The Returns from Early-Stage Investment[*]

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Abstract

This paper provides direct measures of the returns from investing in newly established, innovative companies. By exploiting a large and detailed data set provided to us by the Norwegian Tax Authority, we trace out the entire funding and pricing history of each firm and study performance measures at firm, investment and transaction levels. We demonstrate how firm-level returns are divided between different investor classes and explore the cross-sectional properties of transaction returns across different investor classes and transaction types. The picture that emerges from our analysis helps to illustrate the nature of market frictions often associated with early-stage investment in innovation.

Keywords: returns, investment, entrepreneurship, Venture Capital, early-stage financing.

JEL codes: G11, G23, G24, G32.

1 Introduction

Understanding the risk and return of investing in early-stage innovation is one of the fundamental questions in entrepreneurial finance and the economics of innovation. Two key empirical challenges confound most attempts to study the issue. First, most new firms are privately owned, making their market values difficult to observe. A second problem is sample selection: even when we do observe transactions, the returns we observe are typically generated by the external fundraising activities of the firm. Because poorly performing firms are less likely to raise new funding than successful firms, this potentially introduces a upward bias in the returns of the firms we do see (Cochrane (2005), Korteweg and Sorensen (2010)). It also introduces a stale price problem that varies endogenously with firm quality. These challenges are ultimately a by-product of the acute information asymmetries and search frictions inherent in this market.

In light of these challenges, our paper pursues a simple question: what are the returns to investing in early-stage innovation? To overcome the empirical challenges inherent in this question, we exploit a large, detailed dataset provided to us by the Norwegian Tax Authority, which contains declarations of transaction values and dates, as well as year-end holdings, for all equity investors in all limited liability companies in Norway.[1] We merge these data with complete balance sheet and ownership data, including the identities of CEOs and board members, for all Norwegian firms. From this population of firms, we select newly launched, innovative firms founded between 2004 and 2014.[2] For each firm, we have the complete list of investors, the transaction prices of all sales and purchases of shares, as well as any liquidation

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[1]Limited Liability Companies in Norway are analogous to C-corporations in the U.S. These data are digitally collected for the purpose of calculating wealth and capital gains taxes.

[2]To form a sample of innovative firms based on ex ante characteristics, we include firms that either qualified for financial support by the governmental agency Innovation Norway, and/or were funded through Venture Capital investments.

or other exit events. This allows us to trace out the entire funding and pricing history for these firms and study performance measures at three distinct levels: the *firm* level (i.e., the return to the firm's equity computed over the observed life of the firm); the *investment* level (an individual investor's return to investing in a specific firm's equity, possibly over multiple rounds of investment); and the *transaction* level (the returns to a single round of investment by a single investor). As we show, there is considerable scope for these returns to diverge, based on differences in information, bargaining power, and liquidity considerations between investors and over time.

Beyond merely providing a comprehensive accounting and ownership data for private firms, two additional features of our data are important for our work. First, in addition to fundraising events, we also observe secondary transactions, in which existing investors sell all or part of their equity to another investor (or back to the firm itself). Because these transactions are not driven by the firm's demand for capital, they are free of endogeneity problems that typically surround Venture Capital fundraising events (although they present different endogeneity challenges). Transaction values in secondary trades are not generally known by other investors in the firm, or even in the market. This also means that investors with large portfolios will, in most cases, have a broader market information set than founders and smaller investors. Second, the data allow us to calculate unrealized returns. Prior private equity literature relies on the reported estimates of unrealized net asset values by private equity funds, but evidence in Barber and Yasuda (2017) and Brown, Gredil, and Kaplan (2019) suggests these might be biased. We calculate annual firms' equity market prices based on all observable transactions to estimate unrealized returns. Although these unrealized returns may not be reflective of the actual transaction sale price a particular investor would obtain if a transaction were to occur, they add an important element to the broader picture.

Our paper makes two main contributions. The first is a direct estimate of the returns from early-stage innovation. A popular measure of performance, called the Public Market Equivalent (PME), benchmarks the private return to what would have been earned in a liquid public market index during the same investment-holding period.[3] We find that 50% of firms with a maximal age of twelve years do not create value for shareholders if they are still independently operating, are merged or acquired. Moreover, we observe that the median early-stage investment is a loss relative to what could be earned in a public index either when accounting for both unrealized and realized values or realized value only. However, there is some right-skewness in early-stage investment returns: the mean investor earns almost 50% on their invested capital after market adjustment, while the median investor loses 5%. The variation of realized PME decreases drastically: the standard deviation reduces from 1.46 to 0.67 with a median PME of 0.41 and average PME of 0.67. However, the right-skewness of the returns distribution intensifies when we disaggregate the investment return into separate transactions, leading to substantial average transaction returns, while the median transaction return is 0% p.a.

Our second contribution is to demonstrate how firm-level returns are divided among investors. The returns to early-stage investment in innovation are not distributed equally across investors, even in the same round of investment. On the one hand, firm return's translation rate into investment returns and its explanatory power vary with the financing structure of the underlying firm. On the other hand, once excluding the variation in the selection of underlying assets, we find that different investor classes are able to generate significantly different investment returns. Insiders (founders and directors) and incubators earn most on their investments and Venture Capital investors least. This "residual" variation, which is not related to the underlying asset, accounts for at least 80% of the total variation

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[3]See Robinson and Sensoy (2016) or Kaplan and Schoar (2005) for more details on the calculation of PMEs.

in investment returns.

The return difference between investor classes continues to hold at the transaction level, even after controlling for transaction timing and type. In purchases, founders and directors pay less for their shares than other investor classes, whereas all Venture Capital funds (incl. corporate and government VC funds) and incubators pay an additional premium, independent from whether they purchase shares in financing rounds or from existing investors. Although preferred shares are uncommon in this environment, as in Gornall and Strebulaev (forthcoming) and Agarwal, Barber, Cheng, Hameed, and Yasuda (2019), some shares are simply worth more than other shares and/or investors hold shares at different prices, and the fully diluted, pre-money valuation of the firm does not necessarily capture the value of any individual investor's position.

We find that the positive entrepreneurship premium found at the investment (all founders) and transaction levels (founders in non-Venture Capital-backed firms) is driven by lower purchase prices, additional to founder's choice to participate in certain transaction types, and not by their inherent characteristics that lead to higher realized returns. Directors differ from other investor classes, even after accounting for the lower-paid share purchase price. However, our evidence is indicative that directors' motivation to sell their shares might differ between non-Venture Capital-backed and Venture Capital-backed firms. Lower transaction returns earned by corporate VCs, government VCs and buyout funds are mostly driven by higher purchase prices. At the same time, despite paying higher purchase prices, VC investors and incubators in some Venture Capital-backed firms are able to achieve higher realized returns than all other investor classes.

The paper is part of a broader literature that studies the returns from early-stage investing. Cochrane (2005) and Korteweg and Sorensen (2010) provide statistical methods to overcome the selection bias in venture investments and identified selection-corrected returns

that are considerably lower than the reported returns from standard databases. Kaplan and Schoar (2005), Harris, Jenkinson, and Kaplan (2014), and Robinson and Sensoy (2013) studied limited partners returns who invest in private equity and Venture Capital partnerships and generally find that Venture Capital returns have underperformed comparable public market indexes. Our work also relates to Lerner, Schoar, and Wongsunwai (2007) and Sensoy, Wang, and Weisbach (2014) who show how different classes of investors perform in private equity. It is important to stress, however, that we are concerned with direct investments in early-stage private companies, not capital commitments to partnership investments. In that sense, our work is more closely connected to Ewens and Rhodes-Kropf (2015), and Ewens, Rhodes-Kropf, and Strebulaev (2016), and Ewens, Gorbenko, and Korteweg (2019).

The balance of the paper is structured as follows. Section 2 describes our setting, data and sample selection. Section 3 describes our sample. Section 4 provides the firm-level returns. Section 5 addresses the investment returns and the firm-return split among different investor classes. Section 6 analyzes cross-sectional properties of transaction returns, and Section 7 concludes.

2   Research design

2.1   Setting

Although Norway is a small country in terms of population, in some respects it is an ideal laboratory for understanding returns from investing in early-stage companies. As Figure 1 illustrates, Norway is on a similar footing with many other developed countries in terms of the number of high-growth start-ups as a share of the overall population of new businesses.

Insert Figure 1 here.

The total investment of Venture Capital capital in portfolio companies in Norway relative to GDP was higher than the European average both in 2017 as well as for the period 2013-17, as shown in Figure 2.

Insert Figure 2 here.

Because Norway has been a member of the European Economic Area since 1994, its corporate legislation is harmonized with that of the European Union. All new business ventures which are of interest to our study are limited liability companies, taxed at the corporate level. They are required to file complete annual financial accounts from the time of registration. Appendix A includes an introduction to the legal framework and main tax rules for companies and investors in Norway. The digital process of collecting and storing administrative data ensures its accuracy.[4]

2.2 Data sources

Our main data source is the annual tax declarations of the population of Norwegian public and private limited liability companies and their shareholders.[5] These declarations have been digitally collected in a data warehouse since 2004, and we have obtained all available data up through to the end of the calendar year 2016. We have obtained information about shareholder identities, their shareholdings, and all share purchase and sale transactions. The transaction records include purchase and sale dates, number of shares, transaction type, and prices paid or obtained for these shares. The complete holdings are provided by the end of each calendar year and can be organized either as a firm's ownership structure

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[4]The coverage and reliability of Norwegian register data, in general, received the highest rating in an OECD data quality assessment in Atkinson, Rainwater, and Smeeding (1995).

[5]Approval to use this confidential data source was graciously extended by the Norwegian Tax Administration on September 24, 2018 under strict confidentiality conditions regarding data handling, access, and the non-disclosure of firm or shareholder identities.

or as a shareholder's portfolio. These files also include a unique national firm identification number (*organisasjonsnummer*), which a Norwegian government agency allocates to all firms registered in Norway as well as to foreign institutional shareholders of these firms. The firm identification number is included in all Norwegian register databases and allows for merging of data sets.

We combine the shareholder data with financial accounts data, which contain accounting and corporate information. All Norwegian limited liability firms must file their annual financial accounts with the Register of Company Accounts by the end of July in the year following the accounting year.[6] The fiscal year end for accounting purposes, with very few exceptions, is December 31. The accounting database includes income statements, balance sheets, selected items from the notes with the accounts, and other firm-related information, such as five-digit industry codes and legal forms.[7] The national company registry also provides data on the identities of directors and CEOs. We match this governance information for our sample firms with the shareholder information to be able to define founders and directors shareholders as separate investor classes.[8]

Finally, we have obtained firm-level data from Innovation Norway, the Norwegian government's innovation agency in charge of a majority of the financing support schemes aimed at developing innovative firms, on all grants and loans it provided.

2.3 Sample construction

We have identified all newly established limited liability companies (analogous to C-corps in the U.S.) which have been incorporated since 2004. Most of these companies are small, mom-and-pop operations that are not expected to grow. We are primarily interested in

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[6]More information is provided at www.brreg.no.

[7]The financial accounts' database is further described in Berner, Mjøs, and Olving (2016).

[8]Fuzzy-match based on the names and birth dates with a manual check afterwards.

understanding the returns from investing in early-stage firms with high potential to be innovative, therefore we select all firms which either (1) received an innovation grant or high-risk loan from Innovation Norway (IN firms), or (2) at some point in time have a Venture Capital investor (VC firms), or (3) both (IN&VC firms). By choosing firms that are classified as innovative by the innovation agency, or financed by Venture Capital investors, we are focusing our analysis on firms which are expected to grow and create value for shareholders, and to contribute more broadly to the economy. These signals represent an *ex ante* selection of firms at the time of investment since the actual growth and value-creation are uncertain. Assuming different objective functions between Innovation Norway and Venture Capital investors, received financing from both sources might be a more certain signal of potential innovation capabilities compared to the sub-samples based on only one of the financing sources.

Using the data provided from Innovation Norway, we are able to select all firms that received financing through one of the innovation-related financial supporting programs (see Appendix B). We collect the identities of Norwegian and foreign Venture Capital firms investing in early-stage firms in the Nordic countries from a diverse set of online resources (e.g., Norwegian Venture Capital Association, Thomson VentureXpert, Crunchbase, Orbis, Dealroom). We identify all raised funds by each Venture Capital investor in our administrative ownership data through shareholder name matching. We select firms with at least one identified Venture Capital investor as a shareholder at some point in their life. This list is complemented with VC-backed firms from Thomson VentureXpert, including their Norwegian identification numbers, which enable us to match them to our data. We differentiate Venture Capital investors into VC, corporate VC, government VC, incubators, and buyout funds. Investments by corporate VCs are likely to be additionally motivated by strategic considerations, and not only financial returns. Investments by government VCs might have broader political and economic motives. Additionally, we specify incubators which aim to

specifically support very-early-stage firms, as well as the investments in early-stage firms by funds that are traditionally classified as buyout funds.[9]

In addition to governmental funding from Innovation Norway and equity from Venture Capital investors, our sample firms also receive equity capital injections from founders, directors, other private individuals (business angels, employees, family and friends without a board seat), corporations (also family offices)[10], and financial institutions. These investor classes are central to and specified in our analyses, but their investment decisions are not interpreted as selection signals for defining early-stage innovative companies.

We collect data on the sample firms from their founding year until the end of 2014, and exclude financial services, farms, fisheries, drilling (although not offshore technology or services), and real estate.[11] This approach results in a sample of 1,945 newly established companies between 2004-2014, of which 1,152 firms received financial support from Innovation Norway, 358 firms have (had) a Venture Capital investor at some point in time, and 237 firms received both types of funding.

3 Sample description

3.1 Sample firms

The characteristics of our sample firms are presented in Tables 1-4. Table 1 reports the firm's age at the time of first received financing from Innovation Norway, VCs, corporate VCs, government VCs, incubators or buyout funds. It shows that firms are selected at an earlier

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[9]Several large buyout management firms have started funds focusing on VC investment activities, e.g., EQT Venture Capital fund.

[10]This category can include holding companies held by individuals, which we cannot separate. See Appendix A on legal and tax aspects of holding companies.

[11]Investments into real estate have been given preferential tax treatment in Norway for decades, which has caused a large volume of investment into this sector.

stage by Venture Capital investors (average firm age 1.8 - 2.8 years) compared to Innovation Norway (average firm age 4.0 years). This holds for the entire age distribution. Innovation Norway seems to provide funding only when firms have already survived for a longer period of time, thus, after more of the firm's quality and performance has been revealed. The fact that nearly all Venture Capital financing appears earlier than the Innovation Norway involvement is in line with the findings in Howell (2017) that government agencies are not seen as a certification mechanism to alleviate firm financing constraints. Naturally, incubators are the earliest investors in early-stage innovative firms. 75% of all our Venture Capital-backed firms received their first Venture Capital financing within a maximum of four years since inception.

Insert Table 1 here.

