Who gets to first base? Start-up characteristics and entrepreneurial success

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ABSTRACT

The main finding of this paper is that board composition at founding is related to future company growth. Companies whose initial directors have more prior managerial and entrepreneurial experience grow more than other companies in their cohort (founded in the same industry in the same year). In addition, companies whose initial directors have more prior venture capital (VC) fundraising experience are more likely to raise VC financing in the future. This evidence is consistent with a mentoring role of the board of directors at company founding. Indeed, I find that the quality of directors' prior experience is positively correlated with future company growth. This seems to suggest that directors with more valuable prior experience are able to give better advice. Extant work on boards of private companies focuses on director appointments and board composition after a company has raised outside equity, typically by a VC fund. I contribute to this literature by studying board composition at founding and its relation to future company growth.

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1 Introduction

Innovative high-growth companies are an import driver of economic growth. Entrepreneurial success, however, is skewed - most start-ups fail and very few survivors achieve phenomenal growth. Despite an extensive literature on entrepreneurship, we do not have a clear understanding of which characteristics lead some companies to be so different.

In this article, I aim to contribute to our understanding of entrepreneurial success by studying the relationship between the composition of a company's board of directors at founding and future company growth. From a theoretical perspective, it is not obvious why a start-up would form a board over and above regulatory requirements. In the traditional view, the board of directors is a corporate governance mechanism to alleviate agency problems arising from the separation of ownership and control. Even though founders typically combine majority ownership and management of the operations, I find that 28% of boards of directors at company founding exceed regulatory requirements. A natural question to ask is then: what is the role of the board of directors at a start-up company, and does initial board composition matter for a company's subsequent development path?

The main finding of this paper is that board composition at founding is related to future company growth. Companies whose initial directors have more prior managerial and entrepreneurial experience grow more than other companies in their cohort (founded in the same industry in the same year). In addition, companies whose initial directors have more prior venture capital (VC) fundraising experience are more likely to raise VC financing in the future. This evidence is consistent with a mentoring role of the board of directors at company founding. Indeed, I find that the quality of directors' prior experience is positively correlated with future company growth. This seems to suggest that directors with more valuable prior experience are able to give better advice.

Increasing our understanding of which start-up characteristics predict entrepreneurial success more broadly is important for the following reasons. First, start-ups contribute disproportionately to job creation and productivity growth. For example, company age, rather than size, is correlated with employment growth (Haltiwanger, Jarmin, and Miranda 2013). Second, there is a positive relationship between VC investment and high company growth (Lerner and Nanda 2020). A common presumption in the VC literature is that the board of directors plays a limited role prior to the first significant outside equity investment, which is

oftentimes by a VC fund. VC partners regularly take a board seat at their portfolio companies to monitor company progress and to give advice, if needed. I complement these findings by showing that the board of directors seems to already play a meaningful mentoring role from company birth for a non-negligible fraction of start-ups and that initial board composition is related to future company growth. Third, there is a growing recognition that an economy does not just rely on start-ups but also scale-ups. This is as huge policy debate (Kamal-Chaoui 2018) but there is little academic literature to guide this discussion.

Data availability is a challenge when studying the relationship between initial composition of a company's board of directors and future company growth empirically. It requires information about individual directors and financial performance of companies since founding. To the best of my knowledge, such data is neither available in the US nor in the UK.[1] I therefore collect data on the population of Swedish limited liability companies between 1997 and 2019. I collate data from different sources to construct a company-fiscal year panel that follows start-up companies from birth over time. My principal data source is the Swedish Companies Registration office which has information on annual reports, boards of directors, and company events (e.g., mergers or bankruptcies). I merge data on external equity financing events from Pitchbook, ThomsonOne, and Preqin.

The main threat to identification in my empirical design is that board composition at founding is likely not random. A potential source of endogeneity, when omitted from the estimating equation, is founder quality. Higher quality founders might be able to attract higher quality directors and also cause their companies to grow more. I address this concern by including control variables that proxy for managerial, fundraising, and entrepreneurial experience of individuals holding an executive position (CEO or vice CEO), including those who also serve on the board. These control variables, however, are likely not perfect proxies for founder quality and there could be other factors that affect the matching of directors and start-up companies as well as future company growth.

To address the potential problem of non-random matching of directors and start-up companies more formally, I estimate a two-stage model that controls for selection on observables.

[1] Whilst data on annual reports and boards of directors for all limited companies is publicly available in the UK from Companies House, micro-entities and small companies can submit abridged accounts which contain less information. This makes it difficult to measure the growth of start-up companies, particularly in the initial years after founding. Source: `https://www.gov.uk/annual-accounts/microentities-small-and-dormant-companies`

I draw on evidence that local director labour markets are important for board structure, and more so for smaller companies, (A. Knyazeva, D. Knyazeva, and Masulis 2013) to construct a sample with potential and actual director appointments in local markets (year-county pairs). I estimate the Heckman (1979) sample selection model by using the potential appointments sample in the selection equation and the actual appointments sample in the outcome equation. The intuition of this approach is to control for selection on observables by exploiting the characteristics of all directors and companies in a local market using both realized and unrealized matches. The identifying assumption is that the distributions of directors and companies in each local market are exogenously given. I use local market fixed effects as instruments in the selection equation. The advantage is that these fixed effects allow for a more general matching process. The disadvantage is that fixed effects are somewhat of a black box because it is not straightforward to determine what exactly they are capturing.

This paper contributes to a burgeoning literature on boards of directors of private companies. Extant work focuses on director appointments and board composition after a company has raised outside equity, typically by a VC fund. Using a sample of companies that have raised at least series A financing, Venugopal and Yerramilli (2020) find that non-employee director appointments are related to social connections and complementary skill sets between founders and directors. Companies that appoint non-employee directors are more likely to raise VC financing, have more patents, and are more likely to exit. Ewens and Malenko (2020) document that control on boards of directors of VC-backed companies shifts from entrepreneurs to shared to VCs over time. The authors argue that independent directors play a tie-breaking role on boards with shared control. Baltrunaite and Karmaziene (2020) show that an increase in the supply of non-local directors leads to appointments of higher (lower) quality directors at higher (lower) quality Italian private companies, consistent with positive assortative matching. I complement these papers by studying board composition at founding and its relation to future company growth.

The rest of the paper is arranged as follows. Section 2 describes features of the Swedish entrepreneurial ecosystem that are relevant to this study. Section 3 outlines the sample construction and shows descriptive statistics. Section 4 explains the empirical strategy. Section 5 presents the results. Section 6 concludes.

2 Institutional details

Starting a business in Sweden is relatively easy. Sweden ranks 39th out of 190 on the Starting a Business category in the 2020 World Bank Doing Business rankings, in which it stands out for the low costs involved in business formation.[2] To compare, the US ranks 55th and the UK ranks 18th. Swedish entrepreneurs benefit from a relatively well developed venture capital industry that supplies young high-growth companies with risk capital. Sweden is consistently amongst the top 10 countries in the venture capital investment as percentage of GDP rankings by the OECD between 2007 and 2018.[3] In addition, the country's capital and start-up hub Stockholm does particularly well on investor exits. Spotify's USD 28 billion IPO in 2018 is a prominent example. Stockholm ranks 10th in the Top 30 Global Startup Ecosystems and Runners-Up ranking in the 2020 Global Startup Ecosystem report by Startup Genome.[4]

Policy reforms in the early 1990s made business formation easier (Heyman et al. 2019). The burst of a real estate bubble, which had built up during the 1980s, led to a recession in the early 1990s. Decreasing GDP and increasing unemployment meant that the expensive welfare system was not sustainable any longer. As a response, the government cut spending and introduced a deregulatory reform package to increase Sweden's competitiveness. Some of these reforms made business formation easier. First, lower corporate and capital tax rates benefited young businesses in particular by making it cheaper to raise external capital. Second, product market deregulation lowered barriers of entry. More specifically, the deregulation of utilities and services decreased "knock-on" costs in other sectors (e.g., manufacturing). Third, deregulation in the labour market lowered employment protection and increased companies' flexibility. Whilst permanent employees continued to benefit from high employment protection, temporary employees experienced a decrease in employment protection. This is referred to as the Swedish dual labour market.

All business enterprises must be registered with the Swedish Companies Registration Office before starting to operate.[5][6] The most common form of business enterprise in Sweden is the limited liability company, *aktiebolag* in Swedish. Formation requires only one person

[2] `https://www.doingbusiness.org/en/data/exploreeconomies/sweden#DB_sb`

[3] `https://stats.oecd.org/Index.aspx?DataSetCode=VC_INVEST`

[4] `https://startupgenome.com/reports/gser2020`

[5] Sole traders (self-employed) are an exception because they can opt to only register with the Swedish Tax Agency.

[6] `https://www.verksamt.se/web/international/starting/registration-and-tax`

and a minimum share capital of SEK 25,000 (≈USD 2,500).[7,8] In addition, it is the only company form that offers limited liability to all shareholders.[9] At registration, the founders choose between a private and public company type which differ in the required minimum share capital and the ability to distribute shares.[10] Shareholders can change the company type at the annual general meeting any time after registration. Public companies have a minimum share capital of SEK 500,000, whereas private companies require the previously mentioned SEK 25,000. Private companies must neither advertise their shares to the open market nor have more than 200 shareholders. Public companies do not have such restrictions. Furthermore, only public limited liability companies can apply for their shares to be listed on an exchange.[11]

Swedish law requires all limited liability companies, both public and private, to submit annual reports to the Companies Registration Office.[12] Annual reports include an income statement, a balance sheet, a cash flow statement, and information on the board of directors. To ensure that the submitted data is correct and reliable, limited liability companies must appoint an auditor who assesses the annual reports. Small limited liability companies need neither submit a cash flow statement nor appoint an auditor.[13] In addition to annual reports, the Companies Registration Office has data on mergers, bankruptcies, location changes, and industry changes. Non-compliance or submitting incorrect information results in liquidation and unlimited liability for board members. Companies therefore have strong incentives to submit accurate information.

