Are Some Angels Better than Others?*

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Abstract

This paper explores the tremendous variation in investment performance of angel investors. The returns are highly skewed: Despite the massive losses incurred in most investments, the mean return is twice the invested capital. Investor fixed effects explain far more of the total variation in angel performance than any collection of observable factors. "Better angels" do not earn higher returns by avoiding left-tail realizations as much as they do by achieving extreme right-tail outcomes. As explanations for the performance differences, we contrast better access to deal flow with better deal selection and find that industry-specific knowledge along with deal-selection skill is important.

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1 Introduction

Angel investments are a growing and important source of early-stage capital for startups. In 2016, there were approximately 64,000 angel-funded deals in the US, compared to 8,500 deals made by venture capital (VC) firms. The US angel capital market grew by approximately 19% from 2016 to 2020, when it reached a market size of 25.3 billion USD.[1] Despite the importance of this segment of the capital market, we know relatively little about it. Who are angel investors? What are the characteristics of their investment portfolios? Do some angels' investments persistently perform better than others' – and if so, why?

These questions are important not simply because they sharpen our understanding of early-stage financing of startups and because they connect household finance and entrepreneurship. Numerous policy initiatives around the world aim to encourage investments by individuals in startups. For example, several US states have implemented programs that provide accredited angel investors with investment tax credits.[2] The emergence of online crowdfunding platforms also raises important questions about the nature of individual investors' exposure to startup firms. Understanding the performance of angel investments is essential for evaluating the efficacy and desirability of such policies and programs.

The primary challenge to studying this market is data availability. In this paper, we draw on detailed administrative and tax records from Norway. Our data include equity transactions between individuals and privately held or publicly traded firms. Detailed in-

[1] National Venture Capital Association, 2017 Yearbook, and University of New Hampshire's Center for Venture Research: `https://paulcollege.unh.edu/sites/default/files/resource/files/2016-analysis-report-final.pdf` and `https://paulcollege.unh.edu/sites/default/files/resource/files/2020-analysis-report_.pdf`.

[2] See Denes, Howell, Mezzanotti, Wang, and Xu (2023) for a detailed description of such programs. Norway, the setting of our study, has begun to allow personal taxpayers to generate income tax deductions based on their investments in startup companies. See `https://www.skatteetaten.no/person/skatt/hjelp-til-riktig-skatt/aksjer-og-verdipapirer/om/skatteinsentivordningen/` for more information.

formation on actual share transactions allows us to provide large-scale evidence on realized returns to angel investing and to observe angel investors' performance in other asset classes. The availability of information on multiple investments made by the same investors allows us to analyze performance persistence among angel investors and to uncover the importance of (unobserved) differences between them in explaining variation in investment performance.

Because we are focused on understanding early-stage investments in innovative startups, we define angel investment broadly: An angel investor is any individual who makes an equity investment in a high-innovation-potential firm (HIP) but who is not a part of that firm's founding team. Critical to our ability to define angels in this way is our deployment of an ex ante measure of a firm's expected innovative potential based on characteristics observable at the time of firm founding, potentially before the firm has realized any of its innovative potential. To develop this measure, we use the strategy described in Kisseleva, Mjøs, and Robinson (2024), which is inspired by the Startup Cartography Project in Andrews, Fazio, Guzman, Liu, and Stern (2022). In particular, we start by removing holding companies, subsidiaries, real estate firms, financial firms and firms in industries that are heavily regulated, that have high governmental involvement or that might be considered to have low innovation potential. We then define three indicators for high innovation propensity: one indicator for startups with an English-language name, one for startups located near the largest university cities, and one for startups with at least one geographically distant board member. We define a firm as potentially innovative if it satisfies at least one of these three criteria. Kisseleva, Mjøs, and Robinson (2024) find that these flags are highly predictive of later-stage innovation outcomes, such as receipt of patents, later-stage venture funding, and growth.[3]

We identify all individual investors in such firms in Norway between 2004 and 2018.

[3]We reproduce their findings in Appendix A.

These investors account for approximately 1% of the Norwegian working-age population. To facilitate comparison with other empirical settings, we further differentiate between several angel investor types. First, we identify repeat investors, a group that aligns more closely with the sample of angel investors defined in Bach, Baghai, Strömberg, and Warg (2022). Second, we flag angel investors who sit on other corporate boards as potentially sophisticated investors with management or corporate leadership experience. Finally, we flag angel investors in the top 10% of the wealth distribution, who more closely align with the minimum net worth criterion for being designated an "accredited investor" in US markets, such that we can connect our work to Lindsey and Stein (2020) and Denes, Howell, Mezzanotti, Wang, and Xu (2023).

Our results can be grouped into three broad sets of findings. First, we study the distribution of angel returns. Most angel investments perform poorly relative to alternative investments. Approximately one-third of all investments are a total loss, and only one-quarter of them generate positive undiscounted returns, i.e., distributions in excess of the invested capital.[4] Nevertheless, the returns are characterized by pronounced skewness: the top decile of investments yields more than three times the invested capital, and the top 1% of realized investments generate a 53-fold return. As a result, despite the massive losses incurred in most angel investments, the overall mean return is twice the invested capital.

The second piece of our analysis explores the determinants of the cross-sectional variation in returns that we uncover. Observable characteristics such as investor age, board seat, investment amount and holding period are strong predictors of returns but collectively explain only a small percentage of the overall variation. Investor fixed effects explain approximately one-third of the total variation in angel investment performance—far more than any collection of observable factors. While the decision to become a repeat investor is in

[4]These results are in line with findings from surveys of UK angel investors in Mason and Harrison (2002) and the US in DeGennaro and Dwyer (2014).

itself endogenously linked to the realized return of the first angel investments, angels exhibit a form of performance persistence. Namely, the success or failure of the last firm the angel invested in strongly predict the success or failure of the current firm, especially for investments close in time and in the same industries. This result connects our findings to Kaplan and Schoar (2005); Korteweg and Sorensen (2017); Braun, Jenkinson, and Stoff (2017) and Nanda, Samila, and Sorenson (2020).

Why do some angels earn higher returns than others? To explore this question, we first examine whether the performance differential arises from angels avoiding low-performing investments or instead from their successfully seeking out high-performing investments. High-performing angels are much likelier than other investors to achieve 90^{th} or 95^{th} percentile investment outcomes but no likelier than less well-performing investors to earn above-median returns. Similarly, top-quintile angel investors are much likelier to invest in firms that raise follow-on VC funding. Thus, they do not earn higher returns by avoiding left-tail realizations as much as they do by achieving extreme right-tail outcomes. To use a baseball metaphor, it is not that high-performing angels hit singles and doubles instead of striking out but that they are likelier than lower-performing investors to hit home runs.

Our data do not allow us to determine whether better angels *pick* better firms or whether they *create* better firms. However, the data do allow us to contrast better access to deal flow through network with better selection as potential channels. First, we find that better angels prefer to invest together with a more dispersed base of angels. This speaks against the network explanation, whereby a small group of angels has privileged access to high-quality deals. Second, we examine differences in the returns on domestic publicly traded stock directly held by angel investors. Better angels have higher returns and higher Sharpe ratios in their public market investments. This tendency again runs counter to an explanation turning on access to deal flow because differential access cannot be a factor in publicly traded

stock selection. The performance differentials in public markets are highest for investments in the same industries as those of the angel investments, suggesting that industry-specific knowledge mixed with deal-selection skill is important for explaining performance differences across angel investors.

Our findings contribute to a burgeoning literature on angel investment, including Mason and Harrison (2002); Wong (2002); Kerr, Lerner, and Schoar (2011); DeGennaro and Dwyer (2014); Lerner, Schoar, Sokolinski, and Wilson (2018); Lindsey and Stein (2020); Denes, Howell, Mezzanotti, Wang, and Xu (2023); Bach, Baghai, Strömberg, and Warg (2022) and Xu (2023) as well as Hellmann and Thiele (2015) and Hellmann, Schure, and Vo (2021). This literature highlights the importance of exposure to angel investors for the subsequent success of the firms in question and points to connections between angel and later-stage institutional capital. By linking private investment performance to public investment returns, our work helps illustrate the importance of deal selection as a source of returns in angel markets. This is especially important in light of the emphasis that earlier work has placed on the role of non-pecuniary motives in angel investing.

The paper is structured as follows. Section 2 describes our data and sample. Section 3 describes the returns to angel investing. Section 4 explores the cross-sectional variation in angel returns, while Section 5 disentangles possible explanations behind these differences. Section 6 concludes.

2 Data and Sample Construction

2.1 Data Source and Structure

Norwegian administrative data are recognized for their quality and detail and have been used prominently in research in labor economics, finance and innovation (for recent examples, see

Hvide and Jones, 2018; Fagereng, Mogstad, and Rønning, 2021; Ring, 2023). Our main data come from the annual tax declarations of the population of Norwegian public and private limited liability companies and their shareholders. These declarations have been digitally collected and stored since 2004. We obtain data through December 2018. The data identify firms' shareholders and their shareholdings and all equity purchase, sale and liquidation transactions. Each record includes the date, monetary amount, and number of shares transacted. In addition, we observe whether the shares are purchased in primary financing rounds (88% of all purchases) or in secondary trades with existing investors.

At the most granular level of observation, an investment is a unique combination of an investor (name *aksjonaer_navn* and personal tax identification number *akt_lopenr*), purchase date (*erverv_dato*), firm identifier (*aksje_orgnr*), share class (*aksje_aksjeklasse*) and purchase type (*erverv_type*). By the end of our sample period, an investment may be fully or partially realized through sale or liquidation (*realisasjon_type*) of shares. Thus, in a case where a single initial purchase is liquidated across several distinct sales, we would observe more than one investment outcome. The outcome date is the date of the realization (*realisert_dato*) for realized returns or the last day of our sample period (December 31, 2018) for unrealized investments. Some examples to illustrate the data structure are as follows: (a) An investor j purchases 100 shares in firm i at time t. She sells 50 shares at time s and 50 shares at a later point in time k. This case is one investment with two distinct realized outcomes. (b) An investor j purchases 50 shares in firm i at time t and 50 shares in firm i at a later point in time z. She sells all 100 shares at time s. This case represents two investments, each of them having one realized outcome. (c) An investor j purchases 100 shares in firm i at time t. She sells 50 shares at time s. This case is one investment with both a realized outcome at time s and an unrealized outcome at $k = 12/31/2018$.

The firm identification number (*organisasjonsnummer*) is consistently used in all firm

registries and allows the data to be merged to other databases. Thus, we merge the tax declarations to firm financial statements data, business registry data, bankruptcy registry data, firms' incorporation documents and data on CEOs and board members. We identify board members and executives among all individuals in the tax declarations by fuzzy matching on full names and exact matching on birth dates. In addition, we obtain individual-level wealth and income data for the sample period 2011–2018 from tax returns.

2.2 Identifying Firms with High Innovation Potential

We begin by identifying all newly established limited liability companies (analogous to C-corporations in the US) that incorporated between 2004 and 2017. We remove financial services and real estate firms, newly formed subsidiaries of established companies, holding structures, and firms in industries that are heavily regulated, that have high governmental involvement or that are usually considered non-innovative. To recognize firms potentially seeking early-stage equity financing, we follow Kisseleva, Mjøs, and Robinson (2024), who apply to the Norwegian context a methodology described in Andrews, Fazio, Guzman, Liu, and Stern (2022); Guzman and Stern (2015) and Guzman and Stern (2020). In particular, we use a series of indicators observable at founding to gauge a firm's likely innovation potential at the time it first appears in the tax registry data. The process is described in detail in Kisseleva, Mjøs, and Robinson (2024) and included in Appendix A here. A brief summary follows below.

The first flag is whether the firm has an English-language firm name. The idea behind this flag is that, because Norway is a country of only approximately five million people, an English-language firm name helps the firm be recognizable to a broader, international audience and therefore is a natural choice for an entrepreneur who intends to grow. The second flag is whether the firm is located in a regional innovation hub in Norway. The four

innovation hubs in our data are Oslo, Bergen, Stavanger and Trondheim. These are the four largest cities in the country, and each hosts a major research university and has an associated technology cluster (Hvide and Jones, 2018). The third flag tracks whether one of the company's non-executive board members lives in a geographically distant area from the city in which the company operates. The idea here is that the choice of a geographically distant board member in the year of establishment is a potential indication that the founders (or investors) have recruited a board member with specific technical or market expertise not readily found nearby. Thus, for a firm to be classed as high-innovation-potential (HIP), we require it to be in a potentially innovative industry and to meet the criteria for at least one of our three flags. This procedure yields a sample of 46,121 firms, among them 90% of all the firms that receive any VC funding in our data, which justifies our selection approach.

In Appendix A, we reproduce the sample selection results from Kisseleva, Mjøs, and Robinson (2024), which link these flags to later firm outcomes. Table A2 shows that each flag, both on its own and in combination with the others, is highly predictive of a firm's obtaining a patent, obtaining later-stage equity financing or government innovation grants, achieving an exit for investors, and having higher than average four-year revenue growth. Even more importantly, our HIP sample includes almost all firms selected by investors, accounting for over 90% of the total equity capital invested in all early-stage businesses in Norway in our sample period.[5]

2.3 Identifying Angel Investors

There is no standardized definition of an angel investor across various settings and previous research. We want to keep our definition as broad as possible, and for this purpose, we define an angel investor as an individual who, in her own name or through a fully owned

[5]See Table A3 in Appendix A for details.

holding company, invests at least once in a financing round of a HIP firm of which she is not a founder. We identify founders as a firm's CEO and/or contact person in the year of firm's inception and the two consecutive years. For firms that do not report a CEO or a contact person, we treat the chair of the board as founder.[6] Out of 46,121 HIP firms, 14,376 firms receive at least one investment from 36,749 angels, who comprise 6.1% of all Norwegian direct equityholders and 0.8% (1.3%) of the entire Norwegian (working) population.[7]

Table B1 in Appendix A evaluates who, among all individual investors, is likeliest to make angel investments (i.e., invest in HIP firms). It shows that angels are typically younger and likelier to be men and to be founders (of different firms) themselves, and they also invest in the domestic public stock market. We also find that founders are less likely to invest in smaller and late-stage HIP firms, while being a public market and/or wealthy investor correlates with investing in late-stage and large HIP firms. The latter also tend to invest in more than just one HIP firm. In our sample, solely 12% of angel investors invest in more than one HIP firm (see Figure 1). Thus, in our analyses, we differentiate angels who invest in only one HIP firm (*single-firm angels*) and those who invest in multiple HIP firms (*repeat angels*) during our sample period. This distinction brings our definition of an angel investor closer to the focus on individuals with multiple investments in Bach, Baghai, Strömberg, and Warg (2022).

Insert Figure 1 here.

Furthermore, we define investors as *wealthy angels* if their average wealth level is above the 90^{th} percentile of all angel investors in our sample. This aligns our definition of an angel investor with the US definition of an accredited angel investor and, thus, with the definition in Lindsey and Stein (2020) and Denes, Howell, Mezzanotti, Wang, and Xu (2023).

[6]This applies to only 4% of our sample of HIP firms.

[7]Sources: The shareholder registry from the Norwegian Tax Authorities and Statistics Norway.

In addition, we flag *board-experienced angels*, who are board members of at least one other firm at the time of their first angel investment. Last, we identify *family angels*, who share the last name and/or live on the same street as the founder of the firm.

2.4 Sample Description

To summarize the character of HIP firms, Table 1 provides their descriptive statistics. On average, each HIP firm receives investments from three angel investors (median from one angel investor), although with a far thicker right tail ranging up to a consortium of over 30 angels. Angels invest early in a firm's life. Half of the angels invest in the year of the firm's inception – on average, when the firm is 1.2 years old (median 2.0 years). Firm size at the time of the (first) angel investment is very skewed, with average total assets of million 26 NOK but a median of only thousand 890 NOK. The HIP firms report revenues in the year of the first angel investment of on average 1.3 times total assets (median 0.5 times), although still resulting in average losses of 1.4 times total assets (median 0.05 times). This is consistent with innovative firms' development and investment phase before they start generating profits. However, both revenues and net income have a high right tail. Loans from financial institutions represent on average 15% and convertible loans 4% of the financing of angel-invested HIP firms at the year of the first angel investments. Due to accumulated losses, the average equity ratio at this time is -27% (median 39%). The firms hold large cash balances just after receiving angel financing, on average 39% (median 30%) of assets, while only on average 10% of assets are intangibles (median 0%). The average sample firm has 4.4 employees (median 1.0 employees).

Insert Table 1 here.

The vast majority of such firms remain independently operating (60%), and only 14%

of them experience a positive exit event (13.9% through mergers and acquisitions and 0.2% through initial public offerings). A share of 26% of HIP firms officially file for bankruptcy and/or are liquidated. The average (median) firm age at the time of the (first) exit event is five (four) years old.

Table 2 describes our angel investors. They make on average 1.8 angel investments in 1.2 different HIP firms; these numbers are driven by a few angels, as most angels make only one investment in one firm, as illustrated in Figure 1. On average, angels realize only half of their investments by the end of our sample period. This highlights the importance of assigning implicit values to untraded shares for understanding the totality of investment returns. We describe our imputation method for untraded shares in Section 3.1.

In the year of their first angel investment, angels are on average 44 years old (median 43 years) with an average gross wealth of 6.9 million NOK (median 1.4 million NOK), equivalent to 1 million USD (0.2 million USD), which implies that they on average are wealthier than the average Norwegian household.[8] Angels also have a higher than average household annual income of 970 thousand NOK (median 540 thousand NOK), equivalent to 147 thousand USD (median 82 thousand USD).[9] Both in terms of age, wealth and income, angel investors show a fairly skewed distribution, which includes older and wealthier angels who have much higher income. A total of 83% of the angel investors in our sample are male, a figure that closely aligns with the gender mix in the sample of angel investors in contemporaneous work by Bach, Baghai, Strömberg, and Warg (2022).

The realized portfolio return of our angels captures their overall performance as in-

[8]The statistical agency of Norway (SSB) reports that the average gross wealth of Norwegian households where the main income provider was between 45 and 54 years old is 4.3 million NOK (0.7 million USD) in 2015; see `https://www.ssb.no/statbank/table/10317/`. Wealth and income are measured in 2015 values and converted to USD amounts based on an exchange rate of 6.6 NOK per USD.

