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Firm entry and post-entry performance in selected Norwegian industries

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Abstract: This working paper provides some descriptive statistics concerning patterns of firm entry in selected Norwegian industries over the time period 1997-2005. The direct history of the employees in newborn firms and of the recently employed employees in established firms is used in order to compare the recruitment sources of newborn and established firms. Finally, some simple econometric analysis is performed and used as a tool for describing the importance of different determinants of post-entry survival and success of newborn firms.

Keywords: firm entry, post-entry performance, industry dynamics, sources of recruitment

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1. Introduction

This working paper is the result of a preliminary work for a project named *Research and Development, Industry Dynamics and Public Policy*, which is a joint project with participants primarily from the Norwegian School of Management and the Ragnar Frisch Centre for Economic Research. The part of the project for which this work is most relevant will adress questions like “where do people “end up” when a firm decides to shut down or scale down production?” and “from where do newborn and expanding firms recruit their employees?”. These questions are both closely related to the process of creative destruction (as described by Schumpeter (1942)), and of particular interest will be to investigate whether or not the process of creative destruction is more creative than destructive, meaning that technological progress is achieved without too many resources being lost along the way.

For this preliminary work, however, the focus has been entirely on firm entry and on the post-entry performance of newborn firms in selected Norwegian industries. The paper is organized as follows: Section 2 describes the data and the chosen sample of firms, and the identification procedure used to identify newborn firms. Section 3 then provides some descriptive statistics on the overall patterns of firm entry over the chosen time period (1997-2005). The overall entry rate ranges between 7.5 and 10.9 percent over the time period, and overall exit rates are of comparable magnitude. When grouped by organizational structure, the biggest groups of newborn firms in our sample are private limited companies and sole proprietorships, and when size is measured by the number of employees, the newborn firms are not surprisingly shown to be smaller than the established ones (on average). The entry rates show little variance over geographical location (counties). Finally, section 3 also compares the sources of recruitment for established and newborn firms. Both newborn and established firms recruit most of their employees from other employment, and the newborn firms recruite a relatively larger fraction of their employees from other employment than the established ones. The second most important (identified) base of recruitment is education, which is of relatively more importance for established firms than for the newborn ones.

Section 4 adresses the post-entry survival and success of newborn firms. When survival is defined as having a strictly positive number of registered employees by the end of each year, the average fraction of newborn firms surviving their third operational calendar year is about 60 percent. Simple econometric analysis is used as a descriptive tool in order to get an impression of the importance of some possible determinants of firm survival, and both firm specific and individual specific characteristics (those of a certain key-person for the firm) are included in the analysis. The probability of survival seems to be highest for the private limited companies, and the direct history of the key-person, both in terms of recent work experience and in terms of the last observed "state" (or, from the firm's point of view, the recruitment base) does also appear to be of some importance for the firm's probability of survival. A criterion for success is then defined and discussed, and econometric analysis is again used, this time to describe the potential determinants of post-entry success. We report results that to some extent are similar to those of the survival determination.

2. Data and measurement

The chosen period of analysis is 1997-2005, and the analysis is based on The Register of Employers and Employees (REE), a linked employer-employee register developed for administrative purposes and administered by the social insurance authorities. Employers are obliged, with some exceptions, to report all jobs held by individuals and covering at least four working hours per week. The REE is based on a match between the employee's (anonymous) identification number and the organizational number of the firm, and a firm will appear in the register only when someone is employed for at least four working hours per week. Sole proprietorships, for instance, will thus appear in the REE only if they decide to hire someone, and the register does not count individuals working in their spouse's personal firm as employees.

The REE contains firm specific characteristics like industry codes, geographical location, and organizational structure. The main strength of our data, however, lies in the broad base of information concerning the employees covered by the REE. The REE itself

contains information relevant for the respective employer-employee relationship, like hours worked (in three broad categories), earned income, and opening and closing dates for the employment record. We are also able to attach individual information from several other data sources, including demographic information like gender, age, and highest level of completed education, and monthly information on whether or not the individual received some sort of welfare benefits (such as sickness benefits, pensions, and unemployment benefits) and whether or not the individual was under education. By combining this with yearly information on income from self-employment, we are able to classify each firm's recently employed employees based on their direct employment history before joining the (newborn) firm. Finally, we use the number of years with pension point accumulation for each individual as a measure of general work experience.

As we want to limit the analysis to the private sector, we exclude industries (based on two-digit Standard Industrial Classification (SIC2002) numbers) that are dominated by public enterprises. We also exclude the primary industries, and some of the organizational structures. The following industries are included: Mining and quarrying, Manufacturing, Construction, Wholesale and retail trade, repair of motor vehicles, motorcycles and personal household goods, Hotels and restaurants, Transport, storage and communication, Financial intermediation, and Real estate, renting and business activities[1]. Among these, the largest industries measured by the number of firms each year are the trade industries and the real estate and business services industries (see Table 1). When ordered by relative size the selected industries keep the same ranking over the time period.

[1] Some examples of excluded organizational structures are public corporations, counties and housing cooperatives.

Table 1. Percentage of the total number of firms in each industry.

Industry	Min	Max	Average
Wholesale and retail trade, repair	32.5	36.4	34.2
Real estate, renting and business activities	19.9	24.9	22.9
Construction	13.2	14.3	13.6
Manufacturing	10.9	12.1	11.6
Transport, storage and communication	9.8	10.7	10.3
Hotels and restaurants	6.0	6.3	6.1
Financial intermediation	0.7	1.0	0.9
Mining and quarrying	0.4	0.5	0.5

In order to identify newborn firms, we make use of a procedure consisting of two (simple) steps. First, we merge datasets covering three succeeding years of the REE and assume that all firms not registered in either of the years *t-2* and *t-1* but registered in year *t* are potential newborn firms in year *t*. Firms that were operating in year *t-2* but were "asleep" in year *t-1* for then to reopen in year *t* are thus not counted as newborn in year *t*, but possibly in year *t-2*. In the second step we make use of the employees' registered dates of employment, inferring that a firm is born no later than the first employee is registered as employed by the firm[2]. Apart from these two steps we make no further attempts to limit the number of so called spurious firm entries, but as we base our analysis on firms rather than establishments the (possible) measurement errors are not likely to be very big[3].

[2] The inclusion of this second step of the identification procedure reduced the number of entrants somewhat. There were examples of firms that were classified as newborn in year *t* after the first step, but "disqualified" after the second one because at least one of their employees appeared in the register with an earlier date of employment (for the relevant firm) than in year *t*, even though the firm itself did not appear in the register before year *t*. We have chosen to treat these cases as spurious firm entries as we can see no reason why a firm should want to report earlier dates of employment for its employees than what was actually the case.

[3] Dale-Olsen and Rønningen (2001) show how the problem of administrative changes is reduced when calculating gross job and worker flows based on firm data rather than establishment data.

3. Patterns of firm entry in selected Norwegian industries

3.1. The overall magnitude of firm entry

Table 2 shows how the total number of firms, the number of entrants, and the entry rate vary over the chosen time period. The total number of firms ranges from 92,303 in 2003 to 97,251 in 1998. Starting from 1998, the total number of firms in our selected industries decreases towards its minimum in 2003, before increasing somewhat during the two last years. The number of entrants starts off at its maximum in 1997 (10,413) after which it decreases towards its minimum in 2003 (6,958), before increasing slightly in the end of the period. The entry rate follows a similar pattern: a maximum of 10.9 in 1997, decrease towards the minimum of 7.5 in 2003, while the rate was somewhat higher for the last two years of the period.

Table 2. Total number of firms and employees, number of entrants, entry and exit rates, and entrants' share of employment.