Limited liability companies must set up a board of directors at registration.[14] Swedish corporate governance has a unitary structure with a single board of directors. Boards of

[7]The minimum share capital decreased from SEK 100,000 to 50,000 in 2011 and to 25,000 in 2019.

[8]https://bolagsverket.se/en/bus/business/limited/2.1144/private-and-public-limited-companies-1.8601

[9]https://uk.practicallaw.thomsonreuters.com/0-549-8061?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1#co_anchor_a365676

[10]https://bolagsverket.se/ff/foretagsformer/aktiebolag/starta/publikt-1.3235

[11]https://bolagsverket.se/ff/foretagsformer/aktiebolag/starta/borsbolag-1.17585

[12]Årsredovisningslag [1995:1554] 8 sec. 3 and Bokföringslag [1999:1078] 6 sec. 2.

[13]A company is considered small if it does not exceed two or more of the following criteria during the last two fiscal years: more than 3 employees, more than SEK 1.5 million of total assets, or more than SEK 3 million of net turnover. To be considered large, a company must exceed the same two criteria during both fiscal years. See https://bolagsverket.se/en/bus/business/limited/2.1147/auditor-limited-companies-1.8643

[14]https://bolagsverket.se/en/bus/business/limited/2.1147/board-of-directors-1.8631

private companies must consist of at least one director, and if there are two or more directors, the shareholders must appoint a chairman. Private companies need not appoint a managing director. Boards of public companies must consist of at least three directors, one of which must be appointed chairman. Public companies must also appoint a managing director, who may be a board member but must not be chairman.[15] CEO duality is therefore possible in private but not in public limited liability companies in Sweden.

[15] http://www.bolagsstyrning.se/corporate-governance-in-sweden/the-chief-executive-officer__3721

3 Data

3.1 Sample construction

I collect data on the population of Swedish limited liability companies between 1997 and 2019. I focus on limited liability companies for two reasons. First, it is the most common form of business enterprise in Sweden. Formation is relatively easy[16] and it is the only company form that offers limited liability to all shareholders. Second, Swedish law requires all limited liability companies to submit annual reports to the Companies Registration Office.

I collate data from different sources to construct a company-fiscal year panel that follows start-up companies from birth over time. My principal data source is the Swedish Companies Registration Office which has information on annual reports, boards of directors, and company events (e.g., mergers or bankruptcies). I merge data on external equity financing events from Pitchbook, ThomsonOne, and Preqin.

To construct the sample, I start with the annual reports data from the Swedish Companies Registration Office and restrict it to limited liability companies. I only keep annual reports which follow an accounting type for which I know how income statement and balance sheet are constructed because I use these to construct cash flow statements.[17] Appendix C describes this in more detail. If a company provides both consolidated and unconsolidated financial statements for a given fiscal year, I use the consolidated version to capture the company's overall economic activity. These filters keep 95.6% of the observations, primarily because Swedish law requires only limited liability companies to submit annual reports. I only keep companies that are registered during the sample period because I am interested in studying the life cycle of start-up companies. This drops 46.2% of the remaining observations. I also restrict the sample to companies that have an employee in at least one fiscal year to focus the sample on potential employer companies. This drops 68.1% of the remaining observations. Table 1 lists the filters applied to the raw data to construct the sample and shows how many unique companies and company-fiscal year observations are left after each step.

[16] Formation requires only one person and a minimum share capital of SEK 25,000 (≈USD 2,500).

[17] I keep annual reports which follow either the nature of expense or cost of sales accounting type.

Table 1

Sample construction

This table lists the filters applied to the raw data to construct the sample. It also shows how many unique companies and company-fiscal year observations are left after each step.

Filter applied	# companies	# company-fiscal years
None: Raw data	850,224	7,805,994
Restrict to limited liability companies	828,409	7,725,030
Restrict to nature of expense and cost of sales accounting types	827,480	7,715,557
Restrict to consolidated financial statements if both consolidated and unconsolidated versions are available	827,480	7,465,699
Restrict to years before 2019	822,950	7,410,350
Restrict to companies with known registration date	822,374	7,408,987
Restrict to companies that are registered during sample period	591,876	4,014,637
Restrict to companies that have employees in at least one fiscal year	195,909	1,280,813
Restrict to companies that provide their board composition for every fiscal year	176,268	1,060,499
Restrict to financial statement filings without gaps	176,191	1,060,031

I then augment the annual reports panel with several other datasets. First, I merge company name, location, and industry information by assigning each update submitted to the Companies Registration Office to the corresponding fiscal year in the annual reports panel during which the update occurred. For each company-fiscal year observation, I then keep the latest available information at fiscal year end. I assign municipalities to counties by

using the most recent national classification system.[18] I standardize industry classifications to the latest version of the Swedish standard (SNI 2007) because most company-fiscal years fall under that version.[19]

Second, I add information on liquidations, mergers, bankruptcies, and re-organizations by assigning each event recorded by the Companies Registration Office to the corresponding fiscal year in the annual reports panel during which the event occurred. If a company has multiple events of the same type during a fiscal year, I keep the earliest available record. For each company, I assign events that occur after the latest fiscal year with annual reports data to the last fiscal year in the annual reports panel.

Third, I include three public type indicator variables for each company-fiscal year. These variables take the value of 1 if, at the end of the fiscal year, a company is a public limited liability company, a company's immediate parent is a public company, or the company's ultimate parent is a public company, respectively. I use group structure data from the Companies Registration Office to generate the variables for immediate and ultimate parent companies.[20]

Fourth, I add information on executives and the board of directors at fiscal year end by tracking key personnel appointments and removals filed with the Companies Registration Office. I assign individuals to four mutually exclusive categories: managers, ordinary directors, employee representatives, and ordinary deputy directors. I classify an individual holding an executive position (CEO or vice CEO) as manager. A manager might also serve as a director on the board or be a deputy director. I classify a (deputy) director who is neither a manager nor an employee representative as ordinary (deputy) director. I only treat manager-directors and ordinary directors as members of the board because these are appointed by the owners of the company.[21] Employee representatives are appointed by the labour union and deputy directors only attend board meetings when a regular director is unavailable. I differentiate between manager and non-manager directors to account for their distinct primary responsibilities. The board's main role is to guide the company with respect to its strategy, whereas management is in charge of daily operations. I use individuals' first

[18] https://www.scb.se/hitta-statistik/regional-statistik-och-kartor/regionala-indelningar/lan-och-kommuner/lan-och-kommuner-i-kodnummerordning/

[19] https://www.scb.se/dokumentation/klassifikationer-och-standarder/standard-for-svensk-naringsgrensindelning-sni/

[20] I exclude minority holdings because it is not clear where these are in the groups structure.

[21] Regulatory requirements (e.g., minimum number of directors) also use this definition of board membership.

names to proxy for their gender. I restrict official baby name lists published by government agencies in Sweden, Finland, Norway, Denmark, the UK, and the US to non-ambiguous first names by keeping names given only to boys or girls.[22] I then match each list one at a time (in the order of appearance in the previous sentence) to the Companies Registration Office data.[23] This yields a gender proxy for 97% of the individuals.

Fifth, I merge data on external equity financing events from Pitchbook, ThomsonOne, and Preqin by machting on company name and city. I use the Pitchbook data as base because it has the highest number of investment rounds, and fill in missing variables for existing financing events or add previously missing financing events with data from ThomsonOne and then Preqin (in order of decreasing coverage).

I annualise flow as well as growth stock variables to account for differences in fiscal period lengths. This is important in the context of my study because 93% of fiscal periods that are shorter or longer than 12 months are first fiscal years of companies. I winsorize all growth variables at the 1st and 99th percentiles to alleviate the potential impact of outliers.

3.2 Descriptive statistics

Figures 1 and 2 show entry and survival over time, respectively. Tables 2 and 3 show descriptive statistics at the company-year and company level, respectively.

[22] I apply this restriction separately to each list to allow for gender associations of first names to differ across countries.

[23] I start with Swedish baby names and then match the remaining lists in order of decreasing cultural similarity between Sweden and the respective country of origin to minimize errors in the gender proxy.