[9]For comparison, the average annual salary (before tax) across all sectors in 2015 was 516 thousand NOK (78 thousand USD); see `https://www.ssb.no/statbank/table/11536/`.

vestors.[10] Their average angel portfolio generates a TVPI of 2.31 (median 0.5), and only the top 25% of angels receive their invested capital back. Alternatively, we use Buy-and-hold annualized returns (BHAR), which are the annualized TVPI returns, to account for the holding period of angel investments. An average angel experiences a total loss of 100% (median -30%) in her angel portfolio. Public market equivalent (PME) is TVPI adjusted by the Oslo Børs Benchmark Index (OSEBX) on each cashflow date. The average PME of 1.76 (median 0.40) is lower than that of TVPI, reflecting both time value of money and market-risk adjustment. Also the alternative return measures are heavily skewed, consistent with negative portfolio returns for a majority of angel investors.

Some angels are also active in other capital markets: 37% of angels invest directly in domestic public stock markets, and 9% of angels invest in non-HIP private firms. Angels' portfolio returns in these markets are higher than in their angel portfolio. Using the comparable TVPI measure, angel investors make on average a return of 2.64 in non-HIP firms (median 0.57) and 3.71 in domestic public markets (median 1.04). Also these returns are heavily skewed, but the angel portfolio returns are below the returns in alternative markets across the entire distribution. However, angel portfolio return volatility and skewness are lower than the equivalent for the other markets.

Insert Table 2 here.

[10] Investment returns are weighted average returns (by purchase amount of realized shares) of each angel investor.

3 Returns to Angel Investment

3.1 Measurement of Returns

To calculate angel investment returns, we use a measure commonly used in entrepreneurial finance, *total value to paid-in capital* (TVPI), which is the ratio of total nominal cash (implicitly) received by the investor from an investment to total nominal cash paid into the investment, all in NOK, with no adjustments for any risk or the time value of money. In Appendix C we replace the returns measure with PME and replicate all analyses – the results remain unchanged.

$$TVPI_{i,j,t,s} = \frac{Distribution_{i,j,s}}{Contribution_{i,j,t}}$$

$Contribution_{i,j,t}$ is the amount invested in firm i by angel j at time t. For realized outcomes, whether through sales or liquidation, we directly observe $Distribution_{i,j,s}$, which is the realization proceeds at time s, calculated as the realization price multiplied by the number of realized shares. Thus, we calculate $TVPI_{i,j,t,s}$ as the realization amount divided by the purchase amount of the realized shares, (1) TVPI. To account for unrealized investments, we calculate two additional versions of $TVPI$. In addition to realized investments, (2) TVPI corrects for implicit losses and assumes that if firm i does not report revenues in five consecutive years after the year of angel investment in t, the implied $Distribution_{i,j,s}$ and, therefore, $TVPI_{i,j,t,s}$ is zero. In addition to the assumption of (2) TVPI, (3) TVPI computes for all residual unrealized investments the untraded value of shares based on the most recent price (paid by any investor) observed in the latest financing round at time s. This implies that (3) TVPI includes all angel investments. In this case, $Distribution_{i,j,s} = Share\ price_{i,s} \times Untraded\ shares_{i,j,s}$, which we divide by the purchase amount of unrealized shares.

To illustrate our procedure with regard to investments with several outcomes, we

refer to our examples (a) and (c) introduced in Section 2.1. In example (a), an investor j purchases 100 shares for a price of 100 NOK/share in firm i at time t. She sells 50 shares at time s for 60 NOK/share and 50 shares for 75 NOK/share at a later point in time k. This implies (1) $TVPI = \frac{60\times50+75\times50}{100\times100} = 0.675$. Because it is a fully realized investment (1) $TVPI$ = (2) $TVPI$ = (3) $TVPI = 0.675$.

In example (c), an investor j purchases 100 shares in firm i at time t for a price of 100 NOK/share. She sells 50 shares at time s for 80 NOK/share. This case is one investment with both a realized outcome at time s and an unrealized outcome at $k = 12/31/2018$. This implies (1) $TVPI = \frac{80\times50}{100\times50} = 0.8$, but the other return measures are dependent on the firm outcome: (1) Assume that the firm i does not earn any revenues throughout $t + 5$. Then, (2) $TVPI = \frac{80\times50+0\times50}{100\times100} = 0.4$ and (2) $TVPI$ = (3) $TVPI = 0.4$. (2) Assume that the firm i does earn revenues and has raised equity in a financing round on January 1, 2018, which is later than t. The average share price in that financing round is 125 NOK/share. We calculate (3) $TVPI = \frac{80\times50+125\times50}{100\times100} = 1.025$. In this case, (1) $TVPI$ = (2) $TVPI = 0.8$ and (3) $TVPI = 1.025$.

3.2 Return Distribution

In this section, we explore the distribution of returns to angel investments. Figure 2 illustrates how our methodology for calculating returns to unrealized investment affects the overall return distribution. Specifically, it plots the distributions of angel investment returns over several return buckets and shows that angel returns are characterized by many losses and pronounced right-skewness, regardless of the particular measurement. The solid line, which represents (1) TVPI, shows that more than one-third of realized investments are total losses and that approximately 75% of investments do not yield a positive return in excess of the invested capital. At the same time, 11% of realized investments return more than

three times the invested capital. This return distribution broadly aligns with the survey evidence from the UK in Mason and Harrison (2002) and from the US in DeGennaro and Dwyer (2014). Once we account for the implicit losses, represented by the dashed line for (2) TVPI, an additional 6% of investments are total losses, and a slightly higher share of investments do not yield a positive return. After the inclusion of all unrealized investments in (3) TVPI, represented by the dotted line, the share of total losses is reduced to 21% of the entire return distribution, which now has a much higher proportion of TVPIs that are equal to one. Still, only 10% of all investments return more than three times the invested capital.

Insert Figure 2 here.

Table 3 presents detailed statistics on the returns to angel investing for all investments (Panel A), separately for investments in financing rounds (Panel B) and in secondary trades from existing investors (Panel C). Our sample consists of total 75,290 investments, whereas 2,149 investments (less than 3% of total investments)) have both realized and unrealized outcomes. Out of 36,525 realized investments, 4,726 (13%) investments have more than one realization dates.

The distribution of (1) TVPI indicates that realized angel investments return on average twice the invested capital. The average (2) TVPI decreases slightly because of the inclusion of implicit total losses, while the average (3) TVPI increases slightly because of both the large fraction of investments returning exactly the invested capital (median (3) TVPI of one, which is higher than the medians of (1) TVPI and (2) TVPI) and higher returns in the right tail.

Insert Table 3 here.

Comparison of the returns earned in share purchases in financing rounds (Panel B) and in share purchases in secondary trades (Panel C) shows that the return distributions are similar. However, the average (3) TVPI earned when shares are purchased in secondary trades is higher than when shares are purchased in financing rounds. This is driven by the higher right tail of the secondary trade returns distribution. The average holding period of angel investments is 1,725 days (4.7 years) and the median of 1,333 days (3.7 years). There is no significant difference (more than a couple of months) in the average holding period between angel investments in financing rounds and secondary trades, albeit in the right tail, secondary trades are held more than one year shorter than investments made in financing rounds.

Figure 3 shows the distribution of (3) TVPI by investment size quartile. We observe that the return distribution has a heavier concentration in the third return bucket (*TVPI >0.50 to 1.00*) for the smallest investments and that this concentration declines with investment size. The share of investments that return more than three times the invested capital also declines in investment size from 11.5% for small investments to 7.1% for large investments, indicating that returns from small investments drive the right tail of the return distribution.

Insert Figure 3 here.

In addition, our data allow us to examine angel investments at different stages of firm development, gauged by whether the firm reports any revenues or any value of patents in its financial statements in the year of receiving an angel investment. For this purpose, Table B2 in Appendix B replicates Table 3 Panel A. The results suggest that the reduction in uncertainty from generating revenues or obtaining patents results in higher average returns. Specifically, post-revenue (post-patent) angel investments result in a higher median return

and lower proportion of total losses across all three return measures compared to investments in pre-revenue (pre-patent) firms. The lower share of total losses is accompanied by an overall less skewed return distribution.

Insert Table B2 here.

4 Are Some Angels Better than Others?

4.1 Angels of a Different Kind

As outlined in Section 2.3, we intentionally keep our definition of angels as broad as possible, which allows us to differentiate between various angel types and to connect our study to existing research and different empirical settings. Table 4 replicates Table 3 Panel A for different angel types. Family angels perform on average and across the distribution, worse than other angel types. Their investments exhibit in particular a higher proportion of total losses and a lower right tail. First, such informal investors are thought to require lower returns from the founders because of the information advantages the investors have or because they have non-pecuniary, altruistic motives. Second, despite the lower required returns, informal financing is often less preferred than institutional or angel financing because of the shadow costs if the startup fails – hence the reduced risk-taking behavior demonstrated by family-financed firms (Baik, Karlsen, and Kisseleva, 2023; Lee and Persson, 2016). For these reasons, we exclude this group of angels from our further analyses. This exclusion aligns with the approach in Bach, Baghai, Strömberg, and Warg (2022), the study closest to ours, where the authors require that neither the angel investors themselves nor their family members work in the firm in which they invest.

Insert Table 4 here.

The average (1) TVPI of board-experienced angels, wealthy angels and single-firm angels is approximately the same, ranging from 2.07 for single-firm angels to 2.19 for wealthy angels. Concurrently, the return distribution is the least right-skewed for single-firm angels. When we account for untraded shares, wealthy angels have the lowest average (3) TVPI of 2.10, in comparison to 2.34 (2.29) for board-experienced (single-firm) angels. Wealthy angels also experience the highest proportion of total losses and the lowest median return.

Repeat angels earn the highest average returns among all angel types. Both the right and left tails of their return distribution are thicker than those for any other angel type. When we consider all investments by repeat angels, the average (1) TVPI ((3) TVPI) is 2.62 (2.64), while their first investments yield a (1) TVPI ((3) TVPI) of 2.90 (2.79)[11]. Figure 4 shows that between 11% and 17% of each angel investment calendar year cohort invests repeatedly in HIP firms. Figure 5 shows that 74% of repeat angels invest in two firms (Panel A), while approximately half of them realize only one angel investment (Panel B). Of course, some of the most recent investors may well become repeat investors after the end of our sample period since the median (mean) time period between two investments made by the same angel investor is 567 (952) days during our sample period.

Insert Figure 4 here.

Insert Figure 5 here.

In the following analyses we use (3) TVPI as a measure of returns to account for all observable angel investments. Accounting only for realized returns would induce a selection bias in the distribution of angel investment returns due to the year when an investment has been made and the propensity to realize it.

[11] As we explore later, the relatively higher reazlied return of the first investment itself increases the likelihood of becoming a repeat angel investor.

4.2 Cross-Sectional Variation in Angel Returns

This section attempts to explain the variation in angel investment performance documented in the previous section. To explore the systematic cross-sectional variation in returns to angel investing, we estimate the following ordinary least squares (OLS) regression model:

$$\begin{aligned} TVPI_{i,j,t,s} = \alpha &+ \beta_1 Repeat\ angel_j + \beta_2 Board\ experienced\ angel_j + \beta_3 Investor\ age_{j,t} \\ &+ \beta_4 Male_j + \beta_5 High\ wealth_j + \beta_6 Investment\ amount_{i,j,t} \\ &+ \beta_7 Secondary\ purchase_{i,j,t} + \beta_8 Holding\ period_{i,j,t,s} + \beta_9 Board\ seat_{i,j,t} \\ &+ \beta_{10} \%\ of\ investment\ realized_{i,j,t,s} \\ &+ \beta_{11} Public\ market\ return_{t,s} + \gamma_{i,t,s} + \delta_j + \theta_i + \upsilon_i + \varepsilon_{i,j,t,s} \end{aligned} \quad (1)$$

The dependent variable $TVPI_{i,j,t,s}$ is the natural logarithm (plus one) of the investment return calculated as (3) TVPI. $Repeat\ angel_j$ is a dummy variable taking value one if angel j invests in several HIP firms. $Board\ experienced\ angel_j$ is a dummy variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. $Investor\ age_{j,t}$ is the natural logarithm of the investor's age at the time of investment t. $Male_j$ is a dummy variable taking value one for male angels. $High\ wealth_j$ a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. $Investment\ amount_{i,j,t}$ controls for the investment (purchase) amount of angel investor j into firm i at time t. $Secondary\ purchase_{i,j,t}$ is a dummy variable taking value one if the investor buys shares in a secondary trade. $Holding\ period_{i,j,t,s}$ is the natural logarithm of the holding period t to s of the investment measured in days. $Board\ seat_{i,j,t}$ is a dummy variable taking value one if the angel investor j receives a board seat in the firm i at the time of investment t. $\%\ of\ investment\ realized_{i,j,t,s}$ is the fraction of the investment that is realized at time s.

Public market return$_{t,s}$ is the return on the Oslo Børs Benchmark Index (OSEBX) over the investment period from t to s. $\gamma_{i,t,s}$ represents fixed effects for the purchase and realization calendar year and firm age at the time of investment, δ_j is investor fixed effects, θ_i is industry fixed effects, and υ_i is firm fixed effects. Standard errors are clustered at the firm level.

Table 5 shows the estimation results. Column (1) confirms in a more formal analysis that repeat angels earn on average 6% more than single-firm angels and angels with previous board experience. Observable investor and investment characteristics such as age, investment amount, board seat, investment amount, holding period and share of investment realized are strong predictors of returns, but collectively explain, when also controlling for public market return, firm age, year and industry, only 5.4% of the variation in returns. In particular, older investors, larger investment amounts, a longer holding period and the fraction of the investment realized are associated with lower average returns, while having a board seat is weakly associated with a higher return.

Column (2) replicates Column (1) for the subsample of repeat angels, while Column (3) additionally includes investor fixed effects. The adjusted R-squared increases from 6.9% in Column (2) to 43.6% in Column (3). This result is robust when we limit the sample of repeat angels to those with at least three (Column (4)) or at least four (Column (5)) angel investments. The large increase in explanatory power from introducing an investor fixed effect is evidence of large unobserved heterogeneity across investors, which plays a crucial role in understanding the returns from angel investing and connects our paper to findings in Bach, Baghai, Strömberg, and Warg (2022).

Insert Table 5 here.

In Column (6), we replace the investor fixed effects with firm fixed effects and use the same specification as in Column (1); i.e., we study only the variation in returns between

different angel investors within the same firm. The adjusted R-squared increases further from 5.4% (from Column (1)) to 59.3% (Column (6)), underscoring the assortative matching between angel investors and firms that results in different returns. Overall, Table 5 provides evidence that angel investors vary systematically in their average angel investment performance and that unobserved differences across investors lie behind the observed variation in performance.

4.3 Endogeneity of Repeat Investments

Some investors might shy away from repeat angel investing because of disappointing returns on their first investments. To better understand how the circumstances of the first investment predict whether a second investment occurs, we explore the relationship between the outcome of angels' first investment and their propensity to become a repeat angel. We estimate the following logit regression model:

$$\begin{aligned} \textit{Repeat angel}_j = \alpha &+ \beta_1 \textit{First investment realized}_j + \beta_2 \textit{First investment TVPI}_j \\ &+ \beta_3 \textit{First investment amount}_j + \beta_4 \textit{Board experienced angel}_j \\ &+ \beta_5 \textit{Investor age}_j + \beta_6 \textit{Male}_j + \beta_7 \textit{High wealth}_j + \gamma_j + \varepsilon_j \end{aligned} \tag{2}$$

The dependent variable $\textit{Repeat angel}_j$ is a dummy variable taking value one if angel j invests in several HIP firms. $\textit{First investment realized}_j$ is a dummy variable taking value one if the angel's first investment has been realized during the sample period. $\textit{First investment TVPI}_j$ is the return of the investor's first angel investment, measured either as the natural logarithm (plus one) of the investment return calculated as (1) TVPI (realized investments only) or (3) TVPI (including all unrealized investments). $\textit{First investment amount}_j$ controls for the total amount invested in the first angel investment. $\textit{Board experienced angel}_j$ is a dummy

variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. $Investor\ age_j$ is the natural logarithm of the investor's age at the time of her first angel investment. $Male_j$ is a dummy variable taking value one for male angels. $High\ wealth_j$ is a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. γ_j is a calendar year of the first angel investment fixed effect.

Table 6's Columns (1)–(3) estimate the propensity to become a repeat angel among all angel investors. Column (4) does so in the subsample of early-stage angels, while Column (5) does so in the subsample of late-stage angels. An angel is defined as early stage if her first angel investment occurs in the firm in the year of its inception or one year after. An angel is defined as late stage if her first angel investment occurs in the firm when it is aged five years or older. Columns (6)–(7) estimate the propensity to become a repeat angel among small and large angel investors, respectively. An angel is defined as small if she invests less than 50 thousand NOK and as large if she invests 500 thousand NOK or more in her first angel investment.

Table 6 provides consistent evidence that the probability of an angel's making repeat investments in different HIP firms is positively correlated with successful realization of her first angel investment. The statistically significant coefficient of 0.208 in Column (1) suggests that the odds of becoming a repeat angel is 1.2 times higher for angels whose first investment is realized than for angels whose first investment is not realized. The effect of the return to the realized first investment is higher in Column (2) than when we account for untraded shares ((3) TVPI) in Column (3), confirming that the certainty of investment realization matters. The probability of repeatedly investing in HIP firms is particularly positively correlated with angel wealth, being male, the size of the first investment and board experience, and negatively correlated with investor age. The positive effect of the first realized return is more

pronounced for late-stage (Column (5)) and small (Column (6)) angels, while it does not matter for angels with deep pockets (Column (7)).

Insert Table 6 here.

Table B3 replicates Table 6 for the truncated sample of angel investors, where we include only those, who make her first investment no later than 2,591 days (around seven years) before the end of our sample period. At the same time, we define a repeat angel here as an angel who makes her repeat investment no more than 2,591 days after the first investment. 2,591 days represent the 90^{th} percentile in the distribution of days between two investments in different HIP firms in the entire sample of repeat angels as shown in Table 6. The statistically significant coefficient in Column (1) diminishes and becomes statistically insignificant, while results in Columns (2)–(7) remain the same, implying that the positive association between the successful realization of her first angel investment and the probability to invest again, is not driven by angels investing later in time during our sample period.