Innovative companies develop new business ideas and, thus, engage in investment activities in the early stage of their life cycle. Tables 2a and 2b present accounting-based performance of sample firms following the DuPont decomposition around the time of first received financing, either from Innovation Norway or Venture Capital investors.[12] A median firm in our sample generates a higher total asset turnover when Innovation Norway provides first financing as opposed to a Venture Capital investor. Profit margin, return on assets and return on equity are negative for our median firm, but also higher (less negative) when Innovation Norway provides first financing. This difference might be caused by the actual performance variation in selected companies, but also that they are more developed at the time of the first financing from the governmental agency, as shown in Table 1. Among Venture Capital investors, buyout funds select firms with a better accounting-based performance,

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[12]We show both one year before and the year of the first received financing because almost the half of Venture Capital-backed companies receive their first financing when they are one year old, as shown in Table 1 and, therefore, are not included in Table 2a. At the same time, the calculated ratios in the year of financing are driven by the capital injection itself. Both panels show a consistent picture.

especially given that they do not invest for the first time at a later date than other Venture Capital categories. Negative margins and returns are indicative of investment activities for the median firm. We interpret labor investment, calculated as labor costs relative to total assets, as an indicator of the R&D-investment level through direct labor costs, and we do not find a big divergence between investor classes.

Insert Table 2a here.

Insert Table 2b here.

Previous literature on Venture Capital-backed firms studies investment outcomes by focusing on publicly announced realized exit events (e.g., Cochrane. 2005) as data on these are mostly available. Calculating returns from these investments may lead to a potential success bias. We define mutually exclusive exit events according to the firm's state as of December 31, 2016 as follows:

- *Independently operating:* These firms are independently reporting legal entities at the end of the sample period, i.e. filed financial accounts for the year 2016.

- *Bankrupt (or disappeared):* These firms are either declared bankrupt or were dissolved without a formal bankruptcy, and, thus, do not provide annual financial accounts to the firm registry anymore.

- *Merged:* These firms have have merged with another firm.

- *Acquired:* These firms have become at least 90% owned by another firm. They continue to file financial accounts, but the acquisition is effectively an exit event for the majority of previous investors.[13]

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[13]See Appendix A regarding majority and minority shareholder rights for ownership exceeding 90%.

- *IPOed:* These firms have gone public on the Oslo Stock Exchange.[14] This includes both their main exchange, Oslo Børs, as well as Oslo Axess, which has less listing requirements and accepts younger firms.

The dates of firm exit events come from either the shareholder data (liquidation transaction dates), firm bankruptcy registry (bankruptcy dates), firm merger database (merger dates), or firms' financial accounts (year of becoming acquired, being listed, last year of providing financial accounts).

Insert Table 3 here.

Table 3 describes the last observed age and exit type distribution of our sample firms by the financing sources: Innovation Norway (IN), Venture Capital only (VC), and both (IN&VC). A study of early-stage firm outcomes limited to mergers, acquisitions and IPOs would exclude most of the cases in our setting. Solely Venture Capital-backed firms (VC and IN&VC) in our sample have undergone an initial public offering (IPO), with the higher share in the IN&VC sub-sample (3.0% vs. 1.4%). VC firms die and are merged more frequently and seem to be younger at the time of exit. The results might indicate that these firms are inherently riskier, which may explain why they had not been given Innovation Norway support. IN&VC sub-sample contains, on average, firms that are older at the time of the exit event.

Table 4 summarizes governmental contribution and equity raised by a firm over the entire sample period (from firm inception to 2016) from different investor classes. We differentiate between founders, directors, other private individuals, corporations, financial institutions, and sub-categories of Venture Capital investors: Venture Capital funds (VC),

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[14]See www.oslobors.no

corporate VC, government VC, incubators and buyout funds. There is large variation in financing activity and raised amounts both between sub-samples and within each sub-sample. IN and VC firms have on average slightly more than three financing rounds, while IN&VC firms raise funds on average over more than seven rounds. All Venture Capital-backed firms raise typically around MNOK 4.5 per round, but the median IN&VC firm raises in total the largest amount of MNOK 18.6. Also, Innovation Norway contributes twice as much to the latter sub-sample, indicating that those are high capital-intensity firms which receive the most financing.

Insert Table 4 here.

Most-frequent investors in our sample are corporations (participation in 59% of financing rounds), while Venture Capital (VC) funds are the most active Venture Capital investors (participation in 11% financing rounds). Directors participate in a quarter of all fundraising rounds, while founders are present in less than one-fifth of all financing rounds. Founders, directors and incubators contribute the smallest amounts as they are the earliest investors in the companies. VCs write smaller tickets than corporate VCs and government VCs, which might indicate that VCs diversify risk to a higher extent than other VC types. The median IN firm receives most capital from corporations and financial institutions, the median VC firm from buyout funds (which inject the largest equity amounts across the entire sample), and the median IN&VC firm from both corporate VC and government VC. These findings indicate that within Venture Capital-backed firms, firms that receive only Venture Capital financing seem to have other investor-class dynamics than firms that receive both Venture Capital and governmental financing. Thus, we run our analyses for three sub-samples (IN, VC, IN&VC) instead of mere differentiation of non-Venture Capital-backed vs. Venture Capital-backed firms.

3.2 Sample equity transactions

Our rich data comprise all equity purchase and sale transactions reported to the tax authorities, including the investor class of the buyer (seller), purchase (sale) date, purchase (sale) amount, number of shares purchased (sold), and the type of transaction. We differentiate between primary and secondary purchase transactions. Primary transactions are purchases of newly issued shares in the firm's financing round, while secondary transactions are purchases of already-issued shares from existing shareholders without firm involvement. The inclusion of secondary transactions partially addresses the stale price problem. Because they are not driven by the firm's demand for capital, these transactions are free of the endogeneity problems that typically surround Venture Capital fundraising events. Transaction values in secondary trades are not generally known to other investors in the firm or even in the market. This also means that investors with large portfolios will, in most cases, have a broader market information set than founders and smaller investors.

We also observe whether purchased shares have subsequently been sold. Thus, we separate realized from unrealized transactions which are still held by investors by the end of 2016. Table 5 shows frequencies of different equity purchase and sale transaction types, separated by different investor classes. Column *Post-exit* indicates whether purchase and sale transactions happen after firms' exits via *acquisition* or *IPO*.[15]

<center>Insert Table 5 here.</center>

The vast majority of founders, directors, and all Venture Capital investors buy shares in the fundraising rounds. If they decide to buy shares in secondary transactions, this happens almost always before the firms exit. Private individuals (other than founders and directors), corporations and financial institutions buy shares mostly from existing share-

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[15]Post-exit purchases happen almost entirely through secondary transactions.

holders; while corporations do so more often before the firms exit, private individuals and, particularly financial institutions, do so after the firms exit, specifically, after IPOs. All sub-categories of Venture Capital funds have the lowest realization rate within our sample period. This finding is intuitive as we start with the 2004 firm inception cohort and have to consider a funds investment horizon. Once they realize their investments, they sell two-thirds before the firms exit. Founders and incubators, the earliest investors in a company, sell their shares before the firms exit as well.

4   Firm returns

We estimate returns at the firm level as *Total Value to Paid In* ($TVPI_i$), which is a nominal cash-in/cash-out measure that disregards risk and time value of money, and *Public Market Equivalent* (PME_i), a popular measure of performance, which benchmarks the private return to what could have been earned from investing in a public market index during the same investment-holding period. We follow Kaplan and Schoar (2005) and Robinson and Sensoy (2016) and calculate:

$$TVPI_i = \frac{\sum_K CFO_i}{\sum_K CFI_i}, \tag{1}$$

$$PME_i = \frac{\sum_K \sum_{t=birth}^{T=2016} \frac{CFO_{i,t}}{(1+r_{m,t})}}{\sum_K \sum_{t=birth}^{T=2016} \frac{CFI_{i,t}}{(1+r_{m,t})}}, \tag{2}$$

where $CFO_{i,(t)}$ denotes the sum of dividends paid out by the firm i to all investors K (at time t) and the equity market value of firm i as of 2016, $CFI_{i,(t)}$ is the equity raised by a firm i over the entire sample period (from firm inception to 2016) from all investors K (at time t), and $r_{m,t}$ in the PME_i calculation is the return from the Oslo Stock Exchange Small Cap Index (OSESX) from the firm incorporation date until the time of the respective

cash flow t.[16] This index provides a natural benchmark for investments in newly established innovative firms in Norway. Firm equity market value is the annual weighted average (by shares) purchase price from all observable equity transactions multiplied by the total number of shares outstanding by end 2016 (0 for bankrupt firms). We winsorize both measures at the 1th and 99th percentiles, as in Cochrane (2005); Ewens, Rhodes-Kropf, and Strebulaev (2016).

Table 6a shows distributions of firm-level returns for the entire sample and by the financing sub-samples: Innovation Norway (IN), Venture Capital (VC), and both (IN&VC). 50% of all firms do not create market-adjusted value for shareholders and lose 10% on the injected equity. However, there is an extreme skewness in the right tail of the return distribution, with an average firm creating a return which is more than nine times greater than the liquid public market index.

Insert Table 6a here.

The largest variation in firm returns is in the sub-sample of non-Venture Capital-backed firms. While the median firm loses a market-adjusted 10% on the raised equity, the average firm in that sub-sample outperforms the market index by almost 10 times. These firms receive grants and debt financing from Innovation Norway so that this capital is not included in the denominator of PME calculation. Mechanically, non-equity financing creates value for equity investors.[17] Across Venture Capital-backed firms, the median VC firm loses market-adjusted 31%, while the median IN&VC firm with both sources of financing, earns

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[16]The Oslo Børs Small Cap Index consists of the 10% lowest market-capitalized shares on the Oslo Stock Exchange. The selection process is based on total market capitalization for each share (firm) while the index calculation is based on free-float market capitalization. The Small Cap Index is re-balanced semi-annually and conducted on the basis of figures after closing on the last trading day of October and April.

[17]In a conversation with a Norwegian Venture Capital management firm, a general partner mentioned that they "...always force and help portfolio companies to apply for Innovation Norway financing, because it is cheap money."

4%, although they receive the largest equity amounts. The latter firms also have the lowest dispersion of firm returns.

Table 3 has shown that this sub-sample has the highest rate of IPO exit events. Cochrane (2005) argues, the distribution of return estimates might be driven by the pattern of exits, therefore, Table 6b presents distributions of firm returns by firm exit types as of 2016: independently operating, bankrupt or disappeared, merged, acquired or IPO'd. We observe that IPO'd firms lose less than other firms already at the 5th percentile and outperform the public market index at the 25th percentile by 20%, whereas an average IPO'd firm in our sample earns three-times of the index. The variation of firm returns is low in comparison to firms with other non-bankruptcy exits (standard deviation of 3.33 vs. over 50), which can be attributed to the equity price correction by the public market. The median independently operating firm earns 9% more compared to the index, while the acquired (merged) median firm loses 17% (6%) on the injected equity after market adjustment.

Insert Table 6b here.

5   Investment returns

We estimate returns at investment level similar to Equations 1 and 2, but calculate $TVPI_{i,k}$ and $PME_{i,k}$ at the investor-firm level as follows:

$$TVPI_{i,k} = \frac{\sum CFI_{i,k}}{\sum CFO_{i,k}}, \tag{3}$$

$$PME_{i,k} = \frac{\sum_{t}^{T} \frac{CFI_{i,k,t}}{(1+r_{m,t})}}{\sum_{t}^{T} \frac{CFO_{i,k,t}}{(1+r_{m,t})}}, \tag{4}$$

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where $CFI_{i,k,(t)}$ denotes the sum of dividends paid out by firm i to the investor k (at date t), sale amount of realized shares in firm i, and the firm equity market price multiplied by the number of unrealized shares as of December 31, 2016, $CFO_{i,k,(t)}$ is the sum of the equity injection to the firm i from investor k (at time t) and the total purchase amount in secondary transactions, and $r_{m,t}$ in the $PME_{i,k}$ is the return from Oslo Stock Exchange Small Cap Index from purchase date of the shares, t, until the time of the (realized and unrealized) cash flow T related to those shares. We also calculate *Realized PME$_{i,k}$*, which excludes the partial firm equity market value for unrealized shares in the numerator. We winsorize all return measures at the 1th and 99th percentiles.

Table 7 shows distributions of all investment returns and separately by investor class. We find that after market adjustment, the median early-stage investment is a loss to the investor relative to what they could earn in a liquid public market index, even when including unrealized values. However, there is some right-skewness in the total sample of early-stage investments: the mean investor earns almost 50% on their investment, while the median investor loses about 5%, after adjusting for market return.

Insert Table 7 here.

10% of investments within all investor classes result in a total loss (with the exception of private individuals other than founders and directors), and 50% of investors within each investor class lose money on their investments, after adjusting for market return. However, the extent of these losses is not equal, and starting with the 25th percentile, we observe differences across the entire distribution. After market adjustment, the median individual investor (including founders and directors) loses between 5% (founders) and 7% (directors) on their investment, whereas the median professional investor (financial institutions and Venture Capital with the exception of incubators) loses between 11% (Incubators) and 69%

(government VC). The latter investor class injects high amounts of equity, as revealed in Table 4, and their investments might have broader political and economic motives. Results in Harris, Jenkinson, and Kaplan (2014) and Ang, Chen, Goetzmann, and Phallipou (2018) at the aggregated Venture Capital level, albeit net of fees and carried interest, are very close to our results: a median VC fund has a PME of 0.8 based on Burgiss data and 0.9 based on Preqin data for calendar years 2004-2008, respectively. Both aforementioned studies find that buyout funds perform better than VC funds, which corresponds to our finding of the median PME of 0.79 and a mean PME of 1.44 for buyout funds. On average, VC and corporate VC generate 97% and 130% above the public market index return, respectively, whereas the average return of the government VC is approximately equal to the index.

On average, insiders - founders and directors - have the highest investment returns. They earn more than four-times on their investments after the market adjustment, followed by incubators, who outperform the index by more than three times. Table 4 shows that these investor classes inject the smallest amounts of capital into firms as they are most often the earliest investors in the companies.

We show PME distributions of realized investments within our sample period both for the entire investment sample and of positive realizations only. More than 60% of directors and Venture Capital investors do not realize any investment in our sample period. However, if investments are realized, the variation in PME reduces drastically in comparison to PME that takes unrealized value in account. Specifically, the standard deviation decreases from 3.12 to 0.95 for all investments. Nonetheless, the median investor of all classes loses money when they realize their investments: founders, directors and all VC investors have a total loss, while private individuals lose 44% on their equity investment, after market adjustment. Braun, Jenkinson, and Stoff (2017) analyze fully realized buyout fund investments in the time period between 1974 and 2012 and report a median PME of 1.3 for investments in

2005-2013, and a median PME of 1.5 on European investments. Buyout funds in our sample have an average realized PME of 1.44, but we have a shorter possible realization period of twelve years, and our sample is limited to early-stage firms.

Average realized *positive* PMEs range between 1.03 (other private individuals) and 1.79 (incubators), meaning that investors earn between 2% and 70% above the market index if they exit their investments. This range is significantly lower than our total PME range. Thus, the discrepancy between total PME and realized PME is due to the high proportion of the unrealized value, measured as a partial firm equity market value that also drives the firm-level return.