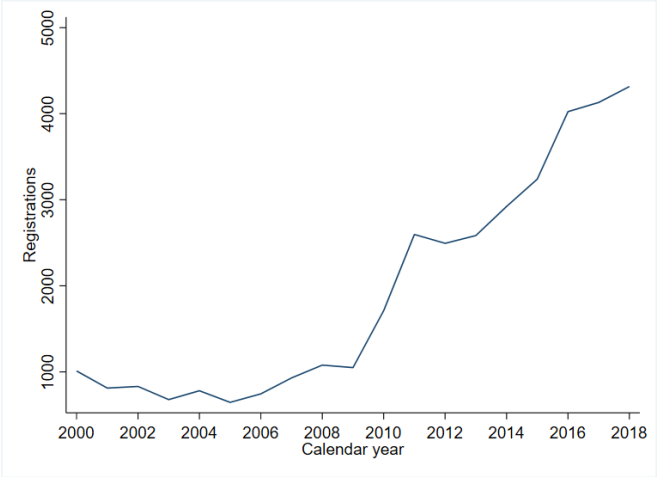
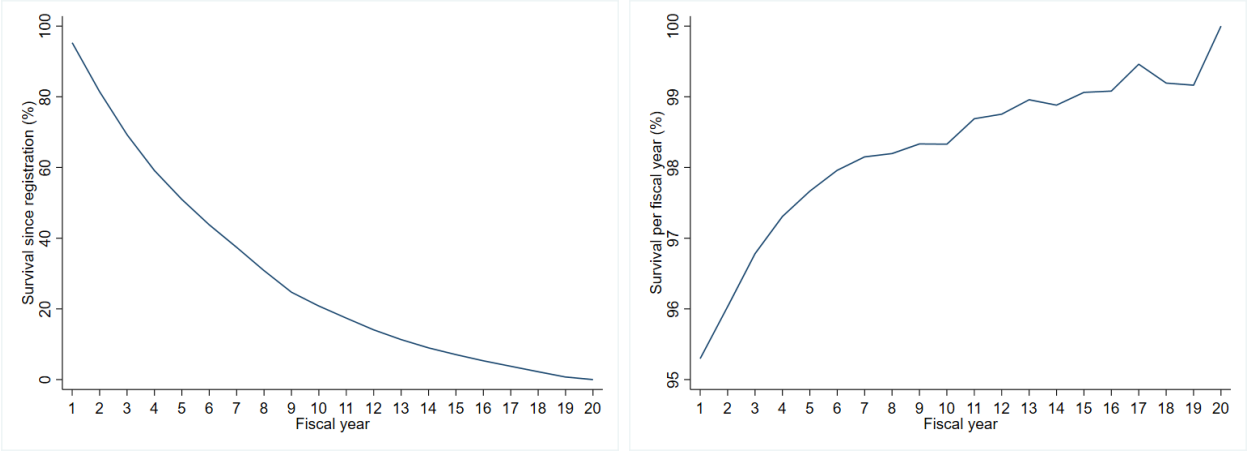


Figure 1. Entry over time. This figure shows the number of annual registrations of limited liability companies between 2000 and 2018.



A: Survival since registration (%). **B: Survival per fiscal year (%).**

Figure 2. Survival over time. This figure shows the survival rate of limited liability companies since registration (Panel A) and for each fiscal year (Panel B). I classify bankruptcy, liquidation, reorganisation, and removal events as failure.

Table 2

Descriptive statistics at company-year level

This table presents descriptive statistics at the company-year level. Panels A, B, C, and D show these for selected items from the income statement, balance sheet, cash flow statement, and other variables, respectively.

Panel A: Income statement

Variable	Mean	SD	p25	p50	p75
Sales	21,566,894	674,754,075	1,076,000	2,451,000	6,706,000
Operating profit/loss	990,465	43,589,486	4,000	148,286	494,000
Profit/loss after financial income	785,144	45,335,925	0	136,000	485,000
Net profit/loss	532,699	39,432,915	2,000	87,000	304,000

Panel B: Balance sheet

Variable	Mean	SD	p25	p50	p75
Total current assets	10,460,175	391,625,104	412,000	929,000	2,347,000
Total fixed assets	13,201,872	520,051,992	12,000	135,000	742,000
Total assets	23,657,271	762,453,691	574,000	1,332,000	3,549,000
Total current liabilities	8,482,068	355,383,461	210,000	518,000	1,449,000
Total non-current liabilities	7,423,263	310,446,411	0	0	268,000
Total equity	6,738,870	254,327,389	136,000	341,000	942,000
Total equity and liabilities	23,653,587	762,452,256	574,000	1,332,000	3,548,000

Panel C: Cash flow statement

Variable	Mean	SD	p25	p50	p75
Cash from operations	−146,396	147,187,556	−161,320	36,080	344,640
Cash from investments	314,178	234,109,029	−52,674	39,000	241,380
Cash from financings	48,693	137,039,933	−288,000	−59,000	0
Change in cash	216,475	32,140,053	−98,000	4,000	178,000

Panel D: Board variables

Variable	Mean	SD	p25	p50	p75
Board size	1.561	1.082	1.000	1.000	2.000
Founding members	1.315	0.865	1.000	1.000	1.000
Females	0.288	0.559	0.000	0.000	0.000
Company has CEO	0.290	0.454	0.000	0.000	1.000
CEO duality	0.039	0.193	0.000	0.000	0.000
Founder CEO	0.249	0.432	0.000	0.000	0.000
Current directorships	1.724	18.172	0.000	0.000	1.000
Directorships	3.489	43.714	0.000	0.000	1.667
Public experience	0.054	0.417	0.000	0.000	0.000
Chairman positions	0.871	11.416	0.000	0.000	0.000
Manager experience	0.300	1.126	0.000	0.000	0.000
VC experience	0.014	0.173	0.000	0.000	0.000
Entrepreneurial experience	2.392	41.803	0.000	0.000	1.000

Panel E: Other variables

Variable	Mean	SD	p25	p50	p75
Dividends	251,562	9,141,246	0	0	113,000
Number of employees	11	207	1	2	5
Salaries to CEO and directors	218,227	6,543,870	0	0	207,000
Salaries to other employees	3,200,612	94,588,201	0	223,000	912,000
Social security contributions	1,249,143	34,763,069	0	139,000	410,000
Bonus to CEO	7,819	581,003	0	0	0
Bonus to other employees	7,108	591,461	0	0	0
Bank overdraft facility granted	892,681	112,425,529	0	0	0
Bank overdraft facility utilized	280,350	23,905,287	0	0	0

Table 3

Descriptive statistics at company level

This table lists descriptive statistics at the company level. The sample consists of 181,109 companies.

Panel A: Outcome variables		
Variable	N	%
Bankruptcy	26,038	14.78
Liquidation	7,425	4.21
Reorganization	934	0.53
Removal	0	0.00
Merger	9,858	5.60
Public company	499	0.28
VC investment	454	0.26
VC exit	89	0.05

4 Empirical strategy

To study the relationship between the composition of a company's board of directors at founding and future company growth, I estimate the following equation

$$Y_i = \alpha + \beta D_i + \gamma C_i + \delta_c + \delta_j + \delta_t + \epsilon_i \tag{1}$$

in which i is a company, Y_i is a future company growth variable, D_i is a vector of ordinary director variables, C_i is a vector of company control variables, δ_c are county fixed effects, δ_j are industry fixed effects, and δ_t are calendar year fixed effects. I measure all variables at the end of the first fiscal year for each company. Appendix A contains definitions for all variables that I use in the analysis.

The set of coefficients of interest in equation 1 is β. The main threat to identification is that board composition at founding is likely not random. A potential source of endogeneity, when omitted from the estimating equation, is founder quality. Higher quality founders might be able to attract higher quality directors and also cause their companies to grow more. I address this concern by including control variables that proxy for managerial, fundraising, and entrepreneurial experience of individuals holding an executive position (CEO or vice CEO), including those who also serve on the board. These control variables, however, are likely not perfect proxies for founder quality and there could be other factors that affect the matching of directors and start-up companies as well as future company growth, which would threaten identification of equation 1.

To address the potential problem of non-random matching of directors and start-up companies more formally, I estimate the following two-stage model that controls for selection on observables:

$$match_{i,d} = \alpha + \beta D_d + \gamma C_i + \delta_c + \delta_j + \delta_t + \delta_m + \epsilon_{i,d} \tag{2}$$

$$Y_{i,d} = \alpha + \beta D_d + \gamma C_i + \delta_c + \delta_j + \delta_t + \lambda IMR_{i,d} + \epsilon_{i,d} \tag{3}$$

in which (2) is the selection equation, (3) is the outcome equation, i is a company, d is an ordinary director, $match_{i,d}$ is a binary variable that equals 1 if company i actually appoints director d, δ_m are local market fixed effects, and $IMR_{i,d}$ is the Inverse Mills ratio from the selection equation. All other variables are the same as in equation 1, with the difference that I measure ordinary director variables at the individual level in equations 2 and 3.

I construct a sample with potential and actual ordinary director appointments to estimate equations 2 and 3. I draw on evidence that local director labour markets are important for board structure, and more so for smaller companies, (A. Knyazeva, D. Knyazeva, and Masulis 2013) to define local markets as county-year pairs. Within each local market, I then create potential appointments by forming all combinations of ordinary directors and companies that are part of an actual appointment. I drop potential appointments for which the individual actually holds a key personnel position at the company during that year.[24] I then keep ten potential appointments for each actual appointment. For each set of ten potential appointments, I hold the actual ordinary director and actual company constant for five of the potential matches, respectively. To illustrate, if company i appoints ordinary director d in local market m, then I create five potential matches of ordinary director d with other companies and five potential matches of company i with other ordinary directors (all in local market m).

I estimate the Heckman (1979) sample selection model by using the potential appointments sample in the selection equation and the actual appointments sample in the outcome equation.[25] The intuition of this approach is to control for selection on observables by exploiting the characteristics of all ordinary directors and companies in a local market using both realized and unrealized matches. The identifying assumption is that the distributions of ordinary directors and companies in each local market are exogenously given. I use local market fixed effects as instruments in the selection equation. The advantage is that these fixed effects allow for a more general matching process. The disadvantage is that fixed effects are somewhat of a black box because it is not straightforward to determine what exactly they are capturing.

[24]Key personnel roles include managers, ordinary directors, employee representatives, and ordinary deputy directors as defined in section 3.1.