To disentangle the performance of the underlying asset from other characteristics and explore the drivers of repeatedly selecting successful or failing firms, we track our HIP firms from their establishment up to the end of our sample period and record whether the firm is bankrupt or liquidated (representing failure) or has been merged, acquired or had an initial public offering (representing success). Thus, the investment performance is now measured by the firm's exit outcome. In the spirit of Kaplan and Schoar (2005), we include the lagged performance of the previous investment (in a different firm) as a right-hand-side variable and run a logit estimation of the following firm-level regression model:

$$Success(Failure)_{i,j,t} = \alpha + \beta_1 Success(Failure)_{i-1} + Controls_{i,j,t} + \gamma_{i,j,t} + \theta_i + \varepsilon_{i,j,t} \qquad (3)$$

The dependent variable $Success(Failure)_{i,j,t}$ is either a dummy variable taking value one

if the firm has a successful exit event (merger, acquisition or IPO) or a dummy variable taking value one if the firm has an unsuccessful outcome (bankruptcy or liquidation). $Success_{i-1}$ ($Failure_{i-1}$) is a dummy variable taking value one if the firm in which the angel invested before has a successful (unsuccessful) exit event. We control (untabulated) for the following investor and investment characteristics: $Investor\ age_{j,t}$, $Male_j$, $High\ wealth_j$, $Investment\ amount_{i,j,t}$ and $Board\ seat_{i,j,t}$. $\gamma_{i,j,t}$ is fixed effects for the calendar year of investment. θ_i represents fixed effects for industry and firm founding and exit years. Standard errors are clustered at the firm level.

Table 7 presents the results for different angel types and investment characteristics. Panel A evaluates what predicts the selection of successful firms while Panel B does so for the selection of failed firms. Columns (1)–(4) in both panels differentiate between different angel types. In particularly, the autoregression coefficient in the subsample of board-experienced angels is significantly higher than in the subsample of board-inexperienced angels. At the same time, board-experienced angels are also likelier to repeatedly invest in successful firms than in failed firms. This result is consistent with the idea that greater sophistication increases an angel's ability to identify and avoid future failing firms. We also find a pronounced difference between high-wealth and low-wealth angels. High wealth angels are likelier to repeatedly invest in successful firms, while low-wealth are likelier to repeatedly invest in failed firms. Our results are consistent with findings in Fagereng, Guiso, Malacrino, and Pistaferri (2020) that returns to wealth are positively correlated with wealth and are persistent over time. They argue that this persistence reflects their financial sophistication, ability to process and use financial information, as well as their ability to overcome inertia.

A wider literature examining performance persistence in private equity finds that exposure to common market conditions may give rise to apparent performance persistence (see, for example, Korteweg and Sorensen, 2017). Columns (5)–(6) differentiate by the

investment timing between firms i and $i-1$. Investments close in time (Column (5)) are sequential investments made 572 days (the median time between investments in our sample) or fewer apart, while investments not close in time (Column (6)) are sequential investments made more than 572 days apart. Indeed, angels are likelier to repeatedly invest in a successful firm if they do so close in time; the autocorrelation coefficient of 0.658 is the highest for these investments. In contrast, when investments are further apart, angels are likelier to repeatedly invest in failed firms. This speaks to the notion that innovative ideas or technologies come in waves and, thus, influence the persistence in firm selection. Columns (7)–(8) confirm this notion by differentiating by the industry focus of firms i and $i-1$. Angels are likelier to repeatedly invest in successful firms if they both operate in the same industry, while opposite is true for failed firms. This indicates that angels who repeatedly invest in the same industry gain industry expertise and are less prone to repeatedly investing in failing firms.

Insert Table 7 here.

Table B4 in Appendix B provides an alternative, converse-conclusion, test of performance persistence. Specifically, we examine potential lottery-like investment behavior of angels. The dependent variable is a dummy variable taking value one if the angel's current investment return is either between the 90^{th} and 95^{th} percentiles (Columns (1)—(3)) or above the 95^{th} percentile (Columns (4)—(6)) of the overall (3) TVPI distribution. The independent variable $Total\ loss_{t-1}$ ($Total\ loss_{t-2}$) is a dummy variable taking value one if the first (second) lagged angel investment in a different firm by the same angel investor is a total loss. The coefficients in Columns (1)–(3) are negative and speak against the idea that angels generate high returns through gambling with risky bets that result in total losses. However, this is the case when they select lottery-like investments and chase extreme returns above the 95^{th} percentile (Columns (4)-(6)). These results confirm that there is indeed some sort of persistence in returns to angel investing up to the 95^{th} percentile.

5 Why Are Some Angels Better than Others?

5.1 Do Better Angels Hit More Home Runs?

Why do some angels earn higher returns than others? To explore this question, we first examine whether the performance differential arises from investors avoiding low-performing investments or instead from their successfully seeking out high-performing investments. To do so, we construct a measure of angel performance that is more closely tied to individual investor traits. This measure is based on the investor-specific conditional mean return from angel investments, which we obtain by recovering angel investor fixed effects from the regression in Equation 1 and as shown in Table 5 Column (3). Based on this measure, we group angel investors into performance quintiles, with the highest quintile representing the best-performing angel investors. Table 8 reports logit estimates from a regression model similar to Equation 1. The dependent variable is a dummy variable taking value one if (3) TVPI is within the stated percentile interval of the overall return distribution. $Angel\ fixed\ effect$ is our investor-specific conditional mean return. We control (untabulated) for all time-variant investor and all investment characteristics as described in Table 5. Standard errors are clustered at the firm level.

Columns (1) and (2) reveal that the estimation coefficients are lower for angels in the top quintile than for angels in the second, third and fourth quintiles, implying that better angels are no likelier than less well-performing investors to earn above-median returns. In contrast, Columns (5)–(8) demonstrate that high-performing angels are much likelier than other investors to achieve 90^{th} or 95^{th} percentile investment outcomes. The third-quintile angels have 60 times higher odds of having an investment outcome in the top 5% than first- and second-quintile angels, while angels in the top quintile have over 5,000 times higher odds of doing so. These results are robust to the inclusion of controls and fixed effects.

Insert Table 8 here.

Previous literature shows that selection of the most promising firms is an important driver of VC portfolio firm success (e.g., Sorensen, 2007). An alternative test to explore why some angels earn higher returns is to examine whether better angels tend to invest in firms that are also selected by VC investors (Hellmann and Thiele, 2015; Hellmann, Schure, and Vo, 2021). To do so, we estimate the following regression model by OLS:

$$\begin{aligned} VC\ Financing_{i,j,t} = \alpha + \beta_1 Angel\ equity\ amount_{i,j} + \beta_2 Angel\ fixed\ effect_j \\ + \gamma_{i,j,t} + \theta_i + \varepsilon_{i,j,t} \end{aligned} \tag{4}$$

The dependent variable $VC\ Financing$ is (a) a dummy variable taking value one if a VC investor invests through a financing round or secondary trades in the same firm as the angel investor at some point in time, (b) the natural logarithm of the total VC equity invested, conditional on receipt of VC financing, (c) a dummy variable taking value one if a VC investor invests after the angel investor first invested in the firm, or (d) the natural logarithm of the VC equity provided after the angel investor first invested in the firm. $Angel\ equity\ amount_{i,j}$ is the natural logarithm of the total equity amount provided by the respective angel investor to the firm. $Angel\ fixed\ effect_j$ is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1 as shown in Table 5 Column (3). The highest quintile represents the best-performing angel investors. γ_t is fixed effects for the investment calendar year. θ_i is fixed effects for firm founding year and industry. Fixed effects are accounting for the fact that deals made later in our sample period have less time to attract follow-on VC funding. Standard errors are clustered at the firm level.

The results in Table 9 confirm that better angels are much likelier to invest in firms

that raise VC funding. Consistently across all columns, more angel equity invested is associated with higher contemporaneous and future VC equity amounts. The logit estimates in Columns (1) and (3) imply that top quintile angels have 1.6–1.8 times higher odds of investing in VC-backed firms than their counterparts in the lowest quintile. At the same time, Columns (2) and (4) provide evidence that, conditional on a firm's receiving VC funding, the provided VC equity amount is unrelated to angel performance. Our data do not allow us to go one step further and to determine whether the positive association with the follow-up VC finacing arises because better angels *pick* better firms or whether they *create* better firms.

Insert Table 9 here.

Overall, our findings provide evidence that better angels do not earn higher returns by avoiding left-tail realizations as much as they do by achieving extreme right-tail outcomes. To use a baseball metaphor, it is not that high-performing angels hit singles and doubles instead of striking out; instead, they are likelier than lower-performing investors to hit home runs.

5.2 Deal Flow vs. Selection

While our data do not allow us to determine whether better angels *pick* better firms or whether they *create* better firms, we can contrast better deal flow through network with better selection ability as potential channels. On the one hand, not all startup investment opportunities are generally available to all investors, implying that some angels might perform better because they face a better proprietary deal flow through their network. On the other hand, some angel investors may outperform others because they simply have better skills in selecting investments (Bach, Baghai, Strömberg, and Warg, 2022).

In an attempt to grasp angel's deal flow, we explore her co-investments with other angels. A co-investment is defined as investing in the same firm in the same year as another angel investor. Figure 6 provides descriptive evidence on the repeat angels' co-investments in our sample of HIP firms. Only 6% of repeat angels do not co-invest with other angels, while a quarter of repeat angels co-invest at least once with a VC investor.[12] This illustrates that co-investing with other angels is an important tendency among repeat angels. This gives rise to the question whether better angels prefer to co-invest with the same group of angels, who has a privileged access to high-quality deals.

Insert Figure 6 here.

To explore the relationship between the angel's performance and how concentrated are her co-investments with other angel investors, we estimate the following regression model by OLS:

$$\begin{aligned} Co-investor\ concentration_j = \alpha + \beta_1 Angel\ fixed\ effect_j + \beta_2 Average\ investment\ amount_j \\ + \beta_3 \sum Co-investments_j + \beta_4 Portfolio\ size_j + \\ \beta_5 Industry\ concentration_j + \gamma_j + \varepsilon_j \end{aligned} \tag{5}$$

The dependent variable $Co-investor\ concentration_j$ is measured as the maximum of the deal fraction of (number of) co-investments made by angel j with another angel k during our sample period; $max(co-investments_{j,k}\ /\ \sum co-investments_j)$. $Angel\ fixed\ effect_j$ is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table 5 Column (3). The highest quintile represents

[12] In contrast, 23% of single-firm angels do not co-invest with other angels, and only 8% of single-firm angels co-invest at least once with a VC investor, as shown in Figure B1.

the best-performing angel investors. $Average\ investment\ amount_j$ is the natural logarithm of the angel investor's average investment amount. $\sum Co-investments$ is the natural logarithm of the angel's total number of co-investments with other angel investors during our sample period. $Portfolio\ size_j$ is the natural logarithm of the total number of HIP firms in which the angel investor has invested. $Industry\ concentration_j$ is a Herfindahl–Hirschman index (HHI) based measure of the industry concentration within the angel's portfolio of investments. For angels investing in one industry only, the industry concentration is 1 (100%). γ_j is fixed effects for the year of the investor's first angel investment.

Table 10 provides evidence that better angels prefer less concentrated co-investments with other angel investors. Columns (1)–(2) include all angel investors, while Columns (3)–(6) examine the subsamples of different angel investor types (*Early-Stage*, *Late-Stage*, *Small*, *Large*), as defined in Table 6. We observe a continuously negative relationship between angel performance and their co-investor concentration measure. The top-quintile angels have a 8.4% lower co-investor concentration compared to the bottom-quintile angels, i.e. better angels are characterized by having a more dispersed number of angel co-investors. Since better angels do not invest alongside the same co-investors to the same extent as worse-performing angels, this speaks against the network channel that better angels have privileged access to high-quality deals.

Insert Table 10 here.

To investigate angel investors' deal selection ability, we turn to the public market, a liquid market that every investor has access to at low cost and where investors share the same set of investment opportunities. Furthermore, because individual investors acquiring a small share of a public company are unlikely to be able to affect the firm itself, a finding of better public investment performance among better angels aligns with the interpretation

that these investors have a higher ability to screen and select firms. For this exercise, we estimate the following regression model by OLS:

$$\begin{aligned} R_{i,j,t,s} = \alpha &+ \beta_1 Angel\ fixed\ effect_j + \beta_2 Repeat\ angel_j + \beta_3 Board\ experienced\ angel_j \\ &+ \beta_4 Angel\ fixed\ effect_j \times Repeat\ angel_j \\ &+ \beta_5 Angel\ fixed\ effect_j \times Board\ experienced\ angel_j \\ &+ \beta_6 Angel's\ industry_{i,j} + Controls_{i,j,t,s} + \gamma_{t,s} + \theta_i + \varepsilon_{i,j,t,s} \end{aligned} \tag{6}$$

The dependent variable $R_{i,j,t,s}$ is the market-adjusted daily return earned by angel investor j in a public stock i in the time period t to s.[13] For unrealized investments, we calculate paper gains with the realization date being the latest observable date with a quoted stock price.[14] The dependent variable is winsorized at the 1^{th} and 99^{th} percentiles. $Angel\ fixed\ effect_j$ is a continuous investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table 5 Column (3). $Repeat\ angel_j$ is a dummy variable taking value one if an angel invests in several HIP firms. $Board\ experienced\ angel_j$ is a dummy variable taking value one if the angel investor holds a board seat in any other firm by the time of her first angel investment.[15] $Angel\ fixed\ effect_j \times Repeat\ angel_j$ and $Angel\ fixed\ effect_j \times Board\ experienced\ angel_j$ is their interaction effect. $Angel's\ industry$ is a dummy variable taking value one for public investments in the same industry as the angel's predominant angel investment industry. We define the predominant industry as the industry in which the angel has in-

[13] We use the Oslo Børs Benchmark Index (OSEBX) as the market return; `https://live.euronext.com/en/markets/oslo/equities-by-index/osebx`.

[14] Approximately 6% of angel investors' public investments remain unrealized by the end of our sample period.

[15] The shares of public stock investments in the sample made by repeat angels and board-experienced angels are approximately 59% and 87%, respectively.

vested most and employ a broad, 10-industry classification. We control (untabulated) for the following investor and investment characteristics: $Investor\ age_{j,t}$, $Male_j$, $High\ wealth_j$, $Investment\ amount_{i,j,t}$ and $Holding\ period_{i,j,t,s}$. $\gamma_{t,s}$ represents fixed effects for the purchase and realization calendar year. θ_i is industry fixed effects. Standard errors are clustered at the firm level.

Table 11 reports the results. Columns (1)–(3) comprise all public stock investments made by angel investors over our sample period. Columns (4)–(6) restrict the sample to public stock investments made prior to the investor's first angel investment. Columns (7)–(9) further narrow down to the subsample of public stock investments made prior to the investor's first angel investment and in the predominant industry of the angel's subsequent investments in HIP firms. The results in Table 11 suggest that better angels have higher market-adjusted returns in their public market portfolios. While the continuous measure of performance in the angel market is not statistically significantly related to public investment returns in Columns (1)—-(6), we observe a statistically significant positive association in Column (7), which implies that the performance differentials in public markets are highest for investments in the same industries as those of the angel investments. A one-standard-deviation increase in the investor-specific conditional mean market-adjusted return from angel investments is associated with a 5.6-basis-point higher daily return, which corresponds to a 22.8% annual return.[16] This result speaks to industry specialization as a potential factor behind the better selection ability of better angels. The positive and statistically significant coefficient of the dummy variable $Angel's\ industry$ in Columns (1)–(6) supports this explanation.

Insert Table 11 here.

[16]The standard deviation of $Angel\ fixed\ effect$ across angel investors is 0.73. The effect of 5.6 basis points is calculated as 0.73×0.077 and corresponds to 0.056%. The annualized return of 22.8% is calculated as $(1 + 0.00056)^{365} - 1) \times 100$.

Repeat angels also do better in the public market with daily market-adjusted returns that are on average 6.1–10.7 basis points higher than those of single-firm angels. Column (8) reveals that the pooled association between angel and public performance is driven by this angel type, whose one-standard-deviation increase in angel performance is associated with 9.9-basis-point higher daily return, which corresponds to a 43.6% annual return.[17]

Relative to single-firm angels, board-experienced angels earn daily market-adjusted returns on average 1.6 basis points higher, albeit only after they become involved in the angel market; the coefficient in Column (6) becomes zero and even turns negative, though statistically insignificant, in Column (9), implying that prior to making angel investments, angels of this type perform similarly in the public market to single-firm angels. The interaction terms remain insignificant throughout all specifications.

The analyses in Table 11 do not account for the angels' risk appetite in the public market. Better angels might have higher average market-adjusted returns because they exhibit riskier investment behavior. Thus, we compute investment-level Sharpe ratios as follows:

$$Sharpe\ ratio_{i,j,s,t} = \frac{(R_{i,j,s,t} - Rf_{s,t})}{\sigma(R_{i,s,t})} \tag{7}$$

$R_{i,j,s,t}$ denotes the daily return earned by investor j on an investment in stock i, $Rf_{s,t}$ is the average daily risk-free (3-month Norwegian government bill) rate, and $\sigma(R_{i,s,t})$ is the standard deviation of the daily return of stock i, all measured over each investment's holding period from t to s. The risk-adjusted estimates presented in Table 12 confirm our results.[18] The now statistically significant positive coefficient of 0.008 in Column (1) implies that a one-standard-deviation increase in the investor-specific conditional mean return from angel

[17]The standard deviation of *Angel fixed effect* across angel investors is 0.73. The effect of 9.9 basis points is calculated as 0.73×0.136 and corresponds to 0.099%. The annualized return of 43.6% is calculated as $(1 + 0.00099)^{365} - 1) \times 100$.

[18]The number of observations drops because of investments realized on the same day, for which we cannot measure the daily standard deviation.

investments is associated with a 7.5% increase in the daily investment Sharpe ratio over the mean.[19] The effect increases in magnitude in the sample of pre-angel investments in the predominant angel industry up to 18.8% (Column (7)).