Tables 8a, 8b, 8c explore cross-sectional properties of investment returns with regard to the underlying firm-level return and investor classes separately for three financing sub-samples IN, VC and IN&VC. We run seven specifications with gradually increasing firm fixed effects in the following OLS regression model:

$$\ln(1 + PME_{i,k}) = \alpha + \beta_1 Investor_k + \beta_2 ln(1 + PME_i) + \mu_i + \varepsilon_{i,k} \tag{5}$$

with $ln(1 + PME_{i,k})$ and $ln(1 + PME_i)$ being the natural logarithms of PME measures at the investment and firm levels, calculated as in Equations 2 and 4, respectively, $Investor_k$ is the investor class categorical variable, which omits other private individuals rather than founders and directors, corporations and financial institutions, as a reference group, and μ_i are firm birth cohort, firm exit or firm fixed effects. Both PME measures are winsorized at the 1th and 99th percentiles before taking their natural logarithms. Standard errors are clustered at the firm level.

Insert Table 8a here.

Insert Table 8b here.

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Insert Table 8c here.

We find that the firm return itself can explain investment returns - although only partially - solely in the absence of Venture Capital investors. The observed explanatory power of specification (1) is 17% in the IN sub-sample (Table 8a), whereas there is no observed explanatory power of specification (1) for Venture Capital-backed firms (Tables 8b and 8c). On the contrary, the firm selection of a certain birth cohort can explain investment returns to a larger extent in all Venture Capital-backed firms: explanatory power increases by around 8% from specification (3) to specification (4). Once taking into account the variation due to the birth cohort and firm exit, a 1% increase in firm return translates to one third into the investment return in IN firms, one quarter in IN&VC firms and only 4% in VC firms, the latter is not significant. Thus, the return of the underlying asset is, at most, the partial driver of the investment return with the highest transmission in IN firms, lower in IN&VC firms and almost non-existent in VC firms after including control variables for some firm characteristics in our specifications.

We evaluate whether the "residual" investment return (independent from the firm return) varies among different investor classes by including firm fixed effects, which accounts for the entire variation from the selection of underlying assets, in specifications (6) (total PME) and (7) (realized PME). We observe the explanatory power of all underlying firms' characteristics in the change of R-squared between specification (5) without firm fixed effect and (6) with firm fixed effect , which ranges between 13% (IN&VC firms) and 27% (IN firms), meaning that the "residual" component makes about 73%-87% of the total variation in investment returns from early-stage innovation (and up to 94% of total variation in realized investment returns).

In all sub-samples, founders and directors have higher investment returns than our reference group, also when considering only the realized PME. Concurrently, investment

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returns of founders are higher than those of directors. Specifically, founders of IN firms earn 27% (23% if realized)[18] more than the reference group and 5% (9%) more than directors. Similarly, founders of VC firms earn 35% (26%) more than the reference group, and 14% (19%) more than directors. In IN&VC firms, founders and directors earn around 32% more than other investors, but founders still can realize their investments with an 10%-higher return than directors. Insiders in our sample seem to perform better than other investor classes, but there is still a return difference between directors and founders, which varies depending on the financing structure of the firm, and increases when founders realize their investments.

Most Venture Capital investors achieve 10%-20% lower investment returns than the reference investor group when considering the total PME in specification (6). However, the realized PME in specification (7) differs within the same investor classes when we differentiate between VC- and IN&VC firms. While we don't observe any realized PME difference for VC and government VC in comparison to our reference group in the VC firms, those two classes generate the lowest investment returns (5% and 10% lower, respectively) among all investor classes in the IN&VC firms. Incubators is the only Venture Capital sub-category that realizes significantly higher returns in all VC firms, similar to those of insiders (16% and 21% more than the reference group).

Overall, we observe that the underlying firm return is divided unequally between investor classes. On the one hand, its translation rate into investment returns and its explanatory power vary with the financing structure of the underlying firms. On the other hand, once accounting for variation in the selection of underlying assets, we show that different investor classes are able to generate significantly different investment returns. Insiders and incubators earn most on their investments and Venture Capital investors the least.

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[18]$27\% = 100 * (e^{0.24} - 1)$

6 Transaction returns

6.1 Transaction returns variation

Due to staged financing in several fundraising rounds, investors purchase firms shares more than once over the firm's life. Moreover, they can buy and sell shares in secondary transactions before and after the firm's exit. Thus, investor cash flows in $TVPI$ and PME measures may result from several transactions of potentially different transaction types. By analyzing separate transaction returns we attempt to disentangle whether the "residual" variation in investment returns is driven by any specific transaction type. Investor's choice to engage in a particular transaction might also be indicative of their investment motivation.

We now calculate gross annualized buy-and-hold transaction returns as:

$$R_j = (1 + \frac{SalePrice_j - PurchasePrice_j}{PurchasePrice_j})^{\frac{1}{t}} - 1 \tag{6}$$

where j refers to a separate transaction, $PurchasePrice$ is an actual price of purchased shares in the transaction j, and $SalePrice$ the actual received price for $realized$ shares after being bought in that transaction j, or the firm equity market price as of December 31, 2016 (0 for bankrupt firms) for $unrealized$ shares. We require a 60-day holding period of shares and exclude all transactions with a purchase price less than 1 NOK (app. 0.1 USD), as these are most likely either internal transfers, or granted options as part of employee compensation programs.

Table 9 shows distributions of transaction returns - winsorized at the 1th and 99th percentiles - separately for different investor classes. This table illustrates the option-like nature of early-stage innovation, even to a higher extent than at the investment level. Within each investor class, 50% of transactions do not yield a positive return. With the exception

of the median financial institution, which experiences losses of -10% p.a., other median investors have a transaction return of 0%. The dispersion of transaction returns within each class is, however, very high and the extreme right-skewness at the transaction level leads to substantial average transaction returns. Insiders and incubators achieve, on average, the highest returns (181% p.a. (founders) and 110% (directors) p.a., followed by corporations and corporate VC (110% p.a. and 104% p.a., respectively). VC and buyout funds earn 86% p.a. and 45% p.a., respectively, while government VC earns the lowest return of 34% p.a. on average.

Insert Table 9 here.

We analyze cross-sectional properties of separate transaction returns with regard to investor classes and transaction types, separately for financing sub-samples in Tables 10a, 10b, 10c. We run six specifications with gradually increasing time and firm fixed effects in the following OLS model:

$$\ln(1 + R_j) = \alpha + \beta_1 Investor_k + \beta_2 D.Secondary_j + \beta_3 D.Realized_j$$
$$+ \xi_{t,T} + \mu_i + \varepsilon_j$$
(7)

with $ln(1 + R_j)$ being the natural logarithm of the gross annualized buy-and-hold transaction j return, as calculated in Equation 6, $Investor_k$ the investor class categorical variable, which omits other private individuals, corporations and financial institutions, as a reference group, $D.Secondary_j$ a dummy variable which equals to one if transaction shares have been purchased from existing investors (as opposite to being newly issued in a fundraising round), $D.Realized_j$ a dummy variable which equals to one if shares have been sold by the end of 2016, $\xi_{t,T}$ purchase and sale calendar years with t being the purchase calendar year and T the

calendar year of the actual sale transaction or December 31, 2016 for *unrealized* shares[19], and μ_i firm fixed effects.[20] R_j is winsorized at the 1th and 99th percentiles before taking the natural logarithm. Standard errors are clustered at the firm level.

Insert Table 10a here.

Insert Table 10b here.

Insert Table 10c here.

We find that timing of transactions can barely explain transaction returns in IN firms: R-squared increases by 3.6% from specification (1) to specification (2). In all Venture Capital-backed firms, timing matters to a greater extent as the explanatory power increases by 16%-17%. Once we introduce firm fixed effects the explanatory power of our model increases to 29%-32% independent of financing structure. This is also in line with our findings at the investment level, that IN firm return transmits more in the investment returns than in all Venture Capital-backed firms. However, even if we control for all underlying firm characteristics and transaction timing, we still observe a variation in transaction returns among different investor classes (specification (3)). Founders and directors earn 6%-22% more than our reference investor group. This effect disappears at the transaction level in IN&VC firms.

A transaction return might be driven by the transaction type itself, and investor's choice to engage in a particular transaction type might be a reflection of their purchase/sale motivation. Specifications (4) and (5) look at the associations between transaction return and

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[19]Robinson and Sensoy (2016) show cyclicality of performance measures to public markets reflecting co-movement between public and private returns. Driessen, Lin, and Phalippou (2012), and Korteweg and Nagel (2016) find evidence of time-series variation in returns.

[20]The combination of firm and calendar year fixed effects takes care of the firm age at the time of purchase and sale.

its type. Our evidence indicates that buying shares from existing shareholders (participation in secondary purchases) has a different motivation in IN firms in comparison to all Venture Capital-backed firms. While the first group has a 9%-higher transaction return from secondary purchases in comparison to participation in financing rounds, secondary transaction returns are (significantly) lower for VC and IN&VC firms, at -38% and -6%, respectively. The observed difference between non-Venture Capital-backed and Venture Capital-backed firms might be due to the fact that Venture Capital investors have larger portfolios and a broader market information set than founders and smaller investors, which they bring into their invested firms.

All investors achieve higher transaction returns if they sell their shares, independent from the financing structure (55% more than unrealized return in IN, 5% more in VC, and 26% more in IN&VC firms). At the same time Table 7 revealed that at the investment level the average realized PME is lower than the average PME that accounts for unrealized value. This finding is indicative of the fair proportion of unrealized shares in an investment. However, if investors sell their shares, they do so at a higher price than the average firm equity market price.

Even when controlling for the transaction type (specification (6)), founders and directors have higher transaction returns than other investor classes in IN firms. The presence of Venture Capital investors, however, reduces this effect: while founders and directors still outperform other investors in VC firms, no insiders in IN&VC firms have statistically different transaction returns from our reference group. The participation choice of a particular transaction type seems to be the variation engine of insiders' returns in VC firms, while insiders in IN firms generate higher returns simply because they are insiders. Corporate VC and incubators have lower transaction returns than the reference investor group in VC firms, whereas all Venture Capital investors, except for incubators, have lower returns than the

reference group in IN&VC firms.

All in all, we observe that transaction timing can only partially explain the variation in transaction returns in Venture Capital-backed firms. Some investors achieve higher (lower) transaction returns under certain circumstances independent of the selection of the underlying asset, timing or transaction type.

6.2 Purchase price deviation from the market price

Given that underlying asset, transaction timing and transaction type can only partially explain return variation among different investor classes, we analyze whether investors differ when they purchase shares. In a private market the purchase price is anchored in contractual agreements, which are subject to negotiations between investors and the firm, as well as between old and new shareholders. Even when investing in the same firm at the same time and within the same share class, investors might have different contractual agreements, which we cannot observe, but which will translate into a difference in purchase price.

For each transaction j we calculate purchase price deviation from the firm's equity market price in the same calendar year:

$$Deviation_j = \frac{(PurchasePrice_j - MarketPrice_{i,t})}{PurchasePrice_j} \tag{8}$$

with $PurchasePrice_j$ being the actual purchase price in the transaction j and $Marketprice_i, t$ being the annual weighted average (by shares) purchase price from all observable equity transactions of the firm i in the calendar year t. We use the purchase price as the denominator to avoid exclusion of observations when the equity market price is equal to zero. A price premium is paid if the purchase price is higher than the market price ($Deviation > 0$). A discounted price is paid if the purchase price is lower than the market price ($Deviation < 0$).

If the purchase price equals to the annual average market price, $Deviation = 0$.

Figure 3 shows the distribution of deviations in our sample. Apart from the right spike, which represents all transactions in bankrupt firms in the year of their bankruptcy, purchase price deviations follow the normal distribution with a few (winsorized) outliers in the left tail. We observe that investors buy shares equally at a premium price and at a discounted price.

Insert Figure 3 here.

Table 11 shows frequencies of transaction purchase price deviations from the market price separately for different investor classes. Founders and incubators buy their shares at the market price in around 40% of transactions. This may also result from being the only (early) investors in a particular year. Directors' transactions are equally distributed, whereas every other investor class purchases shares more often at a price premium.

Insert Table 11 here.

Tables 12a and 12b show distributions of purchase price deviations from the market price for *primary* and *secondary* purchase transactions separately for our investor classes. In primary purchases, all investor classes, except for other private individuals rather than founders and directors and financial institutions, pay a discounted price in comparison to the market price. However, we observe a substantial left-skewness for founders, directors, financial institutions and corporate VC, because a median investor (with the exception of financial institution) pays the market price. A discount can be granted for participation in the follow-up rounds and/or provision of convertible loans. Moreover, a discount can be seen as a reward for some effort (e.g. directors or VC as board members) or as wage compensation (founders), Moskowitz and Vissing-Jørgensen (2002) and Hall and Woodward

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(2010). Hsu (2004) shows that better VCs get better deal terms, e.g., lower purchase price when negotiating with startups. On the other hand, Venture Capital investors may want to have a higher valuation of their firms, and, thus, are willing to pay a higher purchase price. Also, contractual provisions to reduce investment risk, such as liquidation preference, lead to a price premium, Gornall and Strebulaev (forthcoming). In Norway, firms are allowed to issue new shares at different prices as long as it has been approved by existing shareholders in a general meeting. In our sample, almost all Venture Capital investors pay the market price between the 25th and 50th percentile with a 10th percentile being a significantly smaller discount than in all other investor classes. This might be due to their having better access to information about the market price or they are simply being price setters.

Insert Table 12a here.

The features of secondary transactions allow us to evaluate the prices at which original investors can get out of the investment as opposite to prices paid in the financing rounds at which new investors come in. In secondary trades, the purchase price may only deviate from the market price due to negotiation power between the selling and buying parties. Table 12b shows that financial institutions, together with corporations and other private individuals pay, on average, a price premium in secondary purchases as well. Contrary to that, insiders and Venture Capital investors pay less than the market price. Also, here we observe a high left-skewness, which means that existing investors get out of their investment on average at a lower price than the current market price. We interpret this finding that the sale must have been driven either by the liquidity constraint of the existing investor or their information disadvantage about the actual market price.

Insert Table 12b here.

We analyze whether observed purchase price deviations are systematic, and some investor classes pay lower/higher purchase prices, by running six specifications of the following OLS model:

$$Deviation_j = \alpha + \beta_1 Investor_k + \beta_2 D.Secondary_j + \beta_3 Stake_j + \xi_t + \mu_i + \varepsilon_{i,j,t} \qquad (9)$$

with $Deviation_j$ being the purchase price deviation from the annual equity market price of firm i at time t in the transaction j, $Investor_k$ the investor class categorical variable, which omits other private individuals, corporations and financial institutions, as a reference group, $Secondary_j$ a dummy variable indicating whether it is a secondary purchase, $Stake_j$ the purchased ownership stake in transaction j, ξ_t purchase calendar year fixed effects, and μ_i firm fixed effects. $Deviation_j$ is winsorized at the 1th and 99th percentiles. Standard errors are clustered at the firm level. We use $Deviation_j$ instead of purchase price itself as dependent variable, because certain investor classes (e.g. incubators) invest only at certain (e.g. very early) stages, and the difference in purchase price would reflect the difference between firm stages. By using $Deviation_j$, we benchmark purchase prices in each calendar year, but can still interpret a higher (lower) deviation as a higher (lower) purchase price because $Deviation_j$ is a continuous variable with both meaningful sign and magnitude. We include the transaction ownership stake, as Ewens, Gorbenko, and Korteweg (2019) find a U-shaped relationship between VC equity share and firm value and, thus, its purchase price.