[25]Bottazzi, Da Rin, and Hellmann (2008) was the first article in the entrepreneurial finance literature to use this methodology. In their study, the authors use it to control for the non-random matching between VC investors and portfolio companies.

5 Results

5.1 Main results

I provide evidence that companies whose initial directors have more prior managerial and entrepreneurial experience grow more than other companies in their cohort (founded in the same industry in the same year). In addition, companies whose initial directors have more prior venture capital (VC) fundraising experience are more likely to raise VC financing in the future. This evidence is consistent with a mentoring role of the board of directors at company founding. Table 4 presents results of Ordinary Least Squares (OLS) estimation of equation 1. Tables 5 and 6 show the results of OLS estimation of equation 1 in an ordinary director appointment sample without and with control variables, respectively. Table 7 presents results of a two-stage model that controls for selection on observables by estimating equations 2 and 3. Results are consistent across all specifications.

I also find that the quality of directors' prior experience is positively correlated with future company growth (Table 8). This seems to suggest that directors with more valuable prior experience are able to give better advice.

Table 4
Initial board composition and future company growth

This table presents results for regressions of company growth outcomes on initial board of directors composition. The dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is a company. I measure all regressors at the end of a company's first fiscal year. I control for managerial, entrepreneurial, and VC experience as well as current directorships and current directorships squared of managers, employee representatives, and deputy ordinary directors. Other control variables are board size, board size sq, chairman, CEO, CEO duality, no ordinary directors, no managers, no employee representatives, no ordinary deputy directors, sales, total assets, employment, retention rate, public, and VC backed. Appendix A contains definitions for all variables. I also include county, industry, and year fixed effects. *t*-statistics are shown in parentheses, and standard errors are heteroscedasticity robust. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
	Sales growth	Emp growth	Assets growth	Ever VC
Managerial experience	0.0677***	0.0143***	0.0430***	−0.0001
	(5.60)	(4.88)	(5.17)	(−0.19)
Entrepreneurial exp	0.1000***	0.0240***	0.0534***	0.0003
	(11.06)	(10.99)	(8.41)	(0.70)
VC experience	−0.0464	0.0250*	0.1227***	0.0403***
	(−0.75)	(1.81)	(2.66)	(4.99)
Current directorships	0.0983***	0.0204***	0.0911***	−0.0002
	(8.75)	(7.56)	(12.28)	(−0.43)
Current directorships sq	−0.0307***	−0.0068***	−0.0247***	−0.0002
	(−9.39)	(−9.22)	(−12.67)	(−1.09)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	144,043	144,867	144,852	169,808
Adj. R^2	0.11	0.07	0.10	0.02

Table 5

Experience of initial directors and future company growth

This table presents results for regressions of company growth outcomes on experience measures for initial ordinary directors. The dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an ordinary director appointment. I measure all regressors at the end of a company's first fiscal year. I include no control variables. t-statistics are shown in parentheses, and standard errors are clustered at the company level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Managerial exp	0.0778***	0.0178***	0.0378***	0.0010*
	(8.46)	(7.74)	(6.61)	(1.88)
Entrepreneurial exp	0.1844***	0.0409***	0.1096***	0.0005
	(21.39)	(20.48)	(20.22)	(1.05)
VC experience	0.1165***	0.0370***	0.1234***	0.0414***
	(2.67)	(3.46)	(3.82)	(5.72)
Current directorships	0.0980***	0.0275***	−0.0083	0.0026***
	(10.33)	(12.09)	(−1.47)	(4.89)
Current dir'ships sq	−0.0438***	−0.0109***	−0.0195***	−0.0007***
	(−16.19)	(−17.61)	(−12.63)	(−5.64)
Controls	No	No	No	No
Cty, ind, yr FEs	No	No	No	No
Observations	186,801	188,202	188,182	218,839
Adj. R^2	0.02	0.02	0.01	0.01

Table 6
Experience of initial directors and future company growth

This table presents results for regressions of company growth outcomes on experience measures for initial ordinary directors. The dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an ordinary director appointment. I measure all regressors at the end of a company's first fiscal year. I control for managerial, entrepreneurial, and VC experience as well as current directorships and current directorships squared of other ordinary directors, managers, employee representatives, and deputy ordinary directors. Other control variables are board size, board size sq, chairman, CEO, CEO duality, no ordinary directors, no managers, no employee representatives, no ordinary deputy directors, sales, total assets, employment, retention rate, public, and VC backed. Appendix A contains definitions for all variables. I also include county, industry, and year fixed effects. *t*-statistics are shown in parentheses, and standard errors are clustered at the company level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Managerial experience	0.0324***	0.0066***	0.0177***	−0.0004
	(4.00)	(3.34)	(3.44)	(−0.81)
Entrepreneurial exp	0.0724***	0.0172***	0.0401***	0.0004
	(10.65)	(10.44)	(8.96)	(1.11)
VC experience	−0.0589*	0.0037	0.0536**	0.0233***
	(−1.81)	(0.49)	(2.26)	(4.63)
Current directorships	0.0669***	0.0140***	0.0620***	−0.0008*
	(7.80)	(6.81)	(11.58)	(−1.65)
Current directorships sq	−0.0198***	−0.0046***	−0.0171***	−0.0001
	(−7.42)	(−7.53)	(−11.26)	(−0.83)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	180,374	181,593	181,573	209,770
Adj. R^2	0.13	0.10	0.11	0.03

Table 7
Accounting for selection on observables

This table presents results for regressions of company growth outcomes on experience measures for initial ordinary directors using a two-stage model to account for selection on observables. Panels A and B show the output for the outcome and selection equations, respectively. In Panel A, the dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an actual ordinary director appointment. In Panel B, the dependent variable is binary and equals 1 if an ordinary director-company pair is an actual appointment. The unit of analysis is a potential ordinary director appointment. Section 4 explains the empirical strategy in more detail. I measure all regressors at the end of a company's first fiscal year. Control variables and fixed effects are the same as in Table 6. I use local market fixed effects as instruments in the selection equation. t-statistics are shown in parentheses, and standard errors are heteroscedasticity robust. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Outcome equation

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Managerial experience	0.0292***	0.0222***	0.0278***	−0.0003
	(4.08)	(3.12)	(4.07)	(−0.64)
Entrepreneurial exp	0.0760***	0.0659***	0.0634***	0.0003
	(11.84)	(10.22)	(10.26)	(0.73)
VC experience	−0.0517**	0.0051	0.0398	0.0239***
	(−2.00)	(0.20)	(1.64)	(16.04)
Current directorships	0.0874***	0.0713***	0.1006***	−0.0002
	(8.35)	(6.81)	(10.03)	(−0.30)
Current directorships sq	−0.0251***	−0.0215***	−0.0271***	−0.0002
	(−9.36)	(−8.15)	(−10.72)	(−1.47)
Inverse Mills ratio	0.1159	−0.0254	0.2883	−0.0224
	(0.47)	(−0.10)	(1.20)	(−1.16)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	179,586	180,787	180,767	209,771
χ^2	20475.87	14196.11	16012.10	6883.88

Panel B: Selection equation

	(1)	(2)	(3)	(4)
			Match	
Managerial experience	−0.0059	−0.0045	−0.0046	−0.0072**
	(−1.62)	(−1.24)	(−1.25)	(−2.13)
Entrepreneurial exp	0.0009	0.0034	0.0035	0.0078***
	(0.29)	(1.09)	(1.10)	(2.63)
VC experience	−0.0117	−0.0015	−0.0015	−0.0347***
	(−0.89)	(−0.12)	(−0.12)	(−2.85)
Current directorships	−0.0331***	−0.0324***	−0.0324***	−0.0313***
	(−8.76)	(−8.59)	(−8.60)	(−8.78)
Current directorships sq	0.0088***	0.0084***	0.0084***	0.0075***
	(9.02)	(8.61)	(8.61)	(8.13)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes
Observations	2,284,687	2,285,888	2,285,868	2,312,334

Table 8
Quality of initial directors' experience

This table presents results for regressions of company growth outcomes on quality measures for initial ordinary directors' experience. The dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an ordinary director appointment. I measure all regressors at the end of a company's first fiscal year. I control for (i) managerial, entrepreneurial, and VC experience; (ii) current directorships and current directorships squared; and (iii) no quality of experience indicators of the focal ordinary director, other ordinary directors, managers, employee representatives, and deputy ordinary directors. Other control variables are board size, board size sq, chairman, CEO, CEO duality, no ordinary directors, no managers, no employee representatives, no ordinary deputy directors, sales, total assets, employment, retention rate, public, and VC backed. Appendix A contains definitions for all variables. I also include county, industry, and year fixed effects. t-statistics are shown in parentheses, and standard errors are clustered at the company level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Manager sales gwth	0.0063	0.0021	0.0034	0.0014**
	(0.73)	(1.05)	(0.64)	(2.46)
Manager emp gwth	0.0702**	0.0363***	0.0397**	−0.0015
	(2.29)	(5.22)	(2.06)	(−0.75)
Manager assets gwth	0.0141**	0.0041***	0.0066*	0.0005
	(2.34)	(2.84)	(1.77)	(1.15)
Entrepreneur sales gwth	−0.0018	−0.0005	−0.0015	−0.0000
	(−0.72)	(−0.89)	(−0.89)	(−0.01)
Entrepreneur emp gwth	0.0500***	0.0116***	0.0207**	−0.0007
	(3.15)	(3.21)	(2.13)	(−0.89)
Entrepreneur assets gwth	0.0032*	0.0011**	0.0037***	−0.0001**
	(1.79)	(2.52)	(3.44)	(−1.99)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	180,374	181,593	181,573	209,770
Adj. R^2	0.14	0.10	0.11	0.04

5.2 Robustness

A potential concern is that companies with more than one ordinary director appointment during their first fiscal year have duplicate values of the dependent variables. I therefore keep only one ordinary director appointment for each company (chosen randomly) and confirm that all results are robust. Tables 9, 10, and 11 present the output.