	Total number of firms	Number of entrants	Entry rate	Exit rate	Total number of employees	Entrants' share of employment
Year						
1997	95381	10413	10.92	8.06	1184429	1.87
1998	97251	9559	9.83	8.87	1265599	1.67
1999	97070	8442	8.70	8.93	1267478	1.46
2000	96662	8257	8.54	9.44	1248861	1.47
2001	95069	7533	7.92	8.48	1262921	1.35
2002	94407	7399	7.84	9.60	1279433	1.28
2003	92303	6958	7.54	7.36	1255462	1.64
2004	92834	7326	7.89	6.72	1250914	1.62
2005	94013	7417	7.89	.	1253042	1.31
Min	92303	6958	7.54	6.72	1184429	1.28
Max	97251	10413	10.92	9.60	1279433	1.87
Average	94999	8145	8.56	8.43	1252015	1.52

Mata et. al. (1995) investigated newly created plants in Portuguese manufacturing over the time period 1983 to 1989, and they report that "the entry of new competitors exhibits a clearly procyclical pattern" (Mata et. al., 1995, pp. 464). Although Table 2 shows strikingly little variation over the time period (the total number of firms and the total number of employees are particularly stable figures), one could still see traces of such a pattern in our data. The overall entry rate was at its highest during the first expansionary years of the time period, it decreased during the recession lasting from 1999/2000 to 2003, and was somewhat higher during the two last expansionary years of the period[4]. The manufacturing industries, however, do not seem to exhibit a particularly clear procyclical pattern, as compared to other Norwegian industries (Figure 2). The most procyclical entry rates over the period appear to be those of the real estate, renting and business activities industries, and these industries do also show the highest entry rates over the period, together with the hotels and restaurants industries. The entry rate for the manufacturing industries is among the lowest during the whole period, and this is in line with Dale-Olsen and Rønningen (2001), where it is reported that "gross job flows in the Norwegian manufacturing sector are less than gross job flows for the total economy" (Dale-Olsen and Rønningen, 2001, pp. 162). The hotels and restaurants industries and the real estate, renting and business activities industries are pointed out as typical high reallocation industries.

In Table 2 we have also reported annual exit rates for the time period (except for 2005), which is based on the following relationship: the total number of firms in year *t* equals the total number of firms less the number of exits in year *t-1*, plus the number of entrants in year *t*. By comparing the exit rate with the entry rate (the two rates are depicted together in Figure 3), we observe that the two series are of quite the same magnitude. Abstracting from the local minimum in 2001, the exit rate appears to be following a countercyclical lead-lagged pattern, increasing towards its maximum in 2002 before decreasing towards the final years of the period.

[4] Figure 1 provides an illustration of the Norwegian business cycles over the time period, represented by the rate of unemployment. Different statistics describing the Norwegian labour force are available at http://www.nav.no .

Figure 1. Rate of unemployment in Norway, 1995-2006. Numbers from the Norwegian Labour and Welfare Organisation (NAV).

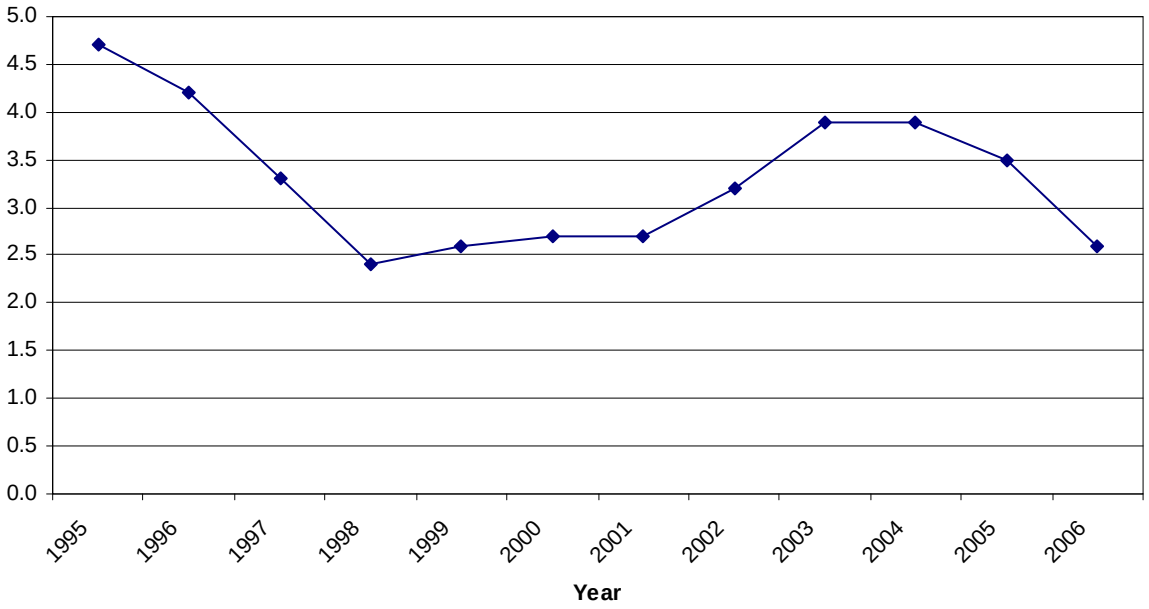


Figure 2. Entry rates by industry.

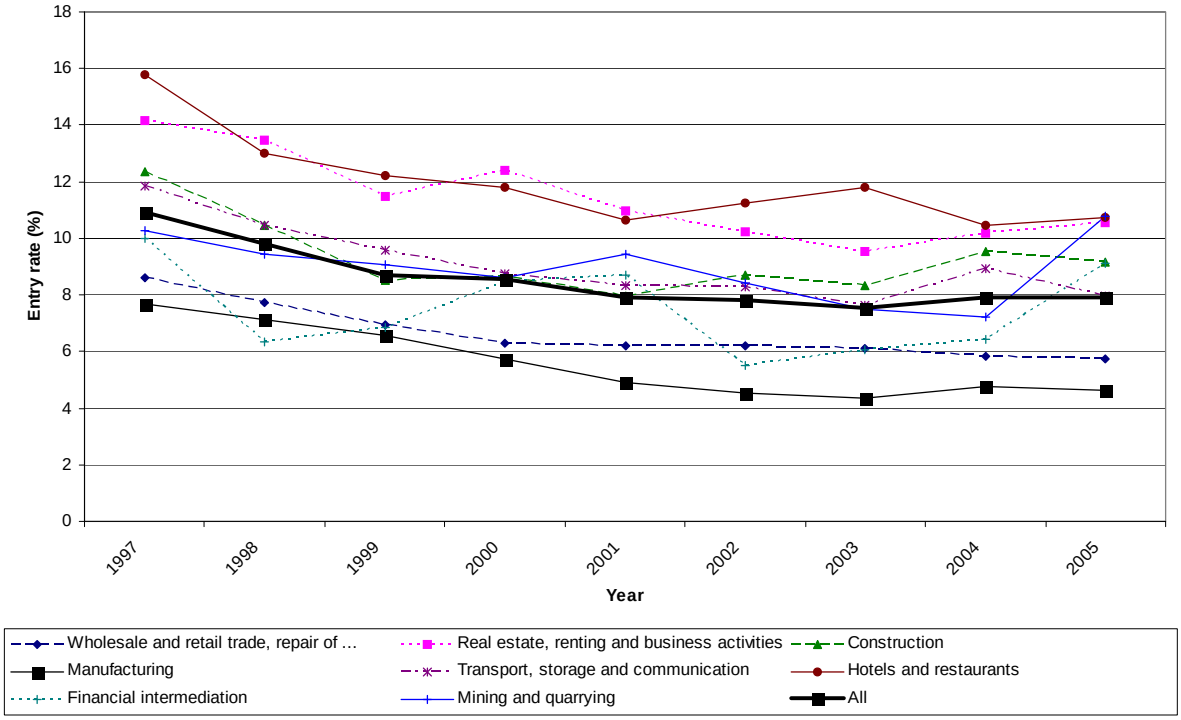
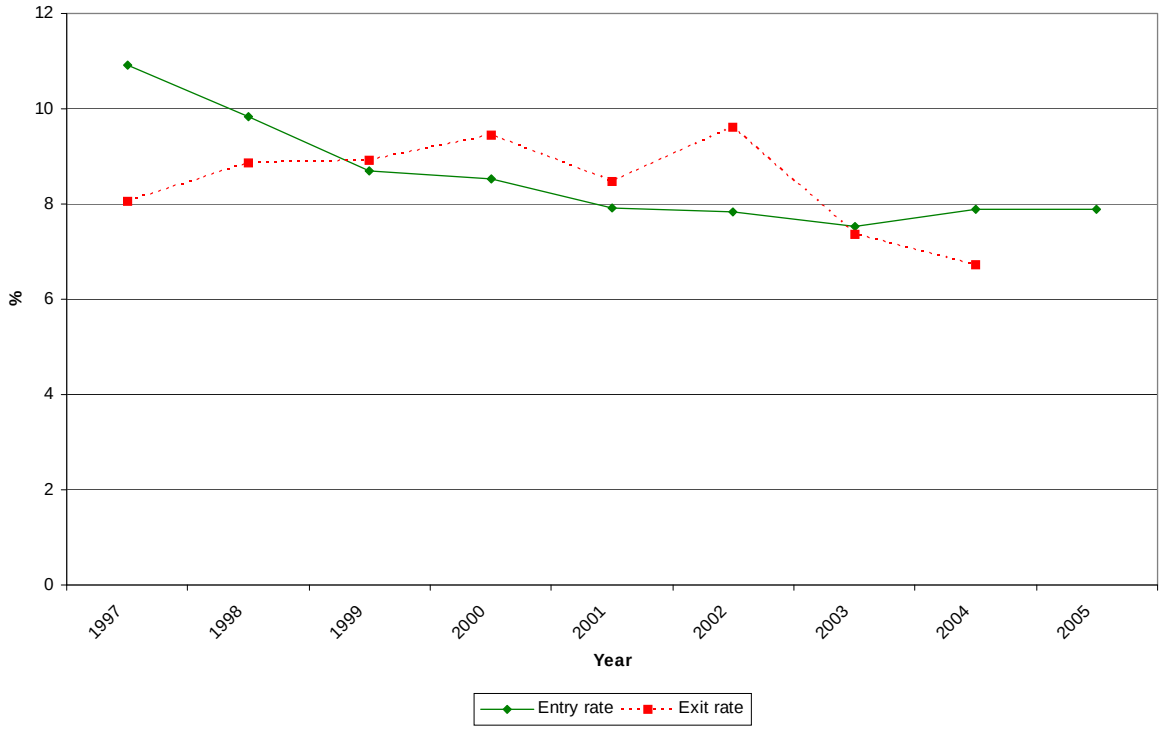


