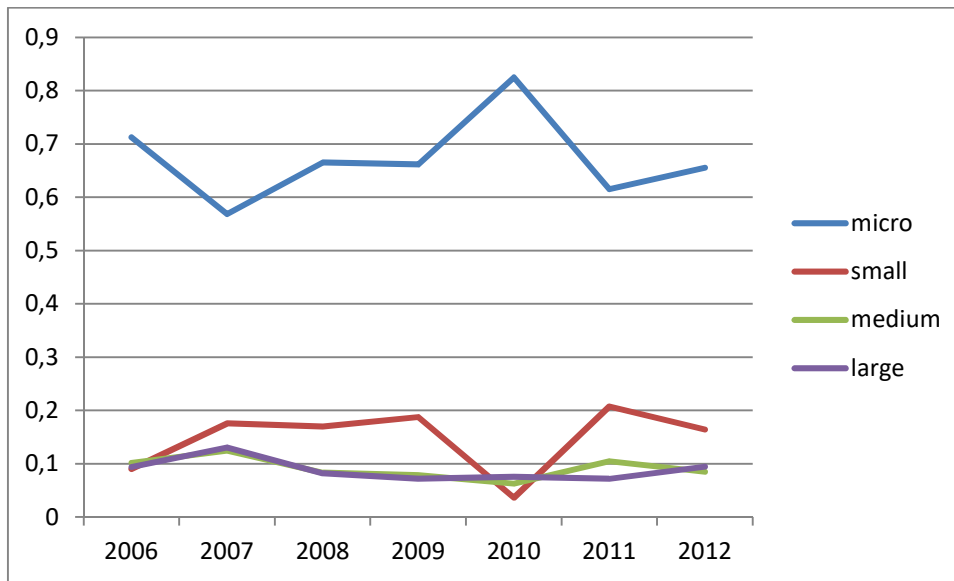
Note: Micro: 1-9 employees; small: 10-49 employees; medium: 50-249 employees; large 250+ employees.

Table 9 shows the share of different size groups in total number of entrants and jobs created by them. We report the totals for the period 2006-2012 as well as the individual years 2006 and 2007, two years where we believe entrants are more correctly identified. The table shows that over the period 2006-2012 about 90 percent of entrants had one or two employees. The share of this size group in total jobs created by entrants varies between 40-60 percent across years. The share of very large firms (500+) in total entrant employment is about 5-6 percent.

Table 9: Distribution of entrants by size

	2006		2007		2006-2012 total	
	Share in no. of firms	share in job creation	Share in no. of firms	share in job creation	Share in no. of firms	share in job creation
1-2	96.36	63.49	91.13	43.40	90.22	47.56
3-4	1.77	3.78	3.50	5.38	4.36	7.06
5-9	0.99	4.01	2.73	8.05	3.13	9.74
10-19	0.43	3.65	1.81	10.78	1.54	9.81
20-49	0.27	5.43	0.49	6.82	0.51	7.43
50-99	0.11	4.62	0.16	5.02	0.13	4.40
100-249	0.06	5.57	0.11	7.45	0.07	5.28
250-499	0.02	3.58	0.04	6.23	0.02	3.24
500+	0.01	5.86	0.02	6.87	0.01	5.49
Total	100.00	100.00	100.00	100.00	100.00	100.00

4. Job creation and destruction

Table 10 shows total job creation and job destruction by entering, continuing and exiting firms over the years 2006-2012, where entering, continuing and exiting firms are as defined above. The first thing to notice is the large number of jobs created by entering firms and the large number of jobs destroyed by exiting firms. Total jobs created by entrants are actually larger than net jobs created by continuing firms. Of course, many jobs created by new entrants are destroyed within a few years, as will be shown below. Also note that gross jobs flows among continuing firms are very large. A total of 13 million jobs have been created by expanding firms and about 8 million jobs have been destroyed by contracting firms.   Finally, as discussed above, due to problems with the definition of entering firms, jobs created by new entrants are possibly overestimated and jobs created by continuing firms are possibly underestimated.

Table 10: Total job creation and destruction by entering, continuing and exiting firms, 2006-2012

	job creation	job destruction	net job creation
entry	6,004,451	0	6,004,451
continuing	13,349,242	8,184,204	5,165,038
exit	0	5,386,712	-5,386,712

To have an idea of the extent of the bias due to the misidentification of entry, Table 11 reports data similar to Table 10, but for the years 2006-2008, where we are more confident that the definition of entry captures true entrants (because a much higher percentage of entering firms have 0 age). It can be seen in that table that jobs created by continuing firms are almost three times as large as those created by entrants, where this ratio was about 2 in Table 10. Continuing firms' share in net job creation is also much larger in Table 11: Net job creation by continuing firms is twice that of entrants in Table 11, whereas in Table 10 net job creation by continuing firms was lower than that of entrants.

Table 11: Total job creation and destruction by entering, continuing and exiting firms, 2006-2008

	job creation	job destruction	net job creation
entry	2,117,635	0	2,117,635
continuing	6,320,498	2,197,965	4,122,533
exit	0	1,485,796	-1,485,796

Table 12 displays the distribution of total jobs created and destroyed between 2006-2012 by size. We note first the excessively high share of very small firms in gross job flows. About 49 percent of

net job creation was undertaken by firms with one or two employees and the share of firms with less than 10 employees in total net job creation was about 64 percent. Note that the share of very large firms (500+) in total net job creation was very small and negative.

Table 12: Job creation and destruction by size, base year classification (2006-2012 total)

Size	job creation	job destruction	net job creation	(%)
1-2	7,805,120	4,975,899	2,829,221	48.92
3-4	1,404,174	1,061,555	342,619	5.92
5-9	1,782,694	1,234,747	547,947	9.48
10-19	1,702,611	1,279,170	423,441	7.32
20-49	1,701,574	1,150,430	551,144	9.53
50-99	1,164,219	714,092	450,127	7.78
100-249	1,465,472	995,202	470,270	8.13
250-499	857,945	676,377	181,568	3.14
500+	1,469,882	1,483,442	-13,560	-0.23

It is well known that calculation of job flows by size categories is sensitive to how size classes are created. The calculations above are based on the base year classification, that is, an observation is classified according to its size in t-1. The literature has emphasized that this may create a "regression to the mean" bias (e.g. Haltiwanger et. al, (2013). [9]

To see whether the size classification of firms makes an important difference, Table 13 reports job creation and job destruction over the same period, but this time firms are classified according to their average size (average of employment in t-1 and t). For entering firms employment in t-1 is assumed to be zero, while for exiting firms employment in period t is assumed to be zero (See also Rijkers et al. 2014). The size classification of firms seems to make a big difference. Under the average size classification, the employment share of very small firms is much smaller, about 17 percent. The share of micro firms (1-9 employees) in total job creation is about 42 percent. As will be seen below, this seems consistent with regression results reported in Section 6 where it is shown that size does not seem to play an important role in job creation.