Table 9
Initial directors' experience and future company growth

This table presents results for regressions of company growth outcomes on experience measures for initial ordinary directors. For robustness, I only keep one ordinary director appointment for each company (chosen randomly). The dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an ordinary director appointment. I measure all regressors at the end of a company's first fiscal year. I control for managerial, entrepreneurial, and VC experience as well as current directorships and current directorships squared of other ordinary directors, managers, employee representatives, and deputy ordinary directors. Other control variables are board size, board size sq, chairman, CEO, CEO duality, no ordinary directors, no managers, no employee representatives, no ordinary deputy directors, sales, total assets, employment, retention rate, public, and VC backed. Appendix A contains definitions for all variables. I also include county, industry, and year fixed effects. t-statistics are shown in parentheses, and standard errors are clustered at the company level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Managerial experience	0.0386***	0.0066**	0.0174**	−0.0004
	(3.39)	(2.40)	(2.32)	(−0.66)
Entrepreneurial exp	0.0723***	0.0166***	0.0484***	0.0004
	(8.25)	(7.76)	(7.90)	(1.00)
VC experience	0.0052	0.0302**	0.0336	0.0304***
	(0.09)	(2.23)	(0.76)	(3.60)
Current directorships	0.0824***	0.0174***	0.0715***	−0.0007
	(7.36)	(6.59)	(9.89)	(−1.25)
Current directorships sq	−0.0233***	−0.0048***	−0.0191***	−0.0001
	(−7.28)	(−6.73)	(−9.86)	(−0.49)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	125,292	126,024	126,010	147,555
Adj. R^2	0.11	0.08	0.10	0.02

Table 10
Accounting for selection on observables

This table presents results for regressions of company growth outcomes on experience measures for initial ordinary directors using a two-stage model to account for selection on observables. For robustness, I only keep one actual ordinary director appointment for each company (chosen randomly). Panels A and B show the output for the outcome and selection equations, respectively. In Panel A, the dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an actual ordinary director appointment. In Panel B, the dependent variable is binary and equals 1 if an ordinary director-company pair is an actual appointment. The unit of analysis is a potential ordinary director appointment. Section 4 explains the empirical strategy in more detail. I measure all regressors at the end of a company's first fiscal year. Control variables and fixed effects are the same as in Table 9. I use local market fixed effects as instruments in the selection equation. t-statistics are shown in parentheses, and standard errors are heteroscedasticity robust. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Outcome equation

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Managerial experience	0.0475***	0.0259**	0.0352***	0.0023
	(4.41)	(2.41)	(3.26)	(1.31)
Entrepreneurial exp	0.0833***	0.0812***	0.0866***	−0.0011
	(9.87)	(9.04)	(9.62)	(−0.68)
VC experience	−0.0236	0.0194	0.0480	0.0231**
	(−0.51)	(0.43)	(1.06)	(2.35)
Current directorships	0.1118***	0.0553	0.0818**	0.0110
	(2.90)	(1.38)	(2.03)	(1.12)
Current directorships sq	−0.0293***	−0.0170**	−0.0252***	−0.0020
	(−4.26)	(−2.42)	(−3.57)	(−1.24)
Inverse Mills ratio	−0.0703	0.1820	0.4735	−0.1405
	(−0.16)	(0.40)	(1.04)	(−1.18)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	124,876	125,599	125,585	147,556
χ^2	6766.94	8017.52	7961.98	907.33

Panel B: Selection equation

	(1)	(2)	(3)	(4)
		Match		
Managerial exp	−0.0157***	−0.0146***	−0.0146***	−0.0157***
	(−3.27)	(−3.06)	(−3.07)	(−3.56)
Entrepreneurial exp	0.0087**	0.0111***	0.0111***	0.0151***
	(2.18)	(2.81)	(2.81)	(4.11)
VC experience	−0.0694***	−0.0605***	−0.0605***	−0.0930***
	(−3.56)	(−3.14)	(−3.14)	(−5.14)
Current dir'ships	−0.1026***	−0.1018***	−0.1018***	−0.0985***
	(−21.33)	(−21.24)	(−21.24)	(−21.87)
Current dir'ships sq	0.0178***	0.0173***	0.0173***	0.0160***
	(14.63)	(14.33)	(14.33)	(13.87)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes
Observations	1,601,680	1,602,403	1,602,389	1,623,224

Table 11
Quality of initial directors' experience

This table presents results for regressions of company growth outcomes on quality measures for initial ordinary directors' experience. For robustness, I only keep one ordinary director appointment for each company (chosen randomly). The dependent variables in columns 1, 2, and 3, are sales growth, employment growth, and total assets growth, respectively, calculated as the average during a company's entire life. The dependent variable in column 4 is binary and equals 1 if a company ever receives VC investment. The unit of analysis is an ordinary director appointment. I measure all regressors at the end of a company's first fiscal year. I control for (i) managerial, entrepreneurial, and VC experience; (ii) current directorships and current directorships squared; and (iii) no quality of experience indicators of the focal ordinary director, other ordinary directors, managers, employee representatives, and deputy ordinary directors. Other control variables are board size, board size sq, chairman, CEO, CEO duality, no ordinary directors, no managers, no employee representatives, no ordinary deputy directors, sales, total assets, employment, retention rate, public, and VC backed. Appendix A contains definitions for all variables. I also include county, industry, and year fixed effects. *t*-statistics are shown in parentheses, and standard errors are clustered at the company level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Sales growth	(2) Emp growth	(3) Assets growth	(4) Ever VC
Manager sales gwth	0.0144	0.0020	−0.0032	0.0012*
	(1.25)	(0.77)	(−0.41)	(1.72)
Manager emp gwth	0.1075**	0.0475***	0.0763***	−0.0013
	(2.57)	(5.06)	(2.68)	(−0.57)
Manager assets gwth	0.0044	0.0023	0.0102*	0.0001
	(0.55)	(1.20)	(1.79)	(0.18)
Entrepreneur sales gwth	0.0023	−0.0008	0.0008	−0.0001
	(0.62)	(−1.01)	(0.32)	(−0.56)
Entrepreneur emp gwth	0.0545**	0.0115**	0.0163	−0.0001
	(2.47)	(2.26)	(1.17)	(−0.10)
Entrepreneur assets gwth	0.0063**	0.0009	0.0062***	−0.0001
	(2.37)	(1.64)	(3.30)	(−0.58)
Controls	Yes	Yes	Yes	Yes
Cty, ind, yr FEs	Yes	Yes	Yes	Yes
Observations	125,292	126,024	126,010	147,555
Adj. R^2	0.12	0.08	0.10	0.03

6 Conclusion

This paper finds that board composition at founding is related to future company growth. Companies whose initial directors have more prior managerial and entrepreneurial experience grow more than other companies in their cohort (founded in the same industry in the same year). In addition, companies whose initial directors have more prior venture capital (VC) fundraising experience are more likely to raise VC financing in the future. This evidence is consistent with a mentoring role of the board of directors at company founding. Corroborating this interpretation, I find that the quality of directors' prior experience is positively correlated with future company growth. This seems to suggest that directors with more valuable prior experience are able to give better advice.

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Appendix A Variable definitions

Table A1
Variable definitions

This table lists definitions for all variables. Panels A, B, C, D, and E contain definitions for dependent, board of directors, key personnel, key personnel experience, and financial variables, respectively.

Panel A: Dependent variables	
Variable	Definition
Average sales growth	A company's average sales growth during its entire life
Average employment growth	A company's average employment growth during its entire life
Average total assets growth	A company's average total assets growth during its entire life
Relative sales growth	Calculated as $(\bar{g}_i - \bar{g}_{j,t})/\sigma_{j,t}$ where $\bar{g}_i$ is a company's average sales growth during its entire life, $\bar{g}_{j,t}$ is the mean of average sales growths of all companies founded in the same industry and year as company i, and $\sigma_{j,t}$ is the standard deviation of average sales growths of all companies founded in the same industry and year as company i
Relative employment growth	Calculated similarly to *relative sales growth* variable above
Relative total assets growth	Calculated similarly to *relative sales growth* variable above
Ever VC	Binary variable that equals 1 if a company receives VC investment at some stage during its life

Panel B: Board of directors variables	
Variable	Definition
Board size	Number of directors who serve on a company's board (sum of manager-directors and ordinary directors)

Board size sq	Number of directors who serve on a company's board (sum of manager-directors and ordinary directors) squared
Chairman	Binary variable that equals 1 if the board has a chairman
CEO duality	Binary variable that equals 1 if the board has a chairman who is also the CEO

Panel C: Key personnel variables

Variable	Definition
CEO	Binary variable that equals 1 if a company has appointed a CEO
No ordinary directors	Binary variable that equals 1 if no ordinary directors serve on a company's board
No managers	Binary variable that equals 1 if no individual has the title of CEO or vice-CEO
No employee representatives	Binary variable that equals 1 if a company does not have any employee representatives
No deputy ordinary directors	Binary variable that equals 1 if a company does not have any deputy ordinary directors