Figure 3. Entry and exit rates.



Finally, Table 2 also includes the total number of employees and the newborn firms' employment share for each year over the period. The total number of employees reaches its maximum in the same year as the entry rate reaches its minimum (2002), and an increase in the total number of employees between two succeeding years is (with one exception in 2004) associated with a decrease in the entrants' share of employment. When counting the total number of employees and calculating the entrants' employment share we have allowed each individual to be counted only once, meaning that those that are registered as employed in several different firms will only be counted as employed in the firm from which they have earned the highest income during the year. Alternatively, one could simply have counted the number of employer-employee relationships, allowing each individual to be counted once for each firm in which she is registered as employed. This final approach would (presumably) inflate the entrants' employment shares

substantially, implying that a relatively large fraction of the newborn firms' employees have other and more important sources of income than the newborn firm[5].

Having pointed at some traces of pro- and countercyclical patterns in our data, one could still argue that the most striking feature of the figures in Table 2 is the lack of (substantial) variation over the time period. This observation corresponds to conclusions drawn by Davis et al. (1996), based on numbers for U.S. manufacturing industries over the time period 1973-1988. They state that during recessions, "job creation tends to fall, and job destruction tends to rise" (1996, pp. 31), but "shutdowns do not account for an unusually large fraction of job destruction during recessions, nor do startups account for an unusually large fraction of job creation during booms" (1996, pp. 34).

3.2. Firm entry by organisational structure, the number of employees, and geographical location

Table 3 shows how the firms in our sample are distributed over different organizational structures. The pattern is rather stable over the time period, although the fraction of private limited companies among established firms did increase in relative size from year to year over the whole time period, at the expense of sole proprietorships and general partnerships. Private limited companies is clearly the biggest group for both newborn and established firms, followed by sole proprietorships, but the fraction of sole proprietorships is substantially bigger and the fraction of private limited companies smaller for newborn firms than for established firms.

[5] Put somewhat differently, the newborn firms' share of total employment is higher when each individual is counted as one employee for each employer-employee relationship related to the individual, as compared to the employment share we obtain when we allow each individual to be counted only once (i.e. only for the main source of income) in the cases where there are several employer-employee relationships related to the same individual. This should imply that those employed in newborn firms to a larger extent than those employed in the established ones are registered with more than one employer-employee relationship, and/or that newborn firms more frequently than established firms are to be regarded as a secondary source of income. The absolute difference between the two approaches' employment shares was about one percentage point for 1997.

Table 3. The distribution of firms over different organizational structures. Minimum, maximum and average percentage in each group, 1997-2005.

Organizational structure	Established firms			Entrants		
	Min	Max	Average	Min	Max	Average
Private limited company	71.18	80.69	76.71	65.77	70.50	69.03
Sole proprietorship	15.24	21.48	17.99	25.35	29.41	26.61
General partnership	1.21	2.22	1.64	1.29	2.38	1.89
General partnership with shared liability	0.45	0.68	0.56	0.87	2.10	1.50
Other legal forms	2.09	4.61	3.05	0.56	1.55	0.93

When comparing our figures with those provided by Statistics Norway[6], it becomes clear that the picture of entrants by organizational structure based on our data is not the same as the official one. The most striking difference lies in the relative size of private limited companies as opposed to the sole proprietorships among entrants. In the official statistics, the sole proprietorships constitute the biggest group of entrants, followed by private limited companies which is about half as numerous, while the picture drawn from our data is quite the opposite. This substantial "measurement error" is likely to be due to the fact that our baseline dataset, the REE, is based on individuals rather than on firms/establishments, implying that a firm is covered by the register only from the moment when someone is registered as employed by the firm. It seems probable that many sole proprietorships might have been operating for some time before deciding to employ someone, and many firms might even go through their whole operational lifetime without having had anyone registered as employed. The inability of measuring accurately the entry of sole proprietorships is to some extent representing a weakness of our data when used for this particular purpose, but on the other hand, it allows us to focus

[6] Different statistics for newly established firms/enterprises are available at the following url (covering the time period 2001-2004): http://www.ssb.no/english/subjects/10/01/fordem_en/.

exclusively on firms that have been operating above some sort of a "minimum scale" at least for some period of time during the relevant year. It could be useful to keep in mind, however, when interpreting the result of this analysis, that the firms in our sample represent a selected group, and they do not give a complete description of "reality".

When considering Figure 4, where firm size is measured as the number of employees by the end of each calendar year, it becomes quite evident that the size distribution of the firms in our sample is strongly skewed towards the left. This appears to be a general feature of the overall size distribution of Norwegian firms. Dale-Olsen and Rønningen (2001) report that over sixty per cent of Norwegian firms employ fewer than five employees, before adding that the fraction of firms with at least five employees employ nearly ninety per cent of the employees. Moreover, it seems to be a well established stylized fact that newly created firms are small as compared to the already existing ones[7], and so is also the case for the firms in our sample. Figure 4 reports fractions of newborn and established firms grouped by the number of employees and averaged over the time period. There are relatively more newborn than established firms in the groups 0, 1, and 2 employees, but from 3 employees and onwards the established firms are relatively more numerous than the newborn ones.

[7] See for example Dunne et. al. (1988) and Mata et. al. (1995) for evidence of this stylized fact.

Figure 4. The number of employees in existing and newborn firms - fraction of firms in each group, averaged over the period 1997-2005.