Tables 13a, 13b, 13c present cross-sectional OLS estimates of the relations between purchase price deviation and investor classes, separately for each financing sub-sample. We control for the timing of the share purchases by including purchase calendar year fixed effects in specification (2)-(6). We observe that timing explains a portion of purchase price variation in Venture Capital-backed firms (R-squared increases by around 14%), however, not in IN firms. Underlying firm characteristics (specification (3)) have a higher explanatory power of

purchase price variation: it is 16% in IN- and IN&VC firms, and 58% in VC firms. Even if firm fixed effects do not have explanatory power of variation in transaction returns in Venture Capital-backed firms, as we have shown before, they do so when explaining share purchase prices.

Insert Table 13a here.

Insert Table 13b here.

Insert Table 13c here.

Purchase prices are lower (19 percentage points) in secondary transactions in IN firms, but slightly higher (5 percentage points) in the VC sub-sample. This confirms that investors might have different motivations to sell shares in different types of firms. Moreover, our results reveal that investors pay lower purchase prices with a higher purchased ownership stake in a transaction. Even if we control for the timing, underlying firm characteristics, transaction type and ownership stake, we observe that different investor classes pay different purchase prices. Although preferred shares are uncommon in this environment, as in Gornall and Strebulaev (forthcoming) and Agarwal, Barber, Cheng, Hameed, and Yasuda (2019), some shares are simply worth more than other shares and/or investors hold shares at different prices, and the fully diluted, pre-money valuation of the firm does not necessarily capture the value of any individual investor's position. Particularly, insiders pay a lower share price, while all Venture Capital investors in all Venture Capital-backed firms pay a higher price. A lower (higher) purchase price mechanically translates into higher (lower) transaction returns for the first (latter) investor class. Thus, the labor component of entrepreneurial activity (Moskowitz and Vissing-Jørgensen. 2002; Hall and Woodward. 2010) and of the monitoring effort of directors are expressed through lower purchase prices.

6.3 Realized returns

Lastly, we evaluate whether the variation in transaction returns is driven by the purchase price variation, or whether some investors realize their shares differently from others. For that purpose, we hold the transaction purchase price constant in realized transactions by replacing it with the firm equity market price in that particular year and calculate the gross annualized buy-and-hold transaction returns similar to equation 6:

$$R_{r,j} = (1 + \frac{SalePrice_j - MarketPrice_{i,t}}{MarketPrice_{i,t}})^{\frac{1}{t}} - 1 \tag{10}$$

where $SalePrice$ is the actual sale price in the transaction j and $MarketPrice$ is defined as the annual shares-weighted average purchase price based on all observable transactions in year t.

We explore cross-sectional properties of realized transaction returns with eliminated variation in purchase prices by running five specifications with gradually increasing time and firm fixed effects of the following OLS model:

$$\ln(1 + R_{r,j}) = \alpha + \beta_1 Investor_k + \beta_2 D.Secondary_j + \xi_{t,T} + \mu_i + \varepsilon_j \tag{11}$$

with $ln(1 + R_{r,j})$ being the natural logarithm of the realized gross annualized buy-and-hold return in the transaction j, $Investor_k$ the investor class categorical variable, which omits other private individuals, corporations and financial institutions, as a reference group, $Secondary_j$ a dummy variable indicating whether it is a secondary purchase, $\xi_{t,T}$ purchase and sale calendar years with t being the purchase calendar year and T the sale calendar year, and μ_i firm fixed effects. $R_{r,j}$ is winsorized at the 1th and 99th percentiles before taking its natural logarithm. Standard errors are clustered at the firm level. We control for the purchase calendar year in specifications (2)-(5) to eliminate the entire purchase-side variation

in the realized return.

Tables 14a, 14b, 14c present cross-sectional OLS estimates of the relations between realized transaction returns and investor classes separately for financing sub-samples. With regard to the number of observations, these panels reveal that the highest realization rate is inherent to IN&VC firms: while there are, on average, 233 realized transactions per firm in those firms, there are 185 realized transactions per firm in VC firms, and solely 4 per firm in non-Venture Capital-backed firms. Thus, there are few investment liquidity events in the last group, which consists, even after exit events, of privately-held firms only. As in previous models, neither the purchase nor the sale timing have a high explanatory power of realized transaction returns in IN firms, whereas the variation in underlying firms explains around 35% of return variation. Timing matters in Venture Capital-backed firms, but with the purchase timing having a higher explanatory power (R-squared of 10% in VC firms and 18% in IN&VC firms), rather than sale timing with R-squared of 4% in VC firms and 1% in IN&VC firms. In Venture Capital-backed firms, their own variation explains a realized return variation to 20% and 6%, respectively.

Insert Table 14a here.

Insert Table 14b here.

Insert Table 14c here.

After eliminating the purchase price variation, we observe that secondary purchases yield higher realized returns both for IN firms and VC firms, albeit to a greater extent for the first sub-sample at around 34%, while only 4% for the latter sub-sample. However, realized transaction returns do not differ with the purchase type in IN&VC firms. Moreover, these panels reveal that founders do not sell their shares with a different return compared to

other investor classes, except marginally for VC firms. Thus, the positive entrepreneurship premium found in our previous analyses at the investment (all founders) and transaction levels (founders in IN firms) is driven by lower purchase prices, additional to founder's choice to participate in certain transaction types, and not by inherent characteristics that lead to higher realized returns. This finding seems to be inconsistent with the theoretical finding in Kirilenko (2001), who shows that the entrepreneur is compensated for risk-bearing and a greater loss of control through the ability to extract higher rents from asymmetric information.

However, directors still differ from other investor classes, even after accounting for the lower-paid share purchase price. Particularly, they earn arond 9% more than other investor classes in VC firms, simply because they are board members. However, directors' motivation to sell their shares might differ between two sub-samples.

Lower transaction returns earned by all Venture Capital investors, as seen in Tables 10b and 10c, are mostly driven by higher assumed purchase prices, because we do not observe any difference in realized returns for corporate VC, government VC, and buyout funds. On the contrary, despite paying higher purchase prices, VC investors in VC firms are able to achieve a 36% higher realized return than all other investor classes. As 4 showed, VCs write smaller tickets than other VC types, which we interpreted as indicative that VCs diversify risk to a higher extent than other VC types. Incubators in IN&VC firms is the only investor class which realizes their investments with a higher return of almost 60% compared to investors among other investor classes.

7 Conclusion

This paper uses comprehensive administrative records to build a complete data set of investments in newly established potentially innovative high-growth firms founded between 2004 and 2016 in Norway. Although the absolute size of the Venture Capital market is smaller in Norway than in the U.S. (Bernstein, Lerner, Sorensen, and Strömberg (2017)), the impact there of private equity on industry performance and the economy is similar to that of the U.S. and the U.K. Moreover, Norway's importance in the oil, shipping, technology and service sectors makes it a relevant environment for understanding returns from early-stage investment in innovation.

These data allow us to answer a very basic question in entrepreneurial finance: what are the returns from investing in newly established, innovative firms? Previous attempts to answer this question have relied on statistical methods to overcome the sample selection bias that confounds inference in this setting. In contrast, we are able to examine the returns directly at the firm, investment and transaction levels. We find that 50% of firms with a maximal age of twelve years do not create value for shareholders if they are still independently operating, are merged or acquired. Moreover, we observe that the median early-stage investment is a loss relative to what could be earned in a public index, either when accounting for both unrealized and realized values or realized value only. However, there is some right-skewness in the early-stage investment returns, which decreases drastically in realized investments, and intensifies when we disaggregate the investment return into separate transactions.

We document that investment returns from privately held early-stage innovative firms are not created equally. On the one hand, firm return's translation rate into investment returns and its explanatory power vary with the financing structure of the underlying firms. On the other hand, once excluding the variation in the selection of underlying assets, we

find that different investor classes are able to generate significantly different investment returns. The returns difference between investor classes preserves at the transaction level, after additionally controlling for the transaction timing and transaction types. The positive entrepreneurship premium found at the investment (all founders) and transaction levels (founders in non-Venture Capital-backed firms) is driven by lower purchase prices, additional to founder's choice to participate in certain transaction types, and not by their inherent characteristics that lead to higher realized returns. Directors differ from other investor classes, even after accounting for the lower-paid share purchase price. However, our evidence is indicative that directors' motivation to sell their shares might differ between non-Venture Capital-backed and Venture Capital-backed firms. Lower transaction returns earned by corporate VCs, government VCs and buyout funds are mostly driven by higher purchase prices. At the same time, despite paying higher purchase prices, VC investors and incubators in some Venture Capital-backed firms are able to achieve higher realized returns than all other investor classes.

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Figure 1: **Growth companies as a share of all young companies.**
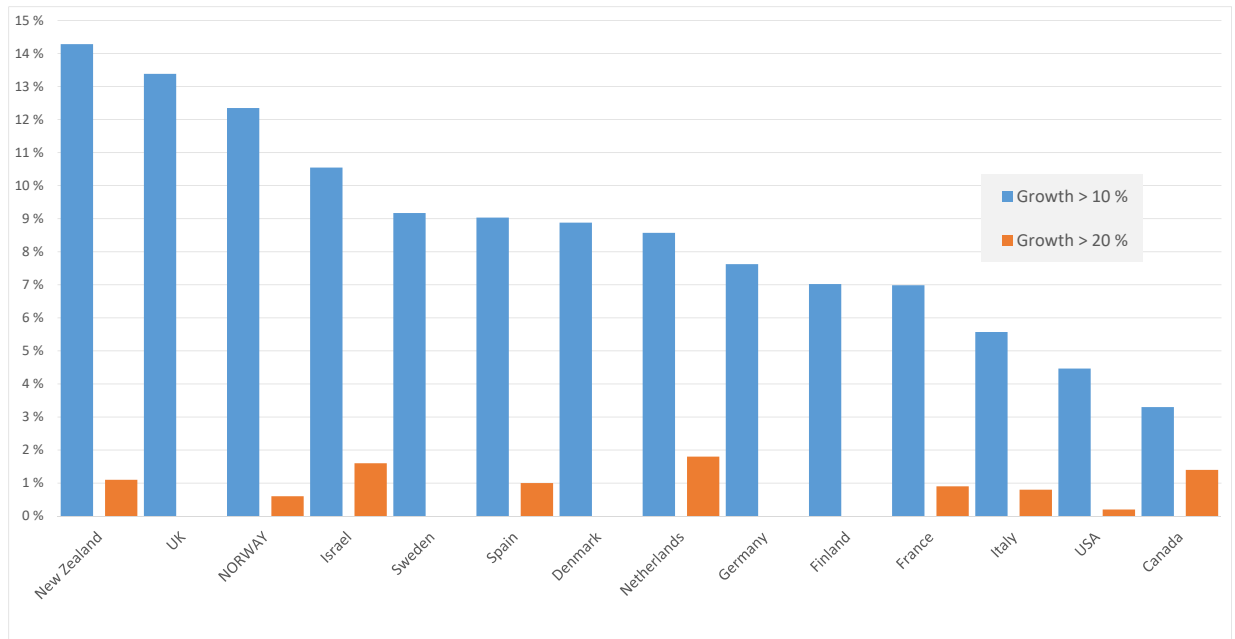
Share of young firms with more than 10 employees that have 3-year average historic growth in employment above 10% or 20%, respectively, measured in 2014. Source: Entrepreneurship at a Glance 2017, OECD.

Figure 2: **All Private Equity Investments in 2017 in% of GDP.**
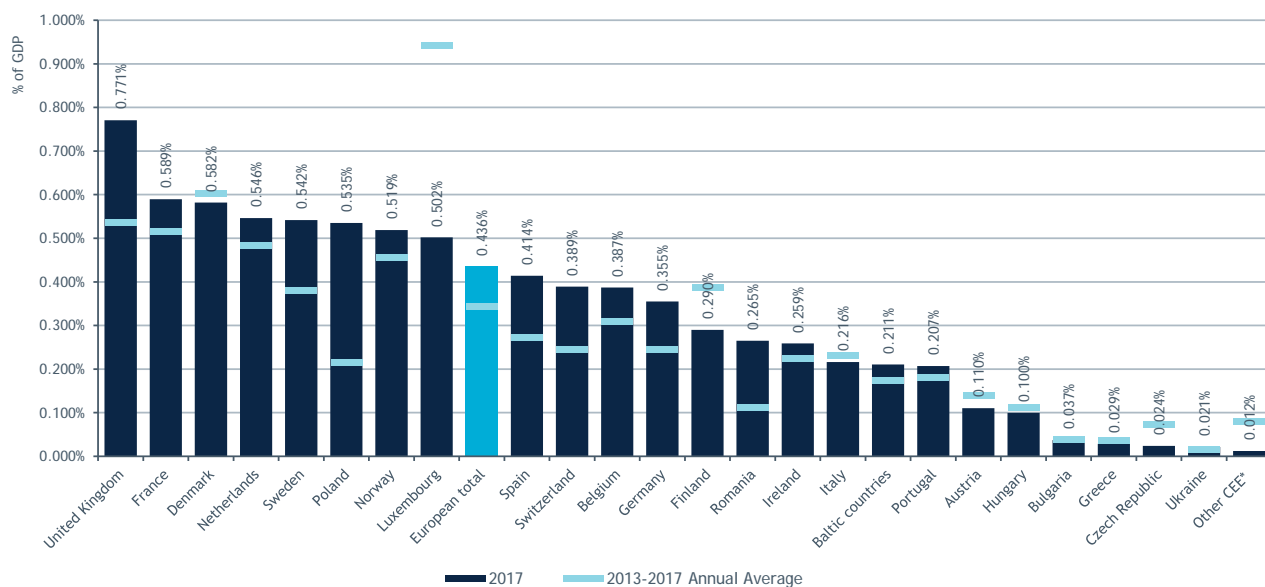
All private equity investments in 2017 and annual average 2013–2017 by country, defined by location of the portfolio firm irrespective of investor location. Source: IMF, World Economic Outlook Database (GDP) / Invest Europe / EDC.