While repeat angels on average still have higher risk-adjusted returns than single-firm angels, we find on average a negative relationship, albeit small in magnitude, between repeat angels' angel and public investment performances, driven by their pre-angel public investments in industries not predominant among their angel investments. In addition, our results reveal that once we adjust for their risk appetite, board-experienced angels earn the lowest returns in the public market, implying that they take more risk to generate returns just as high as those earned by single-firm angels. Board-experienced angels also exhibit the highest negative relationship between their angel and pre-angel public performance, which is, however, also driven by investments in non-predominant angel industries. These results confirm the importance of industry expertise.

Insert Table 12 here.

Overall, our results run counter to explanation emphasizing pure access to deal flow, since differential access to investment opportunities cannot be a factor in publicly traded stock selection. The performance differentials in public markets are highest for investments in the same industries as those of the angel investments; this suggests that industry-specific knowledge mixed with deal-selection skill is important for explaining the performance differences across angel investors.

[19]The standard deviation of *Angel fixed effect* across angel investors is 0.73. The effect is calculated as $0.73 \times 0.008 = 0.006$, corresponding to 7.5% of the mean Sharpe ratio, which has a mean and standard deviation of 0.08 and 0.83, respectively.

6 Conclusion

The better angels that echo through English literature, from Shakespeare's *Othello* to the writings of Abraham Lincoln, are of course references to the better temperaments of the human spirit. Nevertheless, applied to early-stage investing in innovative startups, the phrase encourages us to ask whether some angel investors possess traits that make them perform systematically better than others.

This question would be impossible to answer without highly detailed investment-level time-series data linked back to individual investors in private companies. We assemble such data from Norwegian equity transaction records to measure the performance of angel investors, to compare different types of angels, and to ask, ultimately, whether variation across investors is important for understanding this segment of the capital market and what factors drive it.

We find that there are indeed better angels among us in the early-stage capital market. Investor fixed effects absorb approximately one-third of the total variation in returns, indicating that persistent individual differences are critical for understanding this market. Concomitantly, angel investors exhibit a form of performance persistence: Namely, the returns on the previous angel investment and the success or failure of the last firm the angel invested in strongly predict the performance in the current investment and success or failure of the current firm.

One explanation for this is that some angel investors have access to better deal flows than others such that, even if they choose randomly, they are choosing from a set of potential investments with better ex ante returns than those associated with the deals available to other investors. We do not find evidence supporting this channel. Another explanation is that some angel investors possess better due diligence skills such that they are pickier than others even though all investors face more or less the same ex ante distribution of investments.

Our evidence suggests that industry-specific knowledge mixed with deal-selection skill is important for explaining performance differences across angel investors.

Our results that both in terms of being able to do sequential successful investments in successful firms and that public investments in the same industry as the angel investments predicts higher angel investment returns, further support the impression of the specific deal selection skills of the best performing angel investors, and that this also comes from an industry focus.

Our work also connects entrepreneurship and household finance. We are the first to link the performance in angel investments to performance in other investments, which helps orient the angel investment decision in the broader context of an individual's personal portfolio optimization problem.

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Figure 1: **In How Many Firms Do Angels Invest?**

Figure 1 presents the distribution of angels' portfolio size during our sample period (2003–2018).

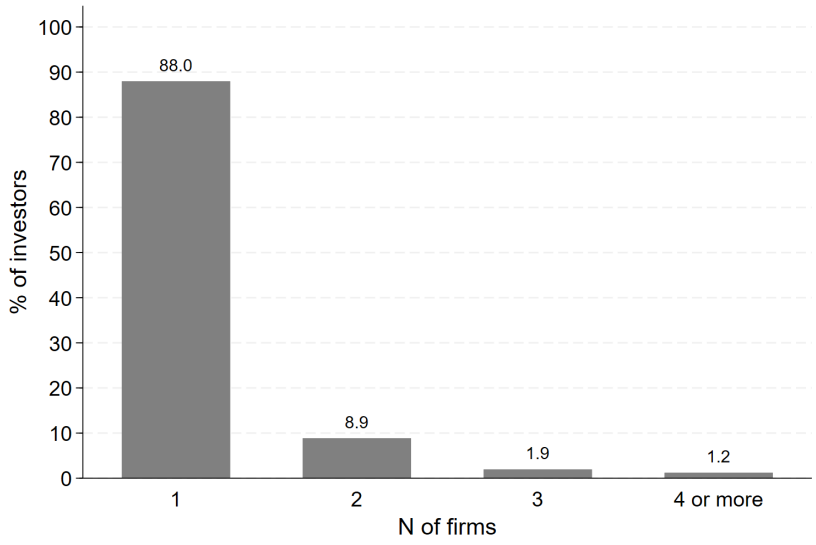

Figure 2: **Distribution of Angel Investment Returns**

Figure 2 presents the distribution of returns to angel investment, by definition in high-innovation-potential (HIP) firms, over our sample period (2003–2018). We measure returns as the *total value to paid-in capital (TVPI)*. We calculate TVPI as the realization amount (through sales or liquidation) divided by the purchase amount of the realized shares, (1) TVPI. For (2) TVPI, we additionally assume that if a firm does not report revenues in the time period of five consecutive years after the year of angel investment, the implied TVPI is zero. For (3) TVPI, we compute for all residual (unrealized) investments the untraded value of shares based on the most recent price observed in the latest financing round. This implies that (3) TVPI includes all angel investments. For investments with multiple outcomes (e.g., partially realized, partially unrealized), TVPI is weighted by the purchase amount of the shares of the respective outcomes.

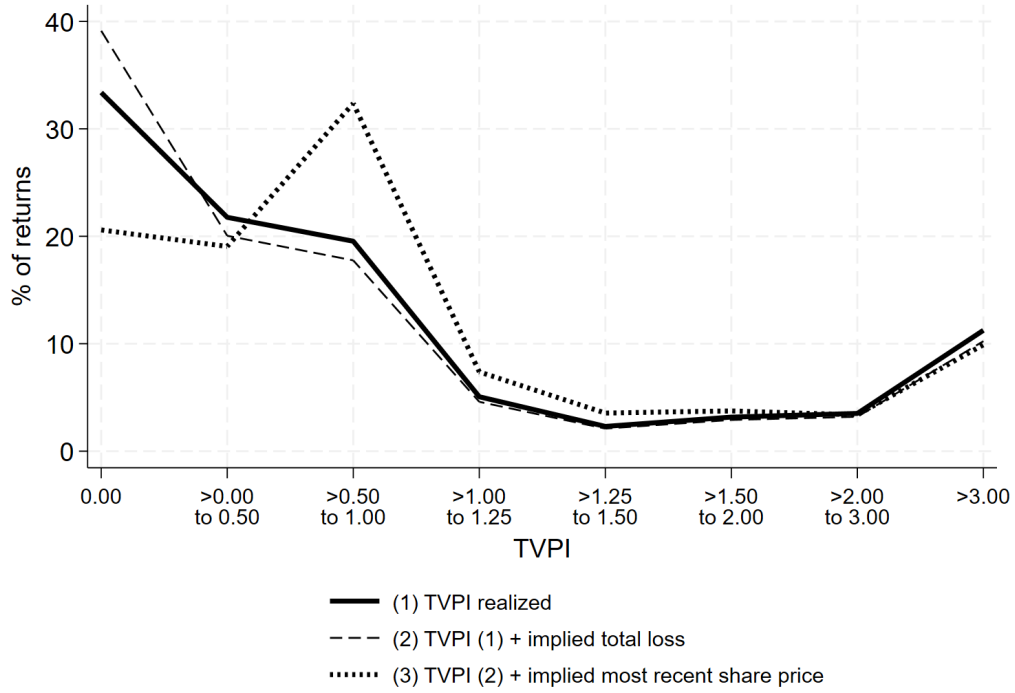

Figure 3: **Distribution of Angel Returns by Investment Size**

Figure 3 presents the distribution of returns, measured as (3) TVPI, by investment amount quartile. Size quartiles are defined as follows: less than 23 thousand Norwegian kroner (NOK) (4 thousand USD)=quartile 1, 23–54 thousand NOK (4–8 thousand USD)=quartile 2, 54–179 thousand NOK (8–27 thousand USD)=quartile 3, and more than 179 thousand NOK (27 thousand USD)=quartile 4. Amounts in USD are based on an exchange rate of 6.6 NOK per US dollar, the average daily interbank market midquote rate reported by Norges Bank over our sample period. We calculate TVPI as the realization amount (through sales or liquidation) divided by the purchase amount of the realized shares. In addition, we assume that if a firm does not report revenues in the time period of five consecutive years after the year of angel investment, the implied TVPI is zero. Finally, we compute for all residual (unrealized) investments the untraded value of shares based on the most recent price observed in the latest financing round. For investments with multiple outcomes, (e.g., partially realized, partially unrealized), TVPI is weighted by the purchase amount of the shares of the respective outcomes.

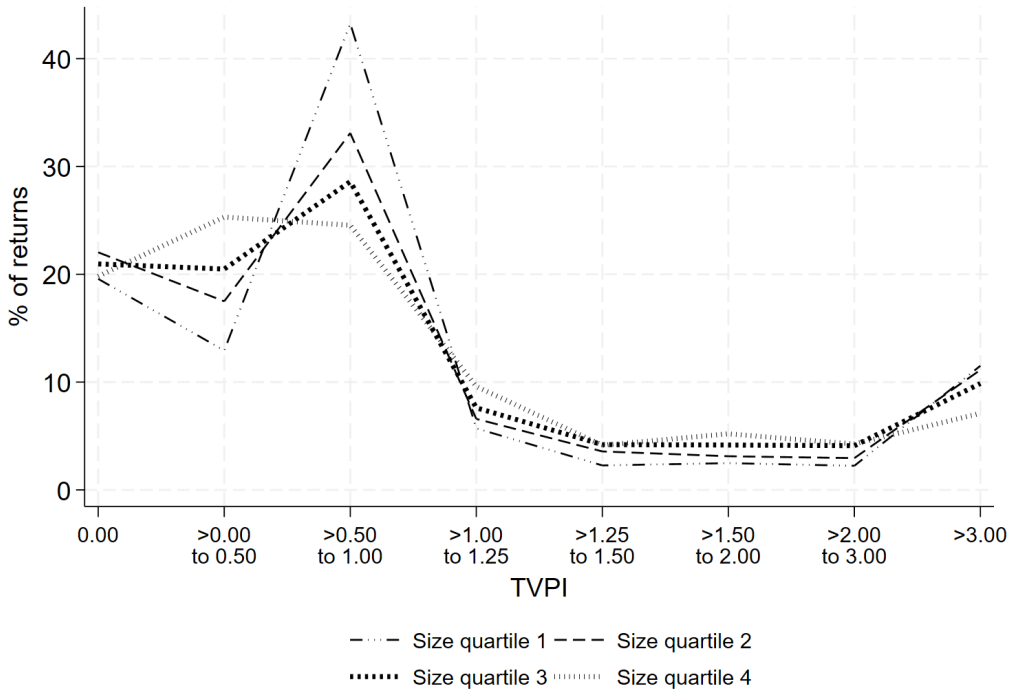

Figure 4: **Share of Angels Investing Repeatedly**

Figure 4 presents the distribution of the share of repeat angels among all angel investors by the calendar year of their first angel investment. A repeat angel is defined as an angel who invests in several HIP firms.

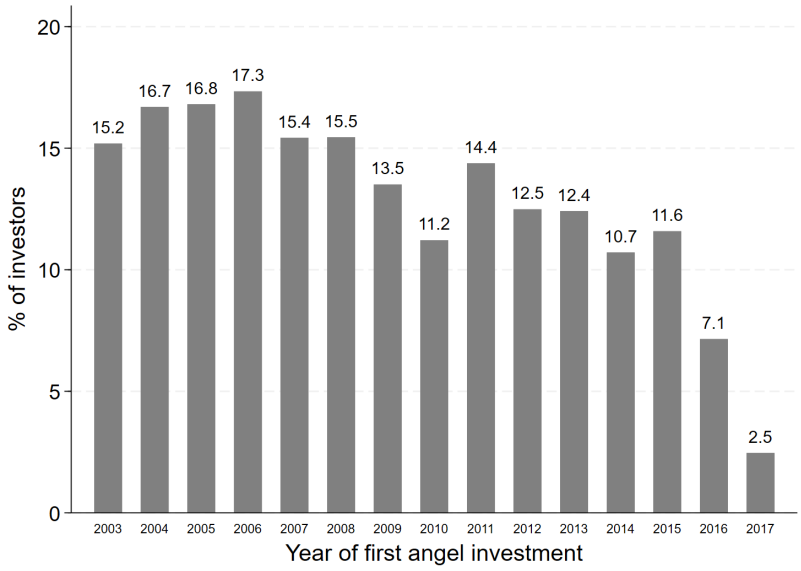

Figure 5: **In How Many Firms Do Repeat Angels Invest?**

Figure 5 replicates Figure 1 for repeat angels only. A repeat angel is defined as an angel who invests in several HIP firms. Panel A is based on all investments, while Panel B is based on the subsample of investments that are realized (through sale or liquidation of shares) by the end of the sample period.

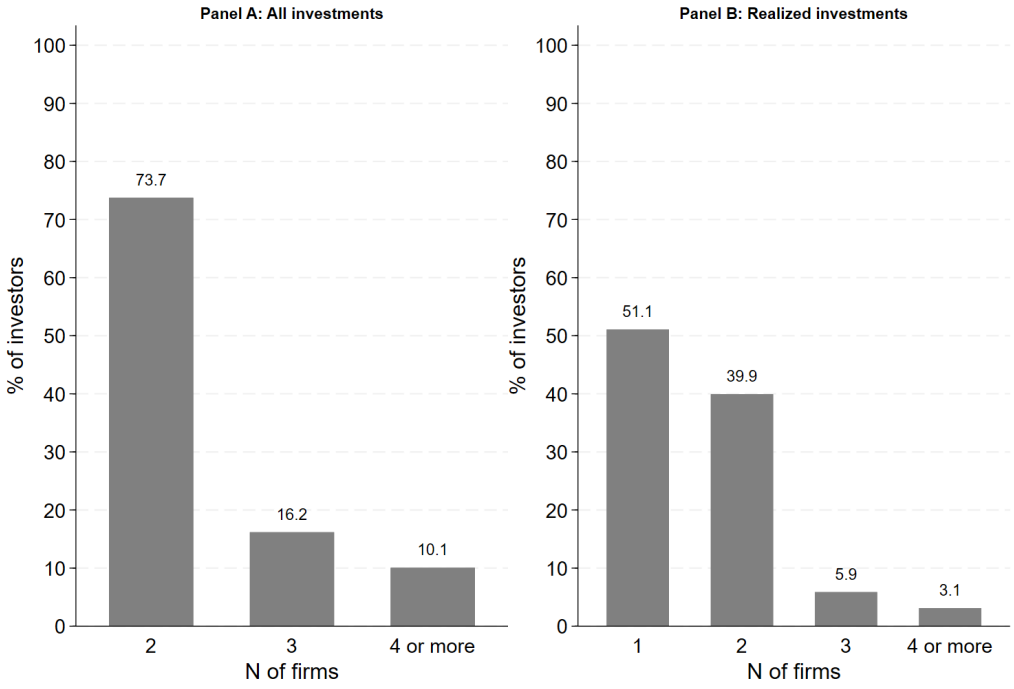

Figure 6: **Co-investments of Repeat Angels**

Figure 6 presents the distribution of the co-investments of repeat angel investors with other angel investors (Panel A) and with venture capital (VC) investors (Panel B). A co-investment with another angel investor (VC investor) is defined as an investment made in the same firm in the same year as another angel investor (VC investor). Figure B1 in Appendix B provides an overview of co-investments of single-firm angel investors.

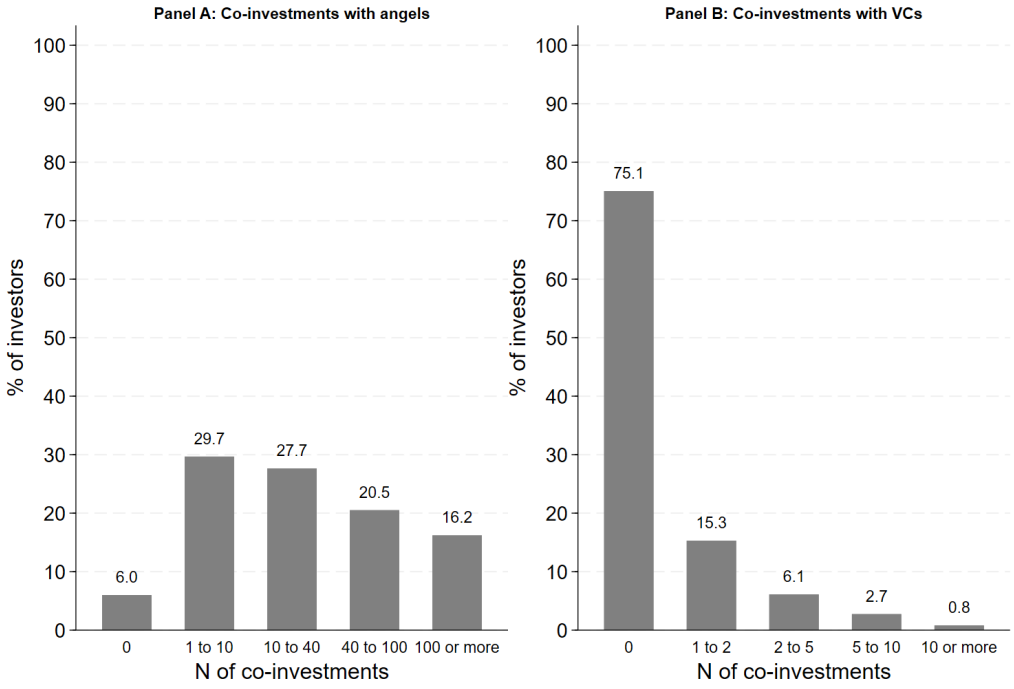

Table 1: Description of Sample Firms

Table 1 reports descriptive statistics of the sample of 14,376 HIP firms that receive angel investments. A HIP firm is a newly established firm (neither a holding nor a subsidiary) and does not operate in financial services or real estate and not in an industry which is not considered as innovative. In addition, it satisfies at least one of the following criteria: English-language name, location near the largest university cities, and having at least one geographically distant board member. All amounts are in million NOK (1 USD is approximately 6.6 NOK over our sample period, based on the average daily interbank market midquotes reported by Norges Bank).