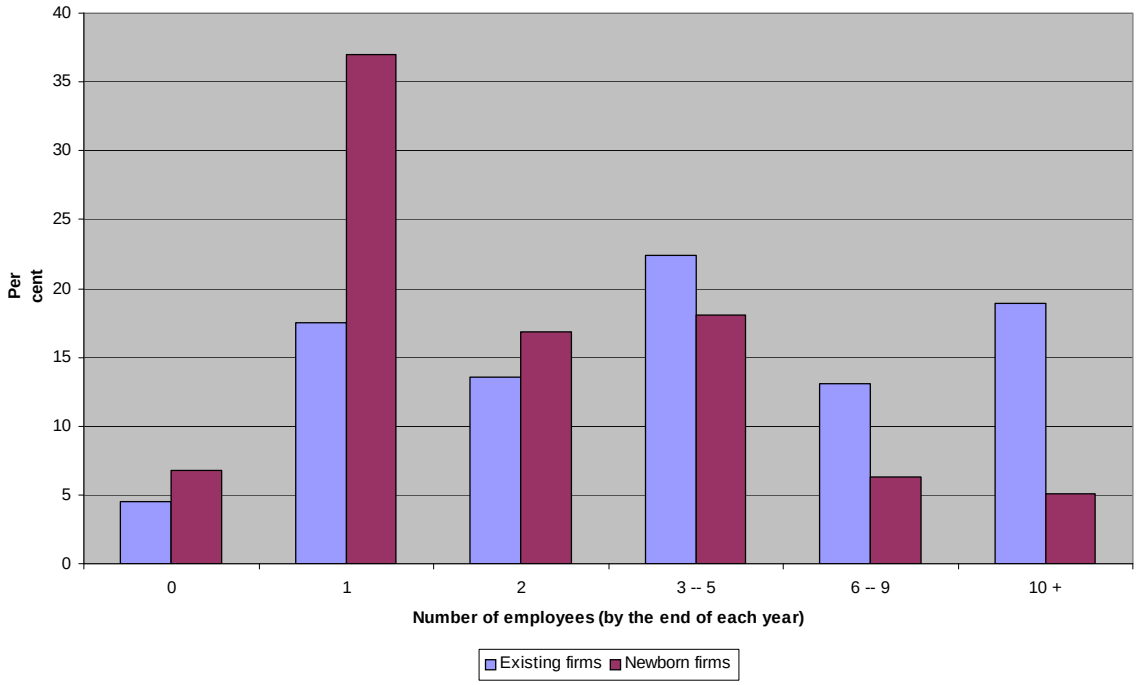


Table 4 shows some features of the geographical spread of the established and newborn firms in our sample. The ranking of counties by the total number of firms is quite stable over the period, in the sense that both the four biggest counties (Oslo, Akershus, Hordaland, and Rogaland) and the four smallest counties (Finmark, Aust-Agder, Sogn og Fjordane, and Telemark) all keep the same rank throughout the whole time period. The differences in entry rates between counties are quite small, but the two counties with the largest average total number of firms over the period (Oslo and Akershus) are also the two counties with the highest average entry rates over the period. Sogn og Fjordane and Møre og Romsdal are at the other end of the scale, both with average entry rates close to 7%.

Table 4. Percentage of firms in each county, and entry rates by geographical location. Minimum, maximum and average, 1997-2005.

	Relative size			Entry rate		
County	Min	Max	Average	Min	Max	Average
Østfold	5.21	5.37	5.28	6.61	10.49	8.45
Akershus	9.78	10.40	10.12	8.32	11.66	9.35
Oslo	15.74	16.07	15.94	8.26	11.92	9.42
Hedmark	3.52	3.62	3.58	7.35	10.42	8.40
Oppland	3.63	3.78	3.70	6.32	10.60	8.09
Buskerud	5.65	5.80	5.71	7.43	11.66	8.84
Vestfold	4.84	5.10	4.97	7.73	11.58	8.86
Telemark	3.29	3.49	3.42	6.84	11.18	8.44
Aust-Agder	2.12	2.24	2.17	6.84	10.61	8.44
Vest-Agder	3.23	3.32	3.26	7.47	10.44	8.49
Rogaland	7.45	7.77	7.56	7.13	10.55	8.59
Hordaland	8.89	9.04	8.98	7.28	10.23	8.12
Sogn og Fjordane	2.27	2.40	2.35	5.18	9.88	6.79
Møre og Romsdal	5.31	5.52	5.39	6.02	8.46	7.15
Sør-Trøndelag	5.27	5.49	5.38	7.43	10.98	8.53
Nord-Trøndelag	2.43	2.52	2.48	6.00	9.39	7.30
Nordland	4.51	4.85	4.67	7.20	11.13	8.34
Troms	3.14	3.33	3.23	6.28	11.20	8.06
Finmark	1.64	1.80	1.71	7.03	12.11	8.95
All				7.54	10.92	8.56

3.3. Sources of recruitment for established and newborn firms

In order to identify the employment bases of both established and newborn firms we make use of information from several sources, including monthly information on received welfare benefits and on educational status, other employment, and yearly information on entrepreneurial income/income from self-employment. We use this information to classify employees in seven different groups depending on which was the latest observed state out of a maximum of six states the last six months before registered as employed in the respective firm. The different groups of states are organized as follows:

A: received pensions (disability pension or regular pension) or participated in vocational rehabilitation,

B: registered as unemployed or received social security benefits,

C: received sickness benefits or maternity leave benefits,

D: been under education,

E: registered as employee in another firm,

F: strictly positive entrepreneurial income from previous calendar year's tax returns[8],

Z: unspecified.

All employees in newborn firms are classified in one of these groups, together with all employees in established firms that are registered for the first time in the respective firm during the relevant year. The time period covered in this section is 1997 to 2002, as 2002 is the last year of coverage presently available for some of these data.

For both established and newborn firms, the most important group of recently recruited employees is E – those that were registered as employed somewhere else before being employed in the relevant firm (see Table 5). The average relative size of this group is biggest for the newborn firms, with a margin of almost 10 percentage points. Abstracting from group Z (unspecified), the second largest group for both established and newborn firms is D, employees moving "directly" from some sort of education and into employment. The average relative size of this group is clearly bigger for established than for newborn firms. There are also substantial differences in the relative size of both group B and group F, implying that established firms to a larger extent than the newborn ones recruit from the unemployed, while some experience from "economic life" is more important for the newborn than for established firms.

[8] Candidates for the group F are only those that have not been classified in either of the groups A-E.

Table 5. Sources of recruitment for established and newborn firms. Minimum, maximum and average percentage of employees from each "state", 1997-2005.

Previous	Established firms			Entrants		
state	Min	Max	Average	Min	Max	Average
A	1.93	3.93	2.91	1.83	3.51	2.63
B	8.39	12.68	9.60	5.60	8.44	6.47
C	1.27	2.91	2.34	0.56	2.42	1.88
D	15.08	19.22	16.72	8.11	10.51	8.97
E	48.35	58.11	53.84	59.36	66.41	63.47
F	1.07	1.51	1.26	2.73	3.59	3.16
Z	11.41	15.32	13.33	11.98	14.94	13.43

4. The post-entry success of newborn firms

4.1. "Activity based" versus "appearance based" survival

Although far from evident under all possible circumstances, it seems natural to treat the survival from one year to another as something close to a necessary condition for success amongst newborn firms[9]. From our data it is possible to derive (at least) two different measures of firm survival, and figures for both measures are reported in Table 6. As our baseline dataset (the REE) is based on individuals, and as our sample of firms is a selection of firms that have been operating above some sort of a "minimum scale" during each calendar year, the most suitable measure of firm survival might be one which is based on economic activity, and where the number of employees is the measure of economic activity. The first survival rates reported in Table 6 are thus simply the share of newborn firms with a strictly positive number of employees by the end of each of the operational years *t*, *t+1* and *t+2*, where *t* is the year of birth (as defined above)[10]. Firms

[9] The presence of acquisitions might be the most obvious objection against treating firm survival as a necessary condition for success. A successful firm acquired by another firm will in this analysis be counted as a "failure" if the acquisition makes the firm (with its original organizational number) disappear from the register.

[10] These survival rates are simply a measure of the probability of surviving the first operational *calendar* years for newborn firms, and they are by no means representing a precise measure of the probability of surviving the first operational years for any given newborn firm in the sample. When identifying newborn firms we do not take into account the fact that the dates of birth for newborn firms each year are actually quite evenly distributed over the twelve month period (even though more firms than usual seem to open in

that are “asleep” for at least one year are counted as failures, implying that firms without any employees by the end of one of these years are not counted as survivors in any of the preceding years, even though some might reappear one or two years later with a strictly positive number of employees.

Table 6. "Activity based" and "appearance based" survival rates.

		Share of newborn firms with a positive number of employees by the end of each year			Share of newborn firms appearing in the register each year	
Year of birth (t)	Number of entrants	Operational year *t*	*t+1*	*t+2*	Operational year *t+1*	*t+2*
1997	10413	91.2	73.0	58.6	84.5	67.4
1998	9559	91.8	74.4	60.0	85.0	67.9
1999	8442	92.5	75.9	61.6	85.1	68.3
2000	8257	92.6	73.3	58.0	83.8	66.3
2001	7533	92.7	72.9	56.4	82.5	63.8
2002	7399	92.6	71.0	58.0	80.5	64.1
2003	6958	91.7	73.0	59.2	81.4	65.1
2004	7326	93.5	74.6	.	82.1	.
Min	6958	91.2	71.0	56.4	80.5	63.8
Max	10413	93.5	75.9	61.6	85.1	68.3
Average	8236	92.3	73.5	58.8	83.1	66.1

The share of newborn firms surviving their first operational calendar year ranges from 91.2 per cent for the 1997 cohort to 93.5 per cent for the 2004 cohort, which leaves us with one-year hazard rates for each cohort of newborn firms between 6.5 and 8.8 per cent. Moving to the two year survival rate (the fraction of firms surviving their second operational calendar year), we see that it takes its minimum of 71 per cent for the 2002 cohort, while it reaches its maximum of 76 per cent for the 1999 cohort. The fraction of firms surviving their third operational year (year *t+2*) ranges between 56.4 per cent for the 2001 cohort and 61.9 per cent for that of 1999.