Figure 3: **Purchase price deviation**
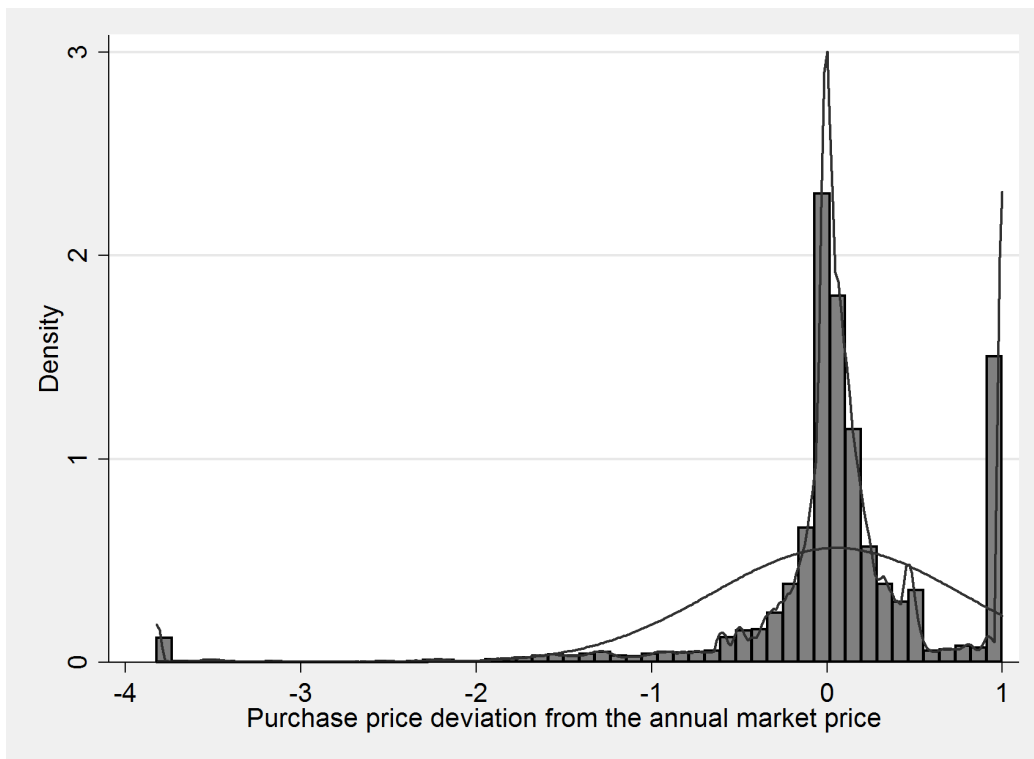
Distribution of the share purchase price deviations at a transaction level from the annual market price, calculated as a weighted average purchase price by the number of shares based on all primary and secondary transactions. The right spike at 1 are transactions in the firms in a year, when the firm went bankrupt.

Table 1: Sample firms' age at the time of first financing

The data comprise the population of Norwegian companies founded during the years 2004-2014, which are classified as innovative either by Innovation Norway, the governmental agency, or have/had at least one Venture Capital investor investing through a fundraising event or a secondary transaction before the firm exit event, or both. We track firms from their birth to 2014 and exclude firms in financial services, agriculture, offshore, electricity and real estate/construction, due to the potential effects of governmental policies. Table 1 presents the firm's age at the time of first received financing from: Innovation Norway, Venture Capital (VC), corporate VC, government VC, and incubators.

First financing from:	N	Mean	Std	Percentiles 25th	50th	75th
Innovation Norway	1,389	4.0	2.6	2	3	5
Venture Capital (VC)	276	2.8	2.2	1	2	4
Corporate VC	84	2.7	2.4	1	2	3.5
Government VC	46	2.6	1.9	1	2	3
Incubators	150	1.8	1.8	1	1	2

Table 2: Sample firms' accounting performance

Table 2 present accounting-based performance of sample firms following the DuPont decomposition around the time of the first received financing either from Innovation Norway or Venture Capital investors. We differentiate between Venture Capital categories: Venture Capital (VC), Corporate VC (CVC), Government VC (GVC), incubators and buyout funds. Total Asset Turnover is defined as *sales/total assets*, profit margin as *net income/sales*, return on assets as *net income adjusted for financial income/total assets*, return on equity as *net income/total equity* and labor investment as *labor cost/total assets*. Panel A shows median performance one year before the first financing. Panel B shows median performance in the year of first financing.

a: One year before the first financing

	Received first financing from:				
	Innovation Norway	VC	CVC	GVC	Incubator
Median Total Asset Turnover	45%	11%	2%	24%	10%
Median Profit Margin	-6%	-100%	-92%	-51%	-78%
Median Return on Assets	-6%	-100%	-92%	-51%	-78%
Median Return on Equity	-42%	-144%	-77%	-132%	-93%
Median Labor Investment	26%	19%	20%	23%	14%

b: Year of the first financing

	Received first financing from:				
	Innovation Norway	VC	CVC	GVC	Incubator
Median Total Asset Turnover	35%	9%	8%	19%	2%
Median Profit Margin	-19%	-87%	-96%	-101%	-46%
Median Return on Assets	-10%	-20%	-11%	-16%	-18%
Median Return on Equity	-83%	-215%	-169%	-203%	-93%
Median Labor Investment	25%	15%	15%	21%	13%

Table 3: Sample firms' outcome as of 2016

Table 3 describes the last observed age and exit type distribution of sample firms by the financing sources: Innovation Norway, only Venture Capital or both. The dates of our exit events come from either the shareholder data (liquidation transaction dates), firm bankruptcy registry (bankruptcy dates), firm merger database (merger dates), or firm financial accounts (year of becoming acquired, being listed, last year of providing financial accounts). Exit categories are mutually exclusive.

	Received funding from:		
	Only Innovation Norway	Only Venture Capital	Both
Number of firms	1,152	358	237
Last observed age (Avg. yrs.)	7.1	6.4	8.1
Independently operating in 2016	60.5 %	50.6 %	62.9 %
Bankrupt or disappeared by 2016	17.7 %	26.3 %	15.6 %
Merged by 2016	5.7 %	7.5 %	5.1 %
Acquired by 2016	16.1 %	14.2 %	13.5 %
IPO'd by 2016	0.0 %	1.4 %	3.0 %

Table 4: Sample firms' equity (and governmental contribution) raised

Table 4 summarizes governmental contribution and equity raised by a firm over the entire sample period (from firm birth to 2016) from different investor types: *founders*, *directors*, *private individuals*, *corporations*, *financial institutions*, *VC*, *CVC*, *GVC*, *incubators* and *buyout funds*. The final row reports the (non-dilutive) contribution from Innovation Norway. Equity amounts are expressed in millions of Norwegian Kroner.

| | Received funding from: | | | | | |
| | Only Innovation Norway | | Only Venture Capital | | Both | |
	Mean	Median	Mean	Median	Mean	Median
Number of financing rounds	3.2	2.0	3.9	3.0	7.6	7.0
Equity raised	83.62	0.91	66.90	4.54	49.28	18.64
Conditional on injection from (% of total financing rounds)						
Founders (*14.7%*)	0.26	0.10	0.31	0.07	0.37	0.11
Directors (*25.7%*)	0.41	0.11	1.28	0.15	0.93	0.38
Venture Capital (VC) (*11.0%*)	-	-	11.19	1.57	13.59	5.02
Corporate VC (*3.2%*)	-	-	30.29	3.02	27.10	15.10
Government VC (*3.0%*)	-	-	23.28	8.80	24.53	12.32
Incubators (*3.9%*)	-	-	0.67	0.15	1.65	0.51
Buyout funds (*0.9%*)	-	-	85.41	39.28	14.67	3.51
Financial Institutions (*1.0%*)	22.21	0.99	33.96	2.61	47.79	4.85
Corporations (*59.1%*)	104.40	1.43	73.52	3.42	24.31	8.25
Private Individuals (*25.3%*)	1.15	0.28	6.15	0.61	2.79	0.99
Innovation Norway contribution	2.64	1.25	-	-	4.68	2.90

Table 5: Equity transactions summary

Table 5 shows frequencies of different equity purchase and sale transaction types, separated by different investor types: *founders*, *directors*, *private individuals*, *corporations*, *financial institutions*, *VC*, *CVC*, *GVC*, *incubators* and *buyout funds*. We differentiate between equity transaction types *primary* vs. *secondary* share purchases and *realized* vs. *unrealized* share sales as of 2016. *Primary* transactions are share purchases in the equity fundraising events, while *secondary* transactions are purchases of already issued shares from existing investors without firm involvement. *Realized* shares are shares sold to other market participants as of 2016, while *unrealized* shares are still held by investors. We define a variable *Post-exit*, which indicates whether purchase and sale transactions happen after firm exits *merger*, *acquisition* and *IPO*.

	Purchase transactions			Sale transactions		
	Primary	Secondary	Post-exit	Unrealized	Realized	Post-exit
All investors	20.3 %	79.7 %	58.5 %	50.3 %	49.7 %	91.1 %
Founders	83.8 %	16.2 %	1.4 %	56.1 %	43.9 %	10.6 %
Directors	72.5 %	27.5 %	4.4 %	61.8 %	38.2 %	19.4 %
Venture Capital (VC)	76.6 %	23.4 %	5.1 %	72.2 %	27.8 %	31.6 %
Corporate VC	86.3 %	13.7 %	2.1 %	68.2 %	31.8 %	29.5 %
Government VC	90.0 %	10.0 %	0.7 %	84.0 %	16.0 %	44.4 %
Incubators	91.6 %	8.4 %	0.0 %	57.8 %	42.2 %	9.1 %
Buyout funds	40.7 %	59.3 %	18.7 %	48.9 %	51.1 %	59.7 %
Financial institutions	6.5 %	93.5 %	84.6 %	43.0 %	57.0 %	97.0 %
Corporations	26.2 %	73.8 %	44.7 %	44.6 %	55.4 %	84.9 %
Private individuals	17.6 %	82.4 %	66.7 %	48.6 %	51.4 %	95.5 %

Table 6: Firm returns

Table 6 shows distributions of returns at the firm level measured as Total Value to Paid In $TVPI_i$, which is a nominal cash-in/cash-out measure that disregards risk and time-value of money, and Public Market Equivalent PME_i. Cash inflow is equity raised by a firm i over the entire sample period (from firm birth to 2016) from all investors. Cash outflows are the sum of dividends paid out to all investors by firm i and the equity market value of firm i as of 2016. Firm equity market value is the annual weighted average (by shares) equity purchase price from all observable equity transactions multiplied by the total number of shares outstanding (0 for *dead* firms). In the PME estimation we discount all cash flows with the market return from the Oslo Stock Exchange Small Cap index (OSESX) from the firm incorporation date until the time of the cash flow t. Panel A shows distributions of $TVPI_i$ and PME_i, separated by financing sources: Innovation Norway, Venture Capital, and both. Panel B shows distributions of $TVPI_i$ and PME_i, separated by firm exit as of 2016: independently operating, bankrupt or disappeared, merged, acquired and IPO'd. $TVPI_i$ and PME_i are winsorized at the 1th and 99th percentiles.

a: Distribution of firm returns by firm financing source

| | | Mean | | | Percentiles | | | | | | |
	N	wins'd	unwins'd	Std	5th	10th	25th	50th	75th	90th	95th
All firms											
TVPI	1,731	9.96	84.76	53.97	0.00	0.00	0.10	1.00	2.59	8.33	21.48
PME	1,731	7.89	80.71	40.22	0.00	0.00	0.08	0.88	2.27	7.33	19.06
Only Innovation Norway											
TVPI	1,138	12.64	105.20	62.47	0.00	0.00	0.20	1.00	2.83	10.68	31.00
PME	1,138	9.81	102.40	45.71	0.00	0.00	0.18	0.90	2.40	9.14	27.52
Only Venture Capital											
TVPI	356	5.02	9.30	30.67	0.00	0.00	0.00	0.88	1.99	5.59	12.98
PME	356	4.54	7.30	27.88	0.00	0.00	0.00	0.69	1.77	5.14	11.17
Both											
TVPI	237	4.52	100.00	32.15	0.00	0.00	0.19	1.19	2.58	4.68	7.62
PME	237	3.73	86.93	23.89	0.00	0.00	0.16	1.04	2.16	4.28	7.28

b: Distribution of firm returns by firm exit

	N	Mean		Std	Percentiles						
		wins'd	unwins'd		5th	10th	25th	50th	75th	90th	95th
Independently operating											
TVPI	1,015	11.48	102.50	55.01	0.13	0.40	1.00	1.20	3.35	10.58	29.46
PME	1,015	9.22	95.68	41.08	0.11	0.33	0.75	1.09	2.98	9.31	27.14
Bankrupt or disappeared											
TVPI	332	0.08	0.08	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PME	332	0.06	0.06	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Merged											
TVPI	105	15.30	55.52	71.11	0.01	0.07	0.63	1.00	2.55	15.82	27.19
PME	105	13.72	81.17	60.42	0.02	0.07	0.44	0.94	2.48	14.97	28.34
Acquired											
TVPI	267	14.64	137.80	72.57	0.00	0.01	0.26	1.00	3.64	9.85	22.93
PME	267	10.50	127.40	50.54	0.00	0.00	0.21	0.83	3.05	9.01	22.46
IPO'd											
TVPI	12	3.83	3.83	3.47	0.49	0.86	1.36	2.63	5.01	7.62	12.64
PME	12	3.33	3.33	3.10	0.42	0.61	1.20	2.11	4.33	7.28	10.92

Table 7: Investment returns

Table 7 shows distribution of investment returns measured as Total Value to Paid In $TVPI_{i,k}$, which is a nominal cash-in/cash-out measure that disregards risk and time-value of money, and Public Market Equivalent $PME_{i,k}$ in firm i by investor k. Cash outflows are total equity contributions to the firm i from investor k as well as the total purchase amount in secondary transactions. Cash inflows are the sum of dividends paid out to the investor k by firm i, sale amount for realized shares in firm i and the partial equity market value of firm i for unrealized shares. Firm equity market value is the annual weighted average (by shares) equity purchase price from all observable equity transactions multiplied by the total number of shares outstanding (0 for bankrupt firms). *Realized PME* does not include partial equity market value of firm i for unrealized shares. In the PME estimation we discount all cash flows with the market return from the Oslo Stock Exchange Small Cap index (OSESX) from the firm incorporation date until the time of the cash flow t. Distributions are separated by different investor type: *founders*, *directors*, *private individuals*, *corporations*, *financial institutions*, *VC*, *CVC*, *GVC*, *incubators* and *buyout funds*. $TVPI_{i,k}$ and $PME_{i,k}$ is winsorized at the 1th and 99th percentiles.

| | | Mean | | | Percentiles | | | | | | |
	N	wins'd	unwins'd	Std	5th	10th	25th	50th	75th	90th	95th
All investments											
TVPI	127,431	1.57	560.80	3.58	0.00	0.01	0.72	0.99	1.19	2.13	4.11
PME	127,431	1.46	545.10	3.12	0.00	0.01	0.69	0.95	1.17	1.97	3.94
Realized PME	127,431	0.67	78.64	0.95	0.00	0.00	0.00	0.41	1.00	1.28	2.37
Realized PME>0	80,371	1.06	124.70	1.01	0.05	0.11	0.54	0.95	1.10	1.76	3.76
Founders											
TVPI	682	4.98	898.70	9.14	0.00	0.00	0.32	1.00	3.56	20.77	31.21
PME	682	4.39	823.50	8.01	0.00	0.00	0.32	0.95	3.07	19.70	27.03
Realized PME	682	0.92	5.38	1.59	0.00	0.00	0.00	0.02	1.00	4.59	5.16
Realized PME>0	380	1.66	9.66	1.83	0.00	0.02	0.29	0.90	2.20	5.16	5.16
Directors											
TVPI	2,333	4.59	5,947.00	8.58	0.00	0.00	0.28	1.00	3.15	15.60	31.21
PME	2,333	4.06	5,694.00	7.49	0.00	0.00	0.25	0.93	2.97	14.48	27.03
Realized PME	2,333	0.78	508.50	1.50	0.00	0.00	0.00	0.00	0.85	3.30	5.16
Realized PME>0	1,120	1.62	1,059.00	1.82	0.00	0.02	0.23	0.88	2.24	5.16	5.16

	N	Mean		Std	Percentiles						
		wins'd	unwins'd		5th	10th	25th	50th	75th	90th	95th
Venture Capital (VC)											
TVPI	521	2.16	5.18	5.57	0.00	0.00	0.02	0.89	1.25	3.54	10.41
PME	521	1.97	4.27	4.96	0.00	0.00	0.02	0.80	1.23	3.19	11.07
Realized PME	521	0.42	1.68	1.09	0.00	0.00	0.00	0.00	0.08	1.22	2.88
Realized PME>0	176	1.24	4.98	1.59	0.00	0.00	0.07	0.82	1.33	4.80	5.16
Corporate VC											
TVPI	113	2.69	7.16	5.76	0.00	0.00	0.09	0.95	1.51	8.85	14.43
PME	113	2.30	7.12	4.89	0.00	0.00	0.09	0.75	1.27	6.76	10.78
Realized PME	113	0.54	2.99	1.43	0.00	0.00	0.00	0.00	0.03	1.17	5.16
Realized PME>0	38	1.62	8.90	2.09	0.00	0.01	0.03	0.57	4.14	5.16	5.16
Government VC											
TVPI	79	1.11	1.99	3.58	0.00	0.00	0.00	0.36	1.04	1.87	3.17
PME	79	0.98	1.79	3.11	0.00	0.00	0.00	0.31	0.95	1.62	2.83
Realized PME	79	0.17	0.19	0.72	0.00	0.00	0.00	0.00	0.00	0.20	1.77
Realized PME>0	17	0.79	0.87	1.41	0.00	0.00	0.03	0.06	0.84	2.83	5.16
Incubators											
TVPI	173	3.57	7.37	7.41	0.00	0.00	0.25	1.00	1.51	10.00	23.50
PME	173	3.32	7.41	6.81	0.00	0.00	0.20	0.89	1.57	8.90	27.03
Realized PME	173	0.81	3.10	1.54	0.00	0.00	0.00	0.00	0.89	2.68	5.16
Realized PME>0	78	1.79	6.88	1.87	0.00	0.04	0.41	1.01	2.45	5.16	5.16
Buyout funds											
TVPI	99	1.33	1.62	3.42	0.00	0.00	0.29	0.90	1.04	1.48	3.87
PME	99	1.24	1.44	3.03	0.00	0.00	0.22	0.79	1.01	1.39	3.88
Realized PME	99	0.45	0.80	0.74	0.00	0.00	0.00	0.01	0.90	1.02	1.07
Realized PME>0	54	0.82	1.47	0.83	0.00	0.15	0.34	0.79	1.01	1.06	1.39

		Mean			Percentiles						
	N	wins'd	unwins'd	Std	5th	10th	25th	50th	75th	90th	95th
Financial institutions											
TVPI	1,067	1.65	3.16	4.26	0.00	0.00	0.08	0.74	1.17	3.20	5.15
PME	1,067	1.50	2.78	3.68	0.00	0.00	0.07	0.73	1.10	3.14	4.54
Realized PME	1,067	0.63	0.80	1.04	0.00	0.00	0.00	0.15	0.92	1.42	3.31
Realized PME>0	615	1.09	1.38	1.17	0.02	0.07	0.35	0.85	1.09	3.11	3.96
Corporations											
TVPI	24,515	2.16	607.10	5.24	0.00	0.00	0.60	1.00	1.23	3.28	7.03
PME	24,515	1.96	533.50	4.55	0.00	0.00	0.57	0.94	1.20	3.11	6.44
Realized PME	24,515	0.66	169.60	1.07	0.00	0.00	0.00	0.11	0.99	1.38	3.19
Realized PME>0	14,000	1.16	297.10	1.20	0.03	0.10	0.46	0.95	1.14	2.84	4.58
Private individuals											
TVPI	94,934	1.29	74.86	2.36	0.00	0.12	0.76	0.99	1.17	1.74	3.43
PME	94,934	1.22	70.61	2.06	0.00	0.11	0.73	0.95	1.15	1.67	3.26
Realized PME	94,934	0.68	1.01	0.89	0.00	0.00	0.00	0.56	1.01	1.26	1.98
Realized PME>0	62,770	1.03	1.53	0.91	0.07	0.11	0.58	0.95	1.09	1.56	3.30

Table 8: Investment return, firm return, and investor class

In Table 8, Panels A-C present cross-sectional OLS estimates of the relations between investment returns $PME_{i,k}$, underlying firm characteristics and investor type for three firm financing source sub-samples. We run seven specifications as in equation 5 with $ln(1 + PME_{i,k})$ being the the dependent variable. *Realized PME* does not include partial equity market value of firm i for unrealized shares. We omit investor types private individuals, corporations and financial institutions, as a reference group. Constant term is included but untabulated. All PME variables is winsorized at the 1th and 99th percentiles before taking their natural logarithm. Standard errors are clustered at the firm level.

a: Only Innovation Norway

Dependent Variable:	Investment PME						
	Total (1)-(6)						Realized (7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Firm PME)	0.36***		0.36***	0.35***	0.31***		
	(0.03)		(0.03)	(0.03)	(0.03)		
Founders		0.18***	0.20***	0.19***	0.20***	0.24***	0.21***
		(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.02)
Directors		0.19***	0.21***	0.21***	0.21***	0.20***	0.13***
		(0.04)	(0.04)	(0.04)	(0.04)	(0.02)	(0.01)
Observations	10,597	10,623	10,597	10,597	10,597	10,623	10,623
R-squared	16.9%	0.7%	17.7%	18.8%	20.0%	47.4%	43.7%
Firm FE	NO	NO	NO	NO	NO	YES	YES
Firm birth cohort FE	NO	NO	NO	YES	YES	NO	NO
Exit FE	NO	NO	NO	NO	YES	NO	NO

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

b: Only Venture Capital

Dependent Variable:			Investment PME				
			Total (1)-(6)				Realized (7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Firm PME)	0.04		0.04	0.13***	0.04		
	(0.03)		(0.03)	(0.02)	(0.03)		
Founders		0.46***	0.47***	0.52***	0.44***	0.30***	0.23***
		(0.12)	(0.13)	(0.11)	(0.12)	(0.04)	(0.04)
Directors		0.24***	0.25***	0.29***	0.23***	0.19***	0.07***
		(0.08)	(0.09)	(0.07)	(0.07)	(0.02)	(0.02)
Venture Capital (VC)		0.00	0.02	0.05	0.02	-0.11***	-0.03
		(0.07)	(0.08)	(0.05)	(0.06)	(0.02)	(0.03)
Corporate VC		0.03	0.04	0.03	-0.07	-0.19***	-0.12**
		(0.10)	(0.10)	(0.09)	(0.10)	(0.05)	(0.06)
Government VC		-0.14	-0.12	-0.06	-0.12	-0.14**	-0.05
		(0.11)	(0.12)	(0.10)	(0.10)	(0.07)	(0.07)
Incubators		-0.05	-0.03	0.03	-0.09	-0.10*	0.15***
		(0.08)	(0.09)	(0.08)	(0.09)	(0.05)	(0.05)
Observations	78,202	78,208	78,202	78,202	78,202	78,208	78,208
R-squared	0.9%	0.3%	1.3%	10.9%	13.1%	27.7%	19.3%
Firm FE	NO	NO	NO	NO	NO	YES	YES
Firm birth cohort FE	NO	NO	NO	YES	YES	NO	NO
Exit FE	NO	NO	NO	NO	YES	NO	NO

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

c: Both Innovation Norway and Venture Capital

Dependent Variable:				Investment PME			
		Total (1)-(6)					Realized (7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Firm PME)	0.07		0.09	0.24***	0.24***		
	(0.06)		(0.06)	(0.04)	(0.06)		
Founders		0.32***	0.39***	0.37***	0.38***	0.27***	0.20***
		(0.10)	(0.12)	(0.10)	(0.10)	(0.04)	(0.04)
Directors		0.28***	0.35***	0.36***	0.35***	0.29***	0.11***
		(0.07)	(0.09)	(0.07)	(0.06)	(0.02)	(0.02)
Venture Capital (VC)		-0.12**	-0.04	-0.05	-0.04	-0.12***	-0.06**
		(0.05)	(0.08)	(0.05)	(0.04)	(0.03)	(0.02)
Corporate VC		0.06	0.13	0.07	0.05	-0.16***	-0.05
		(0.16)	(0.17)	(0.15)	(0.13)	(0.06)	(0.05)
Government VC		-0.37***	-0.27***	-0.26***	-0.25***	-0.22***	-0.11**
		(0.07)	(0.10)	(0.07)	(0.07)	(0.06)	(0.05)
Incubators		0.35***	0.42***	0.38***	0.38***	0.19***	0.28***
		(0.11)	(0.12)	(0.11)	(0.11)	(0.04)	(0.04)
Observations	38,600	38,600	38,600	38,600	38,600	38,600	38,600
R-squared	1.0%	0.8%	2.1%	10.0%	12.0%	24.9%	18.2%
Firm FE	NO	NO	NO	NO	NO	YES	YES
Firm birth cohort FE	NO	NO	NO	YES	YES	NO	NO
Exit FE	NO	NO	NO	NO	YES	NO	NO

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Distribution of transaction returns

Investment cash flows in $TVPI$ and PME can result from several purchase and sale transactions of different types (*primary*, *secondary*, *realized*, and *unrealized*), and can be purchased and sold on different dates. Table 9 shows distribution of gross annualized buy-and-hold transaction returns R_j as defined in equation 6, separated by different investor type: *founders*, *directors*, *private individuals*, *corporations*, *financial institutions*, *VC*, *CVC*, *GVC*, *incubators* and *buyout funds*. Purchase price is the actual price for either *primary* or *secondary* transactions. Sale price is the actual sale price for *realized* shares and annual weighted average (by shares) equity purchase price from all observable equity transactions (0 for bankrupt firms) for *unrealized* shares. We take December 31, 2016 as a "sale" date for *unrealized* shares. We exclude all transactions with a purchase price less than 1 NOK (app. 0.1 USD) as, most likely, these are either internal transfers or granted options as part of employee compensation programs, and require a 60-day holding period of shares in order to qualify as an investment transaction. Transaction returns are winsorized at the 1th and 99th percentiles.

	N	Mean	Std	Percentiles						
				5th	10th	25th	50th	75th	90th	95th
All transactions	204,851	106.1 %	546.1 %	-66.0 %	-46.8 %	-23.7 %	0.0 %	38.9 %	189.8 %	403.2 %
Founders	1,128	181.3 %	758.3 %	-36.3 %	-22.5 %	0.0 %	0.0 %	45.4 %	215.0 %	636.8 %
Directors	3,446	110.0 %	563.6 %	-42.1 %	-24.6 %	-3.1 %	0.0 %	37.6 %	137.5 %	301.5 %
Venture Capital (VC)	1,007	86.1 %	530.8 %	-52.7 %	-32.7 %	-8.6 %	0.0 %	27.5 %	93.3 %	202.7 %
Corporate VC	264	103.9 %	544.5 %	-34.6 %	-23.6 %	-10.3 %	0.0 %	36.4 %	129.4 %	302.0 %
Government VC	167	33.6 %	373.8 %	-31.8 %	-28.5 %	-17.1 %	0.0 %	5.2 %	44.6 %	103.3 %
Incubators	280	71.4 %	339.3 %	-47.4 %	-25.5 %	-1.3 %	0.0 %	56.7 %	132.1 %	289.1 %
Buyout funds	141	44.5 %	305.9 %	-66.2 %	-57.0 %	-30.2 %	0.0 %	24.0 %	73.7 %	134.7 %
Financial institutions	4,502	55.8 %	453.8 %	-64.4 %	-53.5 %	-35.9 %	-10.3 %	14.3 %	71.8 %	178.3 %
Corporations	62,991	110.3 %	565.7 %	-64.8 %	-46.8 %	-23.2 %	0.0 %	39.1 %	165.7 %	416.9 %
Private individuals	132,643	105.1 %	536.9 %	-66.8 %	-46.8 %	-24.1 %	0.0 %	39.9 %	205.4 %	405.0 %

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Table 10: Transaction returns and investor type

In Table 10, Panels A-C present cross-sectional OLS estimates of the relations between transaction returns and investor type for three firm financing source sub-samples. We run six specifications as in equation 7 with $ln(1 + R_j)$, being the dependent variable. We omit investor types private individuals, corporations and financial institutions, as a reference group. Constant term is included but untabulated. R_j is winsorized at the 1th and 99th percentiles before taking their natural logarithm. Standard errors are clustered at the firm level.

a: Only Innovation Norway

	(1)	(2)	(3)	(4)	(5)	(6)
Founders	0.18**	0.11	0.11***			0.12***
	(0.08)	(0.07)	(0.03)			(0.03)
Directors	0.10**	0.06*	0.06***			0.06***
	(0.04)	(0.03)	(0.02)			(0.02)
Secondary purchase				0.09***		0.09***
				(0.01)		(0.01)
Realized shares					0.44***	0.44***
					(0.03)	(0.03)
Observations	15,410	15,410	15,410	15,410	15,410	15,410
R-squared	0.4%	4.6%	29.1%	29.2%	30.3%	30.6%
Purchase calendar year FE	NO	YES	YES	YES	YES	YES
Sales calendar year FE	NO	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)
	b: Only Venture Capital					
Founders	0.33*	0.33*	0.20***			0.14**
	(0.19)	(0.18)	(0.06)			(0.06)
Directors	0.10	0.11	0.11***			0.06**
	(0.11)	(0.07)	(0.03)			(0.03)
Venture Capital (VC)	0.13	0.12	0.06*			0.04
	(0.11)	(0.10)	(0.03)			(0.03)
Corporate VC	0.12	0.13	-0.07			-0.13**
	(0.13)	(0.11)	(0.06)			(0.06)
Government VC	-0.01	-0.06	0.05			-0.02
	(0.11)	(0.12)	(0.10)			(0.10)
Incubators	0.09	0.13	-0.14*			-0.24***
	(0.12)	(0.09)	(0.08)			(0.08)
Secondary purchase				-0.48***		-0.48***
				(0.01)		(0.01)
Realized shares					0.05***	0.05***
					(0.01)	(0.01)
Observations	114,962	114,962	114,962	114,962	114,962	114,962
R-squared	0.0%	16.7%	32.0%	35.2%	32.0%	35.3%
Purchase calendar year FE	NO	YES	YES	YES	YES	YES
Sales calendar year FE	NO	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)
c: Both Innovation Norway and Venture Capital						
Founders	0.02	0.05	0.01			-0.01
	(0.16)	(0.07)	(0.05)			(0.05)
Directors	-0.00	0.03	0.04			0.03
	(0.17)	(0.07)	(0.03)			(0.03)
Venture Capital (VC)	-0.12	-0.09	-0.09***			-0.09***
	(0.17)	(0.08)	(0.03)			(0.03)
Corporate VC	0.05	0.08	-0.16**			-0.16**
	(0.20)	(0.13)	(0.07)			(0.07)
Government VC	-0.18	-0.27*	-0.14*			-0.13*
	(0.20)	(0.15)	(0.07)			(0.07)
Incubators	0.06	0.16	0.10*			0.08
	(0.19)	(0.11)	(0.06)			(0.06)
Secondary purchase				-0.06***		-0.06***
				(0.01)		(0.01)
Realized shares					0.23***	0.23***
					(0.01)	(0.01)
Observations	101,572	101,572	101,572	101,572	101,572	101,572
R-squared	0.0%	17.3%	32.3%	32.3%	33.1%	33.1%
Purchase calendar year FE	NO	YES	YES	YES	YES	YES
Sales calendar year FE	NO	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Transaction purchase prices

Table 11 shows frequencies of transaction purchase price deviations from the average "market" price, which is a shares-weighted average purchase price based on all observable transactions in the purchase year, calculated as in equation 8, separated by different investor type: *founders*, *directors*, *private individuals*, *corporations*, *financial institutions*, *VC*, *CVC*, *GVC*, *incubators* and *buyout funds*. *Price premium* is paid if the purchase price is higher than the annual average market price. *Price discount* is paid if the purchase price is lower than the annual average market price.

	% of purchase transactions bought at:		
	Price premium	Price discount	"Market" price
All purchases	60.3 %	35.6 %	4.1 %
Founders	26.0 %	33.7 %	40.3 %
Directors	33.2 %	36.4 %	30.4 %
Venture capital (VC)	44.6 %	33.3 %	22.1 %
Corporate VC	48.4 %	30.5 %	21.1 %
Government VC	46.7 %	29.3 %	24.0 %
Incubators	30.8 %	26.5 %	42.7 %
Buyout funds	69.2 %	27.5 %	3.3 %
Financial institutions	65.2 %	34.6 %	0.2 %
Corporations	58.2 %	34.8 %	6.9 %
Private individuals	61.4 %	36.8 %	1.8 %

Table 12: Distribution of purchase price deviations

In Table 12, Panels A-B show distributions of purchase price deviations from the average "market" price, which is the shares-weighted average purchase price based on all observable transactions in the purchase year, calculated as in equation 8, for *primary* and *secondary* purchase transactions, separated by different investor type: *founders*, *directors*, *private individuals*, *corporations*, *financial institutions*, *VC*, *CVC*, *GVC*, *incubators* and *buyout funds*. *Price premium* is paid if the purchase price is higher than the annual average market price, thus, *Deviation* > 0. *Price discount* is paid if the purchase price is lower than the annual average market price, thus, *Deviation* > 0. If the purchase price equals to the annual average market price, *Deviation* = 0.

a: Primary purchases

	N	mean	sd	Percentiles						
				p5	p10	25th	50th	75th	90th	95th
Founders	1,214	-32.7 %	109.1 %	-382.2 %	-148.5 %	-3.3 %	0.0 %	0.0 %	20.2 %	63.9 %
Directors	3,249	-24.2 %	96.9 %	-326.1 %	-112.6 %	-4.5 %	0.0 %	2.7 %	35.5 %	73.1 %
Venture capital (VC)	1,131	-2.9 %	62.9 %	-43.9 %	-17.3 %	-0.1 %	0.0 %	6.8 %	41.1 %	70.3 %
Corporate VC	328	-11.1 %	82.0 %	-217.3 %	-11.5 %	0.0 %	0.0 %	3.6 %	39.5 %	66.1 %
Government VC	270	-4.4 %	65.5 %	-54.9 %	-7.1 %	0.0 %	0.0 %	5.9 %	29.2 %	59.6 %
Incubators	339	-7.5 %	68.3 %	-66.4 %	-18.0 %	0.0 %	0.0 %	1.7 %	34.9 %	58.8 %
Buyout funds	74	-0.8 %	73.6 %	-54.9 %	-13.1 %	0.0 %	0.5 %	13.1 %	64.7 %	83.5 %
Financial institutions	412	49.0 %	66.1 %	-48.9 %	-35.7 %	-2.0 %	99.5 %	100.0 %	100.0 %	100.0 %
Corporations	19,076	-5.6 %	85.6 %	-152.9 %	-50.7 %	-2.0 %	0.0 %	16.1 %	84.2 %	100.0 %
Private individuals	26,051	16.2 %	70.2 %	-50.7 %	-12.3 %	-2.9 %	0.0 %	77.0 %	100.0 %	100.0 %

b: Secondary purchases

	N	mean	sd	Percentiles						
				p5	p10	25th	50th	75th	90th	95th
Founders	234	-50.5 %	119.1 %	-382.2 %	-315.5 %	-28.9 %	0.0 %	0.0 %	15.9 %	41.8 %
Directors	1,232	-44.5 %	124.9 %	-382.2 %	-292.1 %	-20.2 %	0.0 %	4.2 %	39.3 %	78.3 %
Venture capital (VC)	345	-15.2 %	93.5 %	-241.7 %	-74.1 %	-12.1 %	0.0 %	12.9 %	62.5 %	98.0 %
Corporate VC	52	-26.2 %	101.0 %	-256.8 %	-142.7 %	-12.9 %	0.0 %	4.9 %	69.9 %	79.6 %
Government VC	30	-71.7 %	112.8 %	-382.2 %	-219.2 %	-123.8 %	-20.4 %	0.0 %	1.9 %	16.5 %
Incubators	31	-5.2 %	69.8 %	-190.4 %	-121.0 %	-1.2 %	0.0 %	8.2 %	82.5 %	82.7 %
Buyout funds	108	-6.1 %	88.1 %	-80.7 %	-17.7 %	-1.0 %	8.3 %	14.6 %	40.4 %	100.0 %
Financial institutions	5,926	13.9 %	45.0 %	-40.0 %	-27.3 %	-6.5 %	6.5 %	31.8 %	100.0 %	100.0 %
Corporations	53,699	3.3 %	70.9 %	-113.4 %	-37.7 %	-4.7 %	6.0 %	23.1 %	100.0 %	100.0 %
Private individuals	121,912	5.7 %	65.6 %	-119.6 %	-49.6 %	-8.2 %	8.0 %	31.8 %	100.0 %	100.0 %

Table 13: Purchase price deviation and investor type

In Table 13, Panels A-C present cross-sectional OLS estimates of the relations between purchase price deviations and investor type for three firm financing source sub-samples. *Price premium* is paid if the purchase price is higher than the annual average market price, thus, $Deviation > 0$. *Price discount* is paid if the purchase price is lower than the annual average market price, thus, $Deviation > 0$. If the purchase price equals to the annual average market price, $Deviation = 0$. We run six specifications as in equation 9 with $Deviation_j$ being the dependent variable. We omit investor types private individuals, corporations and financial institutions, as a reference group. Constant term is included but untabulated. $Deviation_{i,j,t}$ is winsorized at the 1th and 99th percentiles before taking their natural logarithm. Standard errors are clustered at the firm level.

a: Only Innovation Norway

	(1)	(2)	(3)	(4)	(5)	(6)
Founders	-0.11**	-0.12**	-0.17***			-0.19***
	(0.06)	(0.06)	(0.03)			(0.03)
Directors	-0.09***	-0.09***	-0.10***			-0.12***
	(0.03)	(0.03)	(0.02)			(0.02)
Secondary purchase				-0.21***		-0.20***
				(0.02)		(0.02)
Ownership stake					-0.44***	-0.47***
					(0.08)	(0.08)
Observations	19,461	19,461	19,461	19,461	19,023	19,023
R-squared	0.2%	0.9%	16.2%	16.8%	16.9%	17.9%
Purchase calendar year FE	NO	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

b: Only Venture Capital

	(1)	(2)	(3)	(4)	(5)	(6)
Founders	-1.01***	-0.87***	-0.49***			-0.54***
	(0.25)	(0.22)	(0.03)			(0.03)
Directors	-0.59***	-0.42***	-0.15***			-0.15***
	(0.17)	(0.09)	(0.01)			(0.01)
Venture Capital (VC)	-0.27*	-0.17**	0.14***			0.15***
	(0.15)	(0.08)	(0.02)			(0.02)
Corporate VC	-0.30*	-0.16**	0.31***			0.35***
	(0.16)	(0.08)	(0.03)			(0.03)
Government VC	-0.37**	-0.21*	0.03			0.04
	(0.18)	(0.11)	(0.04)			(0.04)
Incubators	-0.32**	-0.16**	0.26***			0.26***
	(0.16)	(0.07)	(0.04)			(0.04)
Secondary purchase				0.05***		0.05***
				(0.00)		(0.00)
Ownership stake					-0.36***	-0.42***
					(0.05)	(0.05)
					(0.0523)	(0.0526)
Observations	142,246	142,246	142,246	142,246	141,377	141,377
R-squared	1.2%	15.4%	57.5%	57.3%	57.7%	58.0%
Purchase calendar year FE	NO	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)

c: Both Innovation Norway and Venture Capital

	(1)	(2)	(3)	(4)	(5)	(6)
Founders	-0.23	-0.29***	-0.17***			-0.12***
	(0.18)	(0.09)	(0.04)			(0.04)
Directors	-0.27	-0.34***	-0.21***			-0.19***
	(0.16)	(0.08)	(0.02)			(0.02)
Venture Capital (VC)	0.07	-0.03	0.12***			0.17***
	(0.16)	(0.07)	(0.02)			(0.02)
Corporate VC	-0.04	-0.10	0.24***			0.31***
	(0.19)	(0.10)	(0.05)			(0.05)
Government VC	0.05	-0.08	0.04			0.08*
	(0.18)	(0.10)	(0.05)			(0.05)
Incubators	0.08	-0.02	0.15***			0.19***
	(0.18)	(0.09)	(0.04)			(0.04)
Secondary purchase				0.00		0.00
				(0.01)		(0.01)
Ownership stake					-1.01***	-1.15***
					(0.08)	(0.08)
Observations	105,963	105,963	105,963	105,963	105,857	105,857
R-squared	0.2%	14.6%	30.7%	30.6%	30.9%	31.0%
Purchase calendar year FE	NO	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Realized transaction returns and investor type

In Table 14, Panels A-C present cross-sectional OLS estimates of the relations between realized transaction returns with the actual purchase price being replaced with the annual average market price and investor type for three firm financing source sub-samples. We calculate gross annualized buy-and-hold transaction returns as in equation 10. We run five specifications as in equation 11 with $ln(1 + R_{r,j})$, being the dependent variable. We omit investor types private individuals, corporations and financial institutions, as a reference group. Constant term is included but untabulated. $R_{r,j}$ is winsorized at the 1th and 99th percentiles before taking their natural logarithm. Standard errors are clustered at the firm level.

a: Only Innovation Norway

Dependent Variable:	All returns	Realized		Realized (market price)		
	(1)	(2)	(3)	(4)	(5)	(6)
Purchase price deviation	-0.38***	-0.33***	-0.31***			
	(0.04)	(0.05)	(0.01)			
Founders				0.06	-0.01	0.01
				(0.09)	(0.07)	(0.07)
Directors				-0.09	-0.06	-0.06
				(0.06)	(0.05)	(0.05)
Secondary purchase						0.29***
						(0.04)
Observations	15,410	4,632	4,632	4,604	4,604	4,604
R-squared	19.3%	11.4%	45.5%	0.1%	39.9%	40.7%
Purchase calendar year FE	NO	NO	YES	NO	YES	YES
Sales calendar year FE	NO	NO	YES	NO	YES	YES
Firm FE	NO	NO	YES	NO	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

b: Only Venture Capital

Dependent Variable:	All returns	Realized		Realized (market price)		
	(1)	(2)	(3)	(4)	(5)	(6)
Purchase price deviation	-0.04	0.19	-0.53***			
	(0.28)	(0.27)	(0.01)			
Founders				0.11	0.15*	0.16*
				(0.16)	(0.08)	(0.08)
Directors				-0.05	0.09**	0.10**
				(0.11)	(0.05)	(0.05)
Venture Capital (VC)				0.47*	0.31***	0.31***
				(0.24)	(0.07)	(0.07)
Corporate VC				0.04	0.04	0.05
				(0.12)	(0.12)	(0.12)
Government VC				-0.22	0.02	0.02
				(0.17)	(0.22)	(0.22)
Incubators				0.24*	0.10	0.11
				(0.14)	(0.15)	(0.15)
Secondary purchase						0.04***
						(0.01)
Observations	114,962	66,194	66,194	51,318	51,318	51,318
R-squared	0.1%	1.3%	41.9%	0.1%	34.0%	34.0%
Purchase calendar year FE	NO	NO	YES	NO	YES	YES
Sales calendar year FE	NO	NO	YES	NO	YES	YES
Firm FE	NO	NO	YES	NO	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

c: Both Innovation Norway and Venture Capital

Dependent Variable:	All returns	Realized		Realized (market price)		
	(1)	(2)	(3)	(4)	(5)	(6)
Purchase price deviation	-0.64***	-0.65***	-0.50***			
	(0.07)	(0.08)	(0.01)			
Founders				0.33	0.11	0.11
				(0.22)	(0.13)	(0.13)
Directors				0.16	0.08	0.07
				(0.20)	(0.07)	(0.07)
Venture Capital (VC)				0.03	-0.12	-0.13
				(0.23)	(0.10)	(0.10)
Corporate VC				0.22	-0.21	-0.21
				(0.22)	(0.17)	(0.17)
Government VC				0.30	-0.01	-0.01
				(0.63)	(0.41)	(0.41)
Incubators				0.47**	0.47***	0.47***
				(0.22)	(0.18)	(0.18)
Secondary purchase						-0.03
						(0.03)
Observations	101,572	55,134	55,134	55,125	55,125	55,125
R-squared	28.1%	20.7%	42.0%	0.0%	24.3%	24.3%
Purchase calendar year FE	NO	NO	YES	NO	YES	YES
Sales calendar year FE	NO	NO	YES	NO	YES	YES
Firm FE	NO	NO	YES	NO	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A   Legal overview for shareholders in Norwegian start-ups

Norwegian early-stage firms are commonly set up as privately held companies with limited liability ('AS')[21], but may be converted into a publicly held corporation ('ASA') ahead of an IPO, as this legal form is required by the stock exchange.[22] In both cases, no shareholder is personally liable for the company's obligations unless they have agreed to specific guarantees. Both AS and ASA companies are taxed entities, and any shareholder distribution has to come from after-tax profits. New companies are registered online at the national companies' registry.[23] The minimum share capital of an AS is NOK 30,000 (app. USD 3,700), while the minimum share capital of an ASA is NOK 1,000,000 (app. USD 122,000).

In firms attracting Venture Capital investors, which are usually used to U.S.-type investor protection, shareholder agreements provide a method to obtain familiar investment conditions, even in a foreign legal setting. These agreements come in addition to the required articles of association. Norwegian corporate legislation, which is harmonized with EU law due to Norway's membership of the European Economic Area since 1994, sets out fundamental principles of equal rights for all shareholders, but allows founders some flexibility in allocating rights through defining different share classes in the firm's articles of association. In addition, commonly used shareholder agreements provide even more flexibility. Covered are, e.g., voting rights allocated to specific share classes or shareholders, dividend or liquidation preferences. Most firms only issue so-called ordinary or A-shares[24] and hence

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[21]The only exceptions to this rule are certain real estate or shipping start-ups for asset-related tax reasons, which we exclude from our sample.

[22]The AS can be compared to the U.S. 'C-corporation' and the U.K. private limited liability company form, and the Norwegian ASA can be compared to the U.S. corporation and U.K. public limited company.

[23]See   https://www.brreg.no/business/limited-company/establish-a-limited-company/form-a-limited-company-online/

[24]We find that app. 98% of the start-ups in our sample have only one class of shares, specifically ordinary

all shares have equal rights, i.e. they carry equal rights to dividends and in liquidations, and have the same voting power. However, a shareholder agreement may still allocate these rights differently between shareholders within the same share class. Shareholder agreements used in Venture Capital-financed companies include similar mechanisms as standard U.S. Venture Capital contracts and typically include drag along/tag along clauses, preferential dividends, liquidation preferences, voting rules and specific allocations of governance rights. Shareholders in 'AS'-companies have, by law, a right of first refusal when any shares are put up for sale, unless this right is waived in the articles of association. The articles of association are publicly available (while shareholder agreements are not). Thus, founders tend to keep the articles fairly compact. The enforceability of shareholder agreements towards both shareholders and third parties is unclear owing to few cases brought before the courts. Figure A1 provides a comparison of how enforceable shareholders' agreements are in different jurisdictions. The situation in Norway is similar to that in the U.S.

When issuing new shares, a general meeting may decide to allow certain investors to pay different purchase prices. In early-stage firms, a variation in purchase prices may likely reflect the relative bargaining position (under consideration of other contractual agreements) of different individual shareholders or shareholder categories. Investors will, in this case, end up owning the same type of shares, but have different cost prices for their shares, even if they all invested in the same round of capital raising for the firm.

General meetings are held at least annually to approve the annual accounts and dividends. This needs to happen no later than end-June in the year following the accounting year. Extraordinary general meetings are held at the initiative of the board, shareholders with at least 10% ownership, or the company's auditor. General meetings, in addition to approving the accounts and electing the board, may revise the articles of association, decide

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shares.

upon equity issues, including convertibles and option/warrant schemes to employees, and provide general powers of attorney to the board to issue new equity in the future. The latter decisions require a 2/3 majority of votes and share capital represented in the meeting, but are subject to the overall principle of fair and equal treatment of the rights of all shareholders. Any agreements between the company and its shareholders, board members or CEO, with a value exceeding certain thresholds, should also be approved by a general meeting. A shareholder owning at least 90% of a company can, by law, force remaining shareholders to sell, but the price may be subject to a public arbitration in court at the majority shareholder's expense. The minority shareholders in such a company also have the right to request they be bought out, using the same procedure.[25]

The firm must have a board of directors consisting of a minimum of one board member elected by the general meeting. In firms with more than 30 employees, the employees also have the right to elect board members. The number of employee-elected board members can increase in relation to the number of employees, up to a maximum of one-third of the board of directors and a minimum of three directors for the largest companies. The board is responsible for hiring and firing the CEO. In most start-ups, the CEO is both the founder and a board member, which makes this less straightforward. At least one half of the members of the board of directors must be resident in Norway or be Norwegian citizens, and with their residential address in, an EU/EEA country.

Firms are subject to national income tax, currently at 22%. A firm's net operating losses may be carried forward and used to reduce future taxable income without restrictions. Dividends and realized capital gains from shares are tax-free for incorporated shareholders to avoid double taxation in corporate structures.[26] Most investors with a portfolio size

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[25]This regulation also follows from the EU directive 2004/25/EF, article 15, on takeovers.

[26]This applies to any corporation's holding of any share in another corporation located in the European Economic Area.

warranting set up and maintenance costs, thus, hold shares via a holding firm and are only taxed on distributions to ultimate shareholders.[27]   Norwegian *individual* shareholders are subject to a dividend tax of 31.7%[28], a tax on realized capital gains of 22%, and a wealth tax of 0.85% on their relative share of book equity values one year earlier. Individual shareholders in a bankrupt firm obtain a tax-deductible loss equivalent to realizing their shares at zero value.

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[27]We exclude the transfers from an individual to a holding company as a separate transaction, but account for the original purchase date when calculating the returns for holding companies.

[28]The annual taxable dividend is reduced by an amount equal to a risk-free return on the invested amount. The interest rate used in 2017 was 0.7%. If such a tax credit remains unused, the shareholder may carry it forward.

	Likely outcome across jurisdictions						
	US	UK	GE	SE	NO	DK	
Typical legal questions arising from shareholders' agreements							**Comments**
Separation of voting rights from ownership to shares — Can shareholders separate their voting rights from the ownership to the shares?	✓	✓	✗	✗	✗	✗	• Voting trusts and irrevocable proxies are legal in US and UK • German and Scandinavian law build on the indivisibility of shares principle, whereby shareholders' rights cannot be separated from the ownership to the share
Shareholders' agreements — Are shareholder voting agreements binding between the parties?	✓	✓	✓	✓	✓	✓	• This was historically disputed in all countries researched, but is now accepted everywhere
Enforceability between the parties — Can shareholder voting agreements be enforced by injunction (specific performance)?	(✓)	✓	✓	✓	(✓)	✓	• This has long been disputed across countries • UK and Germany now have undisputable case law in favor of not only prohibitive, but also mandatory injunction
Can members of the board of directors, acting as such, legally bind the exercise of their powers by agreement?	✗	✗	?	✗	✗	✗	• Board members are typically seen as having a duty to act in the way they at any given point in time find is in the company's best interest
Enforceability toward third parties — Can shareholder voting agreements be enforced as directly dictating the legal effects of past decisions made by the general meeting?	?	(✓)	(✓)	✗	?	✗	• Agreements between shareholders have in the UK been accepted as a corporate act • German case law indicates that a decision by the general meeting can be void if contrary to an agreement entered into by all shareholders
Can shareholders' agreements be enforced toward a person who acquires shares from one of the parties to the agreement?	(✓)	✗	✗	(✓)	?	(✓)	• US state statutes typically require transfer restrictions to be conspicuously noted on the share certificate • Scandinavian law probably at least requires that the transferee knows about the shareholders' agreement

Overview: Enforceability of shareholders' agreements across jurisdictions. Source: J. Woxholth: *Aksjonæravtaler*.

B Firm selection by the governmental agency Innovation Norway

Based on our discussions with Innovation Norway, the governmental agency, we selected the following innovation-related support programs as relevant:

- *Industrial and public sector research and development contracts:* These contracts shall stimulate innovative development cooperation on demanding research and development projects between the firm and its customers. The selection criteria are the project's level of innovation, international marketing potential, as well as economic feasibility and the ability to carry the project through.

- *High-risk loans:* High-risk loans help to cover the needs of small- and medium-sized enterprises for reducing financing constraints in investment projects through additional financing. Innovation loans can finance projects relating to innovation, restructuring, development, growth and internationalization. Some of these loans are granted in cooperation with the European Investment Fund.

- *Grants:* These are given to business concepts which are evaluated to have a high degree of novelty and a high potential for growth and value creation in Norway.

- *Environmental grants:* These include firms that develop, test and produce new, environmentally friendly solutions at a piloting and demonstration phase. The outcomes of these solutions need to exceed current EU-requirements.

We select all firms that have received financing through one of these programs for our sample.

C Additional sample characteristics
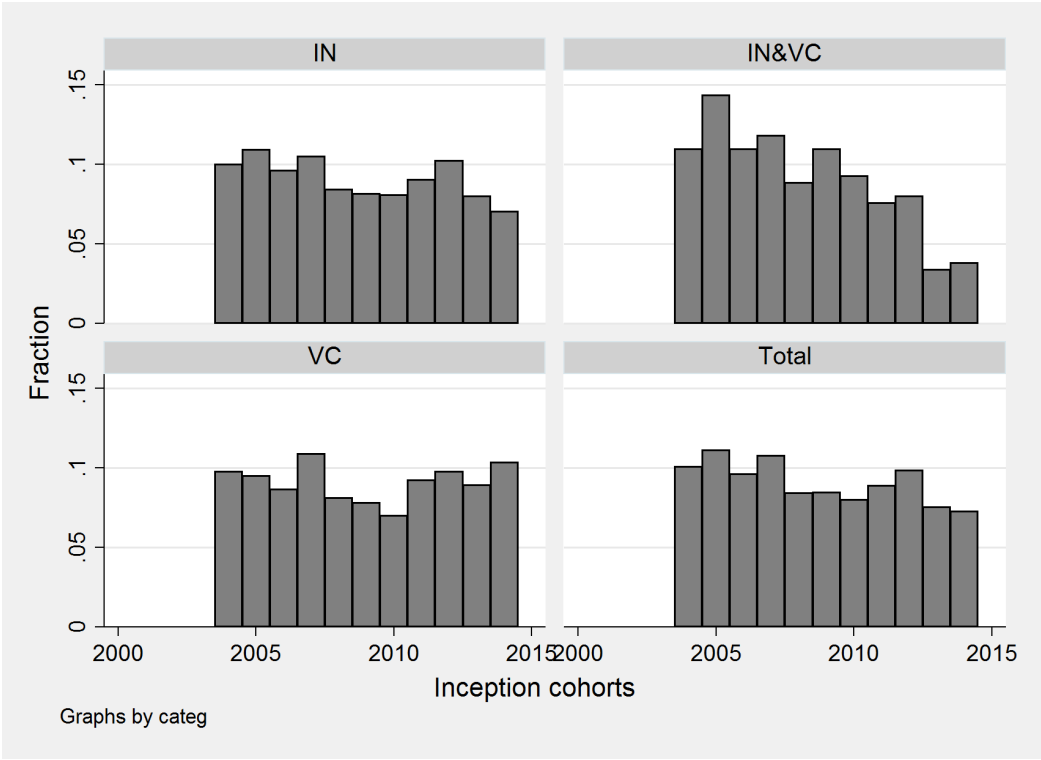
Figure C.1: **Firm birth cohorts**

Graphs by categ

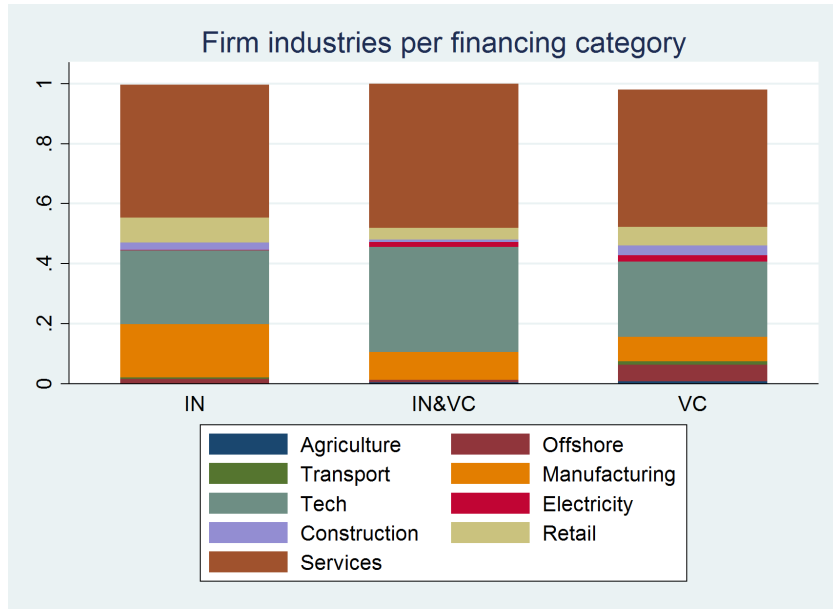Figure C.2: **Firm industries per financing category**

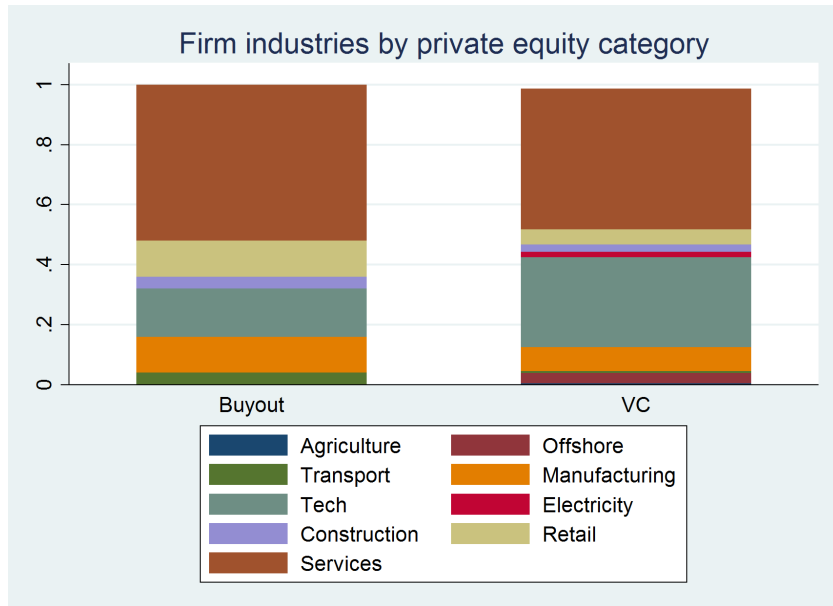Figure C.3: **Firm industries of Venture Capital-backed firms**
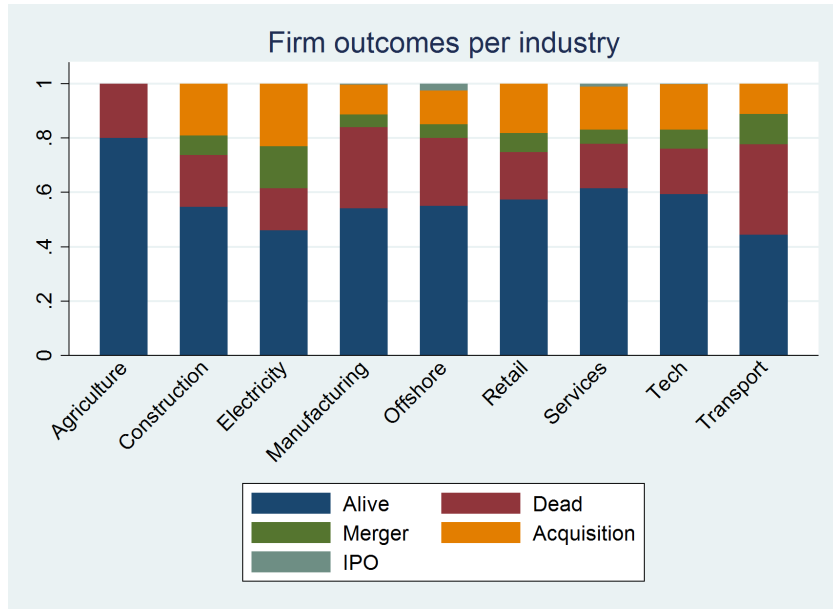
Figure C.4: **Firm outcomes per industry**

Figure C.5: **Firm outcomes per firm birth cohort**