	N	mean	sd	skew.	p10	p25	p50	p75	p90	p95	p99
N of angels per firm	14,376	3.0	8.7	17.6	1.0	1.0	1.0	2.0	5.0	9.0	32.0
Firm characteristics in the year of angel investment											
Firm age	20,697	1.2	2.2	2.2	0.0	0.0	0.0	2.0	4.0	6.0	10.0
N of employees	13,532	4.4	14.3	14.2	0.0	0.0	1.0	4.0	10.0	18.0	52.0
Total assets (TA)	17,752	26.28	197.90	27.37	0.06	0.20	0.89	4.21	20.99	66.89	617.00
Revenues/TA	17,752	132.0%	7.53	67.19	0.0%	0.0%	46.8%	158.5%	288.9%	408.1%	952.6%
Net income/TA	17,752	-142.8%	29.08	-51.73	-116.5%	-36.0%	-4.6%	5.5%	25.6%	38.7%	61.4%
Bank loans/TA	17,752	15.5%	5.20	106.7	0.0%	0.0%	0.0%	0.0%	29.2%	54.8%	103.0%
Equity ratio	17,752	-26.8%	14.64	-49.00	-25.3%	10.8%	38.5%	77.2%	98.0%	100.0%	100.0%
Convertible loans/TA	17,752	4.4%	2.43	119.70	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.4%
Cash/TA	17,752	39.3%	0.38	8.38	1.1%	7.3%	29.8%	66.8%	100.0%	100.0%	100.0%
Intangible assets/TA	17,752	9.8%	0.26	20.73	0.0%	0.0%	0.0%	4.8%	41.6%	64.9%	89.3%
Firm status as of end of our sample period											
Independently operating	14,376	59.9%									
Bankruptcy/liquidation	14,376	26.0%									
M&A	14,376	13.9%									
IPO	14,376	0.2%									
Firm age at first exit event	14,376	5.2	3.6	0.8	1.0	2.0	4.0	7.0	11.0	13.0	14.0

Table 2: Description of Angel Investors

Table 2 reports descriptive statistics of of 36,749 angel investors in HIP firms. All amounts are in million NOK (1 USD is approximately 6.6 NOK over our sample period, based on the average daily interbank market midquotes reported by Norges Bank). Gross wealth represents taxable gross wealth after tax-related value discounts but before any debt deduction. Gross wealth and labor income data are available for 2011 onward and are expressed in 2015 values based on the consumer price index, adjusted for changes to duties and excluding energy goods, published by the statistical agency of Norway (SSB). We calculate *total value to paid-in capital (TVPI)* as the realization amount (through sales or liquidation) divided by the purchase amount of the realized shares. *Buy-and-hold annualized returns (BHAR)* are the annualized TVPI returns. *Public market equivalent (PME)* is TVPI adjusted by the Oslo Børs Benchmark Index (OSEBX) on each cashflow date. Investment returns are weighted average returns (by purchase amount of realized shares) of each angel investor.

	N	mean	sd	skew.	p10	p25	p50	p75	p90	p95	p99
Angel investors' portfolio characteristics											
N of portfolio firms	36,749	1.2	0.6	7.6	1.0	1.0	1.0	1.0	2.0	2.0	4.0
N of investments	36,749	1.8	2.0	7.5	1.0	1.0	1.0	2.0	3.0	5.0	10.0
% realized investments	36,749	50.2%	47.9%	-0.9%	0.0%	0.0%	50.0%	100.0%	100.0%	100.0%	100.0%
Angel characteristics in the year of her first angel investment											
Male	36,749	83.0%									
Investor age	36,749	43.9	12.4	0.4	28.0	34.0	43.0	52.0	61.0	66.0	75.0
Gross wealth	20,436	6.85	68.17	55.99	0.19	0.67	1.40	3.52	9.69	19.67	79.45
Annual labor income	20,436	0.97	3.45	23.48	0.10	0.31	0.54	0.92	1.72	2.88	8.89
Realized portfolio return											
TVPI angel investments	20,246	2.31	7.26	5.36	0.00	0.00	0.50	1.05	3.98	10.05	52.67
BHAR angel investments	20,246	100%	10.13	8.46	-100%	-100%	-30%	1%	66%	177%	9,340%
PME angel investments	20,246	1.76	5.39	5.38	0.00	0.00	0.40	0.99	3.01	7.18	39.13
TVPI non-HIP investments	1,920	2.64	8.67	5.82	0.00	0.00	0.57	1.14	4.73	11.68	66.70
TVPI public investments	13,483	3.71	13.22	6.60	0.60	0.93	1.04	1.39	3.44	10.13	108.30

Table 3: Returns to Angel Investment

Table 3 reports the distribution of returns to angel investment over our sample period (2003–2018). We measure returns as the TVPI. We calculate TVPI as the realization amount (through sales or liquidation) divided by the purchase amount of the realized shares, (1) TVPI. For (2) TVPI, we additionally assume that if a firm does not report revenues in the time period of five consecutive years after the year of angel investment, the implied TVPI is zero. For (3) TVPI, we compute for all residual (unrealized) investments the untraded value of shares based on the most recent price observed in the latest financing round. This implies that (3) TVPI includes all angel investments. For investments with multiple outcomes (e.g., partially realized, partially unrealized), TVPI is weighted by the purchase amount of the shares of the respective outcomes. Panel A reports the distributions of the three measures of TVPI based on all investments in HIP firms. Panels B considers only HIP investments in financing rounds and Panel C only HIP investments in secondary trades. TVPIs are winsorized at the 1^{th} and 99^{th} percentiles within the samples of HIP and non-HIP firm investments.

		N per	TVPI										Total
	N	Angel	mean	sd	skew.	p10	p25	p50	p75	p90	p95	p99	Loss
Panel A: Angel Investments in HIP Firms													
(1) TVPI realized	36,525	1.6	2.16	7.12	5.59	0.00	0.00	0.23	1.00	3.62	9.15	53.21	33.4%
(2) (1) TVPI + implied total loss	39,976	1.6	1.93	6.57	5.74	0.00	0.00	0.04	1.00	3.11	8.04	50.00	39.1%
(3) (2) TVPI + implied most recent share price	75,290	1.7	2.32	8.02	6.50	0.00	0.01	1.00	1.05	3.00	7.68	65.81	20.6%
Holding period (days)	75,290		1,725	1,282	1.00	433	719	1,333	2,445	3,798	4,392	5,261	
Panel B: Angel HIP Investments in Financing Rounds													
(1) TVPI realized	31,741	1.4	2.18	7.18	5.55	0.00	0.00	0.26	1.00	3.64	9.32	53.21	34.1%
(2) (1) TVPI + implied total loss	34,926	1.4	1.94	6.60	5.72	0.00	0.00	0.05	1.00	3.05	7.89	50.00	40.1%
(3) (2) TVPI + implied most recent share price	65,891	1.6	2.28	7.89	6.60	0.00	0.00	1.00	1.02	2.93	7.19	62.50	21.1%
Holding period (days)	65,891		1,732	1,300	1.01	438	713	1,326	2,464	3,862	4,451	5,290	
Panel C: Angel HIP Investments in Secondary Trades													
(1) TVPI realized	4,784	5.4	2.04	6.72	5.87	0.00	0.00	0.08	1.11	3.56	9.00	52.68	28.8%
(2) (1) TVPI + implied total loss	5,050	5.2	1.90	6.32	5.86	0.00	0.00	0.02	1.06	3.18	8.33	50.00	32.5%
(3) (2) TVPI + implied most recent share price	9,399	6.2	2.61	8.87	5.89	0.00	0.01	0.61	1.28	3.56	9.64	65.81	17.3%
Holding period (days)	9,399		1,673	1,153	0.84	410	752	1,389	2,381	3,366	4,017	4,812	

Table 4: Distribution of Returns by Angel Type

Table 4 replicates Table 3 and reports the distribution of returns to angel investments in HIP firms for different angel investor types. Family angels are individual investors who have the same last name as the firm founders. We differentiate between angels who invest in only one HIP firm (single-firm angels) and those who invest in two or more different HIP firms over our sample period (repeat angels). We also identify board-experienced angels; these are investors who at the time of their first angel investment hold a board seat in any other firm. Wealthy angels are individual investors who are above the 90^{th} percentile in the investor wealth distribution over 2011–2018 (the period for which wealth data are available). TVPIs are winsorized at the 1^{th} and 99^{th} percentiles.

		N per	TVPI										Total
	N	Angel	mean	sd	skew.	p10	p25	p50	p75	p90	p95	p99	Loss
Family angels													
(1) TVPI realized	3,720	1.2	1.63	6.30	6.64	0.00	0.00	0.00	1.00	2.06	5.65	45.45	44.4%
(2) (1) TVPI + implied total loss	4,262	1.2	1.39	5.67	6.96	0.00	0.00	0.00	0.94	1.82	4.88	36.94	51.5%
(3) (2) TVPI + implied most recent share price	8,715	1.2	1.76	6.81	8.03	0.00	0.00	1.00	1.00	1.50	4.00	44.95	25.0%
Board-experienced angels													
(1) TVPI realized	20,948	1.7	2.14	7.21	5.62	0.00	0.00	0.24	1.00	3.23	8.70	53.21	32.8%
(2) (1) TVPI + implied total loss	22,856	1.7	1.92	6.67	5.76	0.00	0.00	0.07	1.00	2.85	7.56	50.00	38.5%
(3) (2) TVPI + implied most recent share price	42,659	2.0	2.34	8.11	6.44	0.00	0.01	0.98	1.10	3.00	7.72	65.81	20.4%
Wealthy angels													
(1) TVPI realized	5,000	2.3	2.19	7.98	5.32	0.00	0.00	0.05	1.00	2.69	7.45	53.21	37.3%
(2) (1) TVPI + implied total loss	5,584	2.3	1.91	7.28	5.56	0.00	0.00	0.00	1.00	2.30	6.22	50.00	43.8%
(3) (2) TVPI + implied most recent share price	10,812	2.9	2.10	7.77	6.77	0.00	0.00	0.75	1.06	2.50	5.55	57.04	22.4%
Single-firm angels													
(1) TVPI realized	23,605	1.4	2.07	6.80	5.74	0.00	0.00	0.30	1.01	3.33	8.32	46.67	32.0%
(2) (1) TVPI + implied total loss	25,667	1.4	1.86	6.29	5.87	0.00	0.00	0.08	1.00	2.99	7.20	41.67	37.5%
(3) (2) TVPI + implied most recent share price	47,240	1.5	2.29	7.93	6.56	0.00	0.01	1.00	1.06	2.97	7.21	62.50	20.2%
Repeat angels													
(1) TVPI realized	9,200	2.7	2.62	8.14	4.98	0.00	0.00	0.25	1.13	5.03	12.01	53.21	32.3%
(2) (1) TVPI + implied total loss	10,047	2.7	2.35	7.52	5.10	0.00	0.00	0.08	1.02	4.25	11.36	50.00	38.1%
(3) (2) TVPI + implied most recent share price	19,335	4.4	2.64	8.70	5.92	0.00	0.01	0.97	1.25	3.86	10.00	65.81	19.6%
Repeat angels' first investments													
(1) TVPI realized	4,956	1.7	2.90	8.54	4.65	0.00	0.00	0.26	1.20	6.63	12.86	53.21	31.8%
(2) (1) TVPI + implied total loss	5,469	1.7	2.57	7.85	4.79	0.00	0.00	0.08	1.04	6.08	12.01	50.00	38.2%
(3) (2) TVPI + implied most recent share price	8,871	2.0	2.79	8.95	5.56	0.00	0.00	0.69	1.22	4.57	11.81	65.81	23.3%

Table 5: Cross-Sectional Variation in Angels' Returns

Table 5 reports OLS estimates from the regression model shown in Equation 1. The dependent variable is the natural logarithm (plus one) of the investment return calculated as (3) TVPI as described in Table 3. *Repeat angel* is a dummy variable taking value one if an angel invests in several HIP firms. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm by the time of her first angel investment. *Investor age* is the natural logarithm of the investor's age at the time of the investment. *Male* is a dummy variable taking value one for male angels. *High wealth* is a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. *Investment amount* controls for the investment (purchase) amount. *Secondary purchase* is a dummy variable taking value one if the investor buys shares in a secondary trade. *Holding period* is the natural logarithm of the holding period of the investment measured in actual days. *Board seat* is a dummy variable taking value one if the angel investor receives a board seat in the year of investment. *% of investment realized* is the fraction of the investment that is realized. *Public market return* is the return on the Oslo Børs Benchmark Index (OSEBX) over the investment period. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Angel's total N of investments	>=1	>=2	>=2	>=3	>=4	>=1
	(1)	(2)	(3)	(4)	(5)	(6)
Repeat angel (1/0)	0.061***					0.017*
	(0.023)					(0.010)
Board experienced angel (1/0)	0.006	-0.001				0.034***
	(0.013)	(0.020)				(0.007)
Investor Characteristics						
Ln (Investor age)	-0.128***	-0.205***				0.013
	(0.027)	(0.039)				(0.015)
Male (1/0)	0.033*	0.027				0.021***
	(0.019)	(0.028)				(0.007)
High wealth (1/0)	-0.026	-0.008				0.025**
	(0.020)	(0.022)				(0.011)
Investment Characteristics						
Ln (Investment amount)	-0.047***	-0.066***	-0.110***	-0.107***	-0.102***	-0.108***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.007)
Secondary purchase (1/0)	0.023	-0.013	-0.018	-0.027	-0.037	0.013
	(0.038)	(0.035)	(0.023)	(0.025)	(0.027)	(0.020)
Ln (Holding period)	-0.098***	-0.079***	0.027	0.026	0.026	0.060***
	(0.020)	(0.025)	(0.029)	(0.031)	(0.034)	(0.023)
Board seat (1/0)	0.057**	0.107***	0.110***	0.130***	0.130***	0.140***
	(0.024)	(0.026)	(0.028)	(0.029)	(0.031)	(0.013)
% of investment realized	-0.263***	-0.300***	-0.182***	-0.197***	-0.205***	-0.139***
	(0.059)	(0.075)	(0.058)	(0.061)	(0.066)	(0.044)
Public market return	-0.118**	-0.078	-0.028	-0.039	-0.038	-0.015
	(0.056)	(0.048)	(0.040)	(0.043)	(0.046)	(0.029)
Observations	66,575	42,096	42,096	29,120	22,073	59,149
Adjusted R-squared	5.4%	6.9%	43.6%	43.1%	40.4%	59.3%
Calendar year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment firm age FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	No	No	Yes	Yes	Yes	No
Firm FE	No	No	No	No	No	Yes

Table 6: Endogeneity of Repeat Investments

Table 6 reports logit estimates from the regression model shown in Equation 2. The dependent variable *Repeat angel* is a dummy variable taking value one if an angel invests in several HIP firms. Columns (1)–(3) estimate the propensity to become a repeat angel among all angel investors. Column (4) does so for the subsample of early-stage angels, while Column (5) does so for the subsample of late-stage angels. An angel is defined as early stage if her first angel investment occurs in the firm in the year of its inception or one year after. An angel is defined as late stage if her first angel investment occurs in the firm when it is aged five or older. Columns (6) and (7) estimate the propensity to become a repeat angel among small and large angel investors, respectively. An angel is defined as small if she invests less than 50 thousand NOK and as large if she invests 500 thousand NOK or more in her first angel investment. *First investment realized* is a dummy variable taking value one if the angel's first investment has been realized during the sample period. *First investment TVPI* is the return of the investor's first angel investment, measured either as (1) TVPI (Column (2)) or (3) TVPI (Column (3)). *First investment amount* controls for the total amount invested. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. *Investor age* is the natural logarithm of the investor's age at the time of her first investment. *Male* is a dummy variable taking value one for male angels. *High wealth* is a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. A fixed effect for the calendar year of the first angel investment is included in all specifications. Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Angel Investors	All	All	All	Early-Stage	Late-Stage	Small	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
First investment realized (1/0)	0.208***						
	(0.038)						
Ln (1 + first investment (1) TVPI)		0.197***		0.197***	0.531***	0.260***	-0.033
		(0.021)		(0.023)	(0.152)	(0.028)	(0.086)
Ln (1 + first investment (3) TVPI)			0.139***				
			(0.017)				
Ln (First investment amount)	0.230***	0.250***	0.239***	0.250***	0.110	0.631***	0.159***
	(0.012)	(0.016)	(0.012)	(0.018)	(0.082)	(0.081)	(0.058)
Board experienced angel (1/0)	0.586***	0.571***	0.597***	0.598***	0.714***	0.603***	0.903***
	(0.040)	(0.050)	(0.040)	(0.057)	(0.244)	(0.078)	(0.199)
Ln (Investor age)	-0.542***	-0.553***	-0.534***	-0.590***	-0.035	-0.519***	-1.104***
	(0.064)	(0.082)	(0.065)	(0.093)	(0.397)	(0.128)	(0.259)
Male (1/0)	0.563***	0.578***	0.559***	0.602***	0.050	0.701***	0.447**
	(0.055)	(0.070)	(0.055)	(0.079)	(0.260)	(0.117)	(0.200)
High wealth (1/0)	0.934***	0.900***	0.928***	0.984***	1.082***	1.075***	0.936***
	(0.046)	(0.059)	(0.046)	(0.066)	(0.308)	(0.118)	(0.130)
Observations	36,749	19,545	36,749	15,971	959	9,383	1,628
Pseudo R-squared	9.7%	8.3%	9.8%	8.8%	11.8%	7.8%	10.6%
First investment calendar year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: What Explains the Persistence in Firm Selection?