January, and fewer firms than usual in December). This implies that the so called “one-year survival/hazard rates” actually represent the “one-month survival/hazard rate” for some at the same time as it represents the “twelve-month survival/hazard rate” for others.

The last two columns of Table 6 represent the second possible measure of survival, namely the mere appearance in the register one and two years after the year of birth, respectively. This measure is thus somewhat less demanding than the first one, as the firms are only required to have had at least one person registered as employed during some period of time in the relevant year in order to be classified as survivors, whereas a stricktly positive number of employees *by the end of each year* was required for the first measure. The fraction of firms appearing in the register one year after the year of birth ranges between 80.5 per cent for the 2002 cohort and 85.1 per cent for the cohort of 1999, whereas those appearing in the register also in year *t+2* constitute fractions of all newborn firms in each year *t* lying between 63.8 and 68.3 per cent (for the 2001 and 1999 cohort, respectively). Finally, in the bottom of the table all number series are summarized with minimum, maximum and mean values for the time period.

4.2. The probability of survival – two simple models

To get an impression of the importance of different firm and individual specific characteristics on the probability of survival, we have run a simple econometric model for the probability of surviving the year *t+2* for newborn firms (we return to the first measure of survival discussed in the preceding section, and classify firms as survived if they did appear in the register with a strictly positive number of employees by the end of each operational year). Multivariate analysis is convenient in this context as it makes it possible to take account of the fact that several variables might affect the probability of survival at the same time. As firm specific explanatory variables we have included the year of birth, geographical location (six different regions), industry, and organizational structure. Moreover, we have included some individual specific characteristics based on information concerning the employee first registered as employed by the firm. Our hope is that this individual often will have been a key-person for the firm, and maybe even the entrepreneur herself, but this, of course, might or might not be true. The included individual characteristics are gender, age, previous state (based on the seven different states discussed in section 3.3.), and highest level of completed education (in three broad

categories). Finally, we have measured recent work experience by counting the number of years out of the five years preceding employment in the relevant newborn firm for which the individual has accumulated a strictly positive number of pension points[11]. All explanatory variables are included as dummy variables, and for the remainder of the paper the sample consists of 50,247 newborn firms.

We have estimated the same survival propensity equation under two different frameworks: a logit model and a linear probability model (LPM). The properties of the logit model makes it somewhat better suited (as compared to the LPM) to estimate equations modelling the probability of an event, but as the logit estimates are not straightforward to interpret, we have also reported the OLS estimates from the LPM (see Table 7). The OLS estimates should in this context be interpreted as the marginal effect on the probability of survival for a given firm in the sample, and the LPM will often yield good estimates of the partial effects on the probability of survival near the center of the distribution of the explanatory variables[12].

Table 7 reports parameter estimates, standard errors, and p-values for the logit model and for the LPM model, respectively. The dependent variable takes the value 1 if the firm did survive until the year *t+2*, 0 if not. As all explanatory variables are included as dummy variables, the parameter estimates indicates differences in the probability of survival relative to the reference group, for each group of explanatory variables. The p-values are interpreted as the probability of the true parameter being equal to zero, that is, that the estimated parameter's difference from zero might be due to some sort of a (statistical) coincidence.

Before turning to the results of the estimated regressions, it should be mentioned that the models described and discussed in this section are not meant to be interpreted as complete models of the true probability of survival. The probability of survival is likely to depend on many variables other than those captured by our data and included in the models, and the fact that we are not able to observe and model all relevant factors is a potential source of different methodological problems, in particular those referred to in

[11] For our chosen period of analysis, a person accumulated pension points in a given year if income was above one "base amount". The base amount was 50,603 NOK in 2001.
[12] See for instance Wooldrige (2002) for a further discussion of the suitability of the logit model and the LPM in this context.

the literature as omitted variable bias and endogeneity bias[13]. The models are still useful as tools for descriptive analysis, however, and it could be interesting to take notice of some of the patterns of signs and significance of the different (groups of) parameter estimates reported in Table 7.

First, the firm's organizational structure at the year of birth seems to be of some importance. The probability of survival is highest for the private limited companies (the reference group), and the probability is clearly lower for the other organizational structures in the sample (according to the OLS estimates, the probability is lower by about 25 percentage points).

Moving to the individual characteristics, we first observe that the key-person's gender does not change the probability of firm survival significantly. The recent work experience of the key-person matters, however. The probability of survival is highest if the key-person has been working for each of the five last years before being employed by the newborn firm, and it is lowest if the key-person has not been working at all. The estimated difference between the two extremes is about 11 percentage points. Finally, the previous state of the key-person does also seem to be of some importance. The firms recruiting their first employee from unemployment or social security (state B) are facing the lowest probability of survival, and the only group that is not significantly different from the reference group (E – employment) is state F – those with some experience from "economic life".

[13] This comment will of course also be relevant for the models presented in Table 8, 9 and 10.

Table 7. Survival equation – Logit and LPM.

Percentage of newborn firms survived year *t+2*	59.3					
Parameter	Estimate (Logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Intercept	1.2614	0.0471	<.0001	0.78746	0.01010	<.0001
Year						
1997	Reference					
1998	0.00748	0.0309	0.8087	0.00148	0.00666	0.8237
1999	0.00594	0.0326	0.8554	0.000992	0.00701	0.8874
2000	-0.1676	0.0326	<.0001	-0.03630	0.00707	<.0001
2001	-0.2313	0.0334	<.0001	-0.05039	0.00726	<.0001
2002	-0.1635	0.0340	<.0001	-0.03542	0.00737	<.0001
Region						
East	Reference					
South	-0.00301	0.0295	0.9186	-0.000714	0.00638	0.9108
West	0.0558	0.0305	0.0670	0.01190	0.00656	0.0697
Mid	0.0612	0.0343	0.0745	0.01297	0.00738	0.0788
North	-0.1589	0.0366	<.0001	-0.03496	0.00798	<.0001
Oslo	-0.1423	0.0309	<.0001	-0.03120	0.00671	<.0001
Other areas/ region missing	0.0176	0.4131	0.9660	0.00437	0.08977	0.9612
Industry						
Mining and quarrying	0.1725	0.1519	0.2562	0.03413	0.03123	0.2745
Manufacturing	-0.0222	0.0391	0.5698	-0.00497	0.00841	0.5547
Construction	0.0995	0.0337	0.0031	0.02083	0.00725	0.0040
Wholesale and retail trade, …	Reference					
Hotels and restaurants	-0.2646	0.0379	<.0001	-0.05878	0.00830	<.0001
Transport, storage and communication	0.2885	0.0361	<.0001	0.06310	0.00779	<.0001
Financial intermediation	0.2102	0.1237	0.0894	0.04248	0.02537	0.0940
Real estate, renting and business activities	-0.1080	0.0269	<.0001	-0.02334	0.00581	<.0001
Org. structure						
General partnership	-1.0578	0.0670	<.0001	-0.24838	0.01485	<.0001
Private limited company	Reference					

Table 7 (continued)

