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DISCUSSION PAPER

// MARIUS BERGER AND SANDRA GOTTSCHALK

Financing and Advising Early Stage Startups: The Effect of Angel Investor Subsidies

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Financing and Advising Early Stage Startups: The Effect of Angel Investor Subsidies

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Abstract

In recent years governments around the world have introduced policies to stimulate investments in early stage entrepreneurial companies, in particular investments by Angel investors. In this paper we study whether introducing subsidies to Angel investors has effects on startups' access to financial and managerial resources provided by Angel investors. Using data for a representative sample of entrepreneurial companies in Germany, we analyze the effect of the introduction of a major subsidy program for Angel investors in Germany. Having data before and after the introduction of the program allows us to use a difference-in-differences framework to examine the effect of the program on eligible companies. Our findings indicate that subsidies for Angel investors both increase the chances to receive financing from Angel investors (+36-67%), as well as the amount of financing received (+70-82%). In terms of managerial resources, we find no effects that are significantly different from zero. This result is in contrast to theoretical predictions suggesting negative effects of investment subsidies on the level of managerial support that companies receive. Exploring the mechanisms behind our results, we find that the policy stimulated entry by inexperienced investors, but also increased syndicate sizes of Angel investors in entrepreneurial companies.

Key words: Entrepreneurship Policy, Angel Investors, Venture Capital, Syndication

JEL codes: G28, G24, M13, O38

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1 Introduction

After the financial crisis of 2007/08 policy makers around the world have been concerned about a decline in innovative entrepreneurship (Wilson & Silva, 2013). Limited access to important resources, such as financial, human and social capital, is considered one of the main drivers for this development, as it is widely regarded as one of the major barriers to innovative entrepreneurship (Kerr & Nanda, 2009; Hall & Lerner, 2010). Young innovative firms are particularly affected, as they are subject to a liability of newness. To improve access to essential resources for young and innovative companies, countries have enacted a variety of policy measures. One type of program that has recently received particular attention, are subsidies for Angel investors (European Commission, 2017). Angel investors are wealthy individuals, who invest their own money directly in entrepreneurial firms. From what we know about them, professional Angel investors approach investments in a similar way as venture capital firms (VCF), supporting their portfolio companies not only with money, but also with management support (Ehrlich, De Noble, Moore, & Weaver, 1994; Politis, 2008). Management support may range from informal managerial advice to strategic support on the board , development and commercialization of products and providing access to the investors' network. These activities are viewed as equally important for the development of entrepreneurial companies as access to finance (Quas, Martí, & Reverte, 2020). The extend to which young and innovative companies are able to raise capital and commercialize their ideas, therefore largely depends on the availability of investors who provide 'smart money' in an economy (Popov & Roosenboom, 2013). Yet only a fraction of newly founded ventures are funded by such investors.[1]

Subsidies to Angel investors aim to stimulate investment activity by these individuals in order to increase access to financial and managerial resources for young and innovative companies. Compared to other policy measures targeted at raising investments in entrepreneurial companies, direct subsidies have a relatively low administrative burden and short approval times, which adds to their attractiveness. Still, there have long been concerns that subsidies to Angel investors could distort investment incentives and fail to deliver on their promises to entrepreneurial companies (Lerner, 1998). In particular there have been concerns that investment subsidies may have negative effects on the level of managerial support that companies receive (Keuschnigg & Nielsen, 2003). So far the empirical evidence about such policy effects is very limited.

Denes, Howell, Mezzanotti, Wang, and Xu (2020) study the effect of Angel investors subsidies, using the staggered introduction of tax credits for Angel investors in U.S. states. Their results show no real effects on relevant economic outcomes such as entrepreneurial activity or successful exits of entrepreneurial companies. The authors explain this result with an increased entry of inexperienced individuals into Angel investing, as well as the diversion of subsidies by company insiders. The exclusion of company insiders from such programs seems to be a crucial element for their success. For example, Gonzalez-Uribe and

[1] Berger, Egeln, and Gottschalk (2020) report that in Germany only 4% of high-tech startups receive funding from Venture Capital funds and about 10% from Angel investors.

Paravisini (2019) find that subsidising Angel investors through the Small Enterprise Investment Scheme (SEIS) in the U.K. has significantly increased the growth of entrepreneurial companies. Both studies have in common that they study the effects of Angel investor subsidies on financing constraints and company performance leaving open the question whether Angel investors subsidies have an effect on managerial support.

In this paper we want to contribute to our understanding on the effect that subsidy programs to Angel investors have on financial *and* managerial resources provided to entrepreneurial companies by Angel investors. We examine whether subsidies to Angel investors (i) increase the chances to close a deal with an Angel investor, (ii) increase the amount of capital raised from Angel investors and (iii) have negative effects on managerial support received by Angels. Our study is based on the case of Germany, an economy where venture capital activity has been moderate relative to other OECD countries, but that has recently experienced a surge in investment activity, with its capital city Berlin rising to one of the most important hubs for venture capital investments in Europe (Kraemer-Eis, Signore, & Prencipe, 2016).

For our analysis, we leverage on a unique data set that is based on an annual survey of a representative sample of entrepreneurial companies based in Germany. The data contains information on the financial engagement, as well as the level of managerial support provided by Angel investors to these companies. While survey designs have some disadvantages, they prove to be useful for cases in which information is otherwise difficult to obtain. Managerial support activities by venture capitalists are mostly non-contractible and therefore not recorded in contracts and other official documents. It has become common practice in the literature to study these activities in survey designs (Bottazzi, Da Rin, & Hellmann, 2008; Gompers, Gornall, Kaplan, & Strebulaev, 2020). In addition, the financial engagement of Angel investors is difficult to observe, because many Angel investors prefer to remain anonymous (Wetzel Jr, 1983; Brettel, 2003), and may even have economic incentives to stay under the radar (Engineer, Schure, & Vo, 2019). As the survey was conducted before and after the introduction of a major subsidy program to Angel investors in Germany, we can analyze the effects of the policy in a difference-in-differences framework. To address concerns about confounding factors that could potentially drive our results, we use a version of the difference-in-differences estimator as suggested by Heckman, Ichimura, and Todd (1997). We also conduct several robustness tests to rule out other potential drivers of our results.

Our results indicate that after the introduction of the policy, the availability of financing from Angel investors increased significantly, both in terms of the number of firms that have access to capital, as well as the financing amounts they receive. The probability to close a deal with an Angel investor increased by 36-67%, while the amount of capital received from Angel investors increased by 70-82%. In terms of managerial support, our point estimates have negative signs for Angels investors' engagement on the board and product development support, while the coefficients for coaching, access to networks, and support in Commercialization related tasks are positive. However, none of these coefficients is

significantly different from zero. Our findings for managerial support stand in contrast to our initial hypothesis derived from the literature, which suggests a negative effect on support activities (Kanniainen & Keuschnigg, 2003, 2004; Keuschnigg, 2004).

To understand the mechanisms behind our results, we augment the firm level survey data with ownership data provided by Creditreform, Germany's largest credit rating agency. For all investors that have an open equity position in one of the companies in our sample, we are able to construct their complete investment history. This allows us to look at the entry timing of investors and their portfolio development. Looking at the entry timing of the investors in our sample, we find significant entry of new investors after the policy was introduced, consistent with findings for the U.S. by Denes et al. (2020). However, we also find that portfolios of existing investors increased. Consistent with these patterns, we find that syndicate sizes of Angel investors significantly increased after the introduction of the policy. These findings suggest that although subsidies to Angel investors may not directly affect the investment decisions of professional Angel investors (Stedler & Peters, 2003; Denes et al., 2020), they could have indirect effects through more syndication with inexperienced investors. This could explain why we do not find negative effects on managerial support activity. Syndication may allow Angels to manage their investments more efficiently and ensure that managerial support to companies is not diluted despite financing more of them.

The paper proceeds as follows, in Section 2 we derive our hypothesis regarding the sign of the effect of Angel investor subsidies on financial and managerial support. We end the section with a presentation of Germany's grant for Angel investors. In Section 3 we outline our empirical approach to assess the effect of Angel investor subsidies on financial and managerial support for startup companies, and in Section 4 we present the data. Results of our empirical analysis are summarized in Section 5, and robustness tests provided in Section 5.6. Section 6 concludes our analysis.

2 The case of Angel investor subsidies

2.1 Angel investor subsidies and financing

Financing constraints have been identified as a major barrier to innovative entrepreneurship by both policy makers (Wilson & Silva, 2013) and academics (Kerr & Nanda, 2009). At the most basic level, entrepreneurship is inherently uncertain and requires significant upfront investments, while entrepreneurs are often liquidity constrained (Evans & Jovanovic, 1989; ?, ?; Van Praag, De Wit, & Bosma, 2005). This is especially true for young and innovative entrepreneurs who invest a large part of their resources in innovation projects (Hall & Lerner, 2010). In principle, liquidity constraints could be solved via capital markets. However, several lines of arguments have been established in the economics and finance literature that cast doubt on the efficient functioning of the capital market for young and innovative companies.

Financiers often lack the necessary information about a company's management team and technology to arrive at an informed assessment about the firm's prospects. This is especially true for entrepreneurs without a track record and investing in new technologies. A lack of verifiable information may lead financiers to increase the price or ration the supply of financial capital, which adversely affects the supply of capital to companies (Stiglitz & Weiss, 1981; Amit, Glosten, & Muller, 1990). A second line of argument speaking for financial constraints is that investments in technological innovations cannot be fully appropriated (Arrow, 1972; Levin, 1988). As technological innovations are often based on intangible assets, such as the knowledge stock of employees (Bertoni, Colombo, & Croce, 2010), it can easily disseminate to potential competitors. When knowledge disseminates, it leaves the investing party at a severe disadvantage, as rivals do not bear the risk of failure. This positive externality on rivals leads many economists to the conclusion that investment in research and development activities is generally too low in a laissez-faire state of the economy. Various studies indicate that direct subsidies to entrepreneurial companies help them overcome information frictions, having positive effects on their innovation activity and long-run financial posture (Lerner, 1999; Feldman & Kelley, 2006; Cumming, 2007; Conti, 2018; Söderblom, Samuelsson, Wiklund, & Sandberg, 2015; Howell, 2017; Hottenrott, Lins, & Lutz, 2018; Islam, Fremeth, & Marcus, 2018; Li, Chen, Gao, & Xie, 2019; Giraudo, Giudici, & Grilli, 2019; Berger & Hottenrott, 2020; Hottenrott & Richstein, 2020; Zhao & Ziedonis, 2020). However, these programs are costly and administratively expensive because, subsidies are typically awarded on the basis of evaluations of project proposals and expert assessments.[2]

Subsidies to Angel investors could be a cost effective alternative to such programs by increasing investors' willingness to provide more venture capital to entrepreneurial companies. Subsidies to Angel investors place investment decisions at the investors' discretion but reimburse a portion of the initial investment cost. The reduction in investment cost reduces losses in case the company defaults. In that way these subsidies increase the expected return on investments in entrepreneurial companies and may create incentives to invest more in entrepreneurial companies (Kanniainen & Keuschnigg, 2003, 2004). As Angel investors are considered to be informed investors, they should be able to make an informed assessment about a companies' chances of success (Amit, Brander, & Zott, 1998). Giving investors the discretion to choose investments is seen as an efficient way to allocate resources to the most promising companies while increasing the supply of financing.

In contrast to the view that suggests that Angel investor subsidies increase access to financing, there are reasons to believe that subsidies to Angel investors may leave Angels' investment decisions unaffected. Unlike direct subsidies to entrepreneurial companies, that may serve as a certifying signal (Kleer, 2010) or reduce technological uncertainty, subsidies to Angel investors do not close the information gap, but only change the distribution of

[2]The Hightech Gründerfonds (HTGF), Germany's largest publicly sponsored seed and early stage investment fund, had management fees of approximately 13.89 Million Euros in 2013 and 2014 alone. For successful applicants, it took between 6 and 12 month until a deal was concluded (Geyer, Heimer, & Treperman, 2016).

investors' payoffs. Subsidies to Angel investors could leave investors' investment decisions unaffected, and instead tempt investors to replace their private funds by public funds. Such crowding out would not change the aggregate supply of financing from Angel investors, but instead only shift the sources of funds. A priori, it is not clear whether subsidies to Angel investors are likely to have positive effects on companies' access to financial resources or are more likely to have no such effect. Given that previous research indicates that subsidies to Angel investors positively affect financing, we hypothesize that we will also find *positive* effects on financing.

2.2 Angel investor subsidies and managerial support

Management practices matter. This is true across various types of companies, including entrepreneurial companies (Bloom & Van Reenen, 2010). Bloom et al. (2019) estimate that management practices account for more than 20% of variation in productivity, which makes them one of the most important performance drivers in organizations. At the same time, there appear to be major differences in management practices depending, among other things, on companies' ownership structure (Bloom, Sadun, & Van Reenen, 2015). Entrepreneurial companies that are still owned by founders score by far the lowest in terms of managerial practices.

An important aspect of the investment practices of Angel investors is therefore seen in the managerial support they provide to nascent entrepreneurs. Managerial support comes in various forms (Ehrlich et al., 1994; Politis, 2008) and ranges from informal managerial advice to more formal engagement on the board. Beyond this, Angel investors are reported to support companies in the development and commercialization of products and giving founders of entrepreneurial companies access to their network. While little is known about the effects of different managerial support activities by Angel investors for the performance of entrepreneurial companies , it is likely the case that professional Angel investors have similar abilities to add value as VCFs (Lerner, Schoar, Sokolinski, & Wilson, 2018).[3] Besides alleviating financial constraints in entrepreneurial companies, professional Angel investors therefore likely affect the development of managerial competences in these companies. However, the extent to which Angel investors provide managerial inputs seems to vary across investor types. Some Angel investors seem to pursue a purely passive investment approach, providing only financing through an "informal network led by one (or more) active Angels, who find deals, perform the due diligence, informally syndicate the deal among their network, and manage the investments" (p. 788; Prowse, 1998).

In the context of our paper, an important question is how subsidies to Angel investors may influence the level of managerial support that entrepreneurial companies receive from Angel investors. The current literature provides two channels through which subsidies to

[3]The literature on Venture Capital indicates, that various support activities of VCFs have positive effects on their exit performance, including strategic advice on the board (Lerner, 1995), hiring executives (Hellmann & Puri, 2002; Ewens & Marx, 2017), Commercialization of products (Hellmann & Puri, 2000), and access to the investors' networks (Hochberg, Ljungqvist, & Lu, 2007; Lindsey, 2008; Conti, 2018).

Angel investors may affect the level of managerial support they provide. The first channel is related to the composition of investors' portfolios (Kanniainen & Keuschnigg, 2003, 2004; Keuschnigg, 2004), the second is related to the composition of Angel investor types in the market (Lerner, 1998). Providing managerial support to startups is time consuming and requires intensive care from the investor (Gorman & Sahlman, 1989).[4] Given there are natural constraints on the amount of time an individual can spend on certain activities forces investors to distribute their time and resources across all companies in their portfolio. This creates a trade-off between the number of companies an individual can invest in, and the time that can be effectively spent with each of those companies. As subsidies to Angel investors lower the marginal cost of making an additional investment, investors may increase the number of investments beyond their optimal level (Boadway & Keen, 2006). Kanniainen and Keuschnigg (2003) argue that adding new companies to an Angel investors portfolio gives more companies access to Angel capital, but at the same time lowers the level of managerial advice that each company receives. In their model, the introduction of subsidies to Angel investors therefore lowers the average level of managerial advice that companies receive. Although it is unlikely that marginal changes in investors' portfolio size will lead to measurable empirical effects on management support, the model does contain important implications. For example, subsidies to Angel investors could change their investment strategy from intensively supporting a few companies to funding many company with minimal managerial support. Their original analysis of this relationship was based on a static equilibrium perspective. In a follow up paper to their original work, Kanniainen and Keuschnigg (2004) introduce free entry into their model. They argue that as the level of managerial advice declines in the market, there are opportunities for new investors to exploit and to enter the market. With free entry, the sign of the effect of an investment subsidy is no longer clear. Lerner (1998) argues that subsidies to Angel investors could spur entry by non-professional types of individuals who do not posses the necessary skill to provide managerial support to entrepreneurial companies. In fact, Denes et al. (2020) show that in the U.S., the introduction of tax credits for Angel investors spurred mostly entry from non-professional investors. Increasing the level of non-professional investors in the market may dilute the aggregate level of managerial support. Taken together, the arguments brought forward by the existing literature therefore suggest that we should expect *negative* effects on the *average* level of managerial support that entrepreneurial companies receive from Angel investors, following the introduction of subsidies to Angel investors.

2.3 The Angel investor subsidy program in Germany

In may 2013, the German federal government introduced the program 'INVEST - Zuschuss für Wagniskapital' ('INVEST - Grant for Venture Capital'). The program has three main objectives. First, it aims to facilitate access to venture capital for young innovative com-

[4] Brettel (2003) reports that Angel investors in Germany spend on average more than six days a month on their investments.

panies and to improve their capital endowment in the long term. Second, individuals with an entrepreneurial orientation are to be attracted to high-risk investments in young innovative companies. And third, existing Angel investors are to be encouraged to invest more frequently and more venture capital in young innovative companies. To do so, the program reimburses individuals who invest in young innovative companies 20% of their investment costs in the form of a grant. The grant only applies to equity investments, that is investments that provide capital in exchange for an equity stake in the company. Except for convertible loans - that become eligible once a conversion has taken place - other types of financing instruments are exempt from the program. The equity that the company issues must be common stock and therefore bear the full risk and returns from the investment. In 2017, the program was revised and now includes a tax exemption on capital gains from exiting investments that received a grant. Thus the program aims to create a more active market for equity financing in Germany, an economy that has traditionally been focused on bank financing (?, ?).

To keep administrative overhead low and ensure quick approval times,[5] eligibility criteria are kept simple.[6] Companies must be no more than seven years old at the time of application.[7] At the same time, companies must not have more than 50 employees. Their annual revenues and balance sheet totals must not exceed 10 million Euros.[8] In addition, companies must not be listed and independently owned, and their headquarters must be within the European Economic Area. Further, the program targets innovative companies. As innovativeness is rather difficult to assess, the program applied a heuristic when first introduced, and restricted eligibility to specific industries that the policy maker considers innovative.[9] In additional all startups that hold a patent are considered innovative and therefore eligible. In 2017, the policy maker revised the guidelines that now comprise young companies from other industries but only if they provide a 'proof of innovativeness' through an expert review. By 2019, 6% of startups had made use of that possibility. Therefore eligibility is mainly based on industry classification and patent ownership.

For investors the following eligibility criteria apply. Investors must be natural persons or small investment companies of a maximum of 6 persons are eligible. The shareholders of these investment companies must be natural persons. Sources of funds must originate directly from the individuals who invest in those companies. This requirement essentially excludes Venture Capital Funds (VCFs), as the limited partners of a VCF invest their money indirectly. Also the typical legal form that VCFs use in Germany (GmbH & Co. KG) was ineligible for the grant. As the policy wants to stimulate venture capital investments

[5]The administrative cost of the INVEST program was approximately 657,000 between 2013 and 2015, and subsidized investors of 1,700 start-ups until 2019 (Keil, Hinrich, Theunissen, & Hagedorn, 2019). The time of the award process was on average less than two month (Gottschalk et al., 2016).

[6]For more details on eligibility criteria see: https://www.foerderdatenbank.de/FDB/Content/DE/Foerderprogramm/Bund/BAFA/invest-zuschuss-fuer-wagniskapital.html.

[7]The initial program design allowed firms to be at most 10 years old. As our sample covers only firms up to a maximum age of seven years, this is immaterial for our sample.

[8]This is the definition of an SME according to the Official Journal of the EU (L 124/36 from 20.03.2003).

[9]What constitutes an innovative industry is not clearly defined by the government, but it seems to be mostly based on industries' R&D intensities.

(rather than acquisitions of firms), the maximum equity stake that investors can initially acquire was set at 20%, and investors must hold their shares for at least three years before they are allowed to sell them.

An important aspect of the program is that it aims to exclude insiders. That means, individuals that are affiliated with the company prior to the investment are not eligible for the grant. To do so, the program guidelines require that the application for the grant must be made prior to the conclusion of an investment contract between the investor and the company. The equity issued must be newly issued, i.e. secondary transactions are not permitted. And finally, the equity issuance must result in an increase of the company's financial resources. This excludes, for example, a subsequent conversion of existing credit lines or subordinated loans into equity. In that way, insiders such as co-founders and existing investors are exempt from the subsidy.

The investment amount covered by the program is capped at the top and bottom. Per company, investors must invest at least 10,000 Euros, and per year investors can claim a maximum of 500,000 Euros of their venture capital investments for the subsidy. Companies can claim a maximum of 3 million Euros in venture capital per year for the subsidy, which corresponds to a maximum funding amount of 600,000 Euro per company and year. The assessment basis for the subsidy is the share price of the issued equity, including a share premium, if this had to be paid.[10]

By the end of 2018, 6.374 investments received a grant, and the program has leveraged approximately 513 million Euros in venture capital. This translates to about 13% of early stage investments in startup companies in that time period.[11] In total, investors of about 1,700 companies were supported by the grant between the start of the program and the end of 2018. To put this into perspective, Berger et al. (2020) estimate that about 3,340 firms in high-tech sectors and under the age of four, received an investment from a private individual in the years 2009 to 2012, i.e. before the program was introduced. In the period from 2015 to 2018 - after the program had been introduced - they estimate this number to be at 5,120 firms. The number of additional firms that receive an investment from private investors, is about the size of the number of firms whose investors have received the grant.

3 Empirical strategy

In our empirical analysis we study the role of Angel investor subsidies on firms' access to financial and managerial resources. In particular, we want to study whether Angel investor subsidies increase the number of firms that receive financing from Angel investors, whether it increases the financing amounts they receive from Angel investors, and whether it changes the level of managerial support they receive from Angel investors. To answer these questions, we use a difference-in-differences approach on a cross sectional sample of firms that are representative for the population of startup companies in Germany. In what

[10] For convertible loans, the assessment basis for the subsidy is the conversion amount.

[11] The calculation is based on Invest Europe's market statistic for Germany (INVEST EUROPE, 2019)

follows, we describe our empirical approach. We first explain how we group firms into treatment and control groups, followed by a discussion on identification and interpretation of our estimation results. We then outline the semi-parametric difference-in-differences estimator for cross sectional samples. Details on the data and sample will be described in Section 4.

3.1 Treatment and control groups

To construct treatment and control groups for the difference-in-differences approach, we use the program's eligibility criteria that we outlined in Section 2.3. Investments are eligible for the grant if both the firm, as well as the investor are eligible to the program. Firms eligibility is mainly based on Industry classification and patent ownership, whereas investor eligibility is based on whether the sources of funds. To be considered innovative and therefore eligible for the grant, firms must operate in one of the sectors listed in Table A.1. Sources of funds must originate directly from the individuals investing in the firm. In the following, firms are referred to as being treated if they are eligible to the program and observed in the post-policy period, i.e. after the program has been introduced. With respect to the control groups, the eligibility criteria allow for different grouping choices. On the one hand, we can use companies as a control group that are not eligible for funding due to their industry affiliation or lack of patents. These companies are excluded from the subsidy program due to their company characteristics. On the other hand, we can use companies that have received funding from VCFs. These investments are not eligible for the program due to the investors, because the funding sources of VCFs also include money from third parties.

Table 1: Summary of different treatment and control groups

	Treatment		Control		Sample
Panel	Groups	N	Groups	N	
A	Eligible × Post	3,420	Non-Eligible	10,239	Full
B	Eligible × Post	1,025	Non-Eligible	1,558	Angels' Deal Flow
C	Eligible × Post × Angel	309	Non-Eligible × Angel, VCF	718	Angel and VCF
D	Eligible × Post	309	Non-Eligible × Pre	586	Angel
E	Angel × Post	309	VCF	297	Angel and VCF, Eligible Firms

Note that for each panel the treatment group in the Pre-treatment period is also used as a control group. Further note, that in Panel D, Angel is equal to one for all firms, and in Panel E, Eligible equals one for all observations in the sample.

Our research questions require us to construct control groups from different samples. On the one hand, this has to do with the practical implementation of the specific research questions we aim to answer, but is also related to limitations regarding the data. Table 1 provides an overview of the different specifications. As mentioned earlier, we refer to a firm as being treated, when it is Eligible to the program, and observed in the post-treatment period, i.e. after the program has been introduced (Eligible × Post). When analyzing effects on financing amounts and the level of managerial support (Panels C, D and E),

firms are referred to as being treated if they are i) Eligible to the program, ii) observed in the post-treatment period and iii) financed by Angel investors (Eligible × Post × Angel). Firms are control observations in case they are i) observed in the pre-treatment period, i.e. before the program was introduced (Pre), ii) non-Eligible to the program based on their company characteristics (Non-Eligible) or iii) not financed by Angel investors (VCF).

3.2 Identification

To interpret our estimates in a causal sense, we need to rule out confounding factors that occurred during the same period and are related to eligibility and financing choices. A common way to do this in a difference-in-differences approach is to test whether treatment and control groups follow similar path over time. If this is true, effects can be attributed to the policy in question. Unfortunately the data on financing amounts, financing types (Angel vs. VCF) and managerial support for non-Eligible firms are limited to two observation years, which rules out testing for pre-treatment trends in the outcome variables in our main sample. To reduce the influence of potential changes in firm level characteristics on our results, we employ a semi-parametric difference-in-differences approach as suggested by Heckman et al. (1997). Our data allows us to control for a large number of firm level characteristics, which should largely reduce the impact of changes in firm-level characteristics over time.

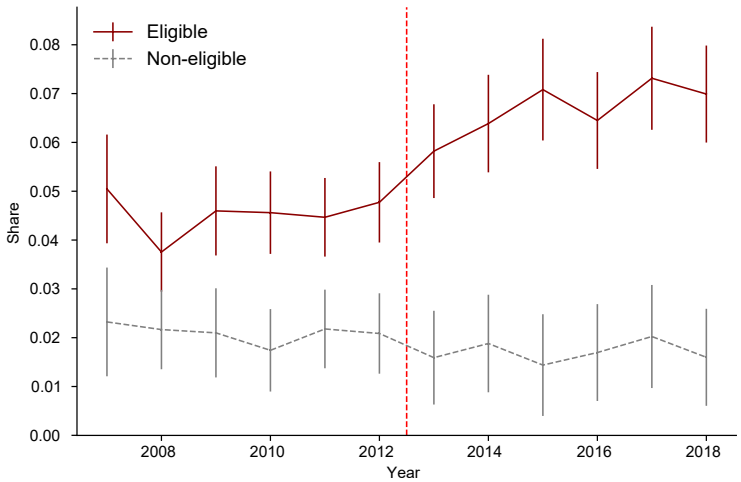


Figure 1: Share of Equity Financed Startups by Eligibility.

Figure 1 shows the share of startups receiving an equity investment in Eligible (red) and non-Eligible industries (gray) by reference year. The red line shows the point in time when the subsidy program was introduced. The error bands depict the 95%-confidence interval. Source: IAB/ZEW Startup Panel.

In addition Figure 1 provides suggestive evidence, that the policy had indeed an effect on equity financing for Eligible firms. It shows the share of equity financed startup companies in Germany for Eligible and non-Eligible industries. While the data in this figure does

not distinguish between equity financing from Angels and equity financing from VCFs, the data in Table 2 suggest that the increase in equity financing has been stems from an increase in the availability of Angel financing. From there it seems unlikely that the effect is driven by an increase in VCF financing. Overall it is more plausible that the increase in equity financing following the introduction of the Angel investor subsidy program shown in Figure 1 is driven by an increase in Angel financing. A general concern about identification in our approach is that eligibility is based on Industry affiliation. Controlling for firm-level characteristics excluding Industry affiliation may not be sufficient to capture the impact of technological shocks on investment opportunities, if technological shocks affect industries differently. While Figure 1 is reassuring in that the effect at the extensive margin seem to be triggered by the policy, we may still be concerned about effects at the intensive margin when assessing changes in the amount of financing that firms receive, as new technological opportunities may drive up valuations. To check whether our results are robust to the arrival of technological opportunities, we conduct additional tests on a reduced sample of firms (see Section 5.6). This sample contains only firms in *Eligible industries*, but allows investments to differ in their *investors' eligibility*. As the arrival of technological opportunities should equally affect the *level* of financing that different investor types provide, effects should be driven by the subsidy, rather than the arrival of technological opportunities.

A limitation of our research approach is that we do not use administrative funding records on actual subsidy events, but rather classify firms into their respective groups based on their observable subsidy eligibility. Our approach is therefore similar to Gonzalez-Uribe and Paravisini (2019) who group firms into "automatic qualifiers" and "non-Eligible firms". In our data, not every Angel investment that went into an Eligible company has necessarily been matched by public subsidies to the investors. Therefore, our results represent a lower bound of the subsidy effect, as we would expect no smaller effect sizes had all Eligible investments been matched with additional funds from the subsidy program.

3.3 Difference-in-Differences Estimation

To estimate the effect of the introduction of Angel investor subsidies on the provision of financial resources and managerial support activities, we employ a difference-in-differences framework. The difference-in-differences approach estimates the difference in an outcome y_{it} between two or more groups over time. In our case, the outcome y_{it} is one of the survey items on financial or managerial support specified in Section 4.2. The parametric version of the difference-in-differences model we estimate is given by the following equation

$$y_{it} = \delta D_{it} + \tau_t + \gamma_i + \beta X_{it} + u_{it}. \tag{1}$$

Here X_{it} is a set of control variables, including dummy variables for a firms' founding cohort, and the region where it is located. γ_i is a group specific indicator which equals one if a firm is in the group that qualifies for the subsidy and zero otherwise. τ_t is an indicator

for the period, and equal to one if a firm is observed after the policy was introduced. The last term u_{it} is an i.i.d. transitory error term. Finally, D_{it} is an indicator equal to one for firms that are treated. In particular, $D_{i1} = 1$ if $\gamma_i = 1$ and $\tau_t = 1$, that is firm i is referred to as being treated if it is in the group of Eligible firms in the post-treatment period.

Our focus will be on the coefficient δ, which represents the effect of the introduction of the Angel investor grant on outcomes y_{it}. As argued earlier, the treatment and control group need to follow parallel paths over time. This assumption is likely to be violated if the treatment and control group differ significantly in relevant variables that are likely to affect the outcome. To account for differences between groups, a common approach is to use non-parametric or semi-parametric matching procedures to balance the distribution of covariates between the treatment and control groups (Heckman et al., 1997; Abadie, 2005). Our approach follows the exposition of Blundell, Dias, Meghir, and Van Reenen (2004). Their approach is applicable to repeated cross-sectional data such as the data we work with and takes into account the possibility of different control groups. The non-parametric version of the difference-in-differences estimator for repeated cross-sections can be written as follows (Blundell & Dias, 2009)

$$\hat{\delta} = \sum_{i \in T_1} \left\{ \left[y_{it_1} - \sum_{j \in T_0} \tilde{w}^T_{ijt_0} y_{ijt_0} \right] - \left[\sum_{j \in C_1} \tilde{w}^C_{ijt_1} y_{ijt_1} - \sum_{j \in C_0} \tilde{w}^C_{ijt_0} y_{ijt_0} \right] \right\} w_i. \tag{2}$$

Here, $\{T_0, T_1, C_0, C_1\}$ represent the treatment group (T_t) and control group (C_t) before and after the introduction of the program, and $\tilde{w}^G_{ijt}$ is the weight of firm j in group G and period t when comparing it to firm i. Note that in repeated cross sections, the group that is treated is compared to both control groups, as well as the treatment group in period $t = 0$. When calculating the weights, each of the non-treated groups is matched separately to the treated group. To calculate the weights, Blundell et al. (2004) use propensity score matching. Recently, other convenient matching procedures have been proposed that deal with some of the shortcomings of propensity score matching, in particular the sometimes remaining imbalance in the covariate distribution. To address this, we will use different matching approaches. This also allows us to check whether our results depend on a particular matching approach.

3.4 Covariate balancing

In the previous paragraph, we emphasized that we need comparable control groups for our treatment group to obtain meaningful estimators. Greater comparability between groups can be achieved by aligning the distribution of observable covariates between the groups. Matching methods achieve this by reweighting and possibly discarding observations. The resulting weights of the matching procedure can then be used in parametric or non-parametric regressions to estimate causal effects under the assumption of ignorability (Rosenbaum & Rubin, 1983). A major advantage of balancing covariates is that it reduces model dependence, which reduces the dependence of the results on specific func-

tional forms. There are a great number of possible matching methods. Among the most popular procedures is propensity score matching.

The intuition behind propensity score matching is simple. For a given firm i, we want to estimate the treatment probability, given a set of observable characteristics. Therefore, the propensity score is defined as $p_i = E(D_i = 1|X_i)$, and can be estimated using some generalized linear models such as logit or probit. Based on the estimated propensity score, we then want to find for each treated individual $D_i = 1$ similar individuals that are untreated $D_k = 0$. To identify matching tuples, several algorithms have been proposed in the literature. For difference-in-differences estimators with repeated cross sections, Heckman et al. (1997) suggest to use a Kernel matching function. The idea of this approach is to use all non-treated observations as controls, but giving those closer to the treated unit higher weights. When using the Kernel Matching approach, the weights w_i in equation (2) are given by $w_i = \frac{K(\frac{p_i - p_k}{h_n})}{\sum K(\frac{p_i - p_k}{h_n})}$, where $K(\cdot)$ is a kernel function to be defined, and h_n is the selected band width of that function.[12]

One shortcoming of matching methods based on the propensity score is that it sometimes performs poorly on the very thing it intends to do, namely increasing covariate balance (King & Nielsen, 2019). While the Kernel function gives some flexibility through appropriate choice of Kernel function, there is a more convenient methods that directly addresses covariate balance. Entropy balancing addresses this problem (Hainmueller, 2012). Entropy balancing directly calculates weights that minimize the imbalance between the covariate distribution of treated and non-treated individuals. Hainmueller (2012) suggests to use the so called entropy divergence as objective function, which is defined as $h(w_i) = w_i log(w_i/q_i)$, where w_i are the weights and q_i is a base weight. This objective function is then minimized subject to balance constraints and a normalizing constraint. The balance constraints are imposed on the moments of the reweighted control group. Therefore the moments of the distributions of the treated and reweighted control group can be exactly matched up to a finite level of tolerance. The normalizing constraint ensures that the weights sum to unity. The numerical implementation of the matching procedure that calculates the weights is discussed in Hainmueller and Xu (2013).

In our application we use the control variables described in Section 4.2 to calculate the balancing weights for both procedures.

4 Data

4.1 Sample description

Our primary data source is the IAB/ZEW Startup Panel. The Startup Panel is based on an annual survey among a representative sample of entrepreneurial companies located in

[12] Note that we estimate the model using the user written Stata command `diff`, and estimate the propensity score using a logistic model and choose a bandwidth of 0.06.

Germany. Companies that enter the survey are drawn from a stratified random sample of the population of newly founded firms in Germany, where firms from high-tech industries are over-represented. When firms enter the survey they are at most three years old. They remain in the survey until they are seven years old. Therefore, our unit of observation are entrepreneurial companies in their early life cycle. Given the sampling procedure of the Startup Panel, our data includes a large sample of high-tech companies. As Angel investors typically invest in innovative companies at an early stage of the company life-cycle, the Startup Panel provides a sound basis for our empirical analysis.

Table 2: Distribution of VC financed and non-financed startups

	Angel Investors' Deal Flow					
Year	Angel & VCF	Angel	No Deal	VCF	No VC	Full
			All			
2012	28	368	512	80	5,241	6,229
2018	72	527	1,010	52	5,761	7,422
Total	100	895	1,522	132	11,002	13,651
			Eligible			
2012	26	201	381	53	2,627	3,288
2018	64	313	626	45	2,370	3,418
Total	90	514	1,007	98	4,997	6,706
			Non-Eligible			
2012	2	167	131	27	2,614	2,941
2018	8	214	384	7	3,391	4,004
Total	10	381	515	34	6,005	6,945

Table 2 shows the number of startups in our sample by the type of venture capital they receive. Startups that receive finance from both Angels investors (Angel) and venture capital funds (VCF) are in the first column. Companies in the column No Deal have not received venture capital, but were part of Angel investors' deal flow. Companies in the Column No VC neither received VC from Angels, nor from VCFs and have not been in contact with Angel investors.

In the years 2012 and 2018, the Startup Panel comprised special surveys on venture capital (VC) financing with a particular focus on financing from Angel investors. Data on financing amounts differentiates between Angel investors and venture capital funds (VCF), and allows us to look at their activity separately. In addition, the special survey included information on managerial support activities from Angel investors. Finally, the survey asked firms that have not closed a deal with an Angel investors, whether they have been in contact with an Angel investor. In the following, we refer to companies that have been in contact with Angel investor, but have not closed a deal with an Angel investor, as being part on Angel investors' deal flow. We dismiss observations that contain missing values in at least one of the key variables that we use in our analysis.[13] Table 2 shows the distribution of the sample by financing source and eligibility of the investment target. The final sample includes 13,651 startup companies (full), of which 11,002 neither had contact with an Angel investor nor received any type of VC financing (No VC). In total, 2,582 companies were in contact with an Angel investor (Deal Flow), 895 of those firms received financing from Angel investors (Angel), 100 firms received financing from both Angel investors and VC

[13]Note that we winsorized the largest 1% of financing volumens and number of Angel investors.

Firms (Angel & VCF) and 1,522 did not close a deal after having been in contact with an Angel investor (No Deal). 132 firms received financing from a venture capital fund but not from an Angel investor (VCF).[14] Because we cannot clearly assign the companies that received financing from both Angels and VCFs to either the treatment or control group, we exclude these companies from our analysis. For our analysis of the financing volumes at the intensive margin, this leaves us with a sample of 1,027 firms that received either financing from either Angel investors or VCFs, but not both.

Given the sampling scheme of the Startup Panel, most companies appear only once in our data set.[15] Thus, our data set is a repeated cross-sectional sample. As the data comprises reference years 2012 and 2018, the data gives us representative information on financing from VCs (both Angel investors and VCFs) shortly before the introduction of the program and after. We use this data structure to estimate the lower bound of the policy effect using the estimation procedure described in Section 3.3.

4.2 Variable description

In this section, we describe our main outcome variables and explain the selection of our control variables, before we present descriptive statistics.

a) Financial outcomes. In the survey, firms were asked to indicate the total amount of financing raised from different sources of VC since foundation. Therefore, Angel Amount gives the total amount of venture capital a firm has received from Angel investors until the observation year. Likewise, VCF Amount gives the total amount raised from venture capital funds, and the sum of both is given by Total VC Amount. In our estimations, we use the natural logarithm of financing amounts.

b) Managerial outcomes. We construct the outcomes on managerial support activities from the respective survey items. Startups were asked to rank the degree of managerial support of their Angel investors on a five-point Likert scale, from 1 (no engagment) to 5 (very active). Managerial support activities covered by the survey include activity on the board, the investors' network, general mentoring, as well as support in commercialization or development related tasks within the company. To make the results interpretable, we standardize managerial outcomes.[16] That way, we can interpret the outcomes as standard deviations from the mean of the baseline control group.

c) Control variables. Our estimation approach critically depends on the assumption that Eligible and non-Eligible firms are comparable over time. Bias would arise, if firm characteristics between Eligible and non-Eligible firms changed over time, and these changes affected either financial and managerial support that companies receive from An-

[14] Note that 67 firms (51%) of firms in the group VCF were not in contact with an Angel, and therefore not part of Angels' deal flow.

[15] Out of the 1,027 firms in our main sample, 4 appeared in both waves.

[16] We standardize outcomes by subtracting the average rating for each category in the baseline control group (non-Eligible firms in the pre-treatment period) and divide this term by the respective standard deviation.

gel investors. Given our limited ability to test for common trends due to data availability, we match firms using a number of different control variables, as explained in Section 3.4. We selected control variables based on an in depth literature review to identify founder and firm characteristics that are most relevant in venture ccapitalists' financing decisions. Thus the control variables we use are based on characteristics of the founding team, as well as company characteristics.

The first set of control variables we use is related to firms' organizational and human capital. Organizational and human capital, such as founders' experience and the composition of the founding team play an important role for the likelihood to receive venture capital, and the amount of venture capital raised. For venture capital investors, the founding team of the company is often cited as the most important selection criterion, and seen as most important factor for success and failure of a venture (Gompers et al., 2020).[17] Founders with an academic background and those with previous management experience are more likely to raise external capital (Gimmon & Levie, 2010), and Industry experience of the founding team is one of the most important investment factors for VCFs (Kaplan & Strömberg, 2004). Founders with previous founding experience are more likely to raise venture capital (D. H. Hsu, 2007), and also raise higher amounts of venture capital (J. Zhang, 2011; Ko & McKelvie, 2018). When founders have raised venture capital with their previous venture, the effects become larger. To account for the effect of the founding team on the likelihood to receive venture capital, and the amounts raised, we use several control variables for founders' organizational and human capital. In particular we use an indicator for founders previous founding experience, founders' years of Industry experience, an indicator for whether the venture was founded by a team, and whether the team had an academic background. A full description of the variables can be found in Table B.2 in the appendix.

While organizational and human capital are regarded as most important factors in the funding decision of venture capital investors, there are other important factors that should be accounted for. A growing literature is reporting on a 'gender gap' in venture capital, suggesting that venture capital investors are biased against women (Ewens & Townsend, 2020; Y. Zhang, 2020). Guzman and Kacperczyk (2019) find that gender differences are highly correlated, and can therefore be largely explained by the growth orientation of startups. We account for gender, and proxy growth orientation of the venture by an indicator variable for whether the venture is the result of a concrete business idea. Finally we control for the development stage of the venture by the company age of the startup, and include regional dummies for East Germany, West Germany and Berlin. Note that we cannot match on Industry affiliation at the NACE 2 level, as eligibility is based on it. To control for Industry affiliation nonetheless, and to capture in part the influence of technological opportunities in different industries, we aggregate industries into Hightech Manufacturing, Software and Technical Services, and Non-Hightech Industries. To address

[17] Although results by Gompers et al. (2020) pertain for VCFs, experimental results by D. K. Hsu, Haynie, Simmons, and McKelvie (2014) suggest no difference of the importance of specific human capital characteristics for VCFs and Angels investment decisions.

concerns that our results are driven by Industry affiliation, we compare companies in Eligible industries that were funded by only Angel investors or only VCFs in Section 5.6.

4.3 Descriptive statistics

Table 3: Summary statistics of outcomes

	Deal Closed Angel or VCF				
	Number of Obs.	Mean	Std. Err.	Min.	Max.
Outcomes: Financial					
Angel	1,027	0.87	0.33	0	1
VCF	1,027	0.13	0.33	0	1
Total VC Amount (in thsd.)	1,027	328.02	802.95	0	10000
Angel Amount (in thsd.)	895	256.61	623.86	0	5300
VCF Amount (in thsd.)	132	812.15	1456.86	5	10000
Outcomes: Managerial					
Board	895	0.21	0.41	0	1
Network	895	0.52	0.50	0	1
Mentoring	895	0.59	0.49	0	1
Commercialization	895	0.25	0.43	0	1
Development	895	0.18	0.39	0	1
Board	895	1.57	1.22	1	5
Network	895	2.30	1.46	1	5
Mentoring	895	2.49	1.48	1	5
Commercialization	895	1.61	1.20	1	5
Development	895	1.44	1.05	1	5
Investor Organization					
Syndication	895	0.34	0.47	0	1
Syndicate Size	895	1.85	1.92	1	17

Table 3 shows summary statistics including only startups either financed by Angel or VC FUND, but not both. Information on syndication and managerial outcomes is not available for startups that received only funding from VCFs.

Table 3 and 4 report the summary statistics for our main sample. The right panel of tables shows the summary statistics for the sample of VC financed companies, excluding those that received financing from both Angels and VCFs. Of the companies that have obtained financing, 87% have received VC from Angel investors and 13% from VCFs. This is consistent with prior assessments of the size of the market for Angel financing and shows that raising money from Angel investors is considerably more common than raising money from VCFs. Looking at the financing amounts raised from either type shows that VCFs provide much larger financing amounts to firms compared to Angel investors. On average, companies in our sample have raised 812 Tsd. Euros from VCFs, which is more than three times the amount they have raised from Angel investors, which is at 257 Tsd. Euros.

In terms of managerial support, there are differences in the kind of support that companies receive from Angel investors. Almost 60% receive some level of informal advice from their investors and more than half of the companies receive access to the investors'

network. Conversely, relatively few companies have an investor who is formally engaged as an advisor on the board (21%), and just as few companies have an investor who is somehow actively involved in the company by taking on commercial (25%) or production-related tasks (18%). Also when looking at the level of involvement, it becomes clear that on average Angel investors are rather focused on opening doors and providing informal advice.

Table 4 reports summary statistics for the firm characteristics we control for in our estimations, differentiated by the different groups in our sample. The proportion of companies that are founded on a concrete business idea - our proxy for companies' innovation and growth potential - is particularly pronounced in firms that receive financing from VCF, where more than two in three firms indicate this. The proportion of firms that receive only financing from Angels is somewhat lower, where only one in two firms indicates it. The share of firms with a female founder with either VCF or Angel financing is similar in size to the average company in our sample. Also founders who receive financing from either Angels or VCF seem to be somewhat more experienced in founding a firm than the average founder in our sample, but on average have less Industry experience. Also, companies who receive financing from either Angels or VCF are more often founded by a team, more often have an academic background, and hold patents. In terms of geographical distribution, a comparatively large proportion of companies is based in Berlin. Tables C.3 - C.12 in the appendix contain a comparison of means before and after balancing the control variables for all samples that we use in our empirical analysis.

Table 4: Summary statistics of control variables

	Angel Investors' Deal Flow											
	Angel & VCF		Angel		No Deal		VCF		No VC		Full	
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.
Firm Characteristics												
Oppourtunity	0.71	(0.46)	0.48	(0.50)	0.50	(0.50)	0.66	(0.48)	0.30	(0.46)	0.34	(0.47)
Female	0.15	(0.36)	0.19	(0.39)	0.15	(0.36)	0.20	(0.40)	0.20	(0.40)	0.19	(0.39)
Founding Exp.	0.66	(0.48)	0.48	(0.50)	0.55	(0.50)	0.51	(0.50)	0.38	(0.49)	0.41	(0.49)
Team	0.69	(0.46)	0.40	(0.49)	0.45	(0.50)	0.58	(0.49)	0.28	(0.45)	0.31	(0.46)
Academic	0.94	(0.24)	0.61	(0.49)	0.69	(0.46)	0.74	(0.44)	0.44	(0.50)	0.49	(0.50)
Industry Exp.	12.50	(9.04)	14.86	(9.96)	15.26	(10.16)	17.17	(9.88)	17.18	(10.29)	16.78	(10.28)
Successful Exit	0.30	(0.46)	0.11	(0.31)	0.11	(0.32)	0.12	(0.33)	0.06	(0.24)	0.07	(0.26)
Startup Age	2.53	(1.86)	2.37	(1.87)	2.27	(1.85)	3.14	(2.18)	2.34	(1.98)	2.34	(1.96)
Size at Start	2.81	(1.62)	2.83	(4.04)	2.53	(2.42)	3.04	(2.79)	2.37	(3.67)	2.43	(3.57)
Patent	0.08	(0.27)	0.07	(0.25)	0.06	(0.24)	0.15	(0.36)	0.02	(0.15)	0.03	(0.18)
Region												
Berlin	0.16	(0.37)	0.06	(0.24)	0.06	(0.24)	0.04	(0.19)	0.03	(0.18)	0.04	(0.20)
West	0.65	(0.48)	0.84	(0.37)	0.83	(0.38)	0.77	(0.43)	0.84	(0.37)	0.84	(0.37)
East	0.19	(0.39)	0.10	(0.30)	0.11	(0.31)	0.20	(0.40)	0.13	(0.33)	0.12	(0.33)
Industry												
Hightech Manufacturing	0.27	(0.45)	0.16	(0.36)	0.14	(0.35)	0.30	(0.46)	0.09	(0.29)	0.10	(0.31)
Software and Techn. Services	0.58	(0.50)	0.30	(0.46)	0.38	(0.49)	0.42	(0.49)	0.24	(0.43)	0.27	(0.44)
Non-Hightech	0.15	(0.36)	0.55	(0.50)	0.48	(0.50)	0.29	(0.45)	0.66	(0.47)	0.63	(0.48)
Number of Obs.	100		895		1,522		132		11,002		13,659	

Table 4 shows summary statistics ...

5 Results

5.1 Angel financing

Table 5: Estimated effect of investor subsidy on financing decision

	Panel B					
	Unbalanced		Entropy Balanced		PS Balanced	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible × Post	0.195***	0.198***	0.130**	0.144***	0.148***	0.159***
	(0.042)	(0.043)	(0.053)	(0.052)	(0.050)	(0.050)
Eligible	-0.195***	-0.197***	-0.135***	-0.150***	-0.149***	-0.158***
	(0.034)	(0.038)	(0.044)	(0.049)	(0.042)	(0.041)
Post	-0.190***	-0.186**	-0.119**	-0.049	-0.144***	-0.100
	(0.035)	(0.073)	(0.047)	(0.095)	(0.044)	(0.089)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes
Region FE		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes
Number of Obs.	2,582	2,582	2,582	2,582	2,569	2,569
R2	0.02	0.03	0.01	0.03	0.01	0.04

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 5 shows the average effect of the Angel investor grant on the likelihood to raise venture capital from an Angel investor. Panel B contains only startups that were in contact with an Angel investor, including those that did not get an investment. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Coefficients are estimated using ordinary least squares.
Columns (1) and (2) do not balance the covariate distribution and use unit weights for the calculation of equation (2). Columns (3) and (4) use Entropy Balancing to balance the covariate distribution. Columns (5) and (6) use Propensity Score Matching to balance the covariate distribution, with the weights specified in Section 3.4. The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region.

We first look at the effect that the introduction of the subsidy program had on companies' chances to raise money from an Angel investor. To do so, we estimate equation (2) with linear probability models for the sample of companies that were part of Angel investors' deal flow. The outcome is equal to one if the company closed a deal with an Angel investor, and zero otherwise. Table 5 shows the results of that estimation. Clearly, companies that were Eligible to the program were significantly more likely to close a deal with an Angel investor after the introduction of the policy. Relative to the baseline probability to close a deal with an Angel investor - which is at 31% - we observe a marginal increase of 20 percentage points. This suggests that for companies that are part of Angel investors' deal flow, the probability to raise money from at least one Angel investor increased by about 61%. In the matched specifications in columns (3) - (6), we estimate that Angel investor subsidies increase the likelihood to close a deal with an Angel investor by about 13-16 percentage points, corresponding to a relative increase in the probability to raise money from Angel investors of about 36-67%. This suggests that - at the extensive margin - the policy positively affects companies' chances to raise financing from Angel investors.[18]

[18]In Table D.13 in the appendix we estimates the same models unconditional on having had contact

5.2 Angel financing amounts

Table 6: Estimated effect of investor subsidy on financing volumes (in logs)

	Panel C					
	Unbalanced		Entropy Balanced		PS Balanced	
	(1)	(2)	(3)	(4)	(5)	(6)
Angel × Eligible × Post	1.025***	0.810***	0.838***	0.663***	0.710***	0.750***
	(0.213)	(0.204)	(0.266)	(0.244)	(0.241)	(0.241)
Eligible × Angel	-0.364**	-0.865***	-0.573***	-0.974***	-0.382**	-0.392**
	(0.160)	(0.168)	(0.208)	(0.202)	(0.175)	(0.176)
Post	0.403***	0.514	0.397*	0.736*	0.716***	1.132**
	(0.156)	(0.381)	(0.212)	(0.403)	(0.193)	(0.446)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes
Region FE		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes
Number of Obs.	1,027	1,027	1,027	1,027	1,015	1,015
R2	0.09	0.23	0.07	0.22	0.09	0.13

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 6 shows the average effect of the Angel investor grant on the amount (in logs) of venture capital raised from an Angel investor. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) use Entropy Balancing to balance the covariate distribution and the calculation for the weights in equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region.

Next we focus on the amounts of financing raised from Angel investors. To do so, we use the sample of firms that has closed a deal with at least one Angel investor or a VCF. The outcome is the natural logarithm of total VC raised since the startup was founded, up until the observation year. The treatment group are firms in the post-treatment period that have raised money from at least one Angel investor and are eligible for the subsidy. The results are presented in Table 6. All models are estimated using ordinary least squares.

All specifications indicate an economically significant effect of the subsidy program on the amount of money raised from Angel investors. The effect is statistically different from zero at the 1%-level throughout all specifications. In the baseline specification, our results suggest that the introduction of the program more than doubled the amount of financing raised from Angels. When accounting for factors that are likely to be correlated with the financing amounts using entropy balancing (columns (3) and (4)), the coefficient drops to about 0.838, which corresponds to an increase of the financing volume by 84%. When in addition controlling for the founding cohort and the region where companies are located, the coefficient drops further, so that the estimated rise in financing volumes is about 66%. The results remain qualitatively similar when using propensity score matching.

with an Angel investor. The relative increase in the probability to close a deal with an Angel investor in those models is qualitatively and also quantitatively very similar.

These results suggest that the introduction of the policy also had a positive effect on the financing volumes provided to entrepreneurial companies by Angel investors.

5.3 Managerial support

Table 7: Estimated effect of investor subsidy on managerial support

	Panel D				
	(1) Board	(2) Mentoring	(3) Network	(4) Commercialization	(5) Development
Eligible × Post	-0.343	0.106	0.075	0.026	-0.026
	(0.230)	(0.173)	(0.188)	(0.179)	(0.178)
Eligible	0.093	0.009	-0.093	0.026	0.232*
	(0.176)	(0.134)	(0.153)	(0.145)	(0.123)
Post	0.553	0.369	0.415	0.432	0.824*
	(0.443)	(0.326)	(0.336)	(0.361)	(0.473)
Constant	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	895	895	895	895	895
R2	0.12	0.05	0.08	0.06	0.06

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 7 shows the average effect of the Angel investor grant on the amount (in logs) of venture capital raised from an Angel investor. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) use Entropy Balancing to balance the covariate distribution and the calculation for the weights in equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Total VC Amount (log), Syndicate Size.

So far, we have looked at the effect of the policy on financial outcomes of the policy. As argued in Section 2.2, there are reasons to belief that the introduction of the Angel investor subsidy could have an effect on the managerial support that companies' receive from Angel investors. Unfortunately, our sample only contains information for managerial support activities by Angel investors. Therefore, we cannot use VCFs as a control group here. Instead, we base the analysis for managerial support on the sample of companies that received financing from Angel investors, but differ in their eligibility to the program. The treatment group are companies that are Eligible for the program, and non-Eligible companies serve as control group.

Our analysis is based on different outcomes. These include the activity of Angel investors on companies' board, their general Mentoring, access to the investors' network, as well as direct support in Commercialization and production related tasks. All outcomes are based on a 5-point Likert scale that is based an assessment of the companies about the level of support that they receive from their Angel investors. We normalized the Likert scale values to be able to interpret the effects as standard deviations relative to the baseline control

group.

Table 7 contains the main results where we used entropy balancing and also accounted for founding cohort and region fixed effects. The results indicate ambiguous effects of the policy on managerial outcomes. While activity on the board has declined by 0.16 standard deviations relative to the baseline control group, and support in production declined by 0.083 standard deviations, engagement in Mentoring, networking and support in Commercialization has on average increased. However, none of the coefficients is statistically different from zero at the 10% significance level. In terms of significance, these results remain qualitatively the same when we consider different matching procedures or include control variables (see Tables D.14 to D.18 in the appendix). From our results, we cannot reject that the policy had no effect on managerial support activities. This is in contrast to our initial conjecture that would have predicted clearly negative effect sizes. To understand the mechanisms behind these results, we will move our analysis to the investor level in the next section.

5.4 Composition of investor types and portfolios

The main interest of our analysis is to understand the effects of subsidies to Angel investors on firms' access to financial and managerial resources. However, we are also interested in understanding the mechanisms that drive these effects. To understand the mechanisms behind our findings we further investigate in how far the policy had an effect on the composition of investor types and investors' portfolios. This will allow us to assess the extent to which mechanisms that are suggested by theory play out empirically. In our discussion of the hypothetical effects of the policy in Section 2.2 we argued that the policy should have an effect on both the entry of new investors as well as the portfolio size of existing investors. To get information on investors and their portfolios, we augment our data with ownership information from the Mannheim Enterprise Panel (MEP). The MEP is a comprehensive firm level database, comprising the universe of German companies, and is based on information from Creditreform, Germany's largest credit rating agency.[19] The MEP contains the population of all firms in Germany and forms the sampling frame of the IAB/ZEW Startup Panel. The database contains detailed information on company owners, i.e. individuals and firms that have an open equity position in companies. As company owners are uniquely identified in the data, we can construct the investment history for all company owners in our sample. As company owners comprise both founders and investors, research assistants manually classified owners into investors and founders. This exercise was conducted by using matching information in the MEP with information in the special surveys (included data on Angel investors' age, gender, ownership share, as well as the number of investors per company), and information that we found on the web (using company websites, as well as other secondary sources such as crunchbase and bloomberg). Table 8 shows the results of this search effort. From the 1,127 companies in our sample, 376 had an open equity position. For those companies we found 1,086 investors of which

[19] For more information on the MEP see Bersch, Gottschalk, Müller, and Niefert (2014).

755 are Angel investors, and 332 venture capital funds.

Table 8: Distribution of investors and startups in MUP

Year	Number of Startups		Number of Investors		
	VC	Open Equity	Total	Angel	VCF
2012	476	117	294	171	123
2018	651	259	792	584	209
Total	1127	376	1086	755	332

Note that not all startups that receive equity from either Angels or VCF have open equity positions.

We first focus on the composition of investor types. Denes et al. (2020) differentiate between professional and non-professional investors. Their notion of professionalism essentially refers to the prior experience of investors. Having the entire investment history for the 1,086 investors in our sample, we can look when these investors made their first venture investment into an entrepreneurial company. Figure 2 shows the entry date of the 755 Angel and 332 VC investors in our sample.

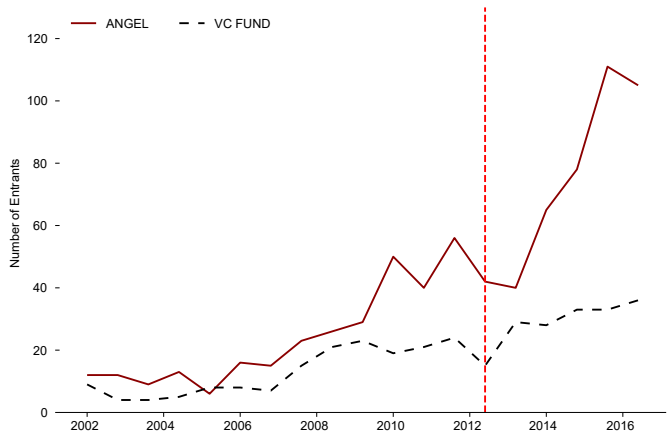


Figure 2: First startup investments by investors in sample.

The graph shows when investors in the sample made their first startup investment. A startup investment is defined as an investment into a company that is at most seven years old when the investment is made and is not an investment company (this excludes primary NACE 3 codes: Activities of head offices (701), Activities of holding companies (642), Trusts, funds and similar financial entities (643), Fund management activities (663)). Furthermore, the investor must not be part of the executive Team.

As we can see, after the introduction of the policy in 2013 there is a spike in the entry pattern of Angel investors. This is consistent with the findings by Denes et al. (2020), and suggests that subsidies to Angel investors spur entry by new investors. An evaluation on the INVEST program in 2015 reports that 20% of subsidized investors have invested for the first time as a result of the program (Gottschalk et al., 2016). Overall, this indicates that the composition of investor types changed as a result of the policy, with an increased in inexperienced investors. Given this change in the composition of investors, one would expect to find a negative average effect on managerial support activities.

Since our results from the previous section do not confirm that subsidies to Angel investors have negative effects on managerial support, the next thing we are going to look at are the portfolios of investors that have been investing prior to 2013, before the introduction of the policy. Previous research suggests that professional Angel investors see subsidies such as tax incentives or grants as non-material for their investment decisions (Stedler & Peters, 2003; Denes et al., 2020). To the extent that we can refer to those investors as professional investors, we would therefore expect to find changes in portfolio sizes following the introduction of the policy. Figure 3 shows the average portfolio size of Angel investors in our sample that have been investing prior to 2013.

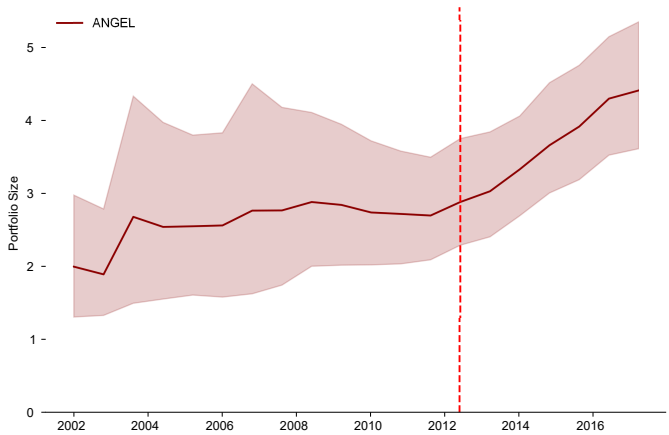


Figure 3: Average portfolio size of incumbent Angel investors in sample.

The graph shows the average size of incumbent investors' startup portfolio. An incumbent investor is defined as having started investing prior to 2013. A startup investment is defined as an investment into a company that is at most seven years old when the investment is made and is not an investment company (this excludes primary NACE 3 codes: Activities of head offices (701), Activities of holding companies (642), Trusts, funds and similar financial entities (643), Fund management activities (663)). Furthermore, the investor must not be part of the executive Team.

Looking at Figure 3, we clearly see that after having remained stable for almost a decade, the average portfolio size of these investors increased markedly after the policy was introduced. This is in contrast to the survey results among professional investors, which suggest that, from the perspective of these investors, the effort to obtain subsidies is disproportionate to their benefits (Denes et al., 2020). In the next section we will provide an explanation to reconcile our seemingly conflicting results with existing research findings.

5.5 Syndication of Angel investors

A large literature documents that Angel investors syndicate their investment in groups (see. e.g. Bonini, Capizzi, Valletta, & Zocchi, 2018; Lerner et al., 2018). Syndicating investment in groups increases Angel investors access to information and deal flow, and allows individual members to reduce direct individual monitoring, because they can access the groups shared skills and resources (Bonini et al., 2018). This leads individuals to invest more, and commit more of their wealth to entrepreneurial companies. Prowse (1998)

Table 9: Syndication of Angel investors

	Panel D					
	Unbalanced		Entropy Balanced		PS Balanced	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible × Post	0.127**	0.113*	0.067	0.039	0.041	0.041
	(0.062)	(0.063)	(0.077)	(0.076)	(0.074)	(0.074)
Eligible	0.064	0.006	0.046	-0.009	0.069	0.076
	(0.046)	(0.054)	(0.056)	(0.064)	(0.053)	(0.055)
Post	0.036	-0.169	0.096	-0.056	0.119**	-0.021
	(0.045)	(0.126)	(0.063)	(0.126)	(0.059)	(0.139)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes
Region FE		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes
Number of Obs.	895	895	895	895	873	873
R2	0.04	0.08	0.03	0.08	0.03	0.08

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table **??** shows the average effect of the Angel investor grant on the likelihood to raise venture capital from a syndicate of Angel investors. Panel D contains startups that raised venture capital from Angel investors but not venture capital funds. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Coefficients are estimated using ordinary least squares.
Columns (1) and (2) do not balance the covariate distribution and use unit weights for the calculation of equation (2). Columns (3) and (4) use Entropy Balancing to balance the covariate distribution. Columns (5) and (6) use Propensity Score Matching to balance the covariate distribution, with the weights specified in Section 3.4. The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region.

reports that not all individuals in those groups are actively engaged, with one or more individuals operating as lead investors, structuring and monitoring the deals. More syndication among Angel investors is an immediate explanation for the investment patterns we find. While the subsidy is primarily used by inexperienced investors, it does have indirect effects on experienced investors, as they increase their investment activity within groups. Inexperienced investors can thus increase the network's deal flow, and the groups' experienced investors bring management support. Survey evidence from the INVEST evaluation supports this explanation. A majority (more then 90%) of inexperienced investors report to invest with more experienced investors (Gottschalk et al., 2016).

To see whether syndication is in fact an explanation for our findings, we return to the firm level data. For the sample of firms that have received financing from at least one Angel investor (Panel D), we analyze how many Angel investors have invested in the company since the company was started.

Table 9 shows the effect of the policy on the likelihood to syndicate. As we see, in the Eligible group the likelihood to syndicate did not increase. However, the syndicate size - meaning the number of Angels investing per company - increased significantly, as shown in Table 10. This suggests that while professional investors may not be attracted by subsidies themselves, subsidies to Angel investors may have indirect effects on professional investors through their investment networks. This could explain why we do not find negative effects

Table 10: Syndicate size of Angel investors

	Panel D					
	Unbalanced		Entropy Balanced		PS Balanced	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible × Post	0.663***	0.585***	0.595**	0.447*	0.504*	0.522**
	(0.214)	(0.210)	(0.287)	(0.267)	(0.261)	(0.249)
Eligible	0.194	-0.118	-0.006	-0.244	0.099	0.157
	(0.123)	(0.150)	(0.187)	(0.194)	(0.158)	(0.156)
Post	0.152	-0.387	0.220	-0.216	0.297	-0.213
	(0.115)	(0.671)	(0.223)	(0.616)	(0.190)	(0.654)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes
Region FE		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes
Number of Obs.	895	895	895	895	873	873
R2	0.05	0.11	0.03	0.13	0.04	0.10

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 10 shows the average effect of the Angel investor grant on the syndicate size, i.e. the number of Angel investors from which startups raise venture capital. Panel D contains startups that raised venture capital from Angel investors but not venture capital funds. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Coefficients are estimated using ordinary least squares.
Columns (1) and (2) do not balance the covariate distribution and use unit weights for the calculation of equation (2). Columns (3) and (4) use Entropy Balancing to balance the covariate distribution. Columns (5) and (6) use Propensity Score Matching to balance the covariate distribution, with the weights specified in Section 3.4. The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region.

on managerial support, albeit subsidies to Angel investors trigger significant entry from inexperienced individuals into Angel investing.

If syndication is in fact a main driver of our results, we would expect that financing amounts have increased because firms are able to raise money from more individuals, but not necessarily because they are able to raise higher amounts from each individual. We therefore return to our estimations on financing volumes, but now we account for the number of investors that are invested in a each company. The results are shown in Table 6.

As we see in Table 11, the effects (columns (1), (3), (4), and (5)) drop in size (to about 35% - 65%) and, when using entropy balancing, we cannot reject that there was no effect on average financing volumes. We therefore conclude that the effect on financing volumes mostly comes from new investors that were crowded in by the policy rather than existing investors increasing their average investment volumes.

5.6 Robustness test: Technological shocks and pre-treatment trends

Given that companies' eligibility is based on Industry classification and patents, we might be concerned that our results are driven by technological shocks that are specific to these industries. If the policy maker was able to identify these shocks then it could be the case

Table 11: Financing amounts accounting for syndicate size

	Panel D					
	Unbalanced		Entropy Balanced		PS Balanced	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible × Post	0.647***	0.643***	0.335	0.369	0.541**	0.629**
	(0.207)	(0.205)	(0.280)	(0.262)	(0.275)	(0.261)
Eligible	0.385**	0.002	0.239	-0.094	0.204	0.189
	(0.150)	(0.172)	(0.185)	(0.198)	(0.205)	(0.194)
Post	0.781***	0.533	1.093***	0.761**	0.860***	0.504
	(0.146)	(0.371)	(0.240)	(0.362)	(0.233)	(0.342)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes
Region FE		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes
Number of Obs.	895	895	895	895	878	878
R2	0.17	0.23	0.14	0.22	0.13	0.18

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 11 shows the average effect of the Angel investor grant on the amount (in logs) of venture capital raised from an Angel investor. Panel D contains startups that raised venture capital from Angel investors but not venture capital funds. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Coefficients are estimated using ordinary least squares.
Columns (1) and (2) do not balance the covariate distribution and use unit weights for the calculation of equation (2). Columns (3) and (4) use Entropy Balancing to balance the covariate distribution. Columns (5) and (6) use Propensity Score Matching to balance the covariate distribution, with the weights specified in Section 3.4. The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Syndicate Size.

that our results are merely driven by these shocks rather than the effect of the subsidy itself. This is especially problematic for our analysis of the financing volumes, as investment specific technology shocks drive up risk premia of companies with growth opportunities (Kogan & Papanikolaou, 2014). This may lead to much higher valuations and therefore more capital inflow into these companies. Related to this is the observation that technological shocks have decreased the cost of starting a business, which has allowed to start a business with smaller investment amounts (Ewens, Nanda, & Rhodes-Kropf, 2018). Again this may be a problem for our specifications of the financing volumes. If we can reject that there was a pre-treatment trend, and still find evidence for an increase in financing volumes after the introduction of the policy, we can be fairly certain, that our results are indeed driven by the policy rather than technological shocks to specific industries.

To check whether our results for the amount of VC raised are robust to technology shocks, we run additional tests on a restricted sample of startups in Eligible industries (Panel E), where the control group is a set of firms that receive financing from venture capital funds (VCFs) that were not subject to the policy. As only Angel investors were Eligible to the subsidy, any effect that we identify should be driven by investor types, rather than by technological opportunities. To test for pre-treatment trends as a result of the developments pointed out by Ewens et al. (2018), we augment the data from the Startup Panel with data from the ZEW/ Microsoft Hightech-Startup Survey 2007. This survey

was a precursor to the IAB/ZEW Startup Panel Bnd already contains many of the items that were later included in the Startup Panel. The crucial difference is that the sample of the High-Tech Startup Survey contains only companies from the high-tech sectors. For our robustness tests this is not an issue, but it explains why we cannot run placebo tests on the entire sample of companies.

Table 12: Robustness test for technological shocks and pre-treatment trends on financing volumes (in logs)

	Panel E							
	Entropy Balanced				PS Balanced			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angel × Post	0.736	0.850**			0.879**	1.199***		
	(0.503)	(0.387)			(0.409)	(0.402)		
Post	0.556	0.730			0.547	0.810		
	(0.481)	(0.558)			(0.382)	(0.653)		
Angel × Pre			0.755	0.491			0.179	-0.011
			(0.979)	(0.615)			(0.580)	(0.535)
Pre			-0.657	-1.090*			-0.163	-1.114*
			(0.961)	(0.630)			(0.555)	(0.628)
Angel	-1.969***	-1.997***	-2.483***	-2.306***	-2.054***	-2.355***	-2.238***	-2.387***
	(0.388)	(0.333)	(0.837)	(0.482)	(0.330)	(0.345)	(0.477)	(0.434)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes		Yes
Region FE		Yes		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes		Yes
Number of Obs.	612	612	449	449	607	607	444	444
R2	0.26	0.40	0.24	0.45	0.26	0.35	0.27	0.35

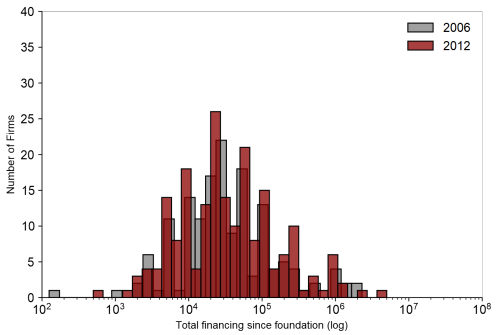
Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 12 shows the average effect of the Angel investor grant on the amount (in logs) of venture capital raised from an Angel investor. Panel E contains startups in Eligible industries that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Pre ist the observation period before 2012 that serves as a placebo test for our results. Coefficients are estimated using ordinary least squares.
Columns (1)-(4) use Entropy Balancing to balance the covariate distribution for the calculation of the weights in equation (2). Columns (5)-(8) use Propensity Score Matching to balance the covariate distribution, with the weights specified in Section 3.4. The *Balancing Covariates include:* Team, Academic, Industry Exp., Startup Age, Size, Region.

Figure 4 shows the distribution of financing volumes in 2006, 2012 and 2018 for financing from Angel investors and VCFs. The distribution of volumes in 2006 and 2012 is relatively stable for both types of financing (see Panels (a) and (c)). While this is also true for VCF financing volumes comparing the years 2012 and 2018 (Panel (d)), there is a clear shift to the right for financing volumes by Angel investors (Panel (b)). These results are also supported in our regression.

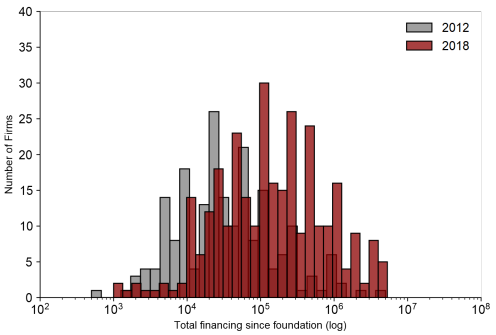
Table 12 shows the results for our robustness tests for technology shocks and pre-treatment trends. Generally, the results show that - on average - companies raise much smaller amounts from Angel investors invest compared to venture capital funds. This is indicated by the negative and strongly significant coefficient on Angel. However, as

columns (1) and (2), and (5) and (6) indicate, financing from Angel investors has increased relative to VCFs. The results remain qualitatively and quantitatively the same. According to these results, subsidies to Angel investors increase the amount of money raised from Angels by about 74-125%.

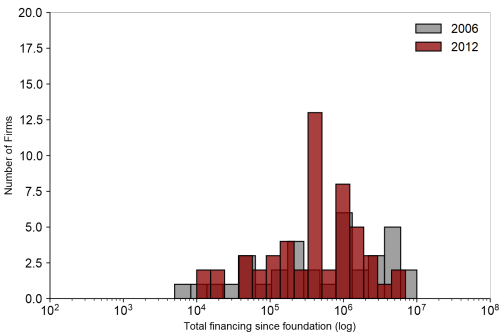
Columns (3)-(4) and (7)-(8) give the results of our test for pre-treatment trends. Indeed, the coefficient on Angel×Post suggests a positive trend of financing volumes provided by Angel investors even before the introduction of the policy, however, none of our results point to a significant pre-treatment trend for any of our specifications. We therefore conclude that our main results are not solely driven by technology shocks that the funding agency was able to anticipate.



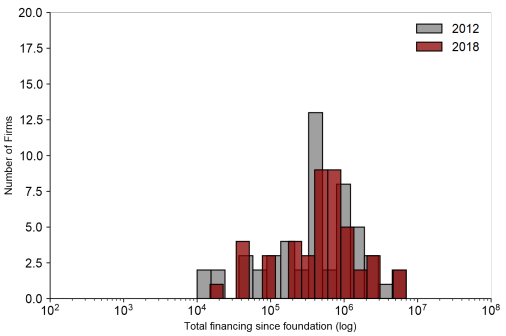
(a) Financing volume from Angels (2006 vs. 2012)



(b) Financing volume from Angels (2012 vs. 2018)



(c) Financing volume from VCs (2006 vs. 2012)



(d) Financing volume from VCs (2012 vs. 2018)

Figure 4: Frequency of observed financing volumes by investor types and years.

6 Conclusion

In this paper, we investigated the effect of investor subsidies on financial and managerial support from Angel investors. Angel investor subsidies have been introduced in various countries as a means to stimulate the early stage capital market for venture capital financing, which is regarded to be an important catalyser for innovative and high-growth entrepreneurship. We investigate the case of Germany where we have detailed firm level

information on financial and managerial support activities of Angel investors in startup companies before and after the introduction of the policy.

Using a difference-in-differences framework we estimated the effect of the introduction of the policy on i) the likelihood to receive VC from Angel investors, ii) the amount of VC raised from Angel investors, and iii) managerial support activities. We find that Angel investor subsidies raise the likelihood to raise VC from Angels by about 14-15%, and funding amounts by about 70%, while they do not seem to have an effect on managerial support. These results are robust to tests for technological shocks as potential driver for the results.

We further investigated the mechanisms that are underlying these results, and find that the increase in financing provided by Angels is largely driven by new investors entering the market rather than incumbent investors. At the same time, we see an increase in syndication size, suggesting that new investors syndicate their investment more often with incumbent investors. This could also explain why we find little to no detrimental effect of the policy on managerial outcomes, which we would expect if entering investors were mostly inexperienced.

Overall, our results suggest that Angel investor subsidies are an effective policy tool to stimulate early stage capital markets for innovative startups. While our data is limited to the case of Germany, we think that the underlying mechanisms that drive our results are not unique to the German market for Angel financing. Nevertheless, we suggest further research in other countries and regions.

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A Innovative industries

Table A.1: NACE codes of Eligible Industries

13.96	Manufacture of other technical and industrial textiles
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
25.6	Treatment and coating of metals; machining
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Building of ships and boats
32.5	Manufacture of medical and dental instruments and supplies
33	Repair and installation of machinery and equipment
58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
90	Creative, arts and entertainment activities

B Descriptives

Table B.2: Description of variables.

Variable name	Type	Description
		Financial outcomes
Angel	Binary	At least one financing round from Angel investor.
VCF	Binary	At least one financing round from VC fund.
Total VC Amount	Continuous	Total VC raised since foundation.
Angel Amount	Continuous	Total VC raised from Angel investors since foundation.
VCF Amount	Continuous	Total VC raised from VC Funds since foundation.
		managerial outcomes
Board	Ordinal	Ranking of Angel engagement on board.[1]
Network	Ordinal	Ranking of Angels' network.[1]
Mentoring	Ordinal	Ranking of Angels' engagement in Mentoring.[1]
Commercialization	Ordinal	Ranking of Angels' support in Commercialization.[1]
Development	Ordinal	Ranking of Angels' support in production related tasks.[1]
		Investor behavior outcomes
Syndication	Binary	More than one Angel investor since foundation.
Syndicate Size	Count	Number of Angel investors since foundation.
		Firm characteristics
Opportunity	Binary	Startup was founded on a concrete business idea.
Female	Binary	At least one Female member in founding Team.
Founding Exp.	Binary	At least one member of founding Team had started a business before.
Team	Binary	Startup was founded by a Team.
Academic	Binary	At least one member of founding Team has academic background.
Industry Exp.	Count	Years of industry experience of founding Team.
Successful Exit	Binary	At least on member of founding Team has sold previous company.
Startup Age	Count	Age of the startup in reference year.
Size	Continuous	Number of full time equivalents employed at start of the company.
Patent	Binary	Business was started with at least one patent.
Region	Categorical	Location of startup: East/ West/ Berlin.
Industry	Categorical	Business sector of startup: Hightech Manufacturing/ Software & Technical Service/ Non-Hightech.

[1] Based on five point Likert Scale, no engagement (1) – very active (5)

C Matching Results

Angel financing

Table C.3: Results of Entropy Balancing (Panel B).

	Panel B: Non-matched							
	Treated Post N=1035		**Treated Pre** N=609		**Control Post** N=305		**Control Pre** N=633	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.52	0.50	0.34	0.47	0.31	0.47	0.51	0.50
Academic	0.78	0.42	0.55	0.50	0.46	0.50	0.74	0.44
Industry Exp.	15.30	10.15	14.34	10.33	15.22	9.51	15.14	9.92
Size at Start	2.67	2.25	2.32	1.99	3.34	6.42	2.62	2.42
Startup Age	2.32	1.72	1.95	1.62	2.78	2.26	2.49	2.02
Founding Exp.	0.59	0.49	0.52	0.50	0.32	0.47	0.54	0.50
Successful Exit	0.15	0.35	0.12	0.33	0.08	0.27	0.09	0.29
Opportunity	0.53	0.50	0.45	0.50	0.39	0.49	0.58	0.49
Female	0.13	0.34	0.20	0.40	0.21	0.41	0.16	0.37
Region								
West	0.81	0.39	0.87	0.33	0.86	0.35	0.78	0.41
East	0.11	0.31	0.08	0.27	0.11	0.31	0.15	0.35
Berlin	0.08	0.27	0.05	0.22	0.03	0.17	0.07	0.26
	Panel B: Matched							
	Treated Post N=1035		**Treated Pre** N=609		**Control Post** N=305		**Control Pre** N=633	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.52	0.50	0.52	0.50	0.52	0.50	0.52	0.50
Academic	0.78	0.42	0.78	0.42	0.78	0.42	0.78	0.42
Industry Exp.	15.30	10.15	15.30	10.75	15.30	10.50	15.30	10.04
Size at Start	2.67	2.25	2.67	2.27	2.68	2.42	2.67	2.44
Startup Age	2.32	1.72	2.32	1.71	2.32	2.19	2.32	1.97
Founding Exp.	0.59	0.49	0.59	0.49	0.59	0.49	0.59	0.49
Successful Exit	0.15	0.35	0.15	0.35	0.15	0.35	0.15	0.35
Opportunity	0.53	0.50	0.53	0.50	0.53	0.50	0.53	0.50
Female	0.13	0.34	0.13	0.34	0.13	0.34	0.13	0.34
Region								
West	0.81	0.39	0.81	0.39	0.81	0.39	0.81	0.39
East	0.11	0.31	0.11	0.31	0.11	0.31	0.11	0.31
Berlin	0.08	0.27	0.08	0.27	0.08	0.27	0.08	0.27

Non-Matched shows the means and standard errors of the treatment group and control groups. **Matched** shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.4: Results of Propensity Score Balancing (Panel B).

	Panel B: Matched							
	Treated Post N=1035		**Treated Pre** N=608		**Control Post** N=300		**Control Pre** N=600	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.52	0.50	0.51	0.50	0.49	0.50	0.49	0.50
Academic	0.78	0.42	0.78	0.42	0.76	0.43	0.73	0.44
Industry Exp.	15.30	10.15	14.82	10.56	15.38	10.05	15.00	9.85
Size at Start	2.67	2.25	2.64	2.25	2.54	2.06	2.59	2.43
Startup Age	2.32	1.72	2.27	1.70	2.56	2.22	2.49	2.02
Founding Exp.	0.59	0.49	0.60	0.49	0.50	0.50	0.53	0.50
Successful Exit	0.15	0.35	0.15	0.35	0.08	0.28	0.08	0.27
Opportunity	0.53	0.50	0.51	0.50	0.57	0.50	0.57	0.50
Female	0.13	0.34	0.14	0.34	0.16	0.37	0.16	0.37
Region								
West	0.81	0.39	0.81	0.39	0.82	0.39	0.80	0.40
East	0.11	0.31	0.11	0.31	0.12	0.33	0.14	0.35
Berlin	0.08	0.27	0.08	0.27	0.06	0.23	0.06	0.25

Matched shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4

Table C.5: Results of Entropy Balancing (Panel C).

	Panel C: Non-matched							
	Treated Post N=313		**Treated Pre** N=266		**Control Post** N=247		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.36	0.48	0.40	0.49	0.40	0.49
Academic	0.80	0.40	0.53	0.50	0.50	0.50	0.65	0.48
Industry Exp.	15.23	10.31	15.38	10.56	15.42	9.25	14.42	9.53
Size at Start	2.63	1.78	2.64	2.28	3.61	6.89	2.59	2.65
Startup Age	2.29	1.65	2.17	1.64	3.02	2.32	2.44	2.02
Founding Exp.	0.58	0.49	0.50	0.50	0.36	0.48	0.47	0.50
Successful Exit	0.17	0.38	0.09	0.29	0.10	0.30	0.05	0.22
Opportunity	0.55	0.50	0.48	0.50	0.45	0.50	0.52	0.50
Female	0.15	0.36	0.20	0.40	0.24	0.43	0.17	0.38
Region								
West	0.81	0.39	0.86	0.35	0.83	0.38	0.81	0.40
East	0.10	0.29	0.09	0.29	0.14	0.35	0.14	0.35
Berlin	0.09	0.29	0.05	0.22	0.03	0.18	0.05	0.22
	Panel C: Matched							
	Treated Post N=313		**Treated Pre** N=266		**Control Post** N=247		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.51	0.50	0.51	0.50	0.51	0.50
Academic	0.80	0.40	0.80	0.40	0.80	0.40	0.80	0.40
Industry Exp.	15.23	10.31	15.23	10.50	15.23	9.55	15.23	9.65
Size at Start	2.63	1.78	2.63	2.03	2.64	2.19	2.63	2.40
Startup Age	2.29	1.65	2.29	1.65	2.29	2.18	2.29	1.95
Founding Exp.	0.58	0.49	0.58	0.49	0.58	0.49	0.58	0.50
Successful Exit	0.17	0.38	0.17	0.38	0.17	0.38	0.17	0.38
Opportunity	0.55	0.50	0.55	0.50	0.55	0.50	0.55	0.50
Female	0.15	0.36	0.15	0.36	0.15	0.36	0.15	0.36
Region								
West	0.81	0.39	0.81	0.39	0.81	0.39	0.81	0.39
East	0.10	0.29	0.10	0.29	0.10	0.29	0.10	0.30
Berlin	0.09	0.29	0.09	0.29	0.09	0.29	0.09	0.29

Notes: **Non-Matched** shows the means and standard errors of the treatment group and control groups. **Matched** shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.6: Results of Propensity Score Balancing (Panel C).

	Panel C: Matched							
	Treated Post N=312		**Treated Pre** N=266		**Control Post** N=236		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.50	0.50	0.40	0.49	0.40	0.49
Academic	0.79	0.40	0.79	0.41	0.64	0.48	0.65	0.48
Industry Exp.	15.27	10.31	15.54	10.49	14.55	8.96	14.37	9.54
Size at Start	2.64	1.79	2.59	1.95	2.55	2.08	2.58	2.61
Startup Age	2.29	1.65	2.34	1.67	2.49	2.19	2.44	2.02
Founding Exp.	0.58	0.49	0.57	0.50	0.47	0.50	0.47	0.50
Successful Exit	0.17	0.37	0.15	0.36	0.05	0.21	0.05	0.22
Opportunity	0.54	0.50	0.55	0.50	0.52	0.50	0.52	0.50
Female	0.15	0.36	0.15	0.36	0.19	0.39	0.17	0.38
Region								
West	0.81	0.39	0.83	0.37	0.81	0.39	0.81	0.40
East	0.10	0.30	0.09	0.29	0.15	0.36	0.15	0.35
Berlin	0.09	0.29	0.07	0.26	0.04	0.19	0.05	0.22

Matched shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.7: Results of Entropy Balancing (Panel D).

	Panel D: Non-matched							
	Treated Post N=313		**Treated Pre** N=214		**Control Post** N=167		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Total VC Amount (in logs)	11.86	1.69	10.82	1.53	10.04	1.33	10.43	1.56
Syndicate Size	2.42	2.69	1.57	1.26	1.41	0.98	1.61	1.38
Team	0.51	0.50	0.30	0.46	0.32	0.47	0.40	0.49
Academic	0.80	0.40	0.46	0.50	0.41	0.49	0.65	0.48
Industry Exp.	15.23	10.31	15.37	10.67	14.02	8.79	14.42	9.53
Size at Start	2.63	1.78	2.57	2.21	3.84	8.13	2.59	2.65
Startup Age	2.29	1.65	2.10	1.64	2.75	2.26	2.44	2.02
Founding Exp.	0.58	0.49	0.49	0.50	0.31	0.46	0.47	0.50
Successful Exit	0.17	0.38	0.10	0.30	0.07	0.26	0.05	0.22
Opportunity	0.55	0.50	0.44	0.50	0.36	0.48	0.52	0.50
Female	0.15	0.36	0.21	0.41	0.26	0.44	0.17	0.38
Region								
West	0.81	0.39	0.88	0.32	0.86	0.35	0.81	0.40
East	0.10	0.29	0.06	0.24	0.12	0.33	0.14	0.35
Berlin	0.09	0.29	0.06	0.23	0.02	0.15	0.05	0.22
	Panel D: Matched							
	Treated Post N=313		**Treated Pre** N=214		**Control Post** N=167		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Total VC Amount (in logs)	11.86	1.69	11.86	1.72	10.43	1.51	10.43	1.56
Syndicate Size	2.42	2.69	2.42	2.15	1.61	1.29	1.61	1.38
Team	0.51	0.50	0.51	0.50	0.40	0.49	0.40	0.49
Academic	0.80	0.40	0.80	0.40	0.65	0.48	0.65	0.48
Industry Exp.	15.23	10.31	15.23	11.13	14.42	8.75	14.42	9.53
Size at Start	2.63	1.78	2.63	1.82	2.59	2.06	2.59	2.65
Startup Age	2.29	1.65	2.29	1.61	2.44	2.12	2.44	2.02
Founding Exp.	0.58	0.49	0.58	0.49	0.47	0.50	0.47	0.50
Successful Exit	0.17	0.38	0.17	0.38	0.05	0.22	0.05	0.22
Opportunity	0.55	0.50	0.55	0.50	0.52	0.50	0.52	0.50
Female	0.15	0.36	0.15	0.36	0.17	0.38	0.17	0.38
Region								
West	0.81	0.39	0.81	0.39	0.81	0.40	0.81	0.40
East	0.10	0.29	0.10	0.30	0.14	0.35	0.14	0.35
Berlin	0.09	0.29	0.09	0.29	0.05	0.22	0.05	0.22

Non-Matched shows the means and standard errors of the treatment group and control groups. **Matched** shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.8: Results of Propensity Score Balancing (Panel D).

	Panel D: Matched							
	Treated Post N=303		**Treated Pre** N=214		**Control Post** N=160		**Control Pre** N=196	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Total VC Amount (in logs)	11.84	1.70	11.02	1.61	10.20	1.57	10.44	1.57
Syndicate Size	2.40	2.63	1.80	1.54	1.50	1.18	1.60	1.38
Team	0.49	0.50	0.48	0.50	0.41	0.49	0.39	0.49
Academic	0.79	0.41	0.79	0.41	0.65	0.48	0.64	0.48
Industry Exp.	15.12	10.13	15.11	10.99	14.12	8.86	13.96	9.28
Size at Start	2.64	1.81	2.51	1.79	2.56	2.06	2.60	2.63
Startup Age	2.27	1.63	2.23	1.60	2.54	2.17	2.45	2.03
Founding Exp.	0.56	0.50	0.57	0.50	0.46	0.50	0.46	0.50
Successful Exit	0.16	0.36	0.14	0.35	0.05	0.21	0.05	0.22
Opportunity	0.54	0.50	0.53	0.50	0.48	0.50	0.51	0.50
Female	0.16	0.37	0.16	0.37	0.18	0.38	0.18	0.39
Region								
West	0.83	0.37	0.84	0.37	0.83	0.37	0.81	0.39
East	0.07	0.26	0.07	0.26	0.12	0.32	0.14	0.35
Berlin	0.10	0.29	0.09	0.29	0.05	0.22	0.05	0.21

Matched shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.9: Results of Entropy Balancing (Panel D).

	Panel D: Non-matched							
	Treated Post N=313		**Treated Pre** N=214		**Control Post** N=167		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.30	0.46	0.32	0.47	0.40	0.49
Academic	0.80	0.40	0.46	0.50	0.41	0.49	0.65	0.48
Industry Exp.	15.23	10.31	15.37	10.67	14.02	8.79	14.42	9.53
Size at Start	2.63	1.78	2.57	2.21	3.84	8.13	2.59	2.65
Startup Age	2.29	1.65	2.10	1.64	2.75	2.26	2.44	2.02
Founding Exp.	0.58	0.49	0.49	0.50	0.31	0.46	0.47	0.50
Successful Exit	0.17	0.38	0.10	0.30	0.07	0.26	0.05	0.22
Opportunity	0.55	0.50	0.44	0.50	0.36	0.48	0.52	0.50
Female	0.15	0.36	0.21	0.41	0.26	0.44	0.17	0.38
Region								
West	0.81	0.39	0.88	0.32	0.86	0.35	0.81	0.40
East	0.10	0.29	0.06	0.24	0.12	0.33	0.14	0.35
Berlin	0.09	0.29	0.06	0.23	0.02	0.15	0.05	0.22
	Panel D: Matched							
	Treated Post N=313		**Treated Pre** N=214		**Control Post** N=167		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.51	0.50	0.40	0.49	0.40	0.49
Academic	0.80	0.40	0.80	0.40	0.65	0.48	0.65	0.48
Industry Exp.	15.23	10.31	15.23	10.95	14.42	8.89	14.42	9.53
Size at Start	2.63	1.78	2.63	1.98	2.59	2.17	2.59	2.65
Startup Age	2.29	1.65	2.29	1.62	2.44	2.15	2.44	2.02
Founding Exp.	0.58	0.49	0.58	0.49	0.47	0.50	0.47	0.50
Successful Exit	0.17	0.38	0.17	0.38	0.05	0.22	0.05	0.22
Opportunity	0.55	0.50	0.55	0.50	0.52	0.50	0.52	0.50
Female	0.15	0.36	0.15	0.36	0.17	0.38	0.17	0.38
Region								
West	0.81	0.39	0.81	0.39	0.81	0.40	0.81	0.40
East	0.10	0.29	0.10	0.30	0.14	0.35	0.14	0.35
Berlin	0.09	0.29	0.09	0.29	0.05	0.22	0.05	0.22

Notes: **Non-Matched** shows the means and standard errors of the treatment group and control groups. **Matched** shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.10: Results of Propensity Score Balancing (Panel D).

	Panel D: Matched							
	Treated Post N=305		**Treated Pre** N=210		**Control Post** N=159		**Control Pre** N=200	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.50	0.50	0.49	0.50	0.43	0.50	0.40	0.49
Academic	0.79	0.41	0.80	0.40	0.68	0.47	0.66	0.48
Industry Exp.	15.24	10.33	14.99	11.05	14.10	8.76	14.14	9.18
Size at Start	2.64	1.80	2.60	1.81	2.57	2.00	2.49	2.12
Startup Age	2.27	1.65	2.30	1.57	2.53	2.13	2.43	2.02
Founding Exp.	0.57	0.50	0.58	0.50	0.45	0.50	0.47	0.50
Successful Exit	0.16	0.37	0.16	0.37	0.04	0.21	0.05	0.22
Opportunity	0.54	0.50	0.48	0.50	0.50	0.50	0.52	0.50
Female	0.15	0.36	0.13	0.34	0.16	0.37	0.18	0.38
Region								
West	0.82	0.39	0.87	0.34	0.81	0.39	0.81	0.39
East	0.09	0.28	0.06	0.24	0.13	0.34	0.14	0.35
Berlin	0.10	0.29	0.07	0.26	0.05	0.23	0.05	0.22

Matched shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.11: Results of Entropy Balancing (Panel E).

	Panel E: Non-matched							
	Treated Post N=313		**Treated Pre** N=45		**Control Post** N=53		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.67	0.48	0.72	0.45	0.40	0.49
Academic	0.80	0.40	0.87	0.34	0.83	0.38	0.65	0.48
Industry Exp.	15.23	10.31	15.67	10.31	18.68	10.00	14.42	9.53
Size at Start	2.63	1.78	2.74	1.72	3.28	3.25	2.59	2.65
Startup Age	2.29	1.65	2.56	1.69	3.36	2.26	2.44	2.02
Region								
West	0.81	0.39	0.78	0.42	0.77	0.42	0.81	0.40
East	0.10	0.29	0.20	0.40	0.19	0.39	0.14	0.35
Berlin	0.09	0.29	0.02	0.15	0.04	0.19	0.05	0.22
	Panel E: Matched							
	Treated Post N=313		**Treated Pre** N=45		**Control Post** N=53		**Control Pre** N=201	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.51	0.51	0.51	0.50	0.51	0.50
Academic	0.80	0.40	0.80	0.41	0.80	0.41	0.80	0.40
Industry Exp.	15.23	10.31	15.23	10.16	15.24	9.77	15.23	9.56
Size at Start	2.63	1.78	2.63	1.83	2.64	2.70	2.63	2.26
Startup Age	2.29	1.65	2.29	1.56	2.29	2.00	2.29	1.98
Region								
West	0.81	0.39	0.81	0.40	0.81	0.40	0.81	0.39
East	0.10	0.29	0.10	0.30	0.10	0.30	0.10	0.30
Berlin	0.09	0.29	0.09	0.29	0.09	0.29	0.09	0.29

Non-matched shows the means and standard errors of the treatment group and control groups. **Matched** shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

Table C.12: Results of Propensity Score Balancing (Panel E).

	Panel E: Matched							
	Treated Post N=313		**Treated Pre** N=45		**Control Post** N=52		**Control Pre** N=197	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Team	0.51	0.50	0.54	0.50	0.44	0.50	0.40	0.49
Academic	0.80	0.40	0.84	0.38	0.72	0.45	0.67	0.47
Industry Exp.	15.23	10.31	15.37	10.36	14.08	8.75	14.65	9.43
Size at Start	2.63	1.78	2.51	1.66	2.48	2.84	2.62	2.67
Startup Age	2.29	1.65	2.57	1.66	3.18	2.07	2.48	2.01
Region								
West	0.81	0.39	0.76	0.43	0.85	0.36	0.80	0.40
East	0.10	0.29	0.21	0.41	0.13	0.34	0.15	0.36
Berlin	0.09	0.29	0.03	0.18	0.02	0.13	0.05	0.22

Matched shows the means and standard errors after balancing weights obtained from the matching procedure described in Section 3.4.

D Results

Angel financing

Table D.13: Estimated effect of investor subsidy on financing decision

	Panel A					
	Unbalanced		Entropy Balanced		PS Balanced	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible × Post	0.043***	0.043***	0.032***	0.034***	0.035***	0.035***
	(0.009)	(0.009)	(0.011)	(0.011)	(0.010)	(0.010)
Eligible	0.012*	-0.008	0.010	-0.011	0.007	0.006
	(0.006)	(0.008)	(0.008)	(0.010)	(0.007)	(0.007)
Post	-0.002	-0.015	0.006	-0.010	0.006	-0.006
	(0.006)	(0.016)	(0.008)	(0.018)	(0.008)	(0.018)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE		Yes		Yes		Yes
Region FE		Yes		Yes		Yes
Industry FE		Yes		Yes		Yes
Number of Obs.	13,659	13,659	13,659	13,659	13,629	13,629
R2	0.01	0.01	0.01	0.01	0.01	0.01

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table D.13 shows the average effect of the Angel investor grant on the likelihood to raise venture capital from an Angel investor. Panel A contains all startups in the IAB/ZEW Startup Panel for which we have full information. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Coefficients are estimated using ordinary least squares.
Columns (1) and (2) do not balance the covariate distribution and use unit weights for the calculation of equation (2). Columns (3) and (4) use Entropy Balancing to balance the covariate distribution. Columns (5) and (6) use Propensity Score Matching to balance the covariate distribution, with the weights specified in Section 3.4. The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region.

Managerial support

Table D.14: Managerial support activities.

	Panel D: unbalanced				
	(1) Board	(2) Mentoring	(3) Network	(4) Commercialization	(5) Development
Eligible × Post	0.044	0.038	0.156	-0.005	0.073
	(0.167)	(0.141)	(0.149)	(0.150)	(0.158)
Eligible	0.331***	0.136	0.186*	0.083	0.142
	(0.124)	(0.107)	(0.110)	(0.111)	(0.112)
Post	0.173	0.079	0.215*	0.093	0.135
	(0.110)	(0.105)	(0.110)	(0.109)	(0.112)
Constant	Yes	Yes	Yes	Yes	Yes
Number of Firms	895	895	895	895	895
R2	0.03	0.01	0.04	0.00	0.01

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table D.14 shows the average effect of the Angel investor grant on the level of managerial support from Angel investors. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) do not balance the covariate distribution and use unit weights for the calculation of equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Total VC Amount (log), Syndicate Size.

Table D.15: Managerial support activities.

	Panel D: unbalanced				
	(1) Board	(2) Mentoring	(3) Network	(4) Commercialization	(5) Development
Eligible × Post	0.022	0.071	0.154	0.038	0.092
	(0.168)	(0.144)	(0.152)	(0.153)	(0.164)
Eligible	0.060	0.048	0.011	0.003	0.125
	(0.133)	(0.117)	(0.128)	(0.123)	(0.130)
Post	0.418	0.220	0.153	0.223	0.402
	(0.379)	(0.267)	(0.298)	(0.314)	(0.383)
Constant	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	895	895	895	895	895
R2	0.08	0.05	0.07	0.05	0.05

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table D.15 shows the average effect of the Angel investor grant on the level of managerial support from Angel investors. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) do not balance the covariate distribution and use unit weights for the calculation of equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Total VC Amount (log), Syndicate Size.

Table D.16: Managerial support activities.

	Panel D: entropy balanced				
	(1) Board	(2) Mentoring	(3) Network	(4) Commercialization	(5) Development
Eligible × Post	-0.373	0.075	0.134	0.002	-0.037
	(0.263)	(0.173)	(0.198)	(0.177)	(0.172)
Eligible	0.300**	0.056	0.034	0.100	0.203*
	(0.151)	(0.122)	(0.137)	(0.126)	(0.109)
Post	0.590**	0.041	0.236	0.087	0.245*
	(0.231)	(0.146)	(0.170)	(0.144)	(0.131)
Constant	Yes	Yes	Yes	Yes	Yes
Number of Firms	895	895	895	895	895
R2	0.02	0.00	0.02	0.00	0.01

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table D.16 shows the average effect of the Angel investor grant on the level of managerial support from an Angel investor. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) use Entropy Balancing to balance the covariate distribution and the calculation for the weights in equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Total VC Amount (log), Syndicate Size.

Table D.17: Managerial support activities.

	Panel D: ps balanced				
	(1) Board	(2) Mentoring	(3) Network	(4) Commercialization	(5) Development
Eligible × Post	-0.343	-0.002	0.184	-0.040	-0.040
	(0.260)	(0.175)	(0.185)	(0.180)	(0.188)
Eligible	0.293*	0.069	0.053	0.150	0.209*
	(0.154)	(0.120)	(0.138)	(0.119)	(0.112)
Post	0.530**	0.112	0.164	0.134	0.250*
	(0.227)	(0.147)	(0.155)	(0.147)	(0.151)
Constant	Yes	Yes	Yes	Yes	Yes
Number of Firms	874	874	874	874	874
R2	0.02	0.00	0.02	0.01	0.01

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table D.17 shows the average effect of the Angel investor grant on the level of managerial support from Angel investors. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) use Propensity Score Matching to balance the covariate distribution and calculate the weights specified in Section 3.4 for the calculation in equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Total VC Amount (log), Syndicate Size.

Table D.18: Managerial support activities.

	Panel D: ps balanced				
	(1) Board	(2) Mentoring	(3) Network	(4) Commercialization	(5) Development
Eligible × Post	-0.234	0.054	0.160	-0.004	-0.064
	(0.229)	(0.171)	(0.183)	(0.180)	(0.186)
Eligible	0.289*	0.037	0.054	0.100	0.192
	(0.160)	(0.121)	(0.135)	(0.117)	(0.120)
Post	0.580	0.284	0.199	0.342	0.820*
	(0.465)	(0.303)	(0.321)	(0.343)	(0.443)
Constant	Yes	Yes	Yes	Yes	Yes
Founding Cohort FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	874	874	874	874	874
R2	0.10	0.05	0.06	0.06	0.07

Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table D.18 shows the average effect of the Angel investor grant on the level of managerial support from Angel investors. Panel C contains startups that raised venture capital from Angel investors or venture capital funds, but not both. Eligible are startups that operate in one of the industries that qualify for the grant, listed in Table A.1. Post is the observation period after 2013, when the Angel investor grant was introduced. Angel are startups that raised venture capital from Angel investors, but not venture capital funds. Coefficients are estimated using ordinary least squares.
Columns (1)-(5) use Propensity Score Matching to balance the covariate distribution and calculate the weights specified in Section 3.4 for the calculation in equation (2). The *Balancing Covariates include:* Team, Female, Academic, Industry Exp., Opportunity, Founding Exp., Startup Age, Size, Region, Total VC Amount (log), Syndicate Size.

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