Table 7 reports OLS estimates from the regression model shown in Equation 3 by subsamples of different angel types and investment characteristics. The dependent variable $Success(Failure)_{i,j,t}$ is either a dummy variable taking value one if the firm has a successful exit event (merger, acquisition or IPO) (Panel A) or a dummy variable taking value one if the firm has an unsuccessful outcome (bankruptcy or liquidation) (Panel B). $Success_{i-1}$ ($Failure_{i-1}$) is a dummy variable taking value one if the firm in which the angel invested before has a successful (unsuccessful) exit event. Columns (1)–(4) differentiate between angel investor types as defined in Table 4. Columns (5)–(6) differentiate by the investment timing between firms i and $i-1$. Investments close in time (Column (5)) are sequential investments made 572 days (median value in our sample) or fewer apart, while investments not close in time (Column (6)) are sequential investments made more than 572 days apart. Columns (7)–(8) differentiate by the industry focus of firms i and $i-1$. Firms $i-1$ and i operate in the same industry in Column (7), while they operate in different industries in Column (8). We employ a broad, 10-industry classification here. We control (untabulated) for the following investor and investment characteristics: $Investor\ age_{j,t}$, $Male_j$, $High\ wealth_j$ (except for Columns (3)–(4)), $Investment\ amount_{i,j,t}$ and $Board\ seat_{i,j,t}$ and include calendar year, founding year and industry fixed effects in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Firm Success

	Angel Investor				Investment Timing		Industry Focus	
	Board-Experienced	Board-In-Experienced	High Wealth	Low Wealth	Close	Not close	Same	Different
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Success_{i-1}$ (1/0)	0.517***	0.205	0.630***	0.332	0.658**	0.179	0.564**	0.263
	(0.193)	(0.350)	(0.212)	(0.248)	(0.323)	(0.177)	(0.231)	(0.219)
Observations	4,994	1,347	2,087	4,233	3,176	3,167	2,571	3,554
Pseudo R-squared	40.9%	49.3%	45.1%	42.8%	47.0%	42.0%	48.7%	42.3%
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Firm Failure

	Angel Investor				Investment Timing		Industry Focus	
	Board-Experienced	Board-In-Experienced	High Wealth	Low Wealth	Close	Not close	Same	Different
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Failure_{i-1}$ (1/0)	0.371**	0.370	0.196	0.439**	0.181	0.437***	0.103	0.392**
	(0.145)	(0.310)	(0.206)	(0.170)	(0.210)	(0.169)	(0.226)	(0.177)
Observations	4,994	1,342	2,087	4,250	3,176	3,167	2,760	3,554
Pseudo R-squared	36.1%	41.3%	38.3%	36.6%	37.6%	40.1%	42.1%	34.3%
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Better Angels and the Tail of Returns

Table 8 reports logit estimates from a regression model similar to Equation 1. The dependent variable is a dummy variable taking value one if the investment return is within the stated percentile interval for the sample distribution of (3) TVPI. *Angel fixed effect* is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table 5 Column (3). The highest quintile represents the best-performing angel investors. We control (untabulated) for all time-variant investor and all investment characteristics as described in Table 5. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

(3) TVPI Percentile (1/0)	50^{th} =<p <75^{th}		75^{th} =<p <90^{th}		90^{th} =<p <95^{th}		p>= 95^{th}	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angel fixed effect								
2nd quintile	1.171***	1.317***	1.348***	1.417***	2.685***	2.998***	0.484	0.992
	(0.139)	(0.105)	(0.202)	(0.194)	(0.685)	(0.686)	(1.229)	(1.230)
3rd quintile	1.872***	1.863***	2.812***	2.816***	4.068***	4.497***	3.285***	4.094***
	(0.112)	(0.128)	(0.242)	(0.236)	(0.714)	(0.716)	(1.018)	(1.022)
4th quintile	1.889***	1.866***	3.672***	3.699***	5.163***	5.718***	4.923***	6.002***
	(0.111)	(0.127)	(0.222)	(0.220)	(0.718)	(0.720)	(1.011)	(1.013)
5th quintile	1.009***	0.956***	3.717***	3.748***	6.627***	6.986***	7.628***	8.550***
	(0.121)	(0.138)	(0.223)	(0.221)	(0.714)	(0.716)	(1.004)	(1.008)
Observations	42,096	42,096	42,096	42,096	42,096	41,938	42,096	41,912
Pseudo R-squared	5.6%	19.6%	13.3%	16.7%	20.2%	24.5%	33.1%	45.7%
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Calendar year FE	No	Yes	No	Yes	No	Yes	No	Yes
Investment firm age FE	No	Yes	No	Yes	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes

Table 9: Better Angels and VC Financing

Table 9 reports logit estimates (Columns (1) and (3)) and OLS estimates (Columns (2) and (4)) from the regression model shown in Equation 4. The dependent variable *VC Financing* in Column (1) is a dummy variable taking value one if a VC investor invests either through a financing round or through secondary trades in the same firm as the angel investor at some point in time. The dependent variable *VC Equity* in Column (2) is the natural logarithm of the total VC equity invested, conditional on receipt of VC financing. The dependent variable *Follow − on VC Financing* in Column (3) is a dummy variable taking value one if a VC investor invests after the angel investor first invested in the firm. The dependent variable *Follow − on VC Equity* in Column (4) is the natural logarithm of the VC equity provided after the angel investor first invested in the firm. *Angel equity amount* is the natural logarithm of the total equity amount provided by the respective angel investor to the firm. *Angel fixed effect* is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table 5 Column (3). The highest quintile represents the best-performing angel investors. Calendar year, founding year and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	VC Financing (1/0)	Ln (VC Equity)	Follow-on VC Financing (1/0)	Follow-on Ln (VC Equity)
	(1)	(2)	(3)	(4)
Ln (Angel equity amount)	0.250***	0.265***	0.292***	0.137***
	(0.032)	(0.047)	(0.035)	(0.045)
Angel fixed effect				
2nd quintile	-0.223*	-0.219	-0.303**	-0.005
	(0.135)	(0.212)	(0.141)	(0.210)
3rd quintile	-0.019	-0.370	-0.166	-0.218
	(0.176)	(0.290)	(0.191)	(0.274)
4th quintile	0.276	-0.258	0.101	-0.134
	(0.200)	(0.318)	(0.218)	(0.298)
5th quintile	0.570***	-0.044	0.451**	-0.069
	(0.212)	(0.320)	(0.227)	(0.325)
Observations	18,815	3,721	18,617	2,740
Pseudo/Adjusted R-squared	11.9%	21.3%	10.5%	18.2%
Fixed effects	Yes	Yes	Yes	Yes

Table 10: Do Better Angels Have the Same Co-investors?

Table 10 reports OLS estimates from the regression model shown in Equation 5. The dependent variable is the angel investor's j co-investor concentration, measured as the maximum of the deal fraction of (number of) co-investments with another angel k during our sample period; $max(co-investments_{j,k}\ /\ \sum co-investments_j)$. A co-investment is defined as investing in the same firm in the same year as another angel investor. Columns (1)–(2) include all angel investors, while Columns (3)–(6) examine subsamples of different angel investor types. An angel is defined as early stage if on average her angel investments occur in firms in the year of their inception or one year after (Column (3)). An angel is defined as late stage if her angel investments occur on average in firms aged five years or older (Column (4)). An angel is defined as small if she invests less than 50 thousand NOK (Column (5)) and as large if she invests 500 thousand NOK or more on average (Column (6)). *Angel fixed effect* is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table 5 Column (3). The highest quintile represents the best-performing angel investors. *Average investment amount* is the natural logarithm of the angel investor's average investment amount. $\sum Co-investments$ is the natural logarithm of angel's total number of co-investments with other angel investors during our sample period. *Portfolio size* is the natural logarithm of the total number of HIP firms in which the angel investor has invested. *Industry concentration* is an HHI-based measure of industry concentration within angel's portfolio of investments. For angels investing in one industry only, industry concentration is 1 (100%). Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Angel Investors	All	All	Early-stage	Late-stage	Small	Large
Angel fixed effect						
2nd quintile	-0.066***	-0.003	-0.010	0.008	-0.011	-0.042*
	(0.010)	(0.005)	(0.009)	(0.015)	(0.009)	(0.023)
3rd quintile	-0.102***	-0.011**	-0.015*	-0.003	-0.024**	-0.042*
	(0.009)	(0.005)	(0.009)	(0.016)	(0.010)	(0.023)
4th quintile	-0.121***	-0.022***	-0.027***	-0.026*	-0.023**	-0.028
	(0.009)	(0.005)	(0.009)	(0.015)	(0.009)	(0.023)
5th quintile	-0.084***	-0.043***	-0.052***	-0.045***	-0.040***	-0.062***
	(0.009)	(0.005)	(0.008)	(0.016)	(0.009)	(0.023)
Ln (Average investment amount)		0.001				
		(0.001)				
Ln ($\sum$ Co-investments)		-0.162***	-0.178***	-0.124***	-0.189***	-0.137***
		(0.001)	(0.002)	(0.004)	(0.002)	(0.004)
Ln (Portfolio size)		0.022***	0.027***	0.013	-0.005	0.023***
		(0.004)	(0.008)	(0.012)	(0.010)	(0.009)
Industry concentration		-0.003	0.000	-0.047	-0.005	0.036
		(0.012)	(0.019)	(0.031)	(0.026)	(0.024)
Observations	11,187	11,187	4,259	1,561	3,071	1,563
Adjusted R-squared	2.0%	69.4%	71.1%	62.0%	75.1%	63.6%
First angel investment year FE	No	Yes	Yes	Yes	Yes	Yes

Table 11: Do Better Angels Do Better in the Public Market?

Table 11 reports OLS estimates from the regression model shown in Equation 6. The dependent variable is the market-adjusted daily return from investments in the domestic public stock market, which is computed as the daily stock return over the angel investor's investment period less the daily return of the Oslo Børs Benchmark Index (OSEBX) over the same period. For unrealized investments, we calculate paper gains with the realization date being the latest observable date with a quoted stock price. The dependent variable is winsorized at the 1^{th} and 99^{th} percentiles. Columns (1)–(3) comprise all public stock investments made by angel investors over our sample period. Columns (4)–(6) restrict the sample to public stock investments made prior to the investor's first angel investment. Columns (7)–(9) further narrow down to the subsample of public stock investments made prior to the investor's first angel investment and in the predominant industry of the angel investor. We define the predominant industry as the industry where the angel has invested most. We employ a broad, 10-industry classification. *Angel fixed effect* is a continuous investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table 5 Column (3). *Repeat angel* is a dummy variable taking value one if an angel invests in several HIP firms. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. *Angel's industry* is a dummy variable taking value one for public investments in the same industry as angel's predominant angel investment industry. We control (untabulated) for *Investor age*, *Male*, *High wealth*, *Investment amount* and *Holding period* in all specifications. Calendar year and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	All investments			Pre-Angel Investments			Pre-Angel Investments Angel's Industry		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Angel fixed effect	0.005	0.006	-0.003	0.002	-0.001	0.027	0.077**	0.037	0.048
	(0.008)	(0.009)	(0.013)	(0.010)	(0.011)	(0.020)	(0.031)	(0.026)	(0.042)
Repeat angel (1/0)		0.061***			0.063***			0.107***	
		(0.009)			(0.009)			(0.028)	
Angel fixed effect × Repeat		-0.003			0.013			0.136*	
		(0.014)			(0.023)			(0.070)	
Board-experienced angel (1/0)			0.016*			0.000			-0.019
			(0.009)			(0.011)			(0.030)
Angel fixed effect × Board-experienced			0.010			-0.030			0.033
			(0.013)			(0.019)			(0.051)
Angel's industry (1/0)	0.033***	0.034***	0.034***	0.029*	0.033**	0.028*			
	(0.011)	(0.011)	(0.011)	(0.017)	(0.016)	(0.017)			
Observations	896,234	896,234	896,234	425,754	425,754	425,754	61,596	61,596	61,596
Adjusted R-squared	1.9%	1.9%	1.9%	1.8%	1.8%	1.8%	2.9%	3.0%	2.9%
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 12: Better Angels' Public Market Risk-Adjusted Returns

Table 12 replicates Table 11 but replaces the dependent variable with the Sharpe ratio, calculated as the daily domestic market stock return less the average daily risk-free (3-month Norwegian government bill) rate, divided by the standard deviation of the daily stock return, all measured over the angel's investment period. For unrealized investments, we assume that the realization date is the latest observable date with a quoted stock price. The dependent variable is winsorized at the 1^{th} and 99^{th} percentiles. We control (untabulated) for *Investor age*, *Male*, *High wealth*, *Investment amount* and *Holding period* in all specifications. Calendar year and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	All investments			Pre-Angel Investments			Pre-Angel Investments Angel's Industry		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Angel fixed effect	0.008**	0.016***	0.013**	0.002	0.010*	0.018**	0.020**	0.014	0.028
	(0.003)	(0.004)	(0.006)	(0.004)	(0.005)	(0.009)	(0.009)	(0.009)	(0.017)
Repeat angel (1/0)		0.020***			0.023***			0.026**	
		(0.004)			(0.004)			(0.011)	
Angel fixed effect × Repeat		-0.022***			-0.026**			0.022	
		(0.006)			(0.011)			(0.024)	
Board-experienced angel (1/0)			-0.017***			-0.022***			-0.036***
			(0.004)			(0.006)			(0.011)
Angel fixed effect × Board-experienced			-0.007			-0.020**			-0.012
			(0.007)			(0.009)			(0.019)
Angel's industry (1/0)	0.019***	0.019***	0.018***	0.027***	0.027***	0.025***			
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)			
Observations	754,717	754,717	754,717	355,075	355,075	355,075	52,596	52,596	52,596
Adjusted R-squared	2.3%	2.3%	2.3%	2.7%	2.7%	2.7%	3.6%	3.6%	3.6%
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

A Identifying Firms with High Innovation Potential in Kisseleva, Mjøs and Robinson (2024)

A.1 Sample Selection

To construct our sample of interest, we begin by identifying all newly established limited liability companies (analogous to C-corporations in the US) incorporated between 2004 and 2017. We remove financial services and real estate firms, newly formed subsidiaries of established companies, holding structures and firms operating in non-innovative industries, which are also heavily regulated, have high levels of public-sector involvement or ownership, are heavily supported via taxes and/or subsidies, or are highly unlikely to engage in value-creating innovative growth projects. In such industries, we expect non-financial objectives such as government policies to be especially important.[20]

Table A1 shows that, out of the population of 79,196 newly formed firms, a total of 902 firms receive at least one investment from an institutional VC investor. For our purposes, VC investors comprise venture capital (traditional, corporate or government-affiliated) funds, early-stage investment funds associated with traditional private equity groups, and incubators. Of course, it is unlikely that most of these 79,196 firms have growth aspirations or the intention to develop large-scale commercial innovation. Hurst and Pugsley (2011) show that most small business owners (in the US) have no desire to grow, operating their own businesses primarily for lifestyle purposes. To identify firms with high potential for

[20]We apply negative selection to rule out such industries. The excluded industries are the following: *agents/traders, agriculture, banks, brokers, cultural event producers, direct health services, education, fisheries, food production, gym/sports facilities, hotels, insurers, investment management, kindergartens, garages, mail-order, mining, museums, oil and gas production, physical shops, public services, publishing, real estate, restaurants, shipping companies, wholesale traders, and direct services (e.g., hairdressers, for tourists, car rental, lawyers, maintenance, accountants, auditors, builders, plumbers, electricians, undertakers, taxis).*

innovation, we draw on the entrepreneurial quality index elaborated by Guzman and Stern (2015) and develop a series of flags or indicators that signal the likely intention to grow.

Guzman and Stern (2015, 2020) start by recognizing that a practical first step for any growth-oriented entrepreneur in the US is to register her business in the state in which she operates: This facilitates paying payroll taxes, unemployment insurance, etc. Incorporated businesses are significantly likelier to grow than non-incorporated businesses. To adapt these insights to the Norwegian business context, we develop three flags that we use to gauge a firm's likely innovation potential at the time that it first appears in the tax registry data. Population counts of the firms satisfying the criteria for these flags are reported in Table A1.

The first flag is whether the firm has an English-language firm name. A total of 26,452 firms, or approximately 33% of the sample, satisfy this criterion. The idea behind this flag is that because Norway is a country of only some five million people, an English-language firm name helps the firm be recognizable to a broader, international audience and therefore would be a natural choice for an entrepreneur intending to grow her firm. Giving the firm an English-language name would not necessarily confer a natural advantage if the firm's objective were to serve the local market, but if the firm developed a product or a service that appealed to customers in many national markets, an English-language firm name would be a logical choice, especially in northern Europe, where English is commonly spoken as a second language.

The second flag is whether the firm is located in a regional innovation hub in Norway. The four innovation hubs in our data are Oslo, Bergen, Stavanger and Trondheim. These are the four largest cities in the country, and each is home to a major research university with an associated technology cluster (Hvide and Jones, 2018). The idea here is to construct a geographical flag that would correspond to a US firm starting up in Silicon Valley, Route 128, Austin (Texas), or the Research Triangle Park area in the US. A total of 23,887 firms,

or approximately 30% of the sample, were started in one of these innovation hubs during our sample period.

The final flag tracks whether one of the company's non-executive board members lives far from the city in which the company is based. For this, we use a zip code concordance and define "far" as a zip code difference of 1,500 zip code digits between the firm's and the board member's addresses. This implies an average beeline distance of more than 300 kilometers. Far fewer firms (14,148 firms, or approximately 18% of the sample) satisfy this criterion. The idea here is that the choice of a geographically distant board member in the year of establishment is a potential indication that the founders (or an investor) have recruited a board member with specific technical or market expertise not readily found nearby.

In some cases, these flags may overlap, while in other cases, the presence of one flag could make the presence of another unlikely. For example, a firm founded in a technology hub may not need to recruit a geographically distant board member for technical expertise. To remain agnostic about which of these flags is more or less salient in a particular setting, we define a firm as a HIP firm if we apply at least one flag to it, which results in a HIP sample of 46,121 firms. This sample contains 90% of all the firms that receive VC funding in our data. Within our HIP sample, 65% of the firms have only one ex ante innovation flag, 29% have two flags and only 5% match on all three selection flags. We label the remaining 33,075 firms, which operate in potentially innovative industries but are not designated with any of the ex ante innovation flags, as non-HIP firms in further analyses.

A.2 Validating the Sample Selection

To demonstrate the power of our flags to predict later-stage outcomes, Table A2 relates a series of firm outcomes to the presence of these flags, both individually and collectively. Panel A focuses on future financing events. In particular, this panel shows that each of these

flags, either alone or in combination, is highly predictive of a firm's receiving VC investment or an innovation-related governmental grant.

Panel B focuses on future milestones related to growth and innovation. The first part of Panel B focuses on patents as an outcome.[21] In particular, firms with English names, but also firms with a geographically distant board member, are much likelier to apply for a patent at some point in time than firms not designated with any of these flags. All flags are highly predictive of the firm's achieving an exit through an IPO, merger or acquisition, as can be seen in the middle portion of Panel B. Last, the far-right portion of Panel B shows that these flags predict four-year revenue growth. The latter outcome also implicitly measures firm survival. Approximately one-third of our sample of newly established operating firms are still in operation after four years.