Parameter	Estimate (Logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
General partnership with shared liability	-0.9993	0.0864	<.0001	-0.23516	0.01921	<.0001
Sole proprietorship	-1.0394	0.0248	<.0001	-0.24327	0.00550	<.0001
Other legal forms	-0.3849	0.0918	<.0001	-0.08504	0.02041	<.0001
Missing	-10.2663	72.7678	0.8878	-0.72908	0.32926	0.0268
Gender	-0.0233	0.0234	0.3195	-0.00482	0.00511	0.3457
Work experience						
One year	-0.4136	0.0486	<.0001	-0.09458	0.01081	<.0001
Two years	-0.3982	0.0444	<.0001	-0.09069	0.00989	<.0001
Three years	-0.2999	0.0401	<.0001	-0.06797	0.00894	<.0001
Four years	-0.2839	0.0326	<.0001	-0.06361	0.00724	<.0001
Five years	Reference					
No years	-0.4624	0.0441	<.0001	-0.10568	0.00974	<.0001
Age						
16-24	-0.1282	0.0387	0.0009	-0.02859	0.00853	0.0008
25-34	-0.1746	0.0253	<.0001	-0.03780	0.00548	<.0001
35-44	Reference					
45-54	0.0398	0.0297	0.1812	0.00827	0.00632	0.1909
55-59	-0.00414	0.0488	0.9324	-0.000898	0.01046	0.9316
60-64	0.0612	0.0718	0.3940	0.01285	0.01536	0.4030
65-69	0.0479	0.1192	0.6877	0.01053	0.02595	0.6850
Previous state						
A	-0.3691	0.0559	<.0001	-0.08355	0.01237	<.0001
B	-0.6743	0.0364	<.0001	-0.15205	0.00800	<.0001
C	-0.3295	0.0568	<.0001	-0.07314	0.01262	<.0001
D	-0.2781	0.0445	<.0001	-0.06384	0.00986	<.0001
E	Reference					
F	0.0404	0.0434	0.3519	0.00831	0.00915	0.3639
Z	-0.1821	0.0256	<.0001	-0.04018	0.00562	<.0001
Education						
Compulsory	-0.2342	0.0339	<.0001	-0.05069	0.00732	<.0001
Intermediate	-0.0624	0.0271	0.0215	-0.01319	0.00581	0.0233
Tertiary	Reference					
Unspecified	-0.2420	0.0509	<.0001	-0.05261	0.01114	<.0001

Hosmer and Lemeshow Goodness-of-Fit Test			R-square	0.1031
Chi-square	DF	Pr > Chi-square	Adjusted R-square	0.1023
33.9281	8	<.0001		

Log Likelihood Ratio Test		
Chi-square	DF	Pr > Chi-square
5259.3389	44	<.0001

4.3. A further assessment of success

In order to narrow down the analysis somewhat, we base our criterion of success on growth in the number of employees during the first three operational calendar years. The theoretical motivation lying behind such a criterion builds on two arguments (presented in Mata et. al. (1995)). First, as pointed out above, it is frequently observed that newly created firms generally are quite small as compared to already existing firms in the same industries, and they are therefore likely to be operating below the minimum efficient scale[14]. This leaves newborn firms with a cost disadvantage as compared to the incumbents, and newborn firms should therefore have particularly strong incentives to expand, if possible.

The second argument builds on the theory of plant-level dynamics (first articulated by Jovanovic (1982)), describing the learning process faced by newly created firms during their early period of activity. It seems reasonable to assume that newborn firms have to deal with relatively more uncertainty than already existing firms, and that there is a particularly intense selection process going on during the first couple of years of production. Newborn firms receiving favourable information on their expected probability of post entry survival (which could include information on their true costs, their relative efficiency, and/or more or less specific information on the demand conditions in the relevant market segment) should have strong incentives to scale up their production activity, while firms receiving less favourable information should be more reluctant to expand and might even want to exit the market[15].

Our preferred definition of post-entry success amongst newborn firms is therefore based both on mere survival and on growth in the number of employees. We measure growth in the number of employees between the end of the year of birth (year *t*) and the year *t+2* amongst those firms that have had at least one employee by the end of each of the years *t*, *t+1* and *t+2*. We classify firms as successful if they have grown faster than

[14] The term "minimum efficient scale" refers to the smallest produced quantity for which a firm's long run average cost curve reaches its minimum.

[15] Using market shares as a measure of firm size, Dunne et al. (1988) find that the size of a cohort of surviving entrants increases as the cohort ages (relative to all firms in the market, and on average across industries). They point out, however, that the increase in the average size of surviving entrants is likely to result both because surviving firms grow and because the smallest entrants are the most likely to exit the market.

the median growth rate of all newborn firms with a strictly positive growth rate between year *t* and year *t+2* and with a positive number of employees by the end of each of the first three operational calendar years.

Before moving on with the analysis, a couple of possible objections to this particular definition of success deserve to be mentioned. First, when conditioning on survival in the sense that a firm needs to be registered with the same organizational number from one year to another, we cut off any firm that has been successful but acquired by another firm at some point of time during our period of observation. Second, different firms could have numerous reasons why they would not want to expand even though they experience some sort of success during their first operational years. Some might for instance value the good sides of running their very own business in their own preferred pace more than enough to offset the temptation of potentially higher profits followed by an expansion. Third, a measure of success that is built on relative growth in the number of employees could be disfavouring firms that are initially big, if high relative growth is more easily obtained for the firms that are small at the time of birth than for those that are relatively bigger[16]. Finally, the fact that we have chosen to measure growth between the end of the years *t* and *t+2* disfavours those firms that have experienced a particularly high growth during their very first operational year, for then to stabilize production at a certain scale and with a certain number of employees.

[16] Pfeiffer and Reize (2000) report that initial firm size has no measurable influence on the probability of survival (this finding contrasts what is usually reported in the litterature (see for instance Dunne et al (1988)), but they find clear evidence of a negative relationship between initial firm size and growth in the number of employees.

Table 8. Success equation – Logit and LPM.

Percentage of newborn firms classified as successful	14.5					
Parameter	Estimate (Logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Intercept	-1.3623	0.0606	<.0001	0.19830	0.00760	<.0001
Year						
1997	Reference					
1998	-0.1416	0.0407	0.0005	-0.01741	0.00502	0.0005
1999	-0.1375	0.0425	0.0012	-0.01709	0.00528	0.0012
2000	-0.0878	0.0424	0.0382	-0.01083	0.00532	0.0419
2001	-0.1498	0.0442	0.0007	-0.01870	0.00547	0.0006
2002	-0.2325	0.0456	<.0001	-0.02845	0.00555	<.0001
Region						
East	Reference					
South	-0.0890	0.0395	0.0241	-0.01081	0.00480	0.0244
West	-0.0305	0.0397	0.4430	-0.00372	0.00494	0.4506
Mid	-0.0742	0.0453	0.1012	-0.00925	0.00556	0.0961
North	-0.2388	0.0514	<.0001	-0.02768	0.00601	<.0001
Oslo	0.00829	0.0401	0.8363	0.00145	0.00505	0.7736
Other areas/ region missing	0.4512	0.4663	0.3332	0.06733	0.06759	0.3191
Industry						
Mining and quarrying	0.6135	0.1623	0.0002	0.08804	0.02351	0.0002
Manufacturing	0.0635	0.0523	0.2252	0.00761	0.00633	0.2296
Construction	0.1402	0.0451	0.0019	0.01715	0.00545	0.0017
Wholesale and retail trade, …	Reference					
Hotels and restaurants	-0.0373	0.0539	0.4890	-0.00349	0.00625	0.5770
Transport, storage and communication	0.3906	0.0468	<.0001	0.04750	0.00587	<.0001
Financial intermediation	0.3787	0.1374	0.0059	0.05270	0.01910	0.0058
Real estate, renting and business activities	0.0974	0.0357	0.0064	0.01162	0.00438	0.0079
Org. structure						
General partnership	-0.4101	0.1016	<.0001	-0.04703	0.01118	<.0001

Table 8 (continued)

Parameter	Estimate (Logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Private limited company	Reference					
General partnership with shared liability	-0.4337	0.1331	0.0011	-0.04914	0.01447	0.0007
Sole proprietorship	-0.4417	0.0359	<.0001	-0.05055	0.00414	<.0001
Other legal forms	-0.1095	0.1207	0.3642	-0.01348	0.01537	0.3803
Missing	-8.1948	105.8	0.9383	-0.14112	0.24791	0.5692
Gender	-0.0688	0.0315	0.0288	-0.00880	0.00385	0.0221
Work experience						
One year	-0.0402	0.0679	0.5537	-0.00496	0.00814	0.5420
Two years	-0.1186	0.0631	0.0602	-0.01389	0.00744	0.0621
Three years	-0.0136	0.0550	0.8050	-0.00170	0.00673	0.8003
Four years	-0.0911	0.0452	0.0438	-0.01092	0.00545	0.0453
Five years	Reference					
No years	-0.1795	0.0645	0.0054	-0.01877	0.00733	0.0105
Age						
16-24	0.1120	0.0533	0.0357	0.01247	0.00642	0.0521
25-34	0.0527	0.0327	0.1071	0.00621	0.00412	0.1320
35-44	Reference					
45-54	-0.1504	0.0388	0.0001	-0.01866	0.00476	<.0001
55-59	-0.3738	0.0704	<.0001	-0.04228	0.00788	<.0001
60-64	-0.2639	0.1009	0.0089	-0.03055	0.01157	0.0083
65-69	-0.3979	0.1825	0.0292	-0.04286	0.01954	0.0283
Previous state						
A	-0.0304	0.0797	0.7030	-0.00333	0.00932	0.7211
B	-0.1759	0.0520	0.0007	-0.02056	0.00602	0.0006
C	-0.1026	0.0782	0.1894	-0.01315	0.00950	0.1664
D	-0.2042	0.0641	0.0014	-0.02422	0.00743	0.0011
E	Reference					
F	-0.0373	0.0549	0.4974	-0.00478	0.00689	0.4878
Z	-0.1444	0.0349	<.0001	-0.01765	0.00423	<.0001
Education						
Compulsory	-0.1613	0.0449	0.0003	-0.01990	0.00551	0.0003
Intermediate	-0.0725	0.0346	0.0363	-0.00963	0.00438	0.0279
Tertiary	Reference					
Unspecified	-0.0826	0.0681	0.2249	-0.01077	0.00839	0.198