Panel D: Key personnel experience variables

Variable	Definition
Managerial experience	Total number of other companies at which an individual has held or holds CEO or vice-CEO positions
Entrepreneurial experience	Total number of other companies at which an individual has been a founding member
VC experience	Total number of VC funding rounds at other companies that an individual has experienced
Current directorships	Number of current directorships at other companies that an individual holds
Current directorships sq	Number of current directorships at other companies that an individual holds squared

Manager sales growth	Average sales growth of other companies at which an individual has held or holds CEO or vice-CEO positions
Manager employment growth	Calculated similarly to *manager sales growth* variable above
Manager assets growth	Calculated similarly to *manager sales growth* variable above
Entrepreneur sales growth	Average sales growth of other companies at which an individual has been a founding member
Entrepreneur employment growth	Calculated similarly to *entrepreneur sales growth* variable above
Entrepreneur assets growth	Calculated similarly to *entrepreneur sales growth* variable above
No quality of experience	Six binary variables that equal 1 if an individual has prior managerial or entrepreneurial experience but there is not enough information to calculate a respective quality of experience measure (*manager sales growth*, *manager employment growth*, *manager assets growth*, *entrepreneur sales growth*, *entrepreneur employment growth*, *entrepreneur assets growth*)

Panel E: Financial variables

Variable	Definition
Sales	Logarithm of 1 plus sales
Total assets	Logarithm of 1 plus total assets
Employment	Logarithm of 1 plus the number of employees
Retention rate	The fraction of net income that a company has not paid out as dividends
Public	Binary variable that equals 1 if a company is a public limited liability company
VC backed	Binary variable that equals 1 if a company currently has VC investors

Appendix B VC investments in Sweden

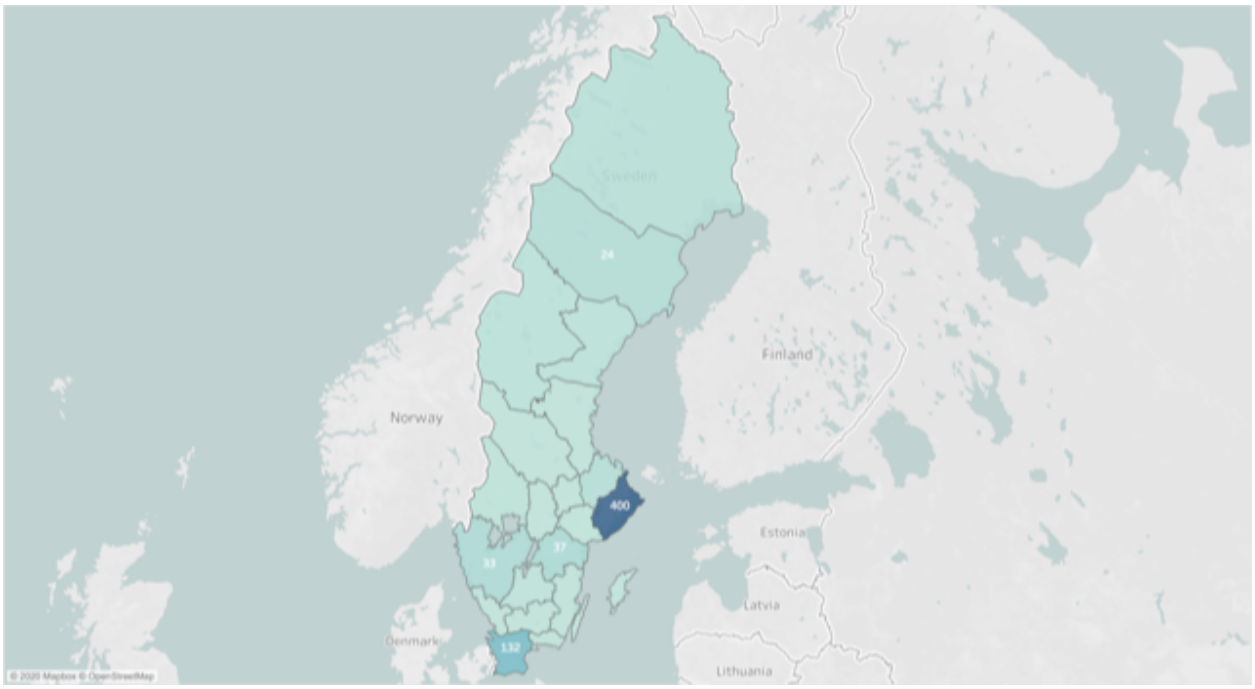
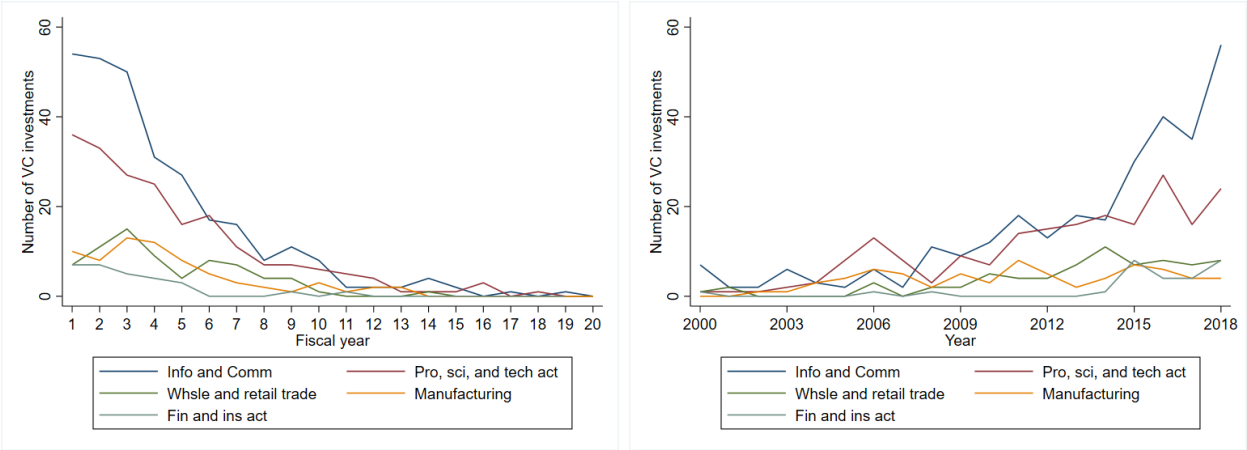
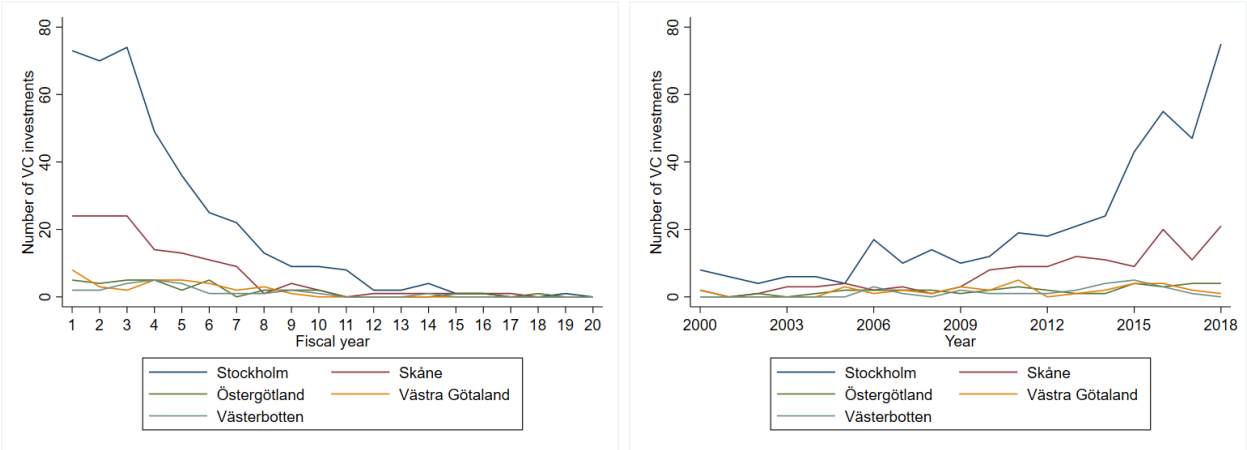


Figure B1. VC investment by county. This figure shows the number of VC investments per county between 2000 and 2018.



A: Fiscal year. **B: Calendar year.**

Figure B2. VC investment by industry over time. This figure shows the number of VC investments for the five industries with the highest VC activity by fiscal year since registration and calendar year in Panels A and B, respectively.



A: Fiscal year. **B: Calendar year.**

Figure B3. VC investment by county over time. This figure shows the number of VC investments for the five counties with the highest VC activity by fiscal year since registration and calendar year in Panels A and B, respectively.

Appendix C Financial statements

This section outlines the income statement and balance sheet items from the annual reports submitted to the Swedish Companies Registration Office and shows how I use these to construct cash flow statements.

I am interested in studying how companies manage cash flows. The annual reports submitted to the Companies Registration Office include an income statement and a balance sheet, neither of which directly shows how cash is spent or generated. The balance sheet shows the aggregate net change in cash from the previous to the current fiscal year. The income statement lists income and expense items that reflect economic activity regardless of when cash is exchanged.[26] It recognizes economic activity by matching revenue and expenses when a transaction occurs, and not when a payment is made.[27] I therefore use the income statement and balance sheet information to construct cash flow statements. Section C.1 uses a stylized example to illustrate how the income statement and balance sheet record transactions, and how the timing of these can be different from when cash is exchanged.

To give some intuition for how I construct the cash flow statements, I use the property of the balance sheet that the total of the left-hand side (assets) is equal to the total of the right-hand side (liabilities and equity).

$$Assets = Liabilities + Equity \tag{4}$$

This implies that the changes from one fiscal year to the next must also be equal on both sides of the balance sheet.

$$\Delta Assets = \Delta Liabilities + \Delta Equity \tag{5}$$

We can decompose the change in assets into the change in cash and the change in all other items, and then solve for the change in cash.

$$\Delta Cash = -\Delta Non\text{-}cash\ assets + \Delta Liabilities + \Delta Equity \tag{6}$$

The cash flow statement breaks down the net change in cash on the balance sheet into

[26] This is known as accrual accounting.
[27] This is known as matching principle.

cash provided by or used for operating, investing, and financing activities during a fiscal year. To compute the net cash from operating activities, I take the net profit/loss from the income statement and adjust it by using non-cash items from the income statement as well as changes in current asset and current liability accounts from the balance sheet. For example, I add back depreciation expenses which decrease net profit but do not involve a cash outflow. Most adjustments to compute the net cash from financing activities involve summing up changes in non-current liability and equity accounts. I calculate the net cash from investing activities as a balancing amount by taking the net change in cash on the balance sheet and subtracting the sum of net cash from operating and financing activities. Figure C1 illustrates how I use items from the income statement and balance sheet account categories to construct the cash flow statement activities. Section C.4 outlines all adjustments I make to construct cash flow statements.

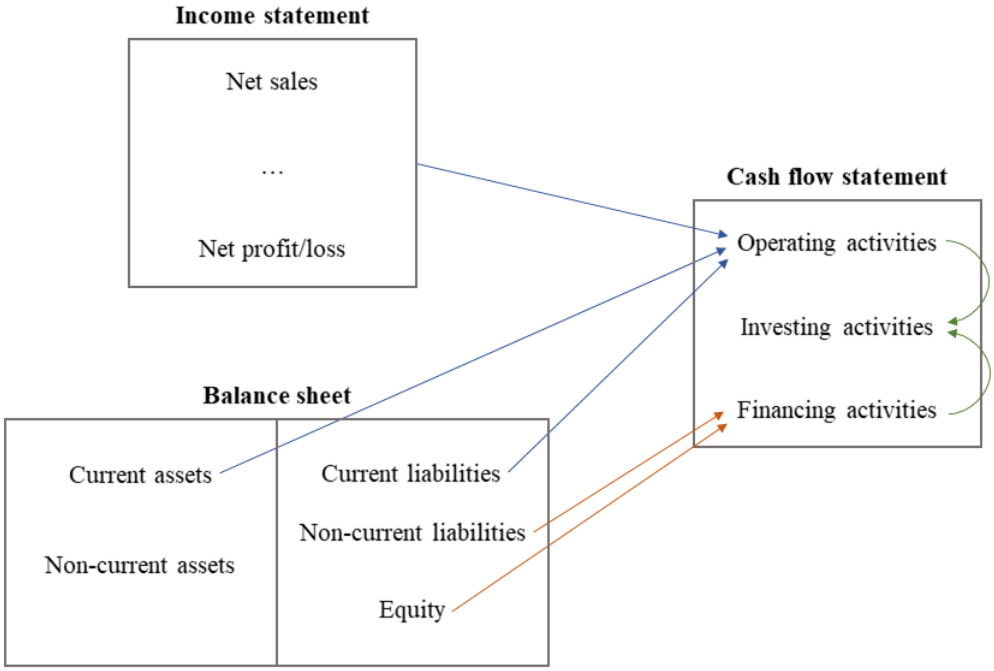


Figure C1. Financial statements. This figure illustrates how I use items from the income statement and balance sheet account categories to construct the cash flow statement activities.

A limitation of the data is that I can only observe net changes in balance sheet items and not all underlying transactions. Ideally, I would break down net changes in balance

sheet items into transactions that involve cash and those that do not. I would then only use transactions that involve cash and assign each to either operating, investing, or financing activities. For example, the net change in the balance sheet item machinery can combine the purchase of a new machine for cash (involves cash) and depreciation (does not involve cash). The purchase decreases *Cash* and increases *Non-cash assets* in Equation 6 by the same amount. Depreciation, on the other hand, decreases both *Non-cash assets* and *Equity* on the right-hand side of Equation 6, leaving cash unchanged. Using the net change in machinery when constructing the cash flow statement would understate the cash outflow from investing activities.

Using net changes in balance sheet items introduces the largest measurement error in the calculation of net cash from investing activities because non-cash transactions account for a relatively large part of non-current assets. Net cash from operating and financing activities should be mostly unaffected. The biggest source of measurement error in net cash from operating activities is most likely the difference between observable tax expenses on the income statement and unobservable actual taxes paid (the effective tax rate). I do not expect this to have a significant effect because my sample consists of young companies for whom tax optimization is probably not that important. Using net changes in balance sheet items for constructing the cash flow statement should not affect the calculation of net cash from financing activities.

I compute net cash from investing activities by taking the net change in cash on the balance sheet and subtracting the sum of net cash from operating and financing activities. This minimizes the measurement error in breaking down the net change in cash into net cash from each of the three activity categories (operating, investing, financing) by trading off granularity in investing activities. I calculate net cash from investing activities as a balancing amount as opposed to the sum of cash from different investing activities.

Companies can choose between the nature of expense and cost of sales accounting types when preparing the income statement. The nature of expense method is easier to follow because it assigns expenses to categories (e.g., raw materials or depreciation), whereas the cost of sales method breaks down expenses according to their function (e.g., cost of goods sold or administrative expenses). The main drawback of the nature of expense method is that the income statement does not show a gross profit. Almost all income statements (96.7%) in my dataset follow the nature of expense method, and companies rarely switch accounting

types (2.7%). Sections C.2.1 and C.2.2 outline income statement items for the nature of expense and cost of sales accounting types, respectively. Similarly, Sections C.4.1 and C.4.2 show how I construct cash flow statements for either accounting type.

Smaller companies have the option to submit abridged annual reports. I find that these companies often leave the most granular balance sheet items blank and only provide the total for that account category. For example, total inventories is much less likely to be missing than its two components work in progress and other inventories. I therefore use the total amounts of account categories instead of the respective component accounts to construct cash flow statements for smaller companies. Abridged financial statements outlines all adjustments that I make when constructing cash flow statements for smaller companies.

C.1 Stylized example

This section uses a stylized example to illustrate how transactions are recorded on the balance sheet and income statement, and that the timing of these can be different from when cash is exchanged.

A company produces a good in period 1, sales the good on account in period 2, and receives payment for the sold good in period 3. In period 1, the asset side of the balance sheet shows a decrease in raw materials and a complementary increase in finished goods reflecting the production costs of the good. This is known as an asset swap because total assets remain unchanged. The income statement does not record anything. In period 2, the asset side of the balance sheet shows a decrease in finished goods by the production costs and an increase in accounts receivable by the sales price. This usually results in an increase of total assets because the sales price of a good is typically higher than its production costs. The income statement reports the sales price of the good as revenue and its production costs as expense. The sales profit appears as net income on the income statement and increases retained earnings (part of equity) on the balance sheet. Both sides of the balance sheet increase by the same amount, the sales profit. In period 3, the balance sheet shows another asset swap with an increase in cash and a decrease in accounts receivable by the sales price. Again, the income statement does not record anything.

This stylized example shows that the company records a profit on the income statement and balance sheet at the time of the sale (period 2), and not when it receives the cash payment

(period 3). I therefore create cash flow statements, which reflect when cash is exchanged, to study how companies manage cash flows.

C.2 Income statement

C.2.1 Nature of expense method

Item	**Variable**
Net sales	*ntoms*
± Inventory change	*lagerf*
± Capitalized work	*aktarb*
+ Other operating income	*rointov1*
− Raw materials and consumables	*ravar*
− Goods for resale	*handvar*
− Other external expenses	*extkosov*
− Salaries and benefits	*perskos*
− Depreciation	*avskriv*
± Financial items affecting comparability	*jfrst1, jfrstfin*
− Other operating expenses	*rorkoov1*
Operating profit/loss	*rorresul*
± Profit/loss from group companies	*resand*
+ Interest income from group companies	*rteinknc*
+ External interest income	*rteinext*
+ Other financial income	*rteinov*
− Interest expenses to group companies	*rtekoknc*
− External interest expenses	*rtekoext*
− Other financial expenses	*rtekoov*
Profit/loss after net financial income	*resefin*
+ Extraordinary income	*extraint*
− Extraordinary expenses	*extrakos*
± Group contributions	*kncbdr*
± Shareholders' contributions	*agtsk*

± Appropriations	*bsldisp*
− Taxes	*skatter*
± Minority shareholdings	*minintrr*
Net profit/loss	*resar*

C.2.2 Cost of sales method

Item	**Variable**
Net sales	*ntoms*
− Cost of goods sold	*kosalvar*
Gross profit/loss	*brutores*
− Selling expenses	*forsko*
− Administrative expenses	*admko*
− R&D expenses	*fouko*
± Financial items affecting comparability	*jfrst2, jfrstfin*
+ Other operating income	*rointov2*
− Other operating expenses	*rorkoov2*
Operating profit/loss	*rorresul*
± Profit/loss from group companies	*resand*
+ Interest income from group companies	*rteinknc*
+ External interest income	*rteinext*
+ Other financial income	*rteinov*
− Interest expenses to group companies	*rtekoknc*
− External interest expenses	*rtekoext*
− Other financial expenses	*rtekoov*
Profit/loss after net financial income	*resefin*
+ Extraordinary income	*extraint*
− Extraordinary expenses	*extrakos*
± Group contributions	*kncbdr*
± Shareholders' contributions	*agtsk*
± Appropriations	*bsldisp*

− Taxes	*skatter*
± Minority shareholdings	*minintrr*
Net profit/loss	*resar*

C.3 Balance sheet

Item	**Variable**
Assets	
Cash	*kabasu*
Short-term investments	*kplacsu*
Accounts receivable	*kundford*
Current receivables from group/associated companies	*kfordknc*
Other current receivables	*kfordov*
Total current receivables	*kfordsu*
Work in progress	*pagarb*
Other inventories	*lagerov*
Total inventories	*lagersu*
Total current assets	*omstgsu*
Participation in group/associated companies	*andknc*
Long-term receivables from group/associated companies	*lfordknc*
Loans to partners and related parties	*landelag*
Other financial assets	*fianltov*
Total financial assets	*fianltsu*
Buildings and land	*byggmark*
Machinery	*mask*
Equipment	*invent*
Machinery and equipment	*maskinv*
Other tangible fixed assets	*matanlov*
Total tangible fixed assets	*matanlsu*
Subscribed capital unpaid	*ejinbet*
Capitalized R&D expenses	*foubautg*

Patents, licenses, concessions etc.	*patlic*
Goodwill	*goodwill*
Other intangible fixed assets	*imanlov*
Total intangible fixed assets	*imanlsu*
Total fixed assets	*anltsu*
Total assets	*tillgsu*
Liabilities and equity	
Current liabilities to credit institutions	*kskkrin*
Accounts payable	*ksklev*
Current liabilities to group/associated companies	*kskknc*
Other current liabilities	*kskov*
Total current liabilities	*ksksu*
Untaxed reserves	*obeskres*
Minority shareholding	*minintr*
Provisions	*avssu*
Bonds	*obllan*
Non-current liabilities to credit institutions	*lskkrin*
Non-current liabilities to group/associated companies	*lskknc*
Other non-current liabilities	*lskov*
Total non-current liabilities	*lsksu*
Nominal share capital	*aktiekap*
Share premium reserve	*overkurs*
Revaluation reserve	*uppskr*
Other restricted equity	*ovrgbkap*
Profit/loss brought forward	*balres*
Group contributions	*kncbdrel*
Shareholders' contributions	*agtskel*
Profit/loss for the year	*resarb*
Total equity	*eksu*
Total liabilities and equity	*eksksu*

C.4 Cash flow statement

C.4.1 Nature of expense method

Item	Variable
OPERATING ACTIVITIES	
Net profit/loss	*resar*
+ Depreciation	*avskriv*
− Group contributions	*kncbdr*
− Shareholders' contributions	*agtsk*
− Appropriations	*bsldisp*
− Δ Accounts receivable	*kundford*
− Δ Current receivables from group/associated companies	*kfordknc*
− Δ Other current receivables	*kfordov*
− Δ Work in progress	*pagarb*
− Δ Other inventories	*lagerov*
+ Δ Current liabilities to credit institutions	*kskkrin*
+ Δ Accounts payable	*ksklev*
+ Δ Current liabilities to group/associated companies	*kskknc*
+ Δ Other current liabilities	*kskov*
+ Δ Deferred taxes	*deferred_taxes*
Net cash provided by/used in operating activities	*kabasu_ope*
FINANCING ACTIVITIES	
Group contributions	*kncbdr*
+ Shareholders' contributions	*agtsk*
+ Appropriations	*bsldisp*
− Dividends	*extraint*
+ Δ Bonds	*obllan*
+ Δ Non-current liabilities to credit institutions	*lskkrin*
+ Δ Non-current liabilities to group/associated companies	*lskknc*
+ Δ Other non-current liabilities	*lskov*
+ Δ Nominal share capital	*aktiecap*

+ Δ Share premium reserve	*overkurs*
+ Δ Revaluation reserve	*uppskr*
+ Δ Other restricted equity	*ovrgbkap*
Net cash provided by/used in financing activities	*kabasu_fin*
INVESTING ACTIVITIES	
Δ Cash	*kabasu_delta*
− Net cash provided by/used in operating activities	*kabasu_ope*
− Net cash provided by/used in financing activities	*kabasu_fin*
Net cash provided by/used in investing activities	*kabasu_inv*

C.4.2 Cost of sales method

Item	**Variable**
OPERATING ACTIVITIES	
Net profit/loss	*resar*
+ Depreciation of cost of goods sold	*avsksalv*
+ Depreciation of selling expenses	*avskfsg*
+ Depreciation of administrative expenses	*avskadm*
+ Depreciation of R&D expenses	*avskfou*
+ Depreciation of other operating expenses	*avskov2*
+ Unspecified depreciations	*avskospc*
− Group contributions	*kncbdr*
− Shareholders' contributions	*agtsk*
− Appropriations	*bsldisp*
− Δ Accounts receivable	*kundford*
− Δ Current receivables from group/associated companies	*kfordknc*
− Δ Other current receivables	*kfordov*
− Δ Work in progress	*pagarb*
− Δ Other inventories	*lagerov*
+ Δ Current liabilities to credit institutions	*kskkrin*
+ Δ Accounts payable	*ksklev*
+ Δ Current liabilities to group/associated companies	*kskknc*

+ Δ Other current liabilities	*kskov*
+ Δ Deferred taxes	*deferred_taxes*
Net cash provided by/used in operating activities	*kabasu_ope*
FINANCING ACTIVITIES	
Group contributions	*kncbdr*
+ Shareholders' contributions	*agtsk*
+ Appropriations	*bsldisp*
− Dividends	*extraint*
+ Δ Bonds	*obllan*
+ Δ Non-current liabilities to credit institutions	*lskkrin*
+ Δ Non-current liabilities to group/associated companies	*lskknc*
+ Δ Other non-current liabilities	*lskov*
+ Δ Nominal share capital	*aktiecap*
+ Δ Share premium reserve	*overkurs*
+ Δ Revaluation reserve	*uppskr*
+ Δ Other restricted equity	*ovrgbkap*
Net cash provided by/used in financing activities	*kabasu_fin*
INVESTING ACTIVITIES	
Δ Cash	*kabasu_delta*
− Net cash provided by/used in operating activities	*kabasu_ope*
− Net cash provided by/used in financing activities	*kabasu_fin*
Net cash provided by/used in investing activities	*kabasu_inv*

Appendix D Abridged financial statements

This section shows how I construct cash flow statements for companies that submit abridged annual reports to the Swedish Companies Registration Office.

D.1 Cash flow statement

D.1.1 Nature of expense method

Item	**Variable**
OPERATING ACTIVITIES	
Net profit/loss	*resar*
+ Depreciation	*avskriv*
− Group contributions	*kncbdr*
− Shareholders' contributions	*agtsk*
− Appropriations	*bsldisp*
− Δ Total current receivables	*kfordsu*
− Δ Total inventories	*lagersu*
+ Δ Total current liabilities	*ksksu*
+ Δ Deferred taxes	*deferred_taxes*
Net cash provided by/used in operating activities	*kabasu_ope*
FINANCING ACTIVITIES	
Group contributions	*kncbdr*
+ Shareholders' contributions	*agtsk*
+ Appropriations	*bsldisp*
− Dividends	*extraint*
+ Δ Bonds	*obllan*
+ Δ Total non-current liabilities	*lsksu*
+ Δ Nominal share capital	*aktiecap*
+ Δ Share premium reserve	*overkurs*
+ Δ Revaluation reserve	*uppskr*
+ Δ Other restricted equity	*ovrgbkap*

Net cash provided by/used in financing activities	*kabasu_fin*
INVESTING ACTIVITIES	
Δ Cash	*kabasu_delta*
− Net cash provided by/used in operating activities	*kabasu_ope*
− Net cash provided by/used in financing activities	*kabasu_fin*
Net cash provided by/used in investing activities	*kabasu_inv*

D.1.2 Cost of sales method

Item	**Variable**
OPERATING ACTIVITIES	
Net profit/loss	*resar*
+ Depreciation of cost of goods sold	*avsksalv*
+ Depreciation of selling expenses	*avskfsg*
+ Depreciation of administrative expenses	*avskadm*
+ Depreciation of R&D expenses	*avskfou*
+ Depreciation of other operating expenses	*avskov2*
+ Unspecified depreciations	*avskospc*
− Group contributions	*kncbdr*
− Shareholders' contributions	*agtsk*
− Appropriations	*bsldisp*
− Δ Total current receivables	*kfordsu*
− Δ Total inventories	*lagersu*
+ Δ Total current liabilities	*ksksu*
+ Δ Deferred taxes	*deferred_taxes*
Net cash provided by/used in operating activities	*kabasu_ope*
FINANCING ACTIVITIES	
Group contributions	*kncbdr*
+ Shareholders' contributions	*agtsk*
+ Appropriations	*bsldisp*
− Dividends	*extraint*

+ Δ Bonds	*obllan*
+ Δ Total non-current liabilities	*lsksu*
+ Δ Nominal share capital	*aktiecap*
+ Δ Share premium reserve	*overkurs*
+ Δ Revaluation reserve	*uppskr*
+ Δ Other restricted equity	*ovrgbkap*
Net cash provided by/used in financing activities	*kabasu_fin*
INVESTING ACTIVITIES	
Δ Cash	*kabasu_delta*
− Net cash provided by/used in operating activities	*kabasu_ope*
− Net cash provided by/used in financing activities	*kabasu_fin*
Net cash provided by/used in investing activities	*kabasu_inv*