Another way to gauge the salience of these innovation flags is to look at capital flows into and out of these HIP firms and compare them to those of the overall firm population, as defined in Table A1 Panel A. This angle is especially important if we want to derive market valuations of these firms. Table A3 shows the amounts of equity capital invested, either in financing rounds or secondary trades, in the shares of all sample firms before their exit events and the amounts paid out through share sales or share liquidations. This offers a market-wide, macro-level overview of the capital that innovative firms garner relative to that drawn by other firms. In addition, Table A3 presents the historical and, if available, current values of untraded shares. We calculate the current value of untraded shares based on the latest observable secondary purchase price in the particular firm.

Our HIP sample received over 90% of the total equity capital invested in all newly established businesses in Norway in our sample period. The 810 ex post selected VC-backed firms with at least one ex ante innovation flag comprise only 1.8% of all HIP firms but

[21] We are grateful to Jorge Guzman for suggesting this outcome.

garner 22% of the equity capital raised. The latter firms represent an even larger share of the volume in secondary purchase transactions. The vast majority of the total capital paid out through share sales or share liquidations occurs in the firms in our HIP sample. These statistics provide further evidence that our selection on ex ante flags captures firms with high odds of raising significant funding to support their investment.

Table A1: Sample Construction

Table A1 describes our sample construction process. Panel A begins with all firms newly founded in Norway between 2004 and 2017, from which we remove financial services and real estate firms, newly formed subsidiaries of established companies, holding company structures, and firms in non-innovative industries. Panel B describes our process for identifying the subsample of firms that have a high propensity to engage in innovation based on ex ante observable characteristics. Thus, we flag firms based on three alternative characteristics measured at year-end of their year of founding: founded with an English-language name, being located in one of the country's four innovation hubs, and having at least one geographically distant board member.

Panel A: Full Sample	Firms	% of (A)
Firms (C-corps) founded in 2004–2017	321,548	
- Financial services and real estate firms	-143,496	
- Subsidiaries of established companies	-19,499	
- Holding structures	-6,275	
- Transaction data not matched	-27,930	
- Non-innovative industry	-45,152	
Newly established firms in potentially innovative industries: (A)	**79,196**	100.00%
***of which at least one VC investment:* (B)**	902	1.14%

Panel B: Ex Ante Innovation Flags	Firms	% of (A)
English name	26,452	33.40%
Located in an innovation hub (Oslo, Bergen, Stavanger, Trondheim)	23,887	30.16%
At least one geographically distant board member	14,148	17.86%

Panel C: HIP Firms	Firms	% of Baseline
At least one ex ante innovation flag (C)	46,121	58.24% of (A)
. . . and received at least one VC investment	810	89.80% of (B)
of which one ex ante innovation flag	30,166	65.41% of (C)
of which two ex ante innovation flags	13,544	29.37% of (C)
of which three ex ante innovation flags	2,411	5.23% of (C)

Table A2: Predicting Later-Stage Firm Outcomes with Ex Ante Innovation Flags

Table A2 reports the results of a regression of later-stage firm outcomes on the three flags used to define our HIP sample. In Panel A, the dependent variables are indicator variables for receiving any later VC financing or governmental innovation-related grant (logit estimations). In Panel B, in the first two sets of regressions, the dependent variables are indicator variables for the firm's having applied for a patent and having experienced a successful exit, defined as a merger, acquisition or IPO (logit estimations). In the final set of regressions, the dependent variable is the growth in revenues between the end of the first year and the end of the fourth year of the firm's life (OLS estimation). All regressions include a year-of-founding fixed effect. A constant term is estimated but suppressed for brevity. Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Predicting Future Financing

	VC Investment (1/0)				Governmental Innovation Grant (1/0)			
English name (1/0)	1.154***			0.984***	1.192***			1.131***
	[0.069]			[0.070]	[0.067]			[0.069]
Innovation hub (1/0)		1.120***		0.916***		0.358***		0.167*
		[0.068]		[0.070]		[0.068]		[0.069]
Distant board member (1/0)			1.181***	0.997***			0.709***	0.589***
			[0.071]	[0.074]			[0.070]	[0.072]
Observations	79,196	79,196	79,196	79,196	79,196	79,196	79,196	79,196
(Pseudo) R-squared	4.4%	4.2%	4.1%	8.4%	7.1%	4.3%	4.9%	7.9%

Panel B: Predicting Future Firm Outcomes

	Patent Application (1/0)				Value-Creating Firm Exit (1/0)				4-Year Revenue Growth			
English name (1/0)	1.209***			1.188***	0.255***			0.191***	1.755***			1.544***
	[0.069]			[0.070]	[0.027]			[0.028]	[0.330]			[0.334]
Innovation hub (1/0)		0.039		-0.153*		0.259***		0.175***		1.264***		0.940**
		[0.073]		[0.074]		[0.028]		[0.028]		[0.329]		[0.331]
Distant board member (1/0)			0.647***	0.559***			0.686***	0.651***			1.977***	1.732***
			[0.074]	[0.075]			[0.029]	[0.029]			[0.394]	[0.396]
Observations	79,196	79,196	79,196	79,196	79,196	79,196	79,196	79,196	27,137	27,137	27,137	27,137
(Pseudo) R-squared	4.7%	1.5%	2.2%	5.2%	8.2%	8.2%	9.2%	9.4%	0.3%	0.2%	0.3%	0.4%

Table A3: Total Capital in Private Capital Market

Table A3 shows the aggregated distribution of total capital invested in and paid out from our sample of newly established operating companies, denoted category (A) in Table A1, and our subsample of HIP firms. Amounts are reported in million USD, where NOK have been converted to dollars at the spot rate prevailing at the time of funding. Percentages are expressed in terms of the population amount indicated in each specific row. We calculate the current value of untraded shares based on the latest observable purchase price (either in a financing round or in a secondary trade) in each particular firm.

	Overall Population	HIP Firms			
				and VC-Backed	
Number of firms	79,196	46,121		*810*	
		58.2% of Total		*1.8% of Sample*	
Total amount:					
Invested in financing rounds	129,542	120,785	*93.2%*	28,518	*22.0%*
Invested in secondary trades	21,871	19,707	*90.1%*	5,392	*24.7%*
Paid out through share sales	20,961	19,079	*91.0%*	4,759	*22.7%*
Paid out through liquidation of shares	3,544	3,405	*96.1%*	684	*19.3%*
Historical value of untraded shares	61,864	54,476	*88.1%*	11,659	*18.8%*
Current value of untraded shares	149,328	136,146	*91.2%*	8,516	*5.7%*

B Additional Figures and Tables

Figure B1: **Co-investments of Single-Firm Angels**

Figure B1 presents the distribution of the co-investments of single-firm angel investors with other angels (Panel A) and with VC investors (Panel B). A co-investment with another angel investor (VC investor) is defined as an investment in the same firm in the same year as another angel investor (VC investor).

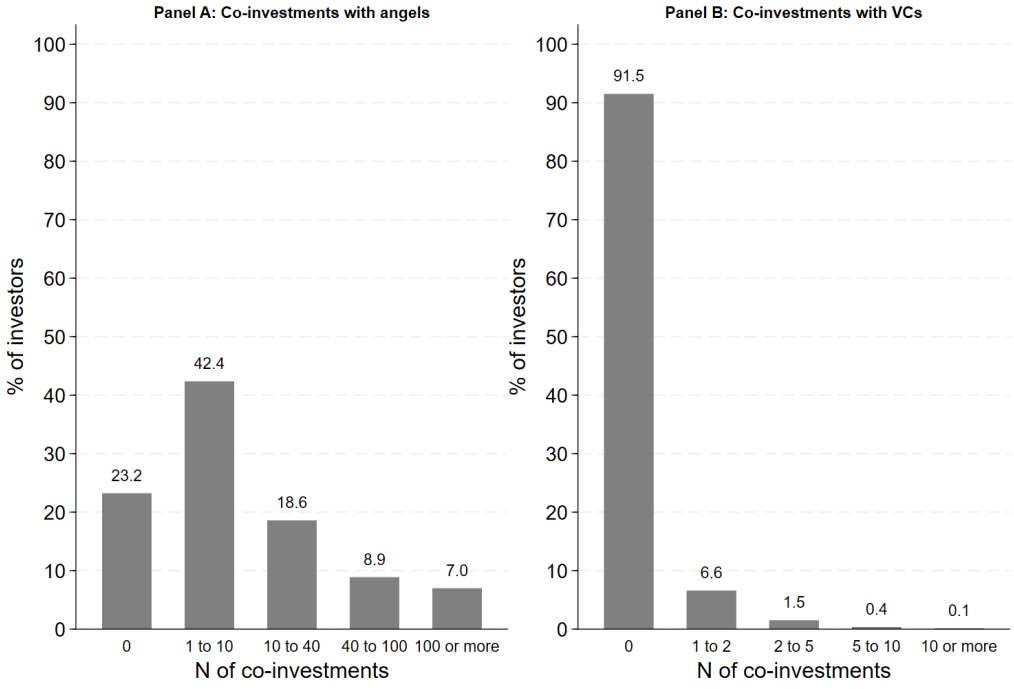

Table B1: Who Becomes an Angel Investor?

Table B1 reports logit estimates from a regression model where the dependent variable is a dummy variable taking value one if an individual invests in a HIP firm and is, thus, an angel investor. Column (1) estimates the propensity to become an angel investor among all individuals investing in both public and private stocks. Column (2) estimates the propensity to become an angel investor among individuals investing in privately held firms only. Columns (3)–(7) estimate the propensity to become a certain type of angel investor among all angel investors. An angel is defined as early stage if on average her angel investments occur in firms in the year of their inception or one year after (Column (3)). An angel is defined as late stage if her angel investments occur on average in firms aged five years or older (Column (4)). An angel is defined as small if she invests less than 50 thousand NOK (Column (5)) and as large if she invests 500 thousand NOK or more on average (Column (6)). A repeat angel is defined as an angel who invests in several HIP firms (Column (7)). *Age in* 2017 is the natural logarithm of the investor's age in 2017. *Male* is a dummy variable taking value one for male investors. *Founder* is a dummy variable taking value one if the investor has founded any HIP firm. *Public stock* is a dummy variable taking value one if the investor makes any direct investments in domestic public stocks during the sample period. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. *High wealth* is a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Angel type	All	All	Early-Stage	Late-Stage	Small	Large	Repeat
N of Angel Investors	*36,749*	*36,749*	*24,795*	*3,155*	*17,062*	*3,192*	*4,419*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln (Age in 2017)	-0.538***	-0.371***	-0.124***	-0.171**	-1.193***	1.191***	0.158**
	(0.016)	(0.029)	(0.044)	(0.072)	(0.043)	(0.086)	(0.065)
Male (1/0)	0.318***	0.243***	-0.030	-0.034	-0.004	0.044	0.397***
	(0.015)	(0.019)	(0.032)	(0.052)	(0.030)	(0.060)	(0.055)
Founder (1/0)	1.504***	0.795***	0.053	-0.155***	-0.071**	0.011	0.668***
	(0.017)	(0.027)	(0.032)	(0.056)	(0.032)	(0.052)	(0.040)
Public stock (1/0)		0.776***	-0.536***	0.542***	-0.566***	0.551***	0.607***
		(0.018)	(0.024)	(0.040)	(0.024)	(0.042)	(0.035)
Repeat angel (1/0)			-0.784***	-0.252***	-0.814***	0.580***	
			(0.034)	(0.062)	(0.038)	(0.049)	
Board-experienced angel (1/0)			0.064**	-0.119***	-0.096***	0.418***	0.361***
			(0.025)	(0.041)	(0.024)	(0.051)	(0.041)
High wealth (1/0)			-0.219***	0.099	-1.025***	1.447***	0.956***
			(0.039)	(0.064)	(0.048)	(0.048)	(0.045)
Observations	388,354	71,843	36,749	36,749	36,749	36,749	36,749
Pseudo R-squared	3.4%	3.9%	3.1%	1.0%	7.6%	12.9%	7.4%
Investor population	Public+Private	Private	Angel	Angel	Angel	Angel	Angel

Table B2: Angel Returns and Firm Characteristics

Table B2 reports the distribution of returns to angel investment by the type of the firm. We measure returns as the TVPI. We calculate TVPI as the realization amount (through sales or liquidation) divided by the purchase amount of the realized shares, (1) TVPI. For (2) TVPI, we additionally assume that if a firm does not report revenues in the time period of five consecutive years after the year of angel investment, the implied TVPI is zero. For (3) TVPI, we compute for all residual (unrealized) investments the untraded value of shares based on the most recent price observed in the latest financing round. This implies that (3) TVPI includes all angel investments. For investments with multiple outcomes (e.g., partially realized, partially unrealized), TVPI is weighted by the purchase amount of the shares of the respective outcomes. We report return distributions separately for investments made in firms depending on whether they have revenues and whether they have any patents on their balance sheet in the year of angel investment. TVPIs are winsorized at the 1^{th} and 99^{th} percentiles.

		N per	TVPI										Total
	N	Angel	mean	sd	skew.	p10	p25	p50	p75	p90	p95	p99	Loss
Pre-revenue firm													
(1) TVPI realized	12,958	1.4	1.87	7.01	6.12	0.00	0.00	0.18	1.00	2.14	6.30	53.21	35.0%
(2) (1) TVPI + implied total loss	15,867	1.4	1.46	6.03	6.75	0.00	0.00	0.00	0.98	1.61	4.48	48.92	46.9%
(3) (2) TVPI + implied most recent share price	24,779	1.4	2.11	8.09	6.61	0.00	0.00	0.70	1.00	2.34	6.08	64.83	29.9%
Post-revenue firm													
(1) TVPI realized	19,847	1.5	2.45	7.32	5.15	0.00	0.00	0.33	1.25	4.71	11.74	50.23	30.3%
(2) (1) TVPI + implied total loss	19,847	1.5	2.42	7.10	5.01	0.00	0.00	0.33	1.25	4.71	11.74	50.00	30.3%
(3) (2) TVPI + implied most recent share price	41,796	1.7	2.56	8.20	6.21	0.00	0.08	1.00	1.26	3.68	9.33	65.81	14.2%
Pre-patent firm													
(1) TVPI realized	27,695	1.5	2.14	7.18	5.60	0.00	0.00	0.24	1.00	3.24	8.98	53.21	32.9%
(2) (1) TVPI + implied total loss	30,481	1.5	1.89	6.59	5.78	0.00	0.00	0.04	1.00	2.81	7.72	50.00	39.0%
(3) (2) TVPI + implied most recent share price	54,448	1.7	2.32	8.07	6.40	0.00	0.00	0.99	1.03	2.95	7.85	62.50	21.7%
Post-patent firm													
(1) TVPI realized	5,110	1.7	2.69	7.34	5.01	0.00	0.00	0.50	1.76	6.19	12.05	50.00	28.1%
(2) (1) TVPI + implied total loss	5,233	1.7	2.60	7.06	4.93	0.00	0.00	0.44	1.68	6.04	12.02	50.00	29.8%
(3) (2) TVPI + implied most recent share price	12,127	1.9	2.69	8.57	6.15	0.00	0.06	1.00	1.41	4.13	10.00	65.81	12.6%

Table B3: Endogeneity of Repeat Investments - Truncated Sample

Table B3 replicates Table 6 for the truncated sample of angel investors, where we include only those, who make her first investment latest 2,591 days (around seven years) before the end of our sample period. At the same time, we define a repeat angel here as an angel who makes her repeat investment latest 2,591 days after the first investment. 2,591 days represent the 90^{th} percentile in the distribution of days between two investments in different firms in the entire sample of repeat angels as shown in Table 6. A fixed effect for the calendar year of the first angel investment is included in all specifications. Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Angel Investors	All	All	All	Early-Stage	Late-Stage	Small	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
First investment realized (1/0)	0.062						
	(0.058)						
Ln (1 + first investment (1) TVPI)		0.170***		0.167***	0.550	0.219***	-0.015
		(0.031)		(0.032)	(0.457)	(0.045)	(0.120)
Ln (1 + first investment (3) TVPI)			0.091***				
			(0.024)				
Ln (First investment amount)	0.238***	0.246***	0.243***	0.230***	0.887***	0.498***	0.128*
	(0.020)	(0.024)	(0.020)	(0.027)	(0.312)	(0.125)	(0.073)
Board experienced angel (1/0)	0.537***	0.540***	0.547***	0.559***	-0.311	0.570***	0.745***
	(0.061)	(0.071)	(0.061)	(0.077)	(0.700)	(0.115)	(0.271)
Ln (Investor age)	-0.504***	-0.503***	-0.485***	-0.540***	2.039*	-0.424**	-0.977***
	(0.097)	(0.117)	(0.098)	(0.128)	(1.179)	(0.195)	(0.363)
Male (1/0)	0.580***	0.543***	0.575***	0.494***	-0.317	0.834***	0.351
	(0.084)	(0.099)	(0.084)	(0.105)	(0.848)	(0.189)	(0.279)
High wealth (1/0)	0.932***	0.943***	0.930***	0.985***	-0.066	1.152***	0.974***
	(0.066)	(0.078)	(0.066)	(0.084)	(0.981)	(0.156)	(0.179)
Observations	16,051	11,422	16,051	9,972	124	4,975	904
Pseudo R-squared	6.8%	7.2%	6.9%	7.1%	17.8%	6.1%	7.9%
First investment calendar year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table B4: Persistence in Total Losses

Table B4 reports logit estimates from the regression model shown in Equation 3. The dependent variable is a dummy variable taking value one if the investment return (investor–firm level) is within the stated percentile interval for the sample distribution of (3) TVPI, calculated as described in Table 3. $Total\ loss_{t-1}$ ($Total\ loss_{t-2}$) is a dummy variable taking value one if the first (second) lagged angel investment in a different firm by the same angel investor is a total loss. *Same industry* is a dummy variable taking value one if the investor's first lagged investment is in the same industry as the current investment. *Investment overlap* is a dummy variable taking value one if the current investment year is before the exit year of the investor's first lagged investment. We control (untabulated) for the following investor and investment characteristics: *Investor age*, *Male*, *High wealth*, *Investment amount*, *Board seat* and *% of investment realized*. Calendar year, investment firm age and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