Hosmer and Lemeshow Goodness-of-Fit Test			R-square	0.0096
Chi-square	DF	Pr > Chi-square	Adjusted R-square	0.0087
2.8676	8	0.9424		
Log Likelihood Ratio Test				
Chi-square	DF	Pr > Chi-square		
500.2675	44	<.0001		

We have modeled the probability of success (as defined above) using the same frameworks as for the probability of survival (a logit model and a LPM), with the same set of explanatory variables, and with the dependent variable taking the value 1 if the firm is classified as successful, and 0 otherwise. The results for the success equation, however, are not very convincing (see Table 8). First, the estimates draw much less "stable" patterns than those for the survival equation. The coefficients are less precisely estimated, and the estimated effects are smaller in magnitude. Second, the chi-square statistic for the log likelihood ratio is only about 1/10 of that of the survival equation, indicating that the success equation provides less additional information as compared to the null model (an "empty" model only consisting of an intercept term) than what the survival equation does. Finally, results for the Hosmer and Lemeshow goodness-of-fit test are reported in the bottom of both Table 7 and Table 8. This test divides the firms into deciles based on predicted probabilities, then computes a chi-square statistic from observed and expected frequencies, and tests the null hypothesis that there is no difference between the observed and predicted values of the response variable[17]. The null hypothesis can not be rejected for the success equation, which is a strong indication that the model does not fit the data very well.

As a third approach we have used an ordered logit framework, with the dependent variable taking three different values: 0 if the firm has not survived until the end of the year *t+2* ("failure"), 1 if the firm has survived until the end of the year *t+2*, and 2 if the firm is classified as successful, using the criterion for success discussed above. Results for this equation are reported in Table 9, and these are similar to those of the survival equation, in terms of patterns of signs and significance of the estimates, and in particular for the groups of estimates highlighted in the discussion around the survival equation (the firm's organizational structure, and work experience and previous state of the first employee).

[17] See the following url for more details on the test and on how to run the test using SAS: http://www.ats.ucla.edu/stat/sas/seminars/sas_logistic/logistic1.htm.

Table 9. Failure/survival/success equation – Ordered logit and OLS.						
Percentage of newborn firms in each category	Failure	40.7				
	Survival	44.8				
	Success	14.5				
Parameter	Estimate (Logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Intercept 2	-1.1481	0.0424	<.0001	.	.	.
Intercept 1	1.1320	0.0423	<.0001	0.98576	0.01455	<.0001
Year						
1997	Reference					
1998	-0.0397	0.0277	0.1512	-0.01593	0.00960	0.0971
1999	-0.0364	0.0291	0.2096	-0.01610	0.01010	0.1109
2000	-0.1389	0.0294	<.0001	-0.04713	0.01018	<.0001
2001	-0.2058	0.0302	<.0001	-0.06909	0.01047	<.0001
2002	-0.1764	0.0306	<.0001	-0.06387	0.01061	<.0001
Region						
East	Reference					
South	-0.0212	0.0265	0.4246	-0.01152	0.00919	0.2100
West	0.0341	0.0272	0.2094	0.00817	0.00945	0.3871
Mid	0.0194	0.0306	0.5258	0.00373	0.01064	0.7261
North	-0.1706	0.0334	<.0001	-0.06264	0.01150	<.0001
Oslo	-0.0903	0.0278	0.0012	-0.02975	0.00967	0.0021
Other areas/ region missing	0.1994	0.3675	0.5874	0.07170	0.12933	0.5793
Industry						
Mining and quarrying	0.3386	0.1278	0.0080	0.12217	0.04500	0.0066
Manufacturing	0.00784	0.0348	0.8219	0.00264	0.01212	0.8277
Construction	0.1051	0.0302	0.0005	0.03799	0.01044	0.0003
Wholesale and retail trade, …	Reference					
Hotels and restaurants	-0.2165	0.0352	<.0001	-0.06227	0.01196	<.0001
Transport, storage and communication	0.3270	0.0323	<.0001	0.11060	0.01122	<.0001
Financial intermediation	0.2519	0.1036	0.0150	0.09518	0.03655	0.0092
Real estate, renting and business activities	-0.0394	0.0240	0.1008	-0.01171	0.00837	0.1618
Org. structure						
General partnership	-0.9474	0.0646	<.0001	-0.29542	0.02139	<.0001

Table 9 (continued)

Parameter	Estimate (logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Private limited company	Reference					
General partnership with shared liability	-0.9059	0.0834	<.0001	-0.28430	0.02768	<.0001
Sole proprietorship	-0.9284	0.0234	<.0001	-0.29382	0.00793	<.0001
Other legal forms	-0.2915	0.0835	0.0005	-0.09852	0.02941	0.0008
Missing	-9.8031	63.4418	0.8772	-0.87020	0.47438	0.0666
Gender	-0.0456	0.0213	0.0320	-0.01362	0.00736	0.0643
Work experience						
One year	-0.3179	0.0458	<.0001	-0.09954	0.01557	<.0001
Two years	-0.3265	0.0417	<.0001	-0.10458	0.01424	<.0001
Three years	-0.2179	0.0374	<.0001	-0.06968	0.01288	<.0001
Four years	-0.2204	0.0301	<.0001	-0.07453	0.01043	<.0001
Five years	Reference					
No years	-0.4150	0.0418	<.0001	-0.12445	0.01403	<.0001
Age						
16-24	-0.0658	0.0359	0.0671	-0.01612	0.01228	0.1894
25-34	-0.1011	0.0226	<.0001	-0.03160	0.00789	<.0001
35-44	Reference					
45-54	-0.0230	0.0260	0.3772	-0.01039	0.00911	0.2542
55-59	-0.1051	0.0432	0.0149	-0.04318	0.01507	0.0042
60-64	-0.0336	0.0635	0.5970	-0.01770	0.02214	0.4240
65-69	-0.0392	0.1077	0.7159	-0.03233	0.03738	0.3871
Previous state						
A	-0.2807	0.0524	<.0001	-0.08687	0.01783	<.0001
B	-0.5771	0.0344	<.0001	-0.17262	0.01152	<.0001
C	-0.2607	0.0523	<.0001	-0.08629	0.01818	<.0001
D	-0.2581	0.0420	<.0001	-0.08806	0.01421	<.0001
E	Reference					
F	0.00702	0.0374	0.8512	0.00353	0.01318	0.7890
Z	-0.1600	0.0232	<.0001	-0.05783	0.00809	<.0001
Education						
Compulsory	-0.2033	0.0303	<.0001	-0.07059	0.01054	<.0001
Intermediate	-0.0598	0.0239	0.0124	-0.02282	0.00838	0.0064
Tertiary	Reference					
Unspecified	-0.2036	0.0467	<.0001	-0.06338	0.01605	<.0001

Log Likelihood Ratio Test			R-square	0.0700
Chi-square	DF	Pr > Chi-square	Adjusted R-square	0.0692
4307.1432	44	<.0001		

4.4. Determinants of firm size

Finally, as an alternative approach a bit on side of the preceding discussion, we have run an ordered logit with a different dependent variable, namely the number of employees by the end of the year *t+2*, divided into nine different groups. The dependent variable takes the following values: one of the values between 0 and 5 if the number of employees was between zero and five, 6 if the number of employees was between six and nine, 7 if the number of employees was between ten and nineteen, and 8 if the number of employees was twenty or more. Results from this final regression are reported in Table 10, and these are similar to those of the survival equation and those of the failure/survival/success equation, with respect to patterns of signs, significance, and relative magnitude of the estimates.

Organizational structure appears to be the one of the firm characteristics included in the regression that matters the most for the size of the firm after its third operational year, in the sense that private limited companies are expected to have more employees than firms of other organizational structures. Turning to the individual characteristics, we have again that the key-person's gender is of no importance. The estimate for the gender dummy is small and insignificant, as was also the case for the survival equation. Those firms for which the key-person has been working for each of the five years preceding employment in the newborn firm are likely to be bigger than other firms, and so is also the case for firms with a key-person recruited "directly" from other employment. We do also notice that the firms with relatively young key-persons are expected to be somewhat bigger than firms with a key-person of age fourty-five or older.

Table 10. Equation for the number of employees by the end of year *t+2*.
Ordered logit and OLS.

No. of employees	Percentage of newborn firms in each category
0	40.7
1	16.7
2	11.8
3	7.5
4	5.2
5	3.8
6-9	7.6
10-19	4.5
> 20	2.1

Parameter	Estimate (logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Intercept 8	-3.1564	0.0492	<.0001	.	.	.
Intercept 7	-1.9487	0.0423	<.0001	.	.	.
Intercept 6	-1.0652	0.0405	<.0001	.	.	.
Intercept 5	-0.7670	0.0402	<.0001	.	.	.
Intercept 4	-0.4261	0.0400	<.0001	.	.	.
Intercept 3	-0.0135	0.0399	0.7346	.	.	.
Intercept 2	0.5501	0.0399	<.0001	.	.	.
Intercept 1	1.2982	0.0403	<.0001	2.94827	0.04789	<.0001
Year						
1997	Reference					
1998	-0.0223	0.0263	0.3976	-0.03453	0.03160	0.2745
1999	-0.00459	0.0276	0.8679	-0.00945	0.03323	0.7760
2000	-0.0992	0.0279	0.0004	-0.09094	0.03351	0.0066
2001	-0.1454	0.0288	<.0001	-0.12741	0.03445	0.0002
2002	-0.1190	0.0291	<.0001	-0.12317	0.03493	0.0004
Region						
East	Reference					
South	-0.0161	0.0253	0.5248	-0.03555	0.03026	0.2400
West	0.0680	0.0258	0.0083	0.07797	0.03110	0.0122
Mid	0.0579	0.0290	0.0460	0.05765	0.03501	0.0996
North	-0.1166	0.0318	0.0002	-0.12024	0.03785	0.0015
Oslo	-0.0412	0.0264	0.1187	0.03042	0.03182	0.3391
Other areas/ region missing	0.3266	0.3449	0.3436	0.46986	0.42567	0.2697
Industry						
Mining and quarrying	0.2168	0.1193	0.0692	0.32808	0.14809	0.0267
Manufacturing	0.0310	0.0329	0.3469	0.07566	0.03989	0.0578
Construction	0.0805	0.0287	0.0051	0.08205	0.03436	0.0169

Table 10 (continued)

Parameter	Estimate (logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
Wholesale and retail trade,…	Reference					
Hotels and restaurants	0.1676	0.0330	<.0001	0.46289	0.03936	<.0001
Transport, storage and communication	0.2460	0.0309	<.0001	0.18405	0.03694	<.0001
Financial intermediation	0.2487	0.0962	0.0097	0.33131	0.12029	0.0059
Real estate, renting and business activities	-0.2904	0.0229	<.0001	-0.40001	0.02755	<.0001
Org. structure						
General partnership	-1.2536	0.0644	<.0001	-1.42551	0.07040	<.0001
Private limited company	Reference					
General partnership with shared liability	-1.1475	0.0822	<.0001	-1.29443	0.09111	<.0001
Sole proprietorship	-1.2481	0.0230	<.0001	-1.48301	0.02610	<.0001
Other legal forms	-0.3125	0.0789	<.0001	-0.31813	0.09679	0.0010
Missing	-8.7339	35.2470	0.8043	-2.35019	1.56136	0.1323
Gender	-0.0274	0.0203	0.1757	0.00269	0.02422	0.9115
Work experience						
One year	-0.3835	0.0444	<.0001	-0.37899	0.05126	<.0001
Two years	-0.3687	0.0403	<.0001	-0.38800	0.04688	<.0001
Three years	-0.2811	0.0360	<.0001	-0.32344	0.04240	<.0001
Four years	-0.2610	0.0288	<.0001	-0.30038	0.03434	<.0001
Five years	Reference					
No years	-0.4863	0.0408	<.0001	-0.48049	0.04619	<.0001
Age						
16-24	-0.00154	0.0346	0.9645	0.07155	0.04043	0.0767
25-34	-0.0465	0.0214	0.0295	0.00276	0.02597	0.9155
35-44	Reference					
45-54	-0.0590	0.0246	0.0162	-0.12242	0.02999	<.0001
55-59	-0.1644	0.0411	<.0001	-0.28796	0.04961	<.0001
60-64	-0.1764	0.0610	0.0038	-0.33986	0.07286	<.0001
65-69	-0.1850	0.1048	0.0775	-0.42763	0.12303	0.0005
Previous state						
A	-0.4571	0.0515	<.0001	-0.54492	0.05868	<.0001
B	-0.6816	0.0335	<.0001	-0.65877	0.03793	<.0001
C	-0.3941	0.0501	<.0001	-0.50389	0.05985	<.0001
D	-0.3128	0.0406	<.0001	-0.36210	0.04678	<.0001
E	Reference					

Table 10 (continued)

Parameter	Estimate (logit)	Standard error	Pr > Chi-square	Estimate (OLS)	Standard error	Pr > | t |
F	-0.2566	0.0354	<.0001	-0.47807	0.04338	<.0001
Z	-0.2995	0.0221	<.0001	-0.42905	0.02663	<.0001
Education						
Compulsory	-0.1511	0.0288	<.0001	-0.15583	0.03470	<.0001
Intermediate	-0.0254	0.0226	0.2620	-0.03695	0.02757	0.1801
Tertiary	Reference					
Unspecified	-0.1988	0.0447	<.0001	-0.17226	0.05281	0.0011

Log Likelihood Ratio Test			R-square	0.1219
Chi-square	DF	Pr > Chi-square	Adjusted R-square	0.1211
6864.9308	44	<.0001		

4.5. Some concluding remarks on the regressions

Three of the four models presented in this section have shown similar patterns of signs, significance, and relative magnitudes of the estimates, especially for the explanatory variables concerning the firms' organizational structure and the previous state and recent work experience for the first employed employee. We have seen that the probability of survival for the private limited companies is higher by about 25 percentage points as compared to that of other types of firms, everything else being equal. Moreover, if the newborn firm's key-person has been working for each of the five years preceding employment in the relevant firm, the probability of survival is predicted to be 11 percentage points higher than if the key-person has not been working in any of these years. Finally, the firms recruiting their key-person "directly" from other employment seem to have the highest probability of survival, while those recruiting from unemployment or social security seem to have the lowest, with an estimated difference of about 15 percentage points.

The model that provides the least convincing results is the success equation presented in Table 8, as the coefficients are less precisely estimated for this model than they are for the other models, and as different test statistics indicate that the overall fit of the model is not very good. One reason for this might be that there are too little

heterogeneity amongst the firms that were classified as successful, especially with respect to the firms' organizational structure and the previous state of the first employee. We have seen that the private limited companies constitute the biggest group of newborn firms (section 3.2., Table 3), and the results from the survival equation indicated that these firms also have the highest probability of survival (section 4.2., Table 7), everything else being equal. As the criterion for success is based on firm survival, one should expect the private limited companies to be much more numerous than those of other organizational structures amongst the firms that are classified as successful in the success equation. A similar point can be made for the explanatory variable conserning the previous state of the first employee.

The (relative) lack of explanatory power of the success equation might as well be due to the specification (or misspecification) of the criterion for success, for which some possible shortcomings were briefly adressed in section 4.3. There exists no universially accepted, objective and clear-cut definition of success to be applied on different types of data covering firms of different nature, possibly operating in widely different settings, and possibly even with differing objectives. Any definition of firm success will thus necessarily be somewhat arbitrary, and the best solution to this problem might be to base the analysis of firm performance on the simple rather than on the more sophisticated measures out of those that could be defined on the basis of economic theory.

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