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[9]"Businesses that recently experienced negative transitory shocks (or even transitory measurement error) are more likely to grow, while businesses recently experiencing positive transitory shocks are more likely to shrink. This effect alone will yield an inverse relationship between size and growth." Haltiwanger et. al, 2013, p. 349.

Size	job creation	job destruction	net job creation	(%)
1-2	6,936,708	5,932,956	1,003,752	17.36
3-4	1,512,019	866,382	645,637	11.16
5-9	2,059,509	1,254,471	805,038	13.92
10-19	1,500,533	963,650	536,883	9.28
20-49	1,838,288	1,079,836	758,452	13.12
50-99	1,253,399	747,864	505,535	8.74
100-249	1,569,879	949,736	620,143	10.72
250-499	965,901	629,755	336,146	5.81
500+	1,717,455	1,146,264	571,191	9.88

## 5. Survival and size transitions

Figure 4 reports the survival rates of cohorts of firms that entered in the years 2006, 2007 and 2008. Except for the very high survival rate after 1 year of entry for the 2007 cohort, the survival rates are remarkably similar across cohorts. About 43 percent of firms die after 4 years and survival rate after 5 years is about 50 percent.[10]

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[10]Some firms exit and then re-appear in the data set. In the paper the survival rate for cohort t in time t+k refers to the ratio of firms entered in t and that do not exit until t+k to the number of firms that entered in t.

Figure 4: Survival rates of cohorts of entrants (%)
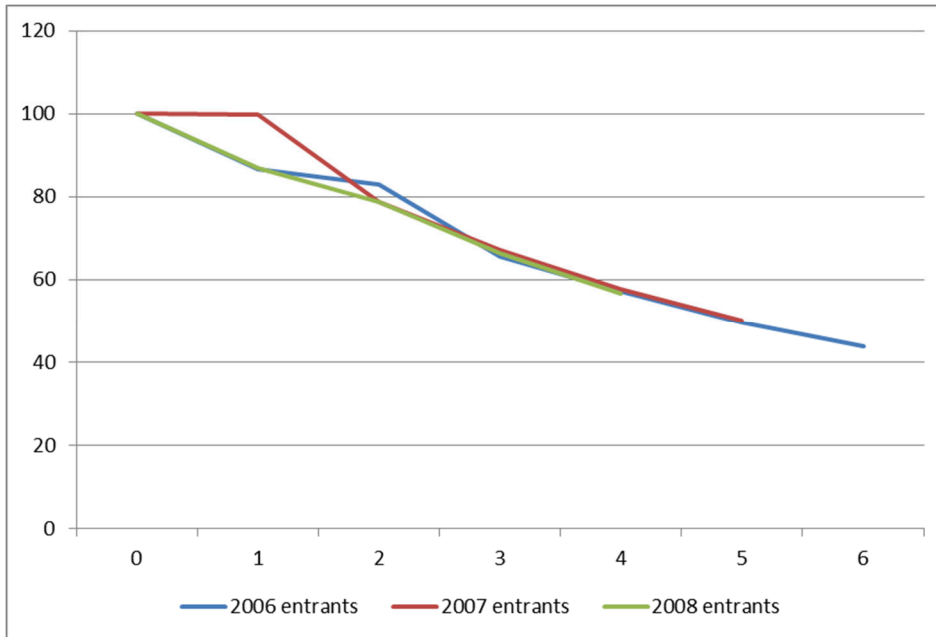
Note: the x-axis shows years after entry

Figure 5 shows survival rates for all firms in 2005, 2006 and 2007. There are some differences across years, especially during the first few years for each cohort, but the overall patterns are similar across years, especially after 4 years of observation. Survival rate is about 72-73 percent after four years and declines to about one half after 7 years.

Figure 5: Survival rates for all firms
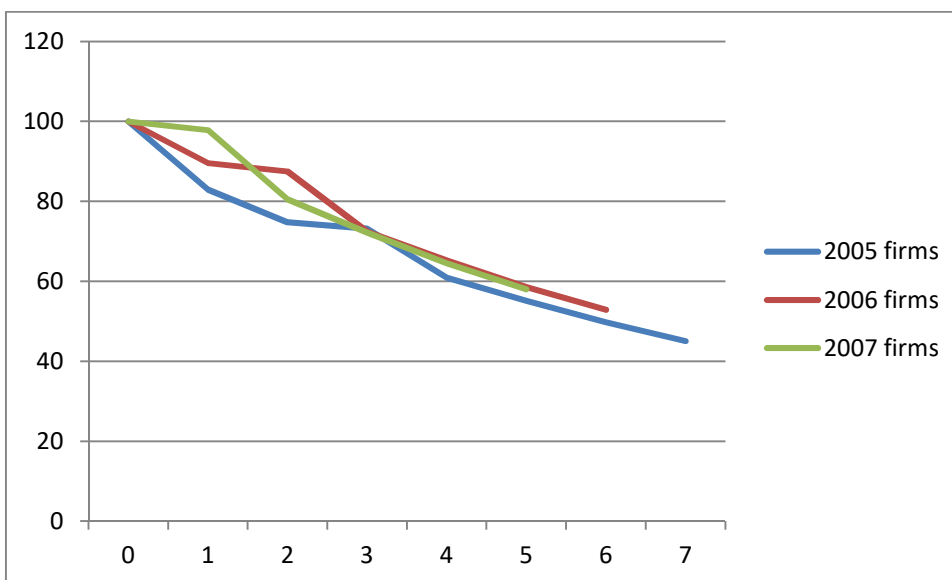
Note: the x-axis shows years after entry.

Table 14 displays information on transitions of firms between different size groups in a period of five years. The table reports the averages calculated over the years 2005-2007. About 43 percent of

firms in the size group 1-2 exit after 5 years; 51 percent remain in the same size group. The share of firms that had 1 or 2 employees in 2005-2007 that grow to have at least 10 employees in 5 years is less than 1 percent. Hence it seems while the contribution of very small firms in the "1-2" size class to job creation is quite high (at least when observations are classified is on the basis of size in the base year), very few of these firms actually grow into larger size classes.

Another important observation is that exit rates decline with size. While about 43 percent of firms in the 1-2 size group and 24 percent of the 3-4 size group exit after 5 years, this ratio declines to less than 15 percent for size groups 50-99, 100-249 and 250-499. Exit ratio for 500+ firms is a bit higher, about 15 percent.

Table 14: 5-year size transition matrix, all firms, average of 2005, 2006 and 2007.

	No. of firms	exit	1-2	3-4	5-9	10-19	20-49	50-99	100-249	250-499	500+
1-2	2,849,436	42.68	50.84	3.84	1.85	0.58	0.19	0.01	0.00	0.00	0.00
3-4	151,729	24.09	27.19	22.53	19.61	5.03	1.37	0.14	0.03	0.00	0.00
5-9	111,998	20.07	16.22	12.90	30.42	15.04	4.57	0.63	0.14	0.01	0.00
10-19	63,826	16.48	10.72	6.43	17.02	29.09	16.96	2.48	0.74	0.07	0.01
20-49	33,763	16.32	5.13	2.46	5.52	14.78	39.10	12.26	3.83	0.47	0.14
50-99	9,501	14.17	1.20	1.22	3.18	6.37	18.30	30.58	21.78	2.49	0.71
100-249	6,342	13.06	0.63	0.43	1.28	3.40	6.92	12.20	45.63	13.16	3.29
250-499	1,939	12.77	0.33	0.19	0.53	1.59	2.90	4.18	17.88	39.67	19.97
500+	1,288	14.85	0.13	0.05	0.07	0.33	1.49	1.70	5.29	11.96	64.14

The size transition matrix for 2006 and 2007 entrants is given in Table 15. The table reports the average of size transition probabilities of 2006 and 2007 entrants 5 years after entry. There are a number of dimensions along which entrants' growth dynamics seem to differ from the rest of the firms. First, for all size classes, a larger proportion of new entrants exit in five years compared to all firms. At the same time, however, for firms that do not exit, larger shares of entrants (relative to all firms) seem to make transitions to higher size classes. For example, for 1-2 firms, only 0.78 percent grow into sizes with at least 10 employees among all firms, while this ratio is 1.5 percent for new entrants. Again, while the ratio of 5-9 firms that make transitions into larger size classes is 20 percent among all firms, the same ratio is 27 percent for entrants; for 20-49 firms, these ratios are 17 percent and 27 percent respectively. Still, Table 15 also shows that a very large share of very small firms (1-2 employees) either exit or do not grow, as was the case for all firms in Table 14. Hence again, while very small firms seem to contribute a lot to net job creation, it seems many of these firms either do not grow or exit.

	No. of firms	exit	1-2	3-4	5-9	10-19	20-49	50-99	100-249	250-499	500+
1-2	355,433	48.27	43.43	4.22	2.59	1.05	0.40	0.03	0.01	0.00	0.00
3-4	9,798	34.35	17.07	15.32	19.65	9.01	4.11	0.39	0.10	0.01	0.00
5-9	6,861	33.12	13.02	7.59	19.23	16.10	8.66	1.80	0.44	0.04	0.00
10-19	4,078	31.27	9.83	4.54	10.13	19.40	17.28	5.44	1.84	0.18	0.09
20-49	1,416	33.28	4.67	1.86	4.07	7.94	20.77	16.62	8.23	1.55	1.01
50-99	506	25.74	0.80	0.75	1.81	4.13	7.76	29.00	25.40	3.63	0.99
100-249	311	23.28	0.47	0.13	0.39	2.06	4.20	7.79	39.21	17.64	4.84
250-499	105	22.47	0.35	0.76	0.00	1.45	1.04	4.83	9.82	41.35	17.93
500+	51	21.46	0.00	0.00	0.00	0.00	0.69	3.11	11.76	15.21	47.77

Figure 6 displays the evolution of the average size of firms that have entered in 2006. The figure displays two measures. "Survivors" refers to the average size of firms that entered in 2006 and appear in the data in the later years (in other words, this measure includes firm that exit and re-enter). "True survivors" refers to those firms which entered in 2006 and continued to exist every year after that, until 2012. The two indicators provide similar results: average size of these firms was about 1.5-2 in 2006 and grew to about 4-4.5 in 2012. These figures are relatively small and clearly reflect the dominance of very small firms among the entrants.

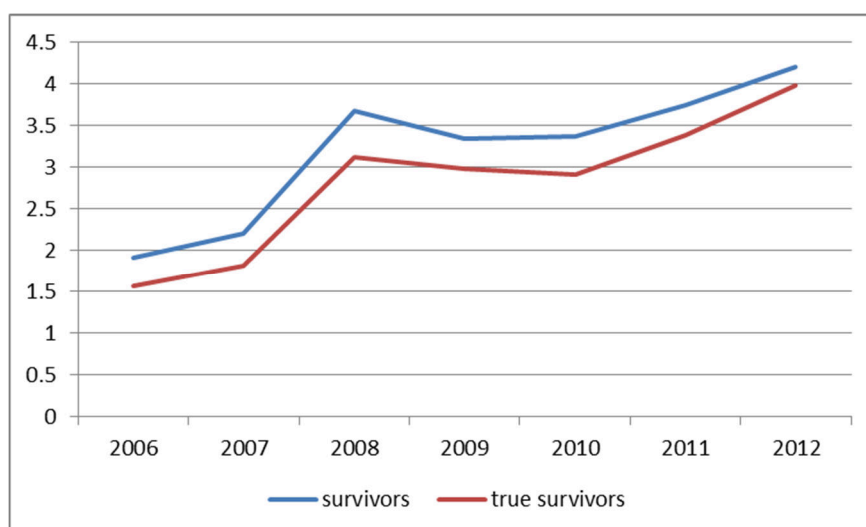Figure 6: Survivors' average size after entry, 2006 entrants

Figure 7 shows the average size of firms for different age groups, for all the economy and for manufacturing in 2012. The average size of age groups is relative to the average size of the youngest age group (0-4 years), which is set equal to 1. In a vibrant economy, we would expect this ratio to increase with age (Hsieh and Klenow 2012). For both the whole economy and for manufacturing, average size first seems to increase by age, until 15-19 years of age. Average size then declines for firms aged between 20 and 35 and then in increases again. For the whole economy, average size of old the oldest group of firms is about twice of the youngest group. For manufacturing, the ratio is about 5 for firms aged 35-39 but declines to about 2.5 for firms older

than 40 years. Hsieh and Klenow (2012) provide similar ratios for US, Mexico and India. For US manufacturing plants, this ratio increases monotonically and the ratio of the average employment of 40+ firms to that of firms in the 0-4 age group is about 8. For Mexico the ratio is about 2 and for India, it is about 1. Turkey seems to lie somewhere between Mexico and the US, in that for some age groups the ratio reaches 3 (age 15-19) or even 5 (age 35-39).

Figure 7: Firms' relative size over the life cycle, 2012
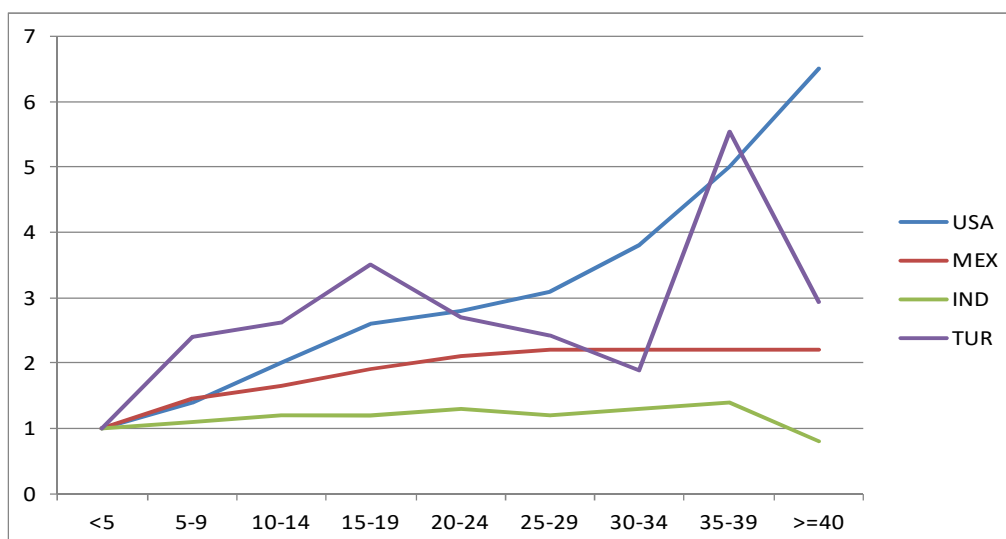
Source: Turkey: Authors' calculations based on BR; India, Mexico and US: Hsieh and Klenow (2012).

6. Employment growth regressions

In this section we examine econometrically the impact of firm size and age on firm employment growth in the BR data set. More specifically we ask whether small firms make a relatively higher contribution to job growth than large firms (as suggested in the discussion presented above) and whether this contribution survives once one controls for age.

In all the regressions below, the dependent variable is job creation rate, as defined by Davis, Haltwanger and Shuh (1996), and is calculated as follows: For each firm employment growth at time t is defined as the change in employment between t and t-1, divided by the arithmetic average of employment over time t-1 and t. This ratio varies between -2 and 2. The employment growth of entrants is set equal to 2 and that of exitors is set equal to -2.

Table 16 reports the first set of regressions.[11] All regressions are weighted by average size of the firm and all regressions include year and industry effects (at one digit level). In the first two

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[11]We refrain from reporting standard errors since almost all regression coefficients are significant at traditional levels, possibly due to the high number of observations.

columns firms are classified according to base year size whereas in column 3 and 4 they are classified according to average size. For visual ease the coefficients of size and age are plotted in Figure 8 and Figure 9, respectively. Column 1 shows that when age is not controlled for, and when firm size is classified according to base year employment, small firms appear to create more jobs. When size is classified according to average employment (column 3) the effect of the smallest size firms diminishes but firms with 3-4 and 5-9 employees still have higher impact on employment growth relative to larger firms. This effect diminishes when age is controlled for. In fact, column 4 reports that the impact of smallest firms on job growth is negative and the impact of 3-4 and 5-9 firms are not that different from larger firms.

Table 16: Job Creation Regressions, 2006-2012

| | Job creation - All firms 2006-2012 | | | |
| | Base year size classification | | Average size classification | |
	1	2	3	4
Size				
1-2	0.126	0.055	0.002	-0.097
3-4	0.090	0.043	0.089	0.029
5-9	0.090	0.046	0.065	0.009
10-19	0.068	0.028	0.030	0.001
20-49	0.056	0.038	0.039	0.017
50-99	0.078	0.060	0.044	0.022
100-249	0.054	0.044	0.029	0.017
250-499	0.027	0.020	0.014	0.009
500+				
Age				
0		1.630		1.697
1		0.217		0.266
2-3		0.035		0.076
4-5		0.021		0.052
6-7		0.007		0.034
8-9		0.015		0.044
10-11		0.012		0.036
12-13		0.002		0.024
14-15		0.018		0.038
16-17		0.024		0.047
18-19		0.012		0.041
20-24		0.012		0.042
25-30		-0.010		0.027
30-34		0.014		0.043
35-39		0.010		0.036
40+				
Constant	-0.090	-0.150	-0.071	-0.160
age*size	No	No	No	No
year effects	Yes	Yes	Yes	Yes
industry effects	Yes	Yes	Yes	Yes
No. of observations	25,800,992	25,621,284	25,800,992	25,621,284
R-squared	0.0463	0.1967	0.0441	0.2008

Note: The dependent variable is Davis-Haltiwanger-Shuh growth rate. In columns 1 & 2 firms are classified into size groups according to base year employment (i.e employment in previous year, except for entrants, where employment in current year is used). In columns 3&4 firms are classified according to average employment over the current year and previous year. The omitted category is largest and oldest firms. All regressions are weighted by average employment of the firm and include year and industry (1 digit) effects.

Figure 8: Job creation by firm size, 2006-2012
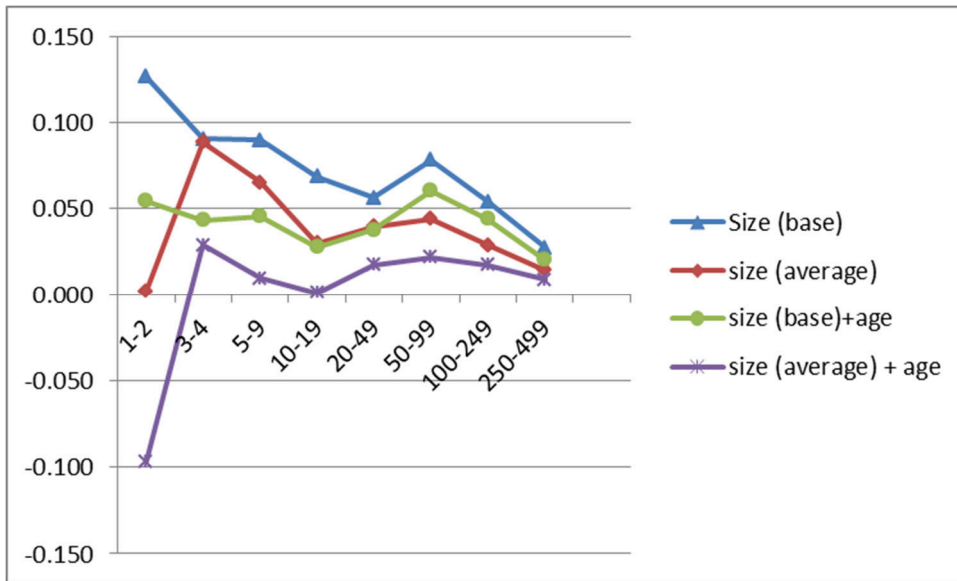
Note: Regression coefficients based on regression results displayed in Table 16.

Figure 9: Job creation by firm age, 2006-2012
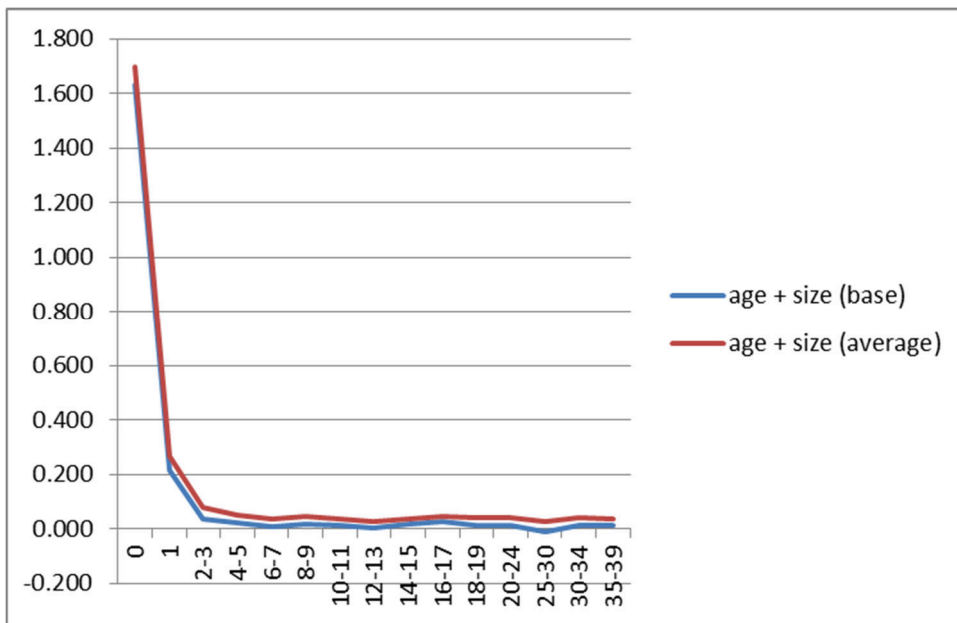
Note: Regression coefficients based on regression results displayed in Table 16.

Table 17 reports our preferred results, when size-age interaction effects are included in the regression equation. Because regression coefficients are difficult to interpret when there are size-age interaction effects, the table (and the corresponding figures Figure 10 and Figure 11) shows the marginal impact of size and age categories evaluated at the mean of the right hand side variables. Especially when average size is classified according to average employment, the impact of smallest firms on job growth is almost zero, and the impact of larger size classes are almost equal to each other.
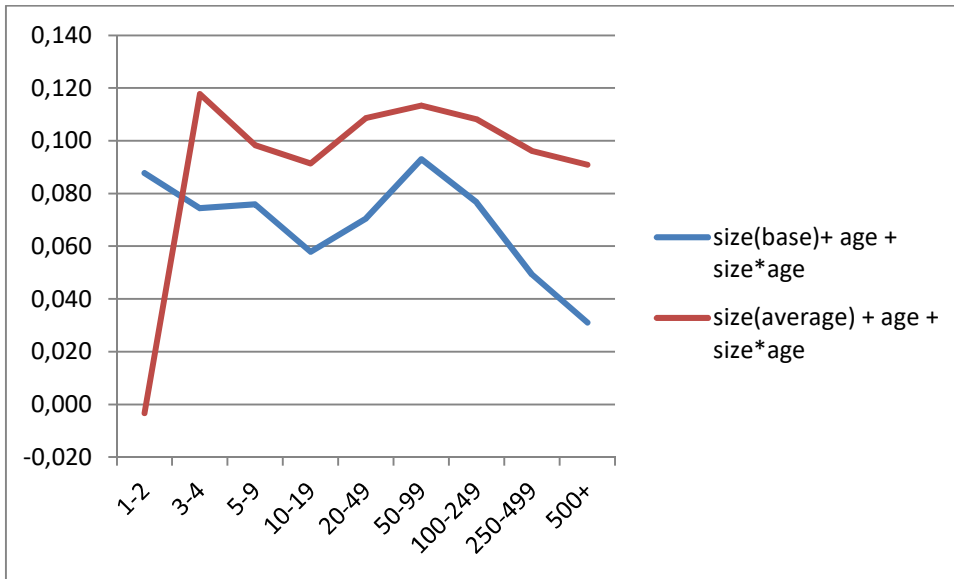
Table 17: Job Creation Regressions, 2006-2012, All Firms, with size-age interaction effects

|	Job creation- all firms 2006-2012 Interaction effects	
	Base year	Average size
	1	2
Size		
1-2	0.088	-0.003
3-4	0.074	0.118
5-9	0.076	0.098
10-19	0.058	0.092
20-49	0.071	0.109
50-99	0.093	0.113
100-249	0.077	0.108
250-499	0.049	0.096
500+	0.031	0.091
Age		
0	1.661	1.671
1	0.219	0.234
2-3	0.024	0.037
4-5	0.018	0.018
6-7	0.004	-0.001
8-9	0.012	0.010
10-11	0.006	-0.001
12-13	0.001	-0.008
14-15	0.014	0.002
16-17	0.021	0.013
18-19	0.008	0.006
20-24	0.005	0.005
25-30	-0.014	-0.010
30-34	0.003	0.005
35-39	-0.007	-0.004
40+	0.002	-0.018
age*size	Yes	Yes
year effects	Yes	Yes
industry effects	Yes	Yes
No. of observations	25,621,284	25,621,284
R-squared	0.199	0.2024

Note: The dependent variable is Davis-Haltiwanger-Shuh growth rate. The columns report the marginal impact of the respective size and age effects evaluated at the mean of the right hand side variables. In column 1, firms are classified into size groups on the basis of base year employment (i.e. employment in previous year, except for entrants, where employment in current year is used). In column 2 firms are classified according to average employment over the current year and previous year. All regressions are weighted by average employment of the firm. All regressions include year and industry (1 digit) effects.

Figure 10: Job Creation by Firm Size, All Firms, 2006-2012, with size-age interaction effects

Note: the marginal impact of respective size classes on job growth evaluated at the mean of the right hand side variables, based on regression results reported in Table 17.

Figure 11: Job Creation by Firm Age, all firms 2006-2012, size-age interaction effects
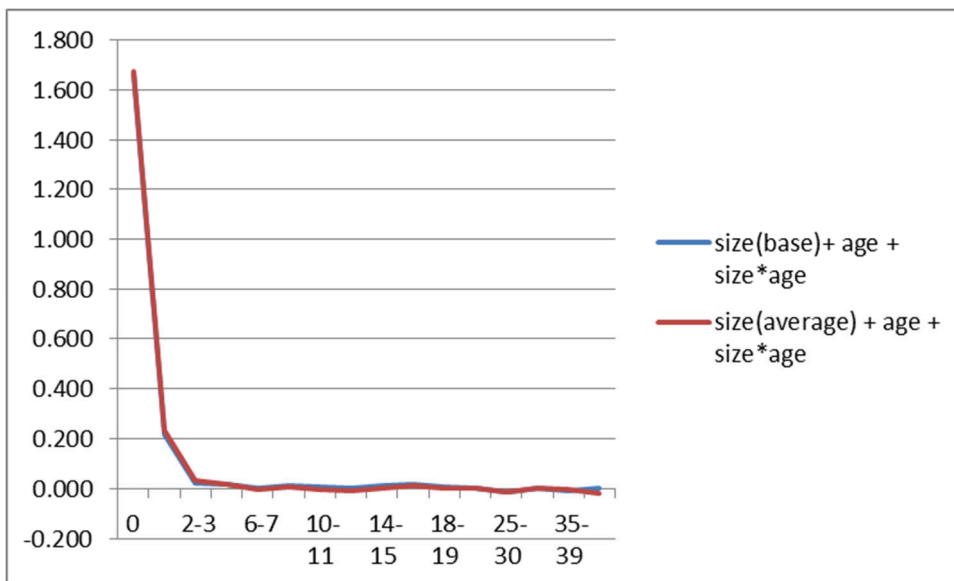
Note: the marginal impact of respective age classes on job growth evaluated at the mean of the right hand side variables, based on regression results reported in Table 17.

Finally, Table 18 and the corresponding figures (Figure 12 and Figure 13) report the results of a similar exercise implemented on continuing firms alone. These regressions include size-age interaction effects as well, and the table reports marginal impacts of respective size and age categories. Comparing column 1 and column 2 (and looking at Figure 12), we see that the classification of size maters quite a bit. When size is classified according to base year, Figure 11 shows an inverse relation between job growth and firm size. By contrast, when size is classified

26

according to average employment, this relation disappears and the impact of different size groups look similar. By contrast, the relation between job growth and firm age look negative, irrespective of how size is classified.

To summarize, econometric evidence seem to suggest that the role of firm size on employment growth is sensitive to how firm size is classified and whether age is controlled for. When there are controls for firm age, and especially when firm size classified according to average employment, small firms do not seem to generate higher employment growth. By contrast, the impact of age seems quite robust. When one focuses on all firms, controlling for size, very young firms create more jobs. With respect to continuing firms, there seems to be a more sustained monotonic negative relation between employment growth and firm age. Younger firms seem to create more jobs, but smaller firms but smaller firms do not seem to.

Table 18: Job Creation Regressions, Continuing Firms 2006-2012, with size-age interactions

|	Base year	Average size
Job creation - continuing firms 2006-2012 Interaction effects		
	1	**2**
Size		
1-2	0.136	0.045
3-4	0.064	0.089
5-9	0.045	0.067
10-19	0.021	0.056
20-49	0.038	0.077
50-99	0.063	0.087
100-249	0.045	0.078
250-499	0.020	0.067
500+	0.004	0.059
Age		
1	0.145	0.172
2-3	0.084	0.096
4-5	0.068	0.069
6-7	0.050	0.047
8-9	0.050	0.049
10-11	0.043	0.038
12-13	0.038	0.030
14-15	0.052	0.042
16-17	0.046	0.040
18-19	0.037	0.035
20-24	0.032	0.032
25-30	0.023	0.028
30-34	0.034	0.036
35-39	0.025	0.030
40+	0.051	0.026
age*size	Yes	Yes
year effects	Yes	Yes
industry effects	Yes	Yes
No. of observations	20,058,383	20,058,383
R-squared	0.0773	0.0662

Note: The dependent variable is Davis-Haltiwanger-Shuh growth rate. The columns report the marginal impact of the respective size and age effects evaluated at the mean of the right hand side variables. In column 1 firms are classified into size groups on the basis of base year employment (i.e employment in previous year, except for entrants, where employment in current year is used). In column 2 firms are classified according to average employment over the current year and previous year. All regressions are weighted by average employment of the firm. All regressions include year and industry (1 digit) effects.

Figure 12: Job Creation by Firm Size, Continuing Firms
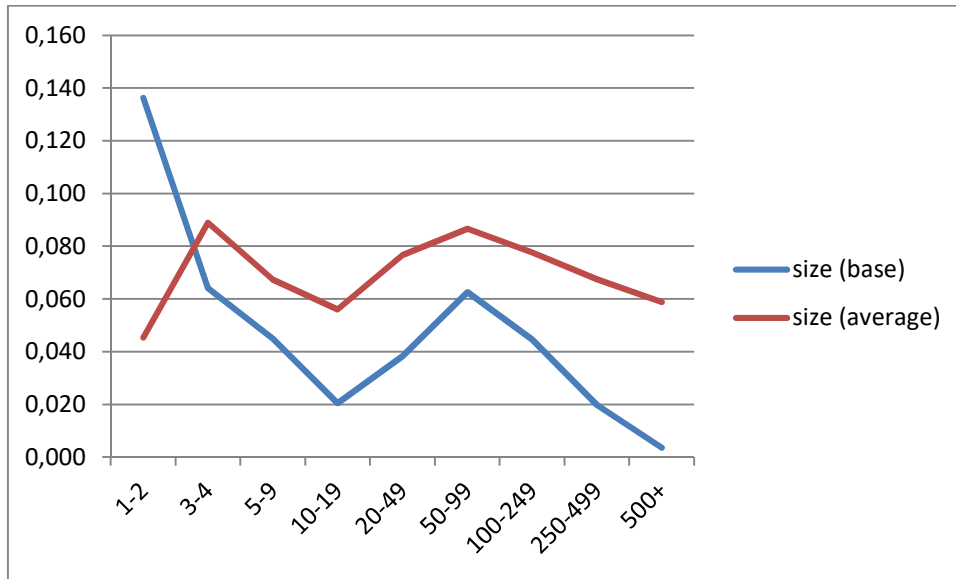
Note: the marginal impact of respective size classes on job growth evaluated at the mean of the right hand side variables, based on regression results reported in Table 18.

Figure 13: Job Creation by Firm Age, Continuing Firms 2006-2012
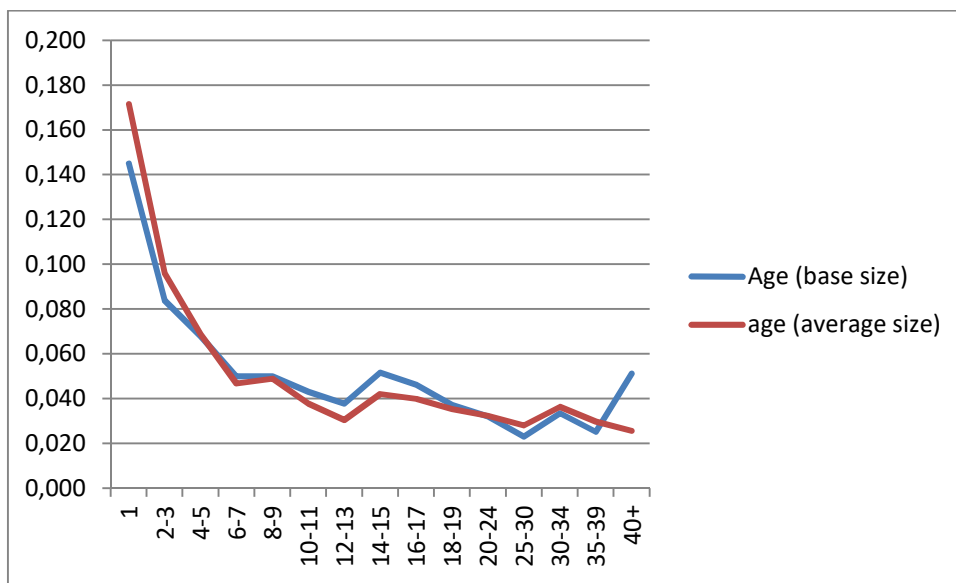
Note: the marginal impact of respective age classes on job growth evaluated at the mean of the right hand side variables, based on regression results reported in Table 18.

7. Conclusions

This paper reports some preliminary results from an analysis of job creation and firm dynamics in Turkey using the Business Register data base compiled by TurkStat. The main results can be summarized as follows:

Between 2005-2012 there is a marked decline in the employment shares of young and small firms and an increase in the employment share of large and mature firms. The decline in the employment share of very small firms (1-2 employees) is especially notable, from about 32 percent in 2005 to about 17 percent in 2012.

Except for electric, gas and water (PU) entry and exit rates are positively correlated across broad sectors, suggesting that creative destruction rather than sector wide profitability shocks account for entry and exit. Broadly, entry and exit rates look similar to those of OECD countries and Latin America.

The data set does not allow tracing mergers and acquisitions. We suspect that many mergers and acquisitions appear as new entry in the data set. This is likely to bias upwards job creation due to new entry.

Between 2006-2012 the share of very small firms (1-2 employees) in total job creation seem very high (about 48 percent), when firm size is classified according to base year. By contrast, the share of very large firms is small and negative. This result is very sensitive to the classification of firm size. When firm size is classified according to average employment, the share of very small firms in total job creation declines to 17 percent and that of very large firms increases to 10 percent.

While very small firms seem to play an important role in job creation (especially when size is classified according to employment in base year) these jobs do not seem persistent. About 43 percent of very small (1-2 employees) firms and 48 percent of very small entrants die within 5 years. Exit rates decline with firm size. Compared to incumbent firms, larger proportions of entrant firms seem to grow into larger size categories.

Regression analysis of employment growth at the firm level shows that whether smaller firms create more jobs is sensitive to both how firm size is classified and whether firm age is controlled for. When the analysis is carried out on all firms, when firm size is classified according to average employment and when age is controlled for, small firms do not appear to create more jobs; in fact, the impact of smallest firms appear to be zero. By contrast very young firms seem to have a disproportionate positive impact on job growth. When the analysis is restricted to continuing firms, job growth does not seem to depend on size, while there seems to be a negative correlation between job growth and firm age. In short, young firms seem to create more jobs but small firms do

not seem to. These findings suggest that an assessment of whether support policies for SMEs on the basis of size are appropriate may be warranted.

8. References

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9. Appendix - Data Description

We use TurkStat business registers ("registers" henceforth) covering the period 2005-2012 for this paper. We restrict sectoral coverage to the sectors covered by the Annual Industry and Service Statistics (AISS). Differently from the AISS approach, we cover all firms, even those which survived less than 6 months. The AISS coverage, by contrast, is restricted to firms that survive at least 6 months. We choose to cover all firms in order to get a better idea of entry and exit. A small fraction of the TurkStat business registers (139000 out of 3495000 in 2012, approximately 4 %) are surveyed by the Annual Industry and Service Statistics (AISS). The following sectors are not covered (NACE rev.2) in the AISS:

A - Agriculture, forestry and fishing

K - Financial and insurance activities

O - Public administration and defense; compulsory social security

T - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

U - Activities of extraterritorial organizations and bodies

A division of J - "Programming and broadcasting activities" in Information and Communication activities is not covered.

Two classes of L - "Buying and selling of own real estate" and "Renting and operating of own or leased real estate" in the Real estate activities (section L) are not covered.

A division of S - "Activities of membership organizations" in Other service activities (section S) is not covered.

The AISS dataset covers all firms with 20 or more employees, and a representative sample of small firms with 1-19 employees. However, all firms with more than one plant (regardless of number of employees) are covered if they are in one of the sectors C (mining and quarrying), E (electricity, gas and water supply) or I (transport, storage and communications).

The AISS is a detailed survey that asks questions on employment, investment, sales, costs and intermediate inputs. Unfortunately, only about half of the firms covered by AISS (firms with 20+ employees) are tracked regularly (panel data), the other half is randomly sampled each year. This is why AISS data does not allow for the study of entry, exit and job creation. For instance when a firm disappears from the AISS, one cannot know for sure whether the firm exited or its employment simply dropped to below 20. Thanks to the full coverage of TurkStat business registers, we can answer such questions.

An important concern that is common to both AISS and BR is whether they are representative given that they cover only formal employment. For this we compare total annual employment numbers

from BR and Household Labor Surveys (HLS) which includes both formal and informal employment in Table 19 The second and third columns in the table are the number of employees (in millions) in, respectively, BR and HLS using the AISS coverage. The fourth column is total employment in Turkey including also sectors not covered by the AISS. As we see from the column 5 in the table, the employment in BR is about 80 percent of the employment in HLS for sectors covered by the AISS. We would like to draw your attention to the slightly increasing trend over the years. As of 2012, this ratio is 90.7 percent. So, we are quite confident that the trends about job creation and firm dynamics we see in BR are likely to reflect overall trends in the Turkish economy

Table 19: Total employment across years: BR vs HLS

year	BR_emp(1)	HLS_emp(2)	Total_emp(3)	(1)/(2)	(1)/(3)
2005	9,7	13,6	20,1	71,6	48,5
2006	9,8	14,2	20,4	69,4	48,2
2007	10,9	14,4	20,7	75,9	52,7
2008	14,5	14,7	21,2	98,4	68,3
2009	12,6	14,6	21,3	86,3	59,2
2010	11,7	15,4	22,6	76,2	51,9
2011	13,9	16,4	24,1	84,5	57,5
2012	15,5	17,1	24,8	90,7	62,5

TurkStat business registers also need to be "cleaned" before they can be used for economic analysis. We undertook the following steps for preparing the data:

1. Duplicate observations caused by the merging several sources were deleted manually.

2. There is a switch from NACE rev.1 to NACE rev. 2 classification in 2009. In order to have a continuous sectoral classification, we mapped NACE rev.1 to NACE rev. 2 at 1 digit level using Table 20.

Table 20: Concordance between NACE rev.1 and NACE rev.2

NACE rev.1	new_code	NACE rev.2	new_code
C	MIN	B	MIN
D	MAN	C	MAN
E	PU	D	PU
F	CONS	E	PU
G	WRT	F	CONS
H	HR	G	WRT
I	TSC		HR
J	RBS	H	TSC
K	RBS	J	TSC
M	CSPSGS	K	RBS
N	CSPSGS	L	RBS
O	CSPSGS	M	RBS
		N	RBS
		P	CSPSGS
		Q	CSPSGS
		R	CSPSGS
		S	CSPSGS

3. Until 2009, the main source of TurkStat business registers was Ministry of Finance records. Starting in 2009, information from the social security institution (SGK) have been used as a secondary source to update or prepare the business registers as well. SGK records are a more reliable source of information on number of workers. Thus, especially before 2009, data on number of workers are noisy and exhibit big jumps especially for those firms that are not covered by the AISS. When a firm is covered by the AISS, that allows a more in depth data collection effort and as a result both the number of workers, and the activity code are corrected. As a result, for many firms that appear not only in the register but also in the AISS, number of workers and activity codes reported in the register and the AISS are different.

4. There are two additional sources of noise regarding number of employees. First, especially in 2009, an important number of firms disappear from the registers. The very same firms appear back in 2010 with the same tax number. For the time being, we consider such disappearance as a framing error, and consider this firm as a continuing firm. Since the number of employees is missing, we need to impute it. A similar case is when there are unrealistic jumps in the number of employees. We tried a combination of the following two approaches.

- If a firm's employment is not missing in every year she is observed, we used interquartile range (IQR). An employment value 1.5 times IQR above or below the upper and lower quartiles is assumed to be an outlier.

- If there are missing values for some years in which the firm is observed, then, we apply the following arbitrary rule. If a firm's employment is ten times higher or lower compared to the previous period, or if the difference in employment is higher than 5000, we consider the change in employment as unrealistic. For small size firms, there are many firms respecting this condition. This is why we apply this rule only to the firms with 50 employees and more.

5. For recent years (2009) both year of birth and the first year of activity are reported, while for earlier years only the first year of activity is reported. If for any observation the year of birth is reported we used this for computing the age of the firm. When this is not reported we used the first year of activity, when available, for the same purpose. If both year of birth and first year of activity are missing, age was not computed. Unfortunately for some of the observations the age information is noisy as well. When multiple ages are computed because we have multiple years of birth or first year of activity, we took the mode.

6. Another problem concerns sectoral classification. For some observations sectoral classification is missing. We assumed that the firms stayed in the most recent sector for such cases. If sectoral information is missing for the first time that the firm appears in the register, we assume that for that year the sector is equal to one recorded in the nearest available future date for which sectoral information is available.