(3) TVPI Percentile (1/0)	90^{th} =<p <95^{th}			p>= 95^{th}		
	(1)	(2)	(3)	(4)	(5)	(6)
$Total\ loss_{t-1}$	-0.358*	-0.335*	-0.378	0.135	0.150	0.563*
	(0.200)	(0.196)	(0.335)	(0.178)	(0.181)	(0.326)
Same industry (1/0)		0.256	-0.085		0.128	0.482*
		(0.263)	(0.234)		(0.172)	(0.278)
Investment overlap (1/0)		-0.140	0.241		0.037	0.398
		(0.304)	(0.356)		(0.172)	(0.451)
$Total\ loss_{t-2}$			-0.104			0.582**
			(0.252)			(0.264)
Observations	6,236	6,236	1,811	6,384	6,384	1,441
Pseudo R-squared	7.1%	7.4%	9.8%	12.5%	12.6%	16.4%
Investments	All	All	All	All	All	All
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

C Replication of Analyses - Public Market Equivalents

Table C1: Cross-Sectional Variation in Angels' Returns

Table C1 reports OLS estimates from the regression model shown in Equation 1. The dependent variable is the natural logarithm (plus one) of the investment return calculated as (3) PME. *Repeat angel* is a dummy variable taking value one if an angel invests in several HIP firms. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm by the time of her first angel investment. *Investor age* is the natural logarithm of the investor's age at the time of the investment. *Male* is a dummy variable taking value one for male angels. *High wealth* is a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. *Investment amount* controls for the investment (purchase) amount. *Secondary purchase* is a dummy variable taking value one if the investor buys shares in a secondary trade. *Holding period* is the natural logarithm of the holding period of the investment measured in actual days. *Board seat* is a dummy variable taking value one if the angel investor receives a board seat in the year of investment. *% of investment realized* is the fraction of the investment that is realized. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Angel's total N of investments	>=1	>=2	>=2	>=3	>=4	>=1
	(1)	(2)	(3)	(4)	(5)	(6)
Repeat angel (1/0)	0.054***					0.015
	(0.020)					(0.009)
Board-experienced angel (1/0)	0.007	0.001				0.031***
	(0.011)	(0.018)				(0.007)
Investor Characteristics						
Ln (Investor age)	-0.110***	-0.179***				0.008
	(0.024)	(0.034)				(0.014)
Male (1/0)	0.031*	0.025				0.019***
	(0.017)	(0.024)				(0.006)
High wealth (1/0)	-0.020	-0.004				0.021**
	(0.018)	(0.019)				(0.010)
Investment Characteristics						
Ln (Investment amount)	-0.039***	-0.056***	-0.098***	-0.094***	-0.090***	-0.095***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.006)
Secondary purchase (1/0)	0.036	0.002	-0.004	-0.013	-0.022	0.024
	(0.031)	(0.029)	(0.020)	(0.021)	(0.023)	(0.017)
Ln (Holding period)	-0.092***	-0.080***	0.007	0.005	0.003	0.038*
	(0.018)	(0.023)	(0.027)	(0.029)	(0.032)	(0.020)
Board seat (1/0)	0.039*	0.088***	0.094***	0.112***	0.113***	0.127***
	(0.022)	(0.022)	(0.025)	(0.026)	(0.028)	(0.012)
% of investment realized	-0.188***	-0.220***	-0.103**	-0.119**	-0.125**	-0.071**
	(0.049)	(0.060)	(0.048)	(0.050)	(0.053)	(0.036)
Observations	66,575	42,096	42,096	29,120	22,073	59,149
Adjusted R-squared	5.0%	6.4%	42.1%	41.3%	38.0%	58.6%
Calendar year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment firm age FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	No	No	Yes	Yes	Yes	No
Firm FE	No	No	No	No	No	Yes

Table C2: Endogeneity of Repeat Investments

Table C2 reports logit estimates from the regression model shown in Equation 2. The dependent variable *Repeat angel* is a dummy variable taking value one if an angel invests in several HIP firms. Columns (1)–(3) estimate the propensity to become a repeat angel among all angel investors. Column (4) does so for the subsample of early-stage angels, while Column (5) does so for the subsample of late-stage angels. An angel is defined as early stage if her first angel investment occurs in the firm in the year of its inception or one year after. An angel is defined as late stage if her first angel investment occurs in the firm when it is aged five or older. Columns (6) and (7) estimate the propensity to become a repeat angel among small and large angel investors, respectively. An angel is defined as small if she invests less than 50 thousand NOK and as large if she invests 500 thousand NOK or more in her first angel investment. *First investment realized* is a dummy variable taking value one if the angel's first investment has been realized during the sample period. *First investment PME* is the PME of the investor's first angel investment, measured either as (1) PME (Column (2)) or (3) PME (Column (3)). *First investment amount* controls for the total amount invested. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. *Investor age* is the natural logarithm of the investor's age at the time of her first investment. *Male* is a dummy variable taking value one for male angels. *High wealth* is a dummy variable taking value one for angel investors who are above the 90^{th} percentile in the investor wealth distribution over the time period 2011–2018. A fixed effect for the calendar year of the first angel investment is included in all specifications. Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Angel Investors	All	All	All	Early-Stage	Late-Stage	Small	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
First investment realized (1/0)	0.208***						
	(0.038)						
Ln (1 + first investment (1) PME)		0.206***		0.204***	0.580***	0.275***	-0.068
		(0.023)		(0.025)	(0.179)	(0.030)	(0.096)
Ln (1 + first investment (3) PME)			0.150***				
			(0.018)				
Ln (First investment amount)	0.230***	0.250***	0.239***	0.250***	0.108	0.632***	0.158***
	(0.012)	(0.016)	(0.012)	(0.018)	(0.082)	(0.082)	(0.058)
Board experienced angel (1/0)	0.586***	0.569***	0.596***	0.596***	0.708***	0.600***	0.903***
	(0.040)	(0.050)	(0.040)	(0.057)	(0.244)	(0.078)	(0.199)
Ln (Investor age)	-0.542***	-0.556***	-0.535***	-0.592***	-0.032	-0.520***	-1.107***
	(0.064)	(0.082)	(0.064)	(0.093)	(0.395)	(0.128)	(0.259)
Male (1/0)	0.563***	0.578***	0.559***	0.603***	0.054	0.700***	0.449**
	(0.055)	(0.070)	(0.055)	(0.079)	(0.259)	(0.117)	(0.200)
High wealth (1/0)	0.934***	0.900***	0.928***	0.984***	1.079***	1.077***	0.938***
	(0.046)	(0.059)	(0.046)	(0.066)	(0.309)	(0.118)	(0.130)
Observations	36,749	19,545	36,749	15,971	959	9,383	1,628
Pseudo R-squared	9.7%	8.2%	9.8%	8.8%	11.7%	7.7%	10.7%
First investment calendar year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table C3: Better Angels and the Tail of Returns

Table C3 reports logit estimates from a regression model similar to Equation 1. The dependent variable is a dummy variable taking value one if the investment return is within the stated percentile interval for the sample distribution of (3) PME. *Angel fixed effect* is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table C1 Column (3). The highest quintile represents the best-performing angel investors. We control (untabulated) for all time-variant investor and all investment characteristics as described in Table C1. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

(3) PME Percentile (1/0)	50^{th} =<p <75^{th}		75^{th} =<p <90^{th}		90^{th} =<p <95^{th}		p>= 95^{th}	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angel fixed effect								
2nd quintile	1.125***	1.235***	1.442***	1.581***	2.161***	2.472***		
	(0.100)	(0.081)	(0.187)	(0.183)	(0.532)	(0.530)		
3rd quintile	1.826***	1.813***	2.713***	2.805***	3.603***	4.012***	2.668***	2.934***
	(0.104)	(0.108)	(0.226)	(0.225)	(0.580)	(0.582)	(0.736)	(0.736)
4th quintile	1.877***	1.829***	3.624***	3.702***	4.746***	5.252***	4.393***	4.911***
	(0.101)	(0.109)	(0.204)	(0.207)	(0.580)	(0.578)	(0.724)	(0.720)
5th quintile	0.902***	0.792***	3.692***	3.781***	6.181***	6.535***	7.151***	7.519***
	(0.107)	(0.112)	(0.202)	(0.212)	(0.577)	(0.573)	(0.716)	(0.714)
Observations	42,096	42,096	42,096	42,096	42,096	41,938	35,328	35,153
Pseudo R-squared	5.7%	18.3%	12.8%	17.9%	20.0%	24.0%	30.4%	42.2%
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Calendar year FE	No	Yes	No	Yes	No	Yes	No	Yes
Investment firm age FE	No	Yes	No	Yes	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes

Table C4: Better Angels and VC Financing

Table C4 reports logit estimates (Columns (1) and (3)) and OLS estimates (Columns (2) and (4)) from the regression model shown in Equation 4. The dependent variable *VC Financing* in Column (1) is a dummy variable taking value one if a VC investor invests either through a financing round or through secondary trades in the same firm as the angel investor at some point in time. The dependent variable *VC Equity* in Column (2) is the natural logarithm of the total VC equity invested, conditional on receipt of VC financing. The dependent variable *Follow − on VC Financing* in Column (3) is a dummy variable taking value one if a VC investor invests after the angel investor first invested in the firm. The dependent variable *Follow − on VC Equity* in Column (4) is the natural logarithm of the VC equity provided after the angel investor first invested in the firm. *Angel equity amount* is the natural logarithm of the total equity amount provided by the respective angel investor to the firm. *Angel fixed effect* is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table C1 Column (3). The highest quintile represents the best-performing angel investors. Calendar year, founding year and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	VC Financing (1/0)	Ln (VC Equity)	Follow-on VC Financing (1/0)	Follow-on Ln (VC Equity)
	(1)	(2)	(3)	(4)
Ln (Angel equity amount)	0.242***	0.254***	0.281***	0.128***
	(0.031)	(0.047)	(0.035)	(0.045)
Angel fixed effect				
2nd quintile	0.125	0.385*	0.194	0.432**
	(0.118)	(0.229)	(0.127)	(0.215)
3rd quintile	0.215	0.101	0.173	0.228
	(0.157)	(0.295)	(0.170)	(0.277)
4th quintile	0.499***	0.182	0.402**	0.217
	(0.181)	(0.319)	(0.202)	(0.296)
5th quintile	0.774***	0.340	0.737***	0.226
	(0.192)	(0.328)	(0.209)	(0.326)
Observations	18,815	3,721	18,617	2,740
Pseudo/Adjusted R-squared	11.8%	21.3%	10.4%	18.4%
Fixed effects	Yes	Yes	Yes	Yes

Table C5: Do Better Angels Have the Same Co-investors?

Table C5 reports OLS estimates from the regression model shown in Equation 5. The dependent variable is the angel investor's j co-investor dispersion, measured as the maximum of the deal fraction of co-investments with another angel k during our sample period; $max(co-investments_{j,k} \ / \ \sum co-investments_j)$. A co-investment is defined as investing in the same firm in the same year as another angel investor. Columns (1)–(2) include all angel investors, while Columns (3)–(6) examine subsamples of different angel investor types. An angel is defined as early stage if on average her angel investments occur in firms in the year of their inception or one year after (Column (3)). An angel is defined as late stage if her angel investments occur on average in firms aged five years or older (Column (4)). An angel is defined as small if she invests less than 50 thousand NOK (Column (5)) and as large if she invests 500 thousand NOK or more on average (Column (6)). *Angel fixed effect* is an investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table C1 Column (3). The highest quintile represents the best-performing angel investors. *Average investment amount* is the natural logarithm of the angel investor's average investment amount. $\sum Co-investments$ is the natural logarithm of angel's total number of co-investments with other angel investors during our sample period. *Portfolio size* is the natural logarithm of the total number of HIP firms in which the angel investor has invested. *Industry concentration* is an HHI-based measure of industry concentration within angel's portfolio of investments. For angels investing in one industry only, industry concentration is 1 (100%). Robust standard errors are reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Angel Investors	All	All	Early-stage	Late-stage	Small	Large
Angel fixed effect						
2nd quintile	-0.076***	-0.001	-0.011	0.005	-0.010	-0.017
	(0.010)	(0.006)	(0.008)	(0.016)	(0.009)	(0.029)
3rd quintile	-0.124***	-0.013**	-0.020**	-0.022	-0.018*	-0.038
	(0.009)	(0.005)	(0.009)	(0.016)	(0.009)	(0.028)
4th quintile	-0.138***	-0.021***	-0.021**	-0.032**	-0.028***	-0.009
	(0.009)	(0.005)	(0.009)	(0.016)	(0.010)	(0.028)
5th quintile	-0.097***	-0.042***	-0.053***	-0.055***	-0.039***	-0.050*
	(0.009)	(0.005)	(0.008)	(0.016)	(0.009)	(0.028)
Ln (Average investment amount)		0.001				
		(0.001)				
Ln ($\sum$ Co-investments)		-0.161***	-0.178***	-0.125***	-0.189***	-0.137***
		(0.001)	(0.002)	(0.004)	(0.002)	(0.004)
Ln (Portfolio size)		0.022***	0.026***	0.014	-0.005	0.024***
		(0.004)	(0.008)	(0.012)	(0.010)	(0.009)
Industry concentration		-0.004	-0.001	-0.050	-0.004	0.036
		(0.012)	(0.019)	(0.031)	(0.026)	(0.024)
Observations	11,187	11,187	4,259	1,561	3,071	1,563
Adjusted R-squared	2.7%	69.4%	71.1%	62.2%	75.1%	63.7%
First angel investment year FE	No	Yes	Yes	Yes	Yes	Yes

Table C6: Do Better Angels Do Better in the Public Market?

Table C6 reports OLS estimates from the regression model shown in Equation 6. The dependent variable is the market-adjusted daily return from investments in the domestic public stock market, which is computed as the daily stock return over the angel investor's investment period less the daily return of the Oslo Børs Benchmark Index (OSEBX) over the same period. For unrealized investments, we calculate paper gains with the realization date being the latest observable date with a quoted stock price. The dependent variable is winsorized at the 1^{th} and 99^{th} percentiles. Columns (1)–(3) comprise all public stock investments made by angel investors over our sample period. Columns (4)–(6) restrict the sample to public stock investments made prior to the investor's first angel investment. Columns (7)–(9) further narrow down to the subsample of public stock investments made prior to the investor's first angel investment and in the predominant industry of the angel investor. We define the predominant industry as the industry where the angel has invested most. We employ a broad, 10-industry classification. *Angel fixed effect* is a continuous investor-level measure of angel investment performance, measured as the investor-specific conditional mean return, which we obtain by recovering investor fixed effects from the regression in Equation 1, as shown in Table C1 Column (3). *Repeat angel* is a dummy variable taking value one if an angel invests in several HIP firms. *Board experienced angel* is a dummy variable taking value one if the angel investor holds a board seat in any other firm at the time of her first angel investment. *Angel's industry* is a dummy variable taking value one for public investments in the same industry as angel's predominant angel investment industry. We control (untabulated) for *Investor age*, *Male*, *High wealth*, *Investment amount* and *Holding period* in all specifications. Calendar year and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	All investments			Pre-Angel Investments			Pre-Angel Investments Angel's Industry		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Angel fixed effect	0.011	0.012	-0.004	0.007	0.001	0.024	0.093***	0.046	0.044
	(0.009)	(0.011)	(0.014)	(0.011)	(0.012)	(0.022)	(0.035)	(0.029)	(0.046)
Repeat angel (1/0)		0.061***			0.063***			0.108***	
		(0.009)			(0.009)			(0.027)	
Angel fixed effect × Repeat		-0.005			0.024			0.158**	
		(0.017)			(0.027)			(0.077)	
Board-experienced angel (1/0)			0.016*			-0.000			-0.020
			(0.009)			(0.011)			(0.030)
Angel fixed effect × Board-experienced			0.019			-0.020			0.057
			(0.015)			(0.021)			(0.058)
Angel's industry (1/0)	0.033***	0.034***	0.034***	0.029*	0.033**	0.029*			
	(0.011)	(0.011)	(0.011)	(0.017)	(0.016)	(0.017)			
Observations	896,234	896,234	896,234	425,754	425,754	425,754	61,596	61,596	61,596
Adjusted R-squared	1.9%	1.9%	1.9%	1.8%	1.8%	1.8%	2.9%	3.0%	2.9%
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table C7: Better Angels' Public Market Risk-Adjusted Returns

Table C7 replicates Table C6 but replaces the dependent variable with the Sharpe ratio, calculated as the daily domestic market stock return less the average daily risk-free (3-month Norwegian government bill) rate, divided by the standard deviation of the daily stock return, all measured over the angel's investment period. For unrealized investments, we assume that the realization date is the latest observable date with a quoted stock price. The dependent variable is winsorized at the 1^{th} and 99^{th} percentiles. We control (untabulated) for *Investor age*, *Male*, *High wealth*, *Investment amount* and *Holding period* in all specifications. Calendar year and industry fixed effects are included in all specifications. Standard errors are clustered at the firm level and reported in parentheses. One, two and three asterisks denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	All investments			Pre-Angel Investments			Pre-Angel Investments Angel's Industry		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Angel fixed effect	0.011***	0.019***	0.014**	0.003	0.011*	0.015	0.025**	0.016*	0.028
	(0.004)	(0.004)	(0.007)	(0.004)	(0.006)	(0.010)	(0.010)	(0.010)	(0.019)
Repeat angel (1/0)		0.020***			0.022***			0.026**	
		(0.004)			(0.004)			(0.011)	
Angel fixed effect × Repeat		-0.024***			-0.024**			0.031	
		(0.007)			(0.012)			(0.027)	
Board-experienced angel (1/0)			-0.017***			-0.022***			-0.037***
			(0.004)			(0.006)			(0.010)
Angel fixed effect × Board-experienced			-0.004			-0.016			-0.006
			(0.007)			(0.010)			(0.020)
Angel's industry (1/0)	0.019***	0.019***	0.018***	0.027***	0.027***	0.025***			
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)			
Observations	754,717	754,717	754,717	355,075	355,075	355,075	52,596	52,596	52,596
Adjusted R-squared	2.3%	2.3%	2.3%	2.7%	2.7%	2.7%	3.6%	3.6%	3.6%
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes