Preliminary

Stagnate or die
– the life and death of new firms

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Abstract
Job creation and job destruction are becoming more and more important target variables for economic policy in the USA with Europe following with some delay. Two recent studies (Haltiwanger et al, 2010 and Ibsen et al 2011) have found that new firms are responsible for a consistent and large part of the total job creation in USA and Denmark, respectively. At the same time it was found for both countries that the death rate among newly started firms is also very high. In this paper we have investigated the longitivity of new firms. In particular we have investigated some of the factors determining the paste of job creations from new firms over the business cycles. Furthermore, we have attempted to identify possible factors that make new firms survive longer.
We have identified two types of new firms where the conditions are quite different in some aspects: those starting within an existing firm and subsequently spun-off and those starting seemingly independently of an existing firm. The two types of firms are presumably different with respect to the endowment of resources allocated to the start up process. In some way, the spin-offs can be considered as a control group for the independent start-ups.

Introduction and Motivation

 Two recent studies (Haltiwanger et al, 2010 and Ibsen et al 2011) have found that new firms

are responsible for a consistent and large part of the total job creation in USA and Denmark,

respectively. At the same time it was found for both countries that the attrition rate among

newly started firms is also very high. These studies showed that it is crucial for the total job

creation that enough new firms are created so that the surviving firms can create new jobs. However, there are several other dimensions of the role as prime job creator. One is if we can identify factors that make young firms better suited at surviving. Another is if we can identify factors that can make new firms to survive longer or shorter. And finally, we will address the question of how many jobs they create over their lifetime, or how big do they become.

This paper will take a quantitative approach and use information from the Danish registers to identify factors that may be important for the survival and growth. At this point we are limited to use information available in the Danish registers. Compared to earlier studies on entrepreneurship on Danish data, see Nanda and Sørensen, 2010, this study uses data on incorporated firms where their study only uses data on individuals starting own firms.

One of the obvious candidates for survival as a young firm is of course the financial background of the persons starting a new business together with information on the bank relationship of the firm. How tempting it is to follow this route, it appears to be very difficult to acquire the necessary information, so at this point we are unable to

Data.

The dataset includes all new private firms and spin-offs that start in the period 1982-2007. Firms can either close within the period or survive at the end of this period. We will have to treat the latter as censored because we do not know whether it closes at a later time or it merges with another firm or is taken over. In case of the latter, the firm will no longer be characterized as a continuing firm in terms of age, so these firms will also be censored.

In this setup firms will never be older than 26 years. Firms that continue and take over other firms or firms that are themselves mother firms to spin-offs are included as continuing firms.

We distinguish between new firms and spin-offs. The former are defined as a firm that has not existed before and which is not composed of people who all come from a particular firm.

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Spin-offs on the other hand are firms that have some connection to a firm the year before or earlier, that is, it is not a new firm without any ties to firms back in time. Also new firms, that have a certain share of employees from an older firm are characterized as a spin-off. Spin-offs from public firms that become private are excluded from the dataset.

Firms with no employees in the first years are included in the data, as long as they have at least 1 employee in the lifetime of the firm, and the age will therefore be calculated from the time the firm enters the dataset. Firms with no employees at any point in time are excluded.

Descriptive statistics

The number of new private firms and spin-offs are shown in Figure 1. The red dashed lines are low points of recessions in the economy and the dashed blue lines are the peaks in the booms of the economy. The creation of new firms and spin-offs follows the business cycles, so the creation of firms rises during booms and decreases during recessions. In the last year of booms the creation of new firms is decreasing, indicating, that the marked is expecting a downturn in the economy. Over time it appears, that more firms are created in the boom years 1982-1986 and 2003-2007 than in the boom years of 1993-2001.

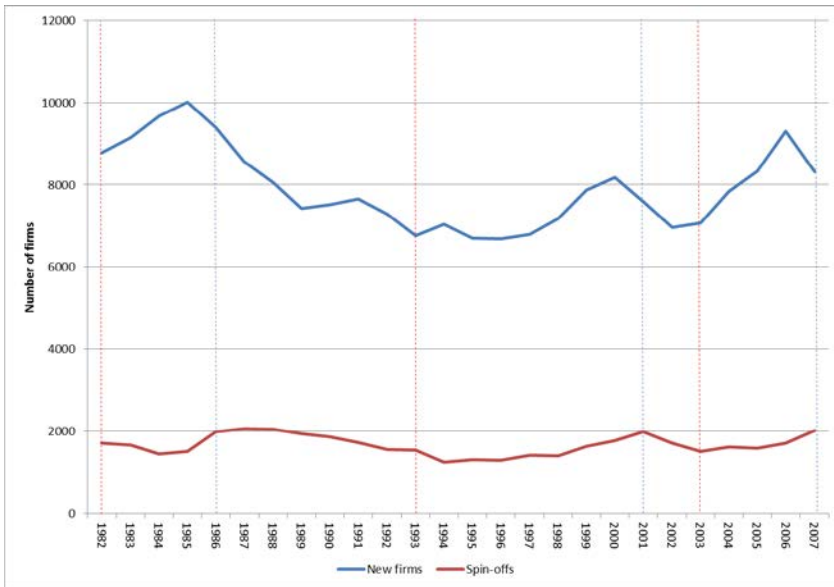Figure 1. New private firms and spin-offs, 1982-2007.

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Figure 2 shows the average number of new firms and spin-offs over the business cycles, and the pattern shows, that the average number of new firms are actually lowest in the middle of an upturn, even lower than in the two recessions.

Figure 2. Average yearly number of new firms and spin-offs over business cycles
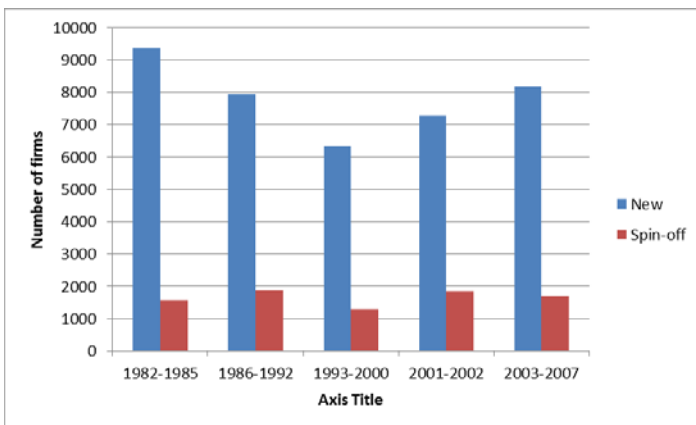
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The number of jobs created by new firms does also vary over time. Figure 3 shows the gross job creation and job creation from start-ups and spin-offs. The job creation from spin-offs is consolidated by mergers and acquisitions in the overall gross job creation, since many spin-offs will be countered by a down size in the mother firm. Therefore the gross job creation from spin-offs should not be seen as a gross job creation per se. Figure 3 shows that the decline in the number of new firms in the upswing from 1995 to 2001 partly is met by a larger job creation from the fewer firms created. But the net result is still that the net job creation in the late 1990s was smaller than in other recent booms.

Figure 3. Total Gross Job creation and job creation from new firms and spin-offs, 1982-2007
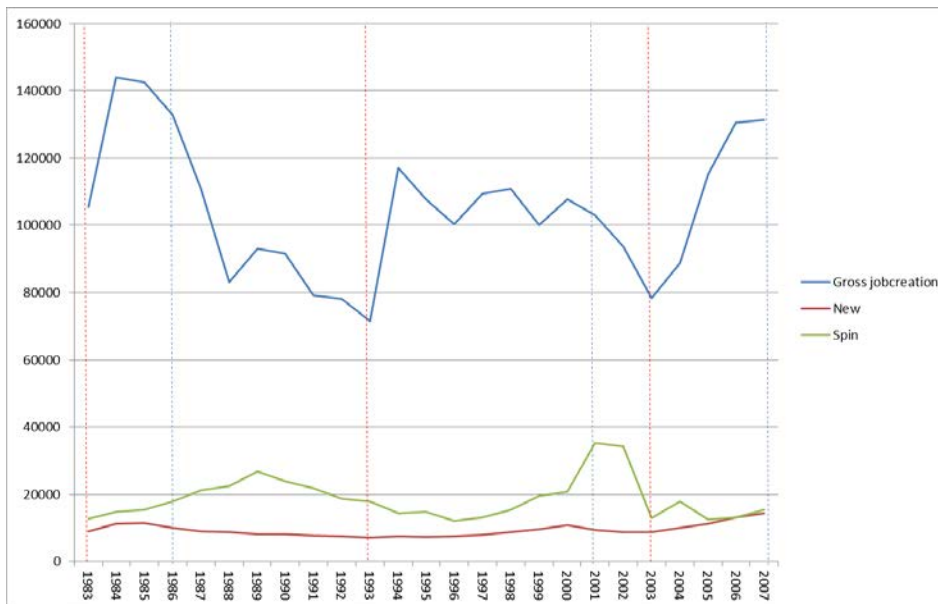
> **Comment [NW1]:** Er det her total job creation, dvs ikke bare fra nye og spin-offs?

Job creation from new firms on the other hand is indisputable job creation with the definition we have chosen, and the new firms share of gross job creation is shown in figure 4. There seems to be an upward trend in the share of gross job creation from new firms. Until 1987, the first boom in the period analyzed, the share is about 8%; during the first recession, the share is rising to almost 10%. In the second boom the share of gross job creation is mainly from existing firms in the beginning, while the share from new firms climbs during the boom. This

climb continues through the dot.com recession, falls in the beginning of the latest boom and climbs again in the last years until the financial crisis starts in 2007. Thus, in the four last business cycles there seems to be a pattern of a rising share of gross job creation from new firms.

Figure 4. New firms share of gross job creation, 1982-2007
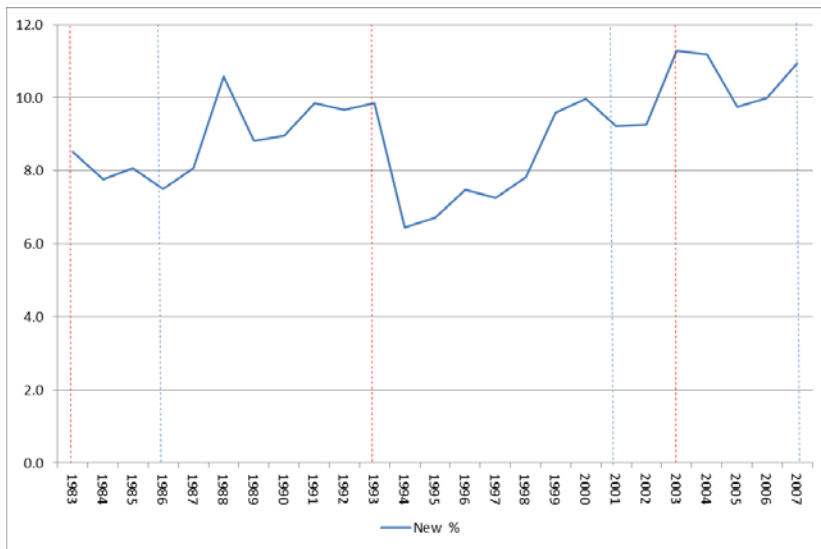
Industry

Figure 5 shows the distribution of new firms and spin-offs on sectors sorted by the share of new firms. Business service, trade and construction have the highest shares of new firms and spin-offs. The difference between the share of new firms and spin-offs is biggest for farming, where the share of spin-offs is much lower and for wholesale, iron and food industry, where the share of spin-offs is higher.

Over time the share of new firms changes considerably, shown in figure 6. However, it is remarkable that the high growth industries in Figure 5 are also industries with high growth in each of the sub periods with a few exceptions. Thus, the share of the primary and all industry sectors decreases in importance along with auto trade, wholesale and transport. Construction and business service on the other hand double their share.

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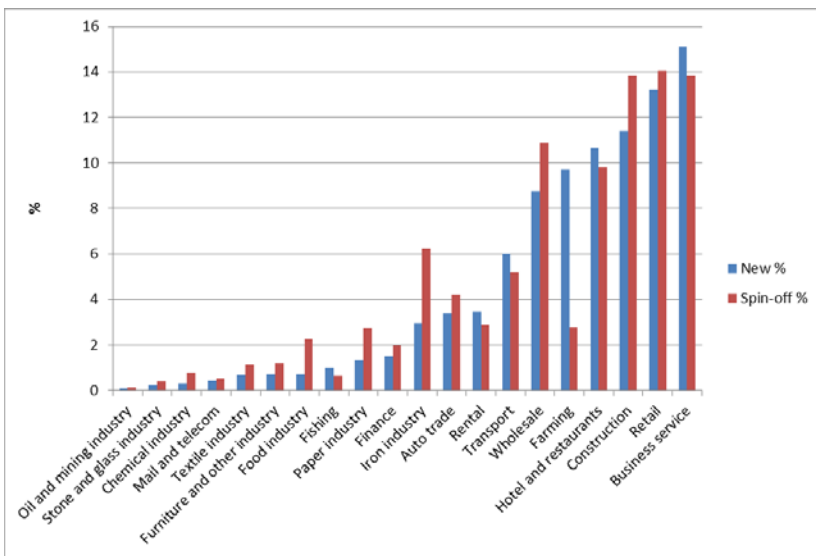Figure 5. New private firms on sectors, 1982-2007

Figure 6. New firms on industry over business cycles

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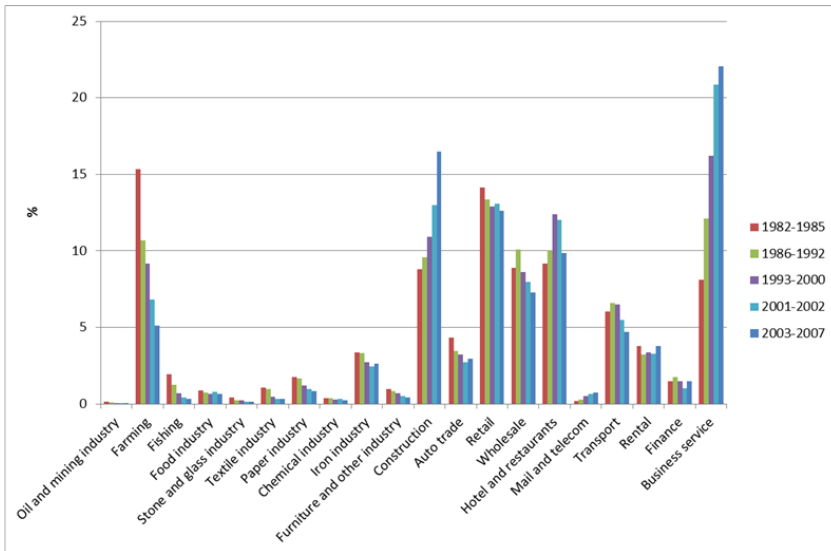
In figure 7, the share of job creation from new firms in each industry is shown for the peak years of the 2 business cycles in 1986 and 2007. The Graph comprises of all identical and new firms where mergers and acquisitions are excluded due to the small industry size of some industries.

Looking at 2007 there is clear difference between the share of jobs created by new firms across industries. In Hotel and restaurants, Business services, fishing and rental more than 12% of the gross job creation is due to creation of new firms. The manufacturing industries, on the other extreme, create a much lower share of gross job creation through establishing new firms.

Over time the manufacturing industries have almost the same share, while finance, farming, construction, fishing and business service have large increases in the share of gross job creation from new firms. That means, that the existing firms create a smaller proportion of new jobs in these sectors.

Figure 7. Share of Gross Job creation from new firms in industry, 1986 and 2007

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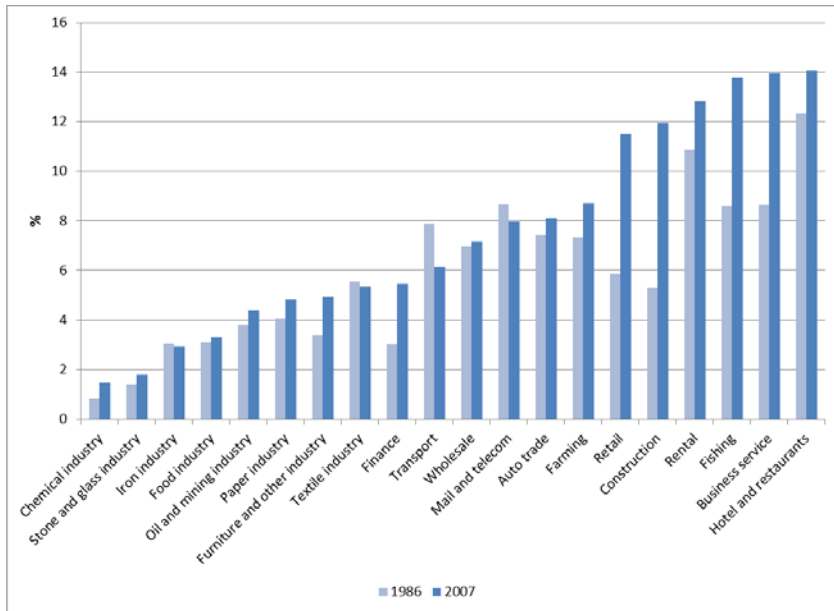
Size of new firms and spin-offs

Overall, new firms create around 8-10% of all new jobs each year (Figure 4). Table 1 shows, they do so in small firms. 30% of the new firms have no employees the first year, and 68% have 1-5 employees. That means, that only 2% of the new firms have more than 5 employees the first year.

Spin-offs come from other firms and therefore they will almost by construction start out with more employees the first year. 64% start out small with 1-5 employees whereas 35% of the spin-offs have more than 5 employees the first year.

Table 1. Employees in new firms and spin-offs the first year

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	New	Spin-offs	New	Spin-offs
	%	%	N	N
No employees	30.6	1.3	62911	580
1-5	67.6	64.4	138897	27711
6-10	1.4	17.1	2932	7345
11-20	0.3	9.8	652	4234
21-30	0.0	3.0	101	1297
31-40	0.0	1.3	32	572
41-50	0.0	0.8	9	340
51-100	0.0	1.3	10	562
101-250	0.0	0.7	6	294
251-500		0.1		63
501-1000		0.1		35
More than 1000		0.1		22

Survival of new and spin-off firms
In the following we take a closer look at survival for new and spin-off firms. Only firms, that have information on CEO's in the firm are included, which means, that 4% of the firms are excluded.

Since a large number of new firms have no employees the first year according to Table 1, information on employees and the share of college graduates is not interesting in the first year of the firm,.

Table 2 shows that the average survival time for a new firm is 4.8 years and 5.3 years for spin-offs. Table 2 also shows, that 87% of closed firms start as new firms so the share of spin-off firms among the closed is much smaller.

Table 3 shows the educational composition of the firms measured as the share of the workforce with at least a college degree. The 2 first columns in table 2 show that the share of new firms that has no college degree is larger among new firms than among spin-offs. These 2 columns include censored observations. The last 2 columns in table 2 show the same pattern for closed firms. The closed firms have a larger percentage of firms with zero college share.

The share of firms with a positive college share below 50% is larger for spin-offs, but the same for college share over 50%.

Looking at industry in table 4, most new firms are in the service sector, and very few of the new firms are in the manufacturing sector. Also most of the closed firms are in the service sector, so in- and outflow of firms is large in this sector.

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Table 2. Age and size at time of closure

		From new	From spin-off
Average age at time of closure	Years	4.8	5.3
Average size at time of closure	Employees	1.7	4
	N	114325	17832

Table 3. Level of education in new, spin-off and closing firms

		New	Spin-off	Closed from new	Closed from spin
		%	%	%	%
College share	0%	78.5	62.0	85.5	77.0
	1-25%	4.8	17.5	1.8	8.2
	26-50%	5.9	10.1	3.5	7.0
	50%+	10.8	10.4	9.1	7.8

Table 4. Distribution across industry

		From new		From spin-off	
		Not censored	Censored	Not censored	Censored
		%	%	%	%
Industry	Auto trade	3.2	3.7	3.8	4.5
	Construction	9.8	14.2	13.3	14.4
	Trade	14.3	11.3	13.4	14.0
	Wholesale	8.9	8.8	10.3	12.0
	Finance	1.4	1.4	2.0	1.8
	Fishing	1.3	0.6	1.0	0.4
	Business service	13.4	17.6	12.5	15.1
	Food industry	0.8	0.7	2.6	2.0
	Hotel	12.6	8.3	13.2	7.4
	Iron industry	2.7	3.3	5.5	6.4
	Chemical industry	0.3	0.3	0.6	0.8
	Farming	9.3	9.4	2.6	2.8
	Furniture and other industry	0.8	0.6	1.5	0.9
	Paper industry	1.4	1.2	2.9	2.6
	Mail and telecom	0.5	0.4	0.4	0.5
	Cole and mining	0.1	0.1	0.1	0.1
	Stone and glass industry	0.3	0.2	0.3	0.4
	Textile	0.9	0.4	1.6	0.7
	Transport	6.2	6.1	5.3	5.3
	Rental	3.2	3.9	2.5	3.3
	Not reported/other	8.6	7.5	4.5	4.6
	N	114325	87306	17832	24996

Table 5 shows average characteristics for the CEO's of new firms and spin-offs. Comparing new and spin-offs leaves the impression that they are not so different. The difference is actually larger for censored versus non-censored. The latter consists of the surviving firms, which appear to have a slightly better educated CEO which is also more mature. The proportion of females is higher but employees are generally less educated and younger than in the non-surviving firms (censored).

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Table 5. CEO characteristics of new, spin-offs and censored versus not censored.

	From new		From spin-off	
	Not censored	Censored	Not censored	Censored
	%	%	%	%
CEO's				
Share women	29.5	22.4	26.4	18.7
Primary school	31.6	20.8	25.3	15.9
Secondary school	7.0	7.1	6.9	6.6
Vocational	42.8	45.0	48.3	48.7
Short college	4.2	9.0	4.5	7.1
Medium college	7.1	9.3	8.3	11.1
Master/phd	3.8	6.5	4.4	9.1
Foreign	1.6	0.8	0.9	0.4
Unknown	2.0	1.4	1.5	1.1
Age less than 30	18.7	10.0	17.5	8.4
Age 30-39	30.3	26.6	29.2	25.9
Age 40-49	27.1	32.8	28.9	33.3
Age 50-59	17.1	21.2	18.0	22.5
Age greater than60	6.8	9.3	6.4	9.9

Figure 8 shows the survival curves for firms starting as new or spin-offs. It is clearly seen that the survival for spin-offs is higher than for firms that start as new.

Figure 8. Survival for firms that starts as new and spin-offs

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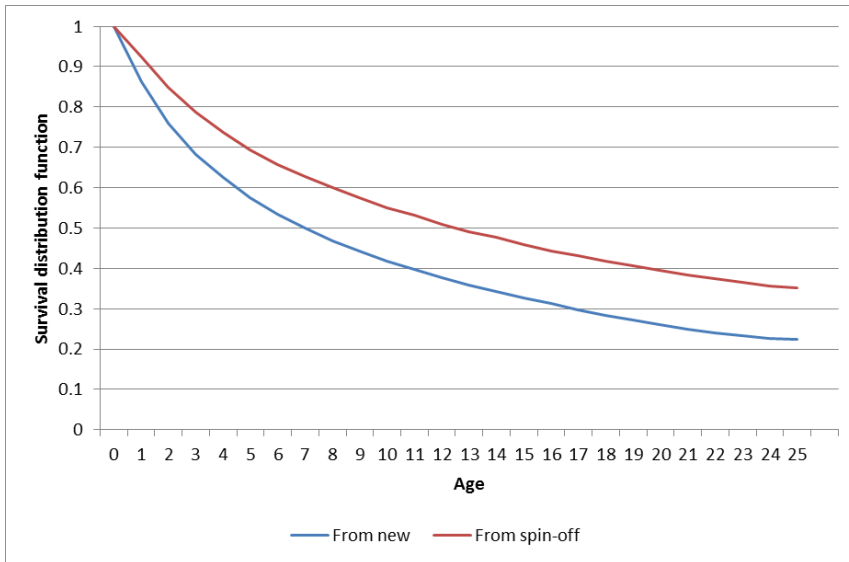
However, thee survival of firms differ among industries. Figure 9 and 10 show the survival curves for the main industries along with the survival for all new firms for comparison. There are remarkable differences in the survival across industries. In the service sector Hotel and restaurants, Mail and telecom, finance and retail the survival is below average (the dashed line), wholesale and business service is on average, and the remaining industries in the service sector have survival rates above average.

Figure 9. Survival, Service Sector

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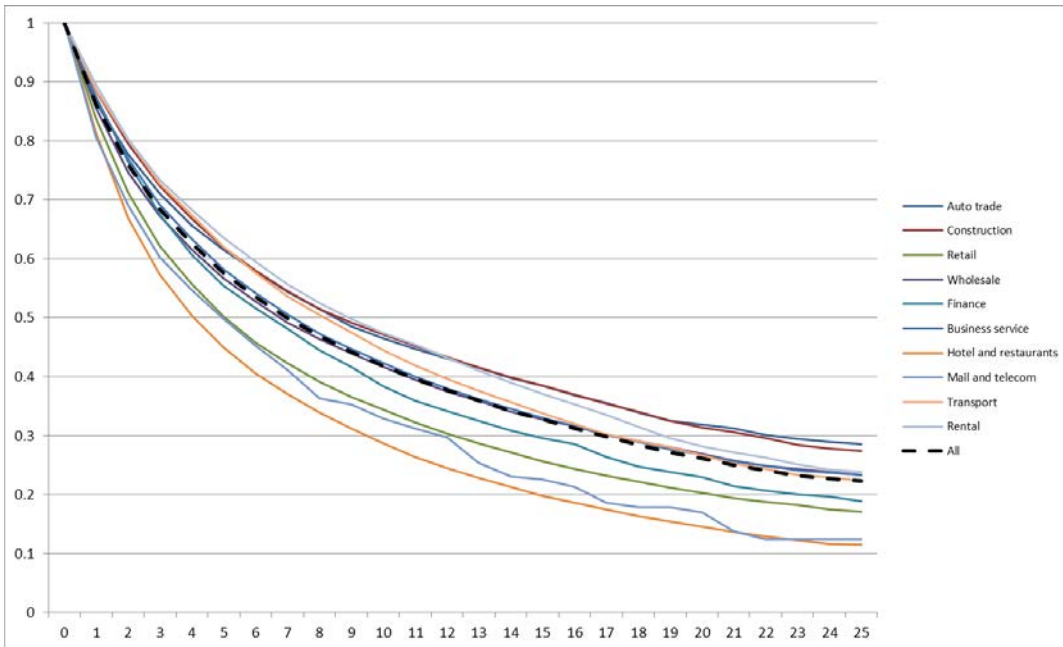
In the manufacturing sector the textile industry and fishing have survival below average, while the best survival is in the chemical and iron industry.

Figure 10. Survival, Manufacturing and Primary Sector

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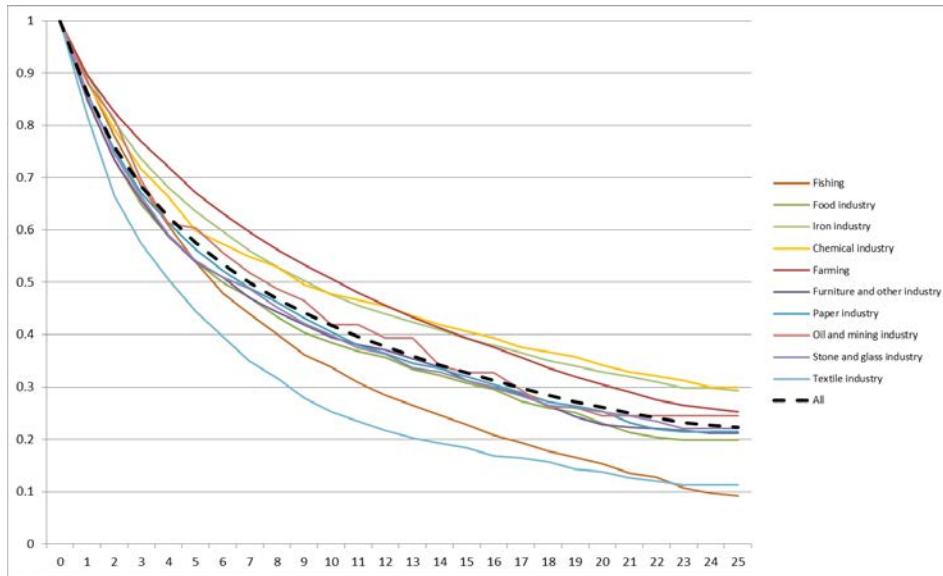
Table 6 shows the estimated hazard function of closing resulting from the duration model. The larger the college share, the greater the hazard for closing. Spin offs have a lower risk of closure than other new firms. The interaction term with the share with college has also a lower hazard meaning that spin offs with high college share have a lower closing risk than other new firms. So a higher college share means lower risk of closure for spin-offs but a larger risk for ordinary new firms. Larger firms are also slightly better in surviving.

Some aspects of the CEO characteristics appear to matter. Thus the maturity, being a woman and having some education increases the survival marginally. But a further education does not help. Higher education increases survival marginally if the firm started as a spin-off. Looking at industries, the hazard of closing all compared to Trade is higher in Mail and Tele, Hotel and Restaurants and Business service. In manufacturing the risk of closure is lower, but this pattern could be a result of manufacturing downsizing rather than closing due to outsourcing etc, while the service sector firms tend to downsize by closing.

Table 6. Estimates of a duration model. The hazard of closing.

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	All			Only New			Only Spin-off		
	Parameter estimate	Std.err.	Hazard ratio	Parameter estimate	Std.err.	Hazard ratio	Parameter estimate	Std.err.	Hazard ratio
College share	0.082	0.013	**1.086**	0.057	0.013	**1.059**	-0.031	0.038	0.97
Spin off	-2.027	0.011	**0.132**						
College share*spin off	-0.294	0.031	**0.745**						
Size	-0.047	0.001	**0.954**	-0.060	0.002	**0.941**	-0.033	0.001	**0.968**
Age, CEO	-0.018	0.000	**0.982**	-0.020	0.000	**0.981**	-0.010	0.001	**0.99**
Gender, CEO	-0.016	0.007	**0.984**	-0.026	0.007	**0.974**	0.059	0.018	**1.061**
Primary Education, CEO									
Secondary Education, CEO	-0.029	0.012	**0.971**	-0.036	0.013	**0.965**	-0.017	0.033	0.983
Vocational Training, CEO	-0.051	0.007	**0.951**	-0.048	0.007	**0.953**	-0.082	0.019	**0.921**
Short College, CEO	0.015	0.015	1.015	0.022	0.016	1.022	-0.091	0.041	**0.913**
Medium College, CEO	0.017	0.013	1.017	0.024	0.014	1.024	-0.104	0.035	**0.901**
Long College, CEO	-0.016	0.017	0.984	0.025	0.018	1.025	-0.327	0.045	**0.721**
Foreing Education, CEO	0.287	0.023	**1.333**	0.304	0.024	**1.355**	0.244	0.082	**1.276**
Unknown Education, CEO	0.153	0.021	**1.165**	0.164	0.022	**1.178**	0.037	0.064	1.038
Trade									
Farming	-0.216	0.011	**0.805**	-0.229	0.012	**0.795**	-0.085	0.048	0.919
Fishing	-0.177	0.026	**0.838**	-0.207	0.027	**0.813**	0.261	0.079	**1.299**
Cole industry	-0.233	0.101	**0.792**	-0.181	0.110	0.835	-0.546	0.259	**0.579**
Food industry	-0.082	0.028	**0.922**	-0.069	0.034	**0.933**	-0.042	0.050	0.959
Textile industry	0.028	0.029	1.029	0.027	0.033	1.028	-0.036	0.063	0.965
Paper industry	-0.058	0.022	**0.944**	-0.071	0.026	0.932	-0.038	0.048	0.962
Chemical industry	-0.040	0.047	0.961	-0.052	0.054	0.95	0.029	0.096	1.03
Stone and glass industry	-0.081	0.054	0.922	-0.068	0.059	0.934	-0.243	0.136	0.785
Iron industry	-0.054	0.017	**0.948**	-0.073	0.019	0.93	0.007	0.037	1.007
Furniture industry	0.026	0.030	1.026	-0.022	0.035	0.978	0.223	0.064	**1.25**
Construction	0.066	0.011	**1.068**	0.059	0.012	**1.061**	0.153	0.028	**1.165**
Auto trade	-0.086	0.017	**0.918**	-0.089	0.018	**0.915**	-0.085	0.043	**0.918**
Whole sale	0.025	0.011	**1.025**	0.040	0.012	**1.041**	-0.040	0.030	0.961
Hotel and restaurants	0.176	0.010	**1.193**	0.154	0.011	**1.166**	0.387	0.028	**1.473**
Transport	-0.031	0.013	**0.969**	-0.039	0.014	**0.962**	-0.018	0.038	0.982
Mail and tele	0.341	0.041	**1.406**	0.372	0.044	**1.451**	0.118	0.114	1.125
Finance	-0.020	0.024	0.98	0.000	0.026	1	-0.148	0.057	**0.862**
Rental	-0.124	0.017	**0.883**	-0.138	0.018	**0.871**	0.025	0.051	1.025
Business service	0.156	0.010	**1.169**	0.162	0.011	**1.176**	0.116	0.030	**1.123**
Other industry	0.574	0.022	**1.775**	0.586	0.023	**1.796**	0.299	0.089	**1.349**

Note: Year dummies not reported

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Growth

We now turn to growth in surviving firms. The period in this section covers 1993-2007, since detailed industry codes only exists from 1993 onwards. Thus, firms starting earlier than 1993 are excluded.

The vast majority of firms never grow larger than 10 employees, that is 91% of the firms, that survives after 10 years have 10 employees or less (Table 7), and similarly only about 3% of all surviving firms have more than 20 employees.

Table 7. Firm size for new firms, the first year and after 5 and 10 years, 1993-2007

After	1 year	5 years	10 years
	%	%	%
No employees	26.04	12.36	11.86
1-5 employees	71.92	73.22	67.80
6-10 employees	1.60	9.18	11.70
11-20 employees	0.35	3.70	5.67
21-30 employees	0.05	0.81	1.52
31-40 employees	0.02	0.30	0.55
41-50 employees	0.01	0.15	0.30
51-100 employees	0.01	0.22	0.42
101-250 employees	0.00	0.06	0.14
251-500 employees	0.00	0.01	0.03
501-1000 employees	0.00	0.01	0.01
1000+ employees	0.00	0.00	0.00
N	112483	43282	15427

The low number of firms with more than 10 employees can be explained by the fact that growth rates slow down as firms get older. We have run a regression with yearly growth on the LHS and age of the firm, size and year dummies on the right hand side. Only coefficients from age dummies expressed as relative to the growth in year 10 are shown in table 8.

Except for textile and fishing all firms have a significant higher growth the first years of the 10 year period compared to year 10. Some firms only have a few years with significant higher growth, others have higher growth in longer periods, but generally, the growth declines over time. The chemical industry is the only industry that has a rather large growth for a long period, but never the less declining over time.

Table 8. Annual growth compared to growth in the 10th year, firms surviving 10 years

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
Cleaning	**0.21**	**0.13**	**0.14**	0.08	-0.01	**0.08**	**0.09**	0.04	0.05	-
IT-service	**0.31**	**0.15**	**0.14**	**0.13**	**0.09**	0.06	0.05	0.03	-0.01	-
Wood industry	**0.33**	0.16	0.20	0.23	0.05	0.01	0.09	0.17	0.02	-
Autotrade	**0.18**	**0.12**	**0.09**	**0.07**	**0.06**	0.04	0.03	0.02	0.01	-
Construction	**0.31**	**0.17**	**0.14**	**0.09**	**0.08**	**0.07**	**0.06**	**0.04**	0.02	-
Retail	**0.16**	**0.10**	**0.07**	**0.04**	**0.04**	0.02	0.02	0.01	0.00	-
Electronics industry	**0.50**	**0.27**	**0.22**	**0.27**	**0.18**	0.10	**0.13**	0.10	**0.13**	-
Wholesale	**0.24**	**0.14**	**0.09**	**0.08**	**0.05**	**0.04**	**0.05**	**0.04**	**0.03**	-
Finance	**0.21**	**0.13**	**0.10**	**0.12**	0.07	0.04	0.03	0.06	0.04	-
Fishing	0.14	0.13	**0.18**	0.09	0.13	0.05	0.11	0.00	-0.02	-
Business service*	**0.21**	**0.10**	**0.06**	**0.05**	**0.04**	**0.04**	0.01	0.02	0.01	-
Food	**0.48**	**0.19**	0.08	0.06	0.13	0.06	0.00	0.09	-0.02	-
Rubber&Plastics	**0.25**	0.01	0.18	-0.04	0.14	-0.09	0.04	0.08	0.01	-
Hotel and restaurants	**0.17**	**0.05**	0.04	0.04	0.00	**0.05**	0.04	0.00	-0.01	-
Iron	**0.41**	**0.26**	**0.21**	**0.18**	**0.14**	**0.10**	**0.14**	**0.08**	0.06	-
Chemical	**0.53**	**0.55**	**0.52**	**0.52**	**0.40**	0.30	**0.35**	**0.34**	0.33	-
Farming	**0.04**	**0.04**	0.02	0.01	0.02	**0.04**	0.02	-0.01	0.02	-
Machine industry	**0.36**	**0.21**	**0.14**	0.10	0.08	0.10	0.07	0.09	0.05	-
Furniture and other industry	**0.21**	0.08	0.12	0.03	0.05	-0.05	-0.01	0.01	-0.04	-
Paper and graphics	**0.30**	**0.21**	**0.16**	**0.17**	0.09	**0.15**	0.04	0.04	-0.03	-
Mail and telecom	**0.26**	0.16	0.02	0.05	0.07	-0.05	0.13	0.04	-0.11	-
Stone and glass	**0.29**	0.17	0.07	0.07	0.10	-0.01	0.10	0.11	-0.11	-
Textile	0.11	**0.18**	0.10	0.06	0.05	0.03	-0.01	-0.04	-0.04	-
Transport	**0.16**	0.04	0.04	**0.05**	0.00	0.00	0.00	0.00	-0.02	-
Rental	**0.10**	**0.08**	**0.06**	0.05	0.04	0.02	0.02	0.02	-0.01	-

* Architects, laywers, consultancy and other

Note: Since only firms, that survive 10 years are included, the coal and mining industry is excluded for lack of observations. New and closed firms are excluded as well as firms going from and to 0 employees.

Table 10 describes the employment growth of all new firms in the period 1993 – 2007 and the proportion of firms in each industry that has grown to more than 10 employees. The growth in employment is very low in most industries with IT- and business services and rentals as the exception. Furthermore, there seems to be very little association between aggregate employment growth rate and the success rate measured as the share with more than 10 employees at the industry level. Indeed, a correlation coefficient between the two measures (columns in Table 10) is less than 10%.

Table 10. Employee growth and share with more than 10 employees after 10 years, 1993-2007

Preliminary

	Growth Employees, 1993-2007	More than 10 employees after 10 years
	%	%
Cole and mining	3.7	50.0
Mail and telecom	2.6	28.3
Food	-1.8	26.2
Machine industry	-0.5	26.1
Rubber&Plastics	0.2	23.9
Chemical	2.3	23.1
Wood industry	0.8	22.6
Electronics industry	1.3	21.9
IT-service	17.5	17.9
Cleaning	6.6	16.8
Iron	-0.5	15.4
Furniture and other industry	-1.5	14.3
Wholesale	1.2	13.0
Construction	3.4	11.7
Paper and graphics	0.0	11.7
Finance	0.1	10.6
Business service*	5.3	10.6
Textile	-4.7	8.5
Hotel and restaurants	3.7	8.2
Transport	1.2	7.9
Retail	2.3	5.6
Autotrade	2.5	5.4
Rental	9.9	4.7
Fishing	-3.2	1.2
Farming	0.3	0.9
Stone and glass	-0.7	0.0
Unknown/other	2.5	4.6

* Architects, laywers, consulting, other

The lack of correlation between employment growth and share of firms with more than 10 employees after 10 years at the sector level can to some extent be explained by large variations of survival rates among industries. Table 11 shows that Coal and mining and mail and telecom have very few firms left after 10 years, but a rather large percentage of the firms have grown to more than 10 employees. It looks like these firms either "grow or die".,

The service sector is very different as very few service sector firms grow beyond 10 employees. However, service sector firms do actually survive at a greater rate than other sectors. Service firms are therefore not "grow or die" but more "stagnate and survive". IT-service and cleaning are somewhat an exception, since they have larger shares of firms with more than 10 employees, but especially in IT-service, very few firms are alive after 10 years. The higher survival rate is part of the explanation for the job generation in the service sectors.

A few manufacturing sectors (machine industry and Rubber&Plastics industries) stands out. They have both a high share of growth firms and high survival rates.

Preliminary

So the common notion, that job creation should come from existing small and medium sized firms growing larger do not seem to be true in all industries. Especially in the service sector, many firms that do survive never grow beyond 10 employees.

Correlation between survival and share of 10+ employees...TBW

Table 11. Firms with more than 10 employees after 5 and 10 years on industry, 1993-2007

|	More than 10 employees		Firms left	
	After 5 years	After 10 years	After 5 years	After 10 years
	%	%	%	%
Cole and mining	5.6	50.0	27.7	6.2
Mail and telecom	18.0	28.3	29.8	6.7
Food industry	14.2	26.2	34.9	11.3
Machine industry	9.5	26.1	50.2	21.2
Rubber&Plastics industry	8.7	23.9	51.1	25.6
Chemical industry	16.0	23.1	40.3	10.5
Wood indutry	10.1	22.6	43.6	15.2
Electronics industry	10.7	21.9	46.7	17.8
IT-service	10.7	17.9	33.6	7.8
Cleaning	9.8	16.8	36.3	12.4
Iron industry	10.4	15.4	41.7	15.8
Furniture and other industry	9.1	14.3	44.7	16.4
Wholesale	6.4	13.0	41.5	15.2
Construction	6.0	11.7	36.1	12.2
Paper and graphics industry	5.5	11.7	40.1	16.2
Finance	5.2	10.6	34.2	13.7
Business service	6.8	10.6	34.3	10.6
Textile industry	7.1	8.5	39.9	15.6
Hotel and restaurants	6.1	8.2	33.3	10.5
Transport	4.3	7.9	47.3	18.5
Retail	3.0	5.6	34.5	10.9
Autotrade	3.2	5.4	42.3	17.2
Rental	3.1	4.7	40.9	15.8
Fishing	0.0	1.2	43.7	14.9
Farming	0.6	0.9	50.9	23.9
Stone and glass industry	3.6	0.0	39.8	12.8
Unknown/other	3.6	4.6	40.7	15.7

* Architects, laywers, consultancy and other

The differences in job generation among sectors can also be explained by structural shifts in the economy. It seems like the expansion of jobs within a sector is nicely correlated with an expansion of firms within the same sector. Figure 12 shows the average annual growth in employment and in the number of firms within each industry. Only Chemical, Electronics, Woods and Plastic and Rubber industry have a positive job creation, but have a negative growth in number of firms. The rest of the manufacturing sector has both negative job growth and firm growth. Most of the service industries have both an increase in the number of firms and employment. Mail and telecom have been through a liberalization when the national telecom company was privatized in 1998, and the rather large number of new firms in this industry is the result of the liberalization. The many new cell phone companies that arise in this period is an illustration of this point. Though data are cleaned, so privatized firms are removed from data, some spin-offs of spin-offs will not be removed and will contribute to the large growth in this industry along with new players in the market.

Figure 12. Annual growth in number of employees and in firms, %.

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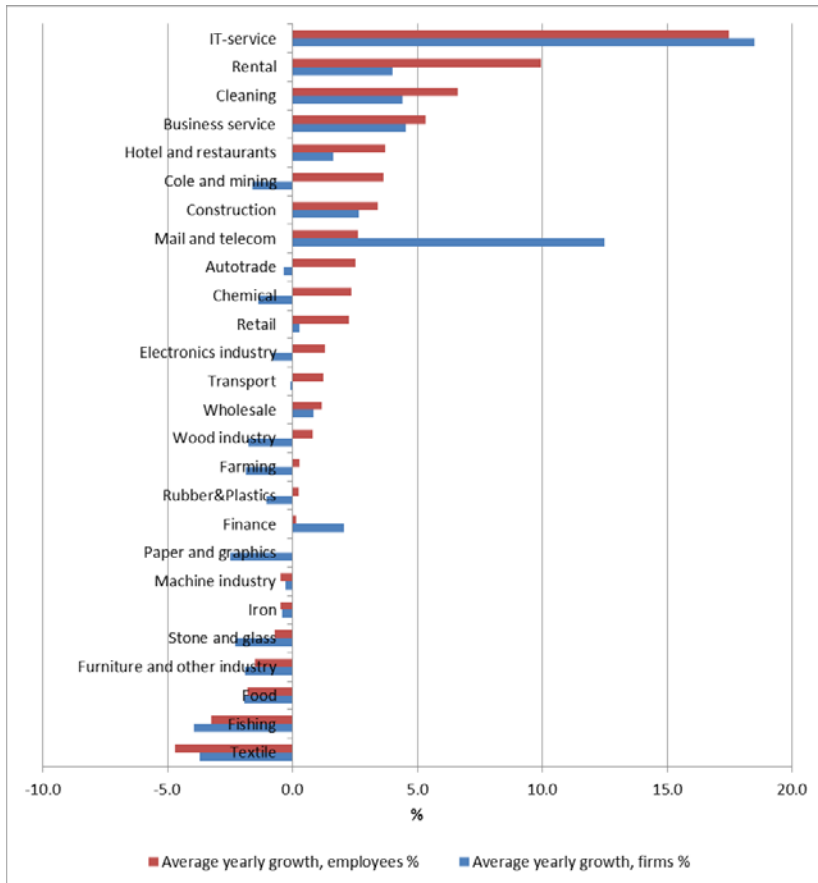
The increased number of firms in some industries can also be seen by looking at the share of new and exiting firms at the industry level. The share of new and closed firms of the average number of firms in the period is shown in figure 13. Only in fishing the number of closed firms is higher than the number of new firms. The share of new firms is highest in mail and telecom, IT-service, cleaning, hotel and restaurants and business service. These industries also have a high share of closures though it is much lower than the creation of new firms. The rest of the service sector also have fairly high shares of new firms, and higher than the share of closures. On the other hand the manufacturing sector have lower share of new firms and the share of closures is relatively higher than in the service sector.

Figure 13. Share of new and closed firms of average number of firms, 1993-2007
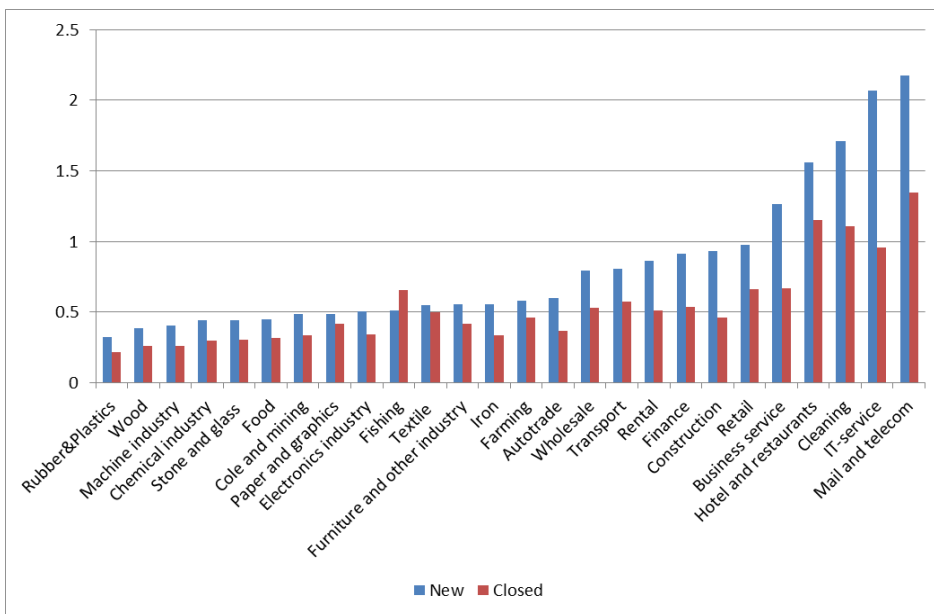
The difference in growth of employees and firms in a few sectors indicates, that the average size of firms changes over time. The difference is shown in figure 14. Most industries experience a small increase in the average firm size, though mail and telecom, finance, textile, machine industry and IT-service actually becomes smaller in average. The textile industry is an outsourcing industry, so the size change will most likely be production moving out of the country.

Figure 14. Change in average size of firms 1993-2007

Preliminary
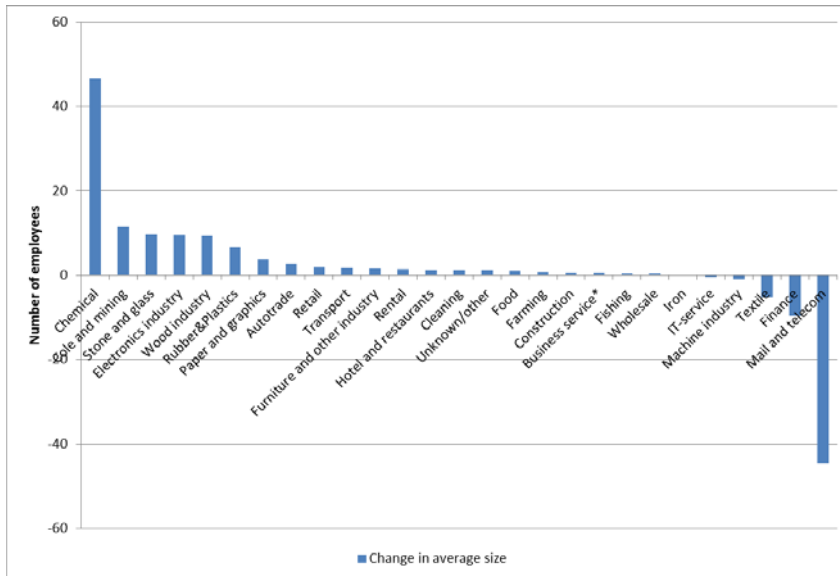
The main part of the manufacturing sector experienced negative growth in the number of firms and a negative growth of employees. This indicates an increasing concentration of employees on fewer firms. The share of new firms is lower than in the service sector while the closing share is relatively higher.. The exceptions are the Chemical, Electronics and Wood industry. The period from 1993 to 2007 ends just before the financial crisis, and if these larger firms in the manufacturing sector in the light of the crisis fire or chose to outsource, a large fraction of these jobs will be lost. Using the results of this paper it is not likely that creation of many more new firms will have a large impact on the manufacturing sector similar to the service industries. Here, expansion of a few of the survivors seems to be a better opportunity

The service sector, on the other hand, is characterized by many new firms starting up, and creating new jobs, but while many of the service sector industries have a relatively high share still alive after 10 years, they have a very small share of the surviving firms with more than 10 employees.

Thus, the prospects for general growth in employment depends on a contracting manufacturing industry and a service industry, where most firms remain small. If these

tendencies cannot be reversed the only hope for future growth in employment lies in increasing the level of entrepreneurship.

This paper has demonstrated that spin-off firms, which is firms created within an existing firm, are quite successful, so here is another source for future development.

The results on which companies grow and which do not have a clear consequence for the discussion on the low productivity growth in Denmark. From 1993 to 2007 Denmark experienced an overall productivity growth of merely 1% per year. Our main result is that the main job creation has happened in small service firms. Since the service industry is the industry with the lowest productivity growth among all industries this may be a good explanation why overall productivity growth has been so low in Denmark. This does not answer the question why the service industry has had a lower productivity growth than in neighbouring countries.

Conclusions

It has been shown in this paper that 50% of all newly started firms survive their 7 year birthday. In the service sector Hotel and restaurants, Mail and telecom, Finance and Retail the survival is below average while wholesale and business service is on average. In manufacturing the risk of closure is generally lower.

This study has demonstrated that it is safer to start a new firm within an existing firm (as a spin-off). Such firms tend to live 5 year longer (measured at the 50% survival rate) and to grow more than firms started outside existing firms. The reason is probably better access to know how, finance and all other sorts of resources.

However, there are few firms started within an existing firm so this is of limited help in creating more jobs.

For new firms the growth is only modest, so at the age of 10 years there are only 3% of the surviving firms (about 450 firms), which has made it into more than 20 employees. Growth is very low and declining with age for all industries with IT- and business services and rentals as the exception. Furthermore, there seems to be very little association between aggregate employment growth rate in an industry and the success rate measured as the share with more than 10 employees at the industry level. The main reason for that is large variations in

survival rates among industries. An example is that Coal and Mining and Mail and Telecom have very few firms left after 10 years, but a rather large percentage of the firms have grown to more than 10 employees. It looks like these firms either "grow or die".,

The service sector is very different as very few service sector firms grow beyond 10 employees. However, service sector firms do actually survive at a greater rate than other sectors. Service firms are therefore not "grow or die" but more "stagnate and survive". IT-service and cleaning are somewhat an exception, since they have larger shares of firms with more than 10 employees, but especially in IT-service, very few firms are alive after 10 years. Thus, the higher survival rate is part of the explanation for the job generation in the service sectors. A few manufacturing sectors (machine industry and Rubber&Plastics industries) stands out. They have both a high share of growth firms and high survival rates.

So the common notion, that job creation should come from existing small and medium sized firms growing larger do not seem to be true in all industries. Especially in the service sector, many firms that actually survive never grow beyond 10 employees. At the moment we do not have a clear understanding of what keeps these firms back in growth, but one has to acknowledge that a number of firms by nature are not meant to grow. However, this does not rule out that the growth of these service sector jobs are held back because of institutional or financial reasons. Without changing these, the only way the service industry can create more jobs will be through the creation of more new firms.

The main part of the manufacturing sector experienced a concentration of employees on fewer firms. The share of new firms is lower than in the service sector while the closing share is relatively higher. The period from 1993 to 2007 ends just before the financial crisis, and if these larger firms in the manufacturing sector in the light of the crisis fire or choose to outsource part of the production, a large fraction of these jobs will be lost. Using the results of this paper it is not likely that the manufacturing sector will increase the number of jobs by more new firms but rather through expansion of a few of the surviving firms.

Finally, it is worth emphasizing that the composition of the growth pattern of Danish firms most likely has had a negative impact on the productivity growth in recent years.

Literature
Haltiwanger et al, 2010
Ibsen et al 2011

Preliminary

Nanda, Ramana, and Jesper B. Sorensen. "Workplace Peers and Entrepreneurship." *Management Science* 56, no. 7 (July 2010): 1